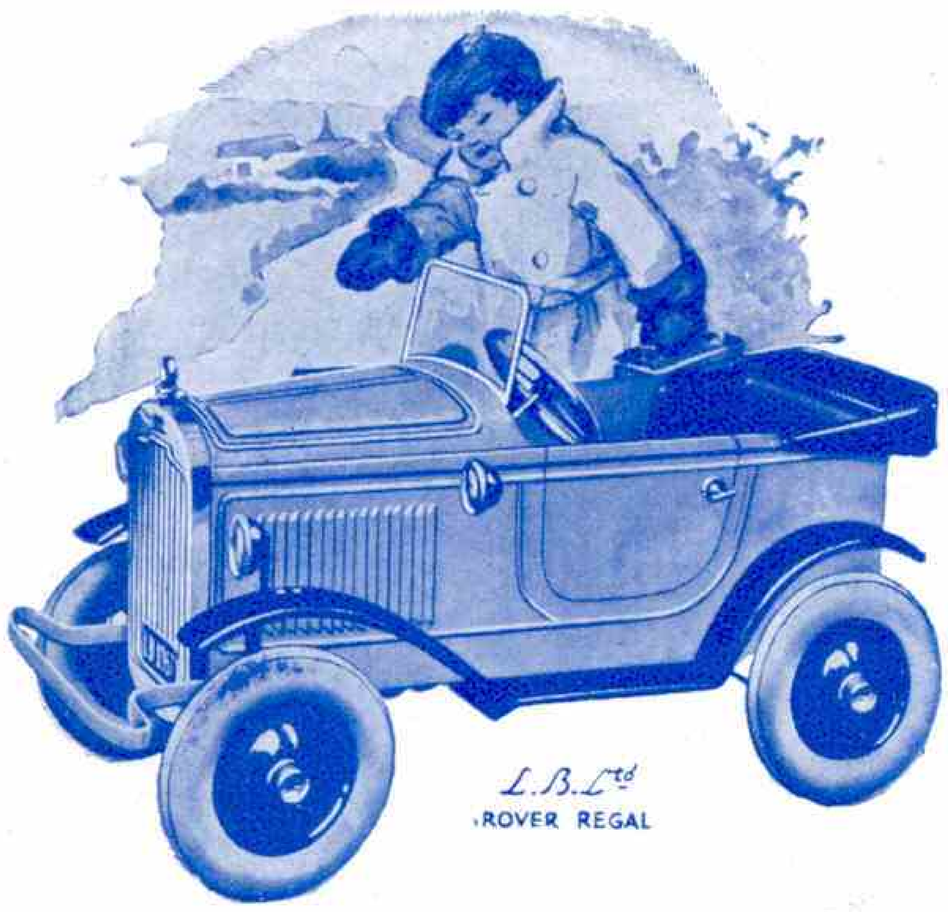
VOL. XVI. No. 12 DECEMBER 1931

MECCANO MAGAZINE

A REMARKABLE DRILLING MACHINE (see page 946)

Toy Cars with the real car look!



If you want the most realistic toy motor, built on sound engineering principles and fitted with really correct radiator, insist on a TRI-ANG (Regd. Trade Mark) car. The new models shown here are all wonderfully life-like productions, having pressed steel bodies with opening side doors, facsimile nickel-plated radiators, and adjustable tubular framed windscreens. They are easily propelled by improved double crank drive with rubber pedals, and will stand up to really hard usage. The glossy enamel gives a finishing touch to TRI-ANG (Regd. Trade Mark) cars which puts them in a class by themselves. See the famous Tri-ang trade mark before you buy!

ROVER REGAL *is suitable for children 4-8 years old. Ball-bearing back axle to double crank drive. Adjustable windscreen, dummy hood, upholstered seat, bumper, 4 lamps, balloon disc wheels with rubber tyres.* **42/-**

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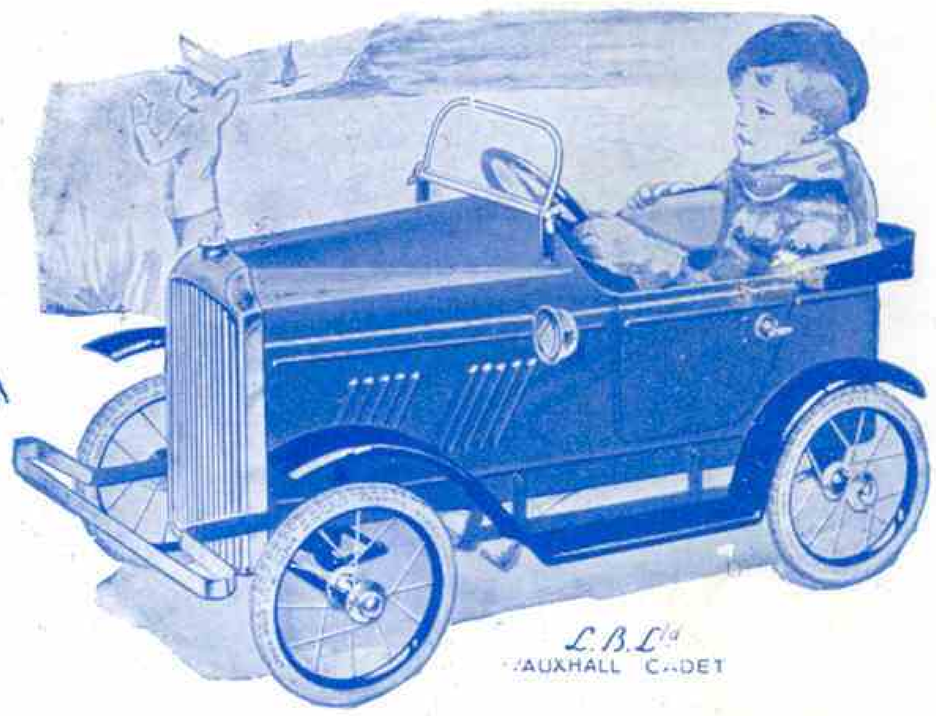
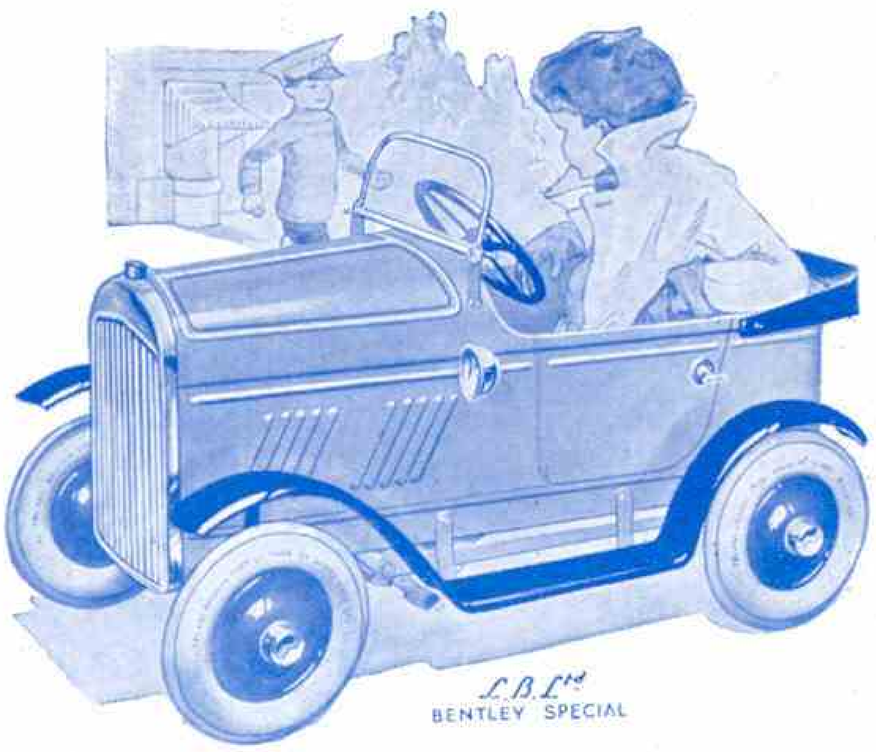
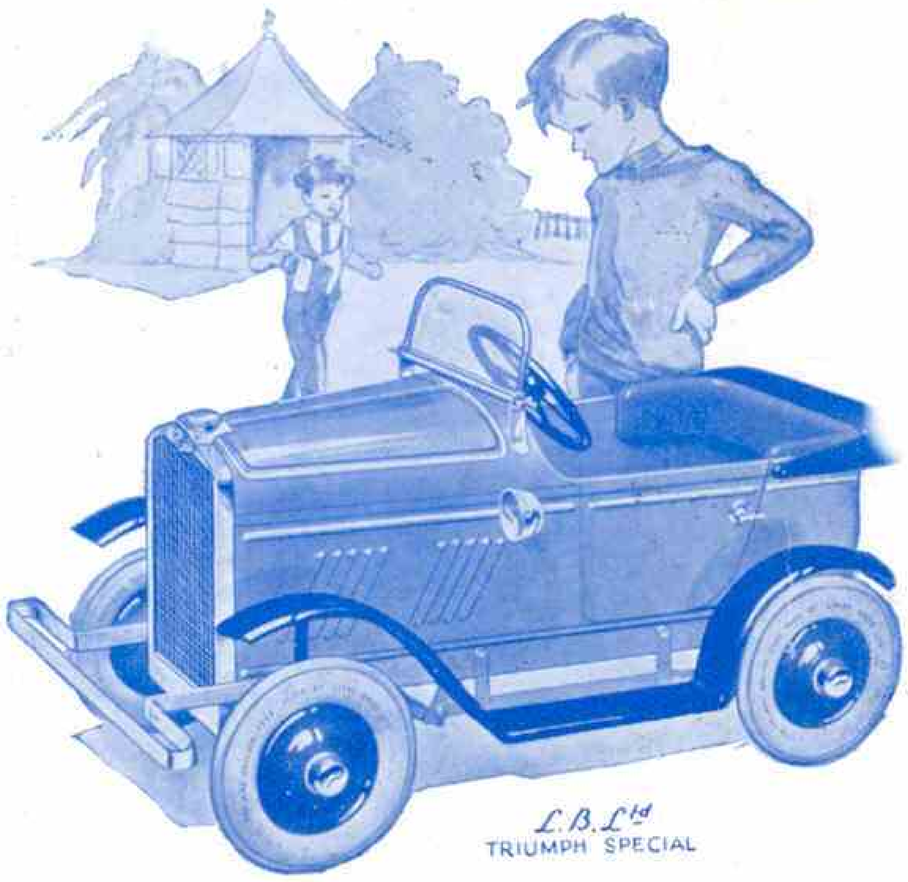


VAUXHALL CADET.—*For ages 2½-5 years. Pressed steel body, beautifully finished royal blue. Facsimile Vauxhall radiator, adjustable screen, nickel-plated bumper, side door, dummy hood.* **35/-**



BENTLEY SPECIAL.—*Plated Bentley radiator, adjustable windscreen, side door, 8" balloon wheels. Upholstered back, dummy hood. Mudguards and steps. Finished blue. For kiddies 2½-5 years.* **25/6**



TRIUMPH SPECIAL.—*Correct model of Triumph radiator with badge and cap. Adjustable tubular framed screen. Pressed steel body, opening side door. 8" balloon wheels, ½" rubber tyres. Upholstered back, dummy hood. Painted beige, red lines. Ages 2½-5 years.* **29/6**

TRI-ANG

Regd. Trade Mark

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MECCANO MAGAZINE

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England

Vol. XVI. No. 12
December, 1931

With the Editor

Christmas Greetings To You All!

Once more I have the pleasant duty of wishing my readers in all parts of the world a "Very Merry Christmas." As the "*M.M.*" is published on the first day of each month, my greeting comes three weeks in advance; but most of us are already preparing for Christmas, and the days will fly like magic. The year has been one of great progress for Meccano and all its world-wide activities. Next month I hope to refer to this progress in detail, and to show how the boundaries of Meccanoland still continue to spread steadily outward.

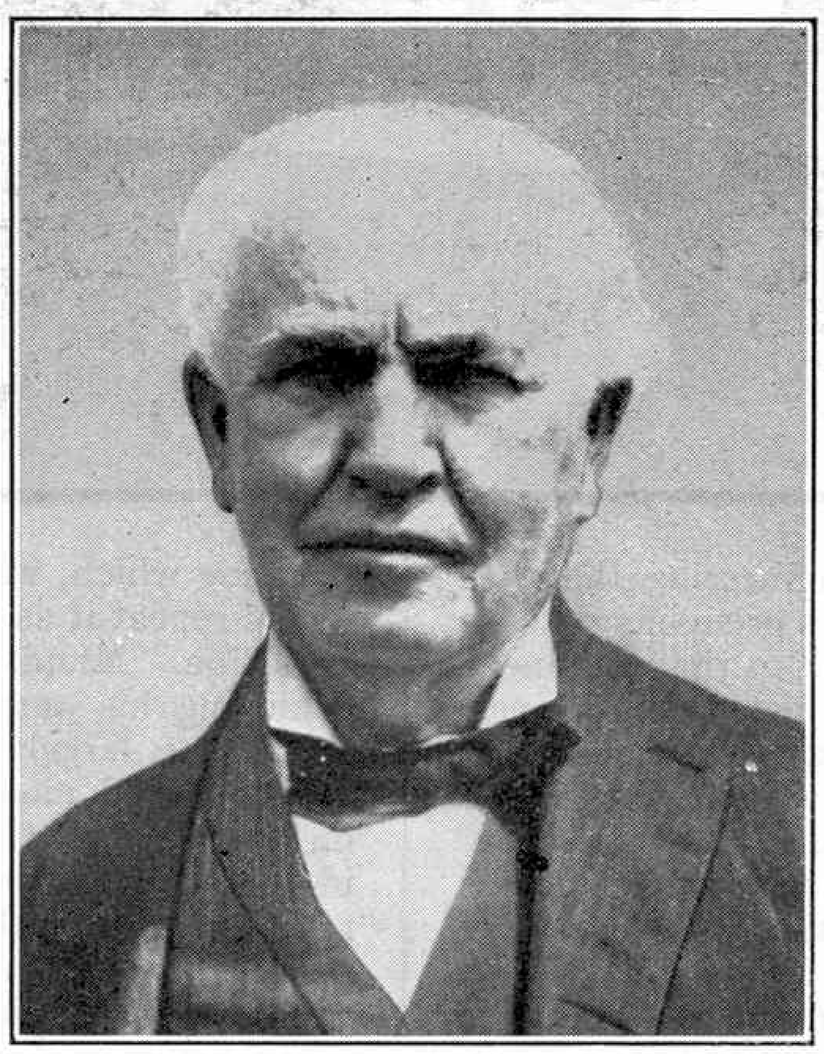
Mr. Frank Hornby, M.P.

I am sure that all readers will join with me in congratulating Mr. Frank Hornby, the inventor of Meccano and Managing Director of Meccano Ltd., on his election as Member of Parliament for the Everton Division of Liverpool. This country is now passing through a difficult period, in which it is more than ever necessary that the House of Commons should include representatives of the best business brains. From this point of view Mr. Hornby is an ideal Member. He has had a long and wide experience of trade and commerce, not only at home, but with practically every civilised country. He has a unique international reputation as the inventor of the world's greatest constructional toy, and the founder of a great British business. His knowledge of the trade and economic conditions of foreign countries has not been gained at second-hand, for he has travelled widely on the Continent, and has made no less than 60 crossings of the Atlantic. A few years ago, with the object of increasing still further his knowledge of nations and their people, he made a journey round the world. Many readers will remember the account of this journey he wrote for the "*M.M.*," and his splendid descriptions of scenes of everyday life and activity in Japan, China, Singapore, Java, Burma, India and elsewhere.

Mr. Hornby has always been keenly interested in the development of the British Empire, and in the closer co-operation of its many units with the Mother Country. During his election campaign he adopted as his slogan, "Britain First. Empire Always!" and no words could better express his determination to take every possible step to develop still further the unity on which depends the prosperity of the Empire.

Buy British Goods!

There are now in this country something like 2,500,000 workpeople unemployed. There are various reasons for this state of affairs, but one of the most important is the fact that enormous quantities of foreign-made goods are bought by British people, to the neglect of home-produced products. To a large extent foreign goods are purchased deliberately on account of their cheapness, no thought being given to the disastrous effect that such a policy is bound to have on our home industries. In other cases purchasers accept an article merely because it happens to suit their particular purpose, without troubling to inquire whether it is British-made or not. During the present serious crisis it is the absolute duty of every British subject to buy British goods in preference to foreign, whenever this is at all possible. During the next three weeks "*M.M.*" readers will have a great opportunity of "doing their bit" in this direction. Large sums will be spent on toys and Christmas presents of all kinds, and if every "*M.M.*" reader will buy British-made goods himself, and as far as possible insist that his parents and uncles do the same, an important step will have been taken towards restoring British trade and thus reducing the terrible number of unemployed.



The late Thomas Alva Edison.

A Great Inventor

In the death of Thomas Alva Edison in his 85th year the world has lost one of its most remarkable figures. He was an inventor of a unique type, and one that possibly may not occur again. His name is closely associated with the development of electric lighting, and therefore it was a fitting tribute to his memory that was paid in New York when the whole of the electric lights throughout the city were switched off for a brief period on the evening following his funeral.

Edison displayed originality and enterprise from a very early age. As a boy he sold newspapers on trains in order to obtain money to buy chemicals and apparatus with which to carry out experiments. He even produced a journal of his own, which is believed to be the first newspaper ever printed on a train in motion. He used the proceeds to equip a small compartment on the train as a laboratory, and everything was proceeding smoothly when an explosion occurred, resulting in his forcible ejection by a guard, who naturally objected to such goings on! Edison's railway work led him to take an interest in telegraphy, and eventually in electricity generally. His first inventions were improvements in telegraphic instruments, and he devised a successful system of automatic telegraphy that was adopted in many countries, including Great Britain.

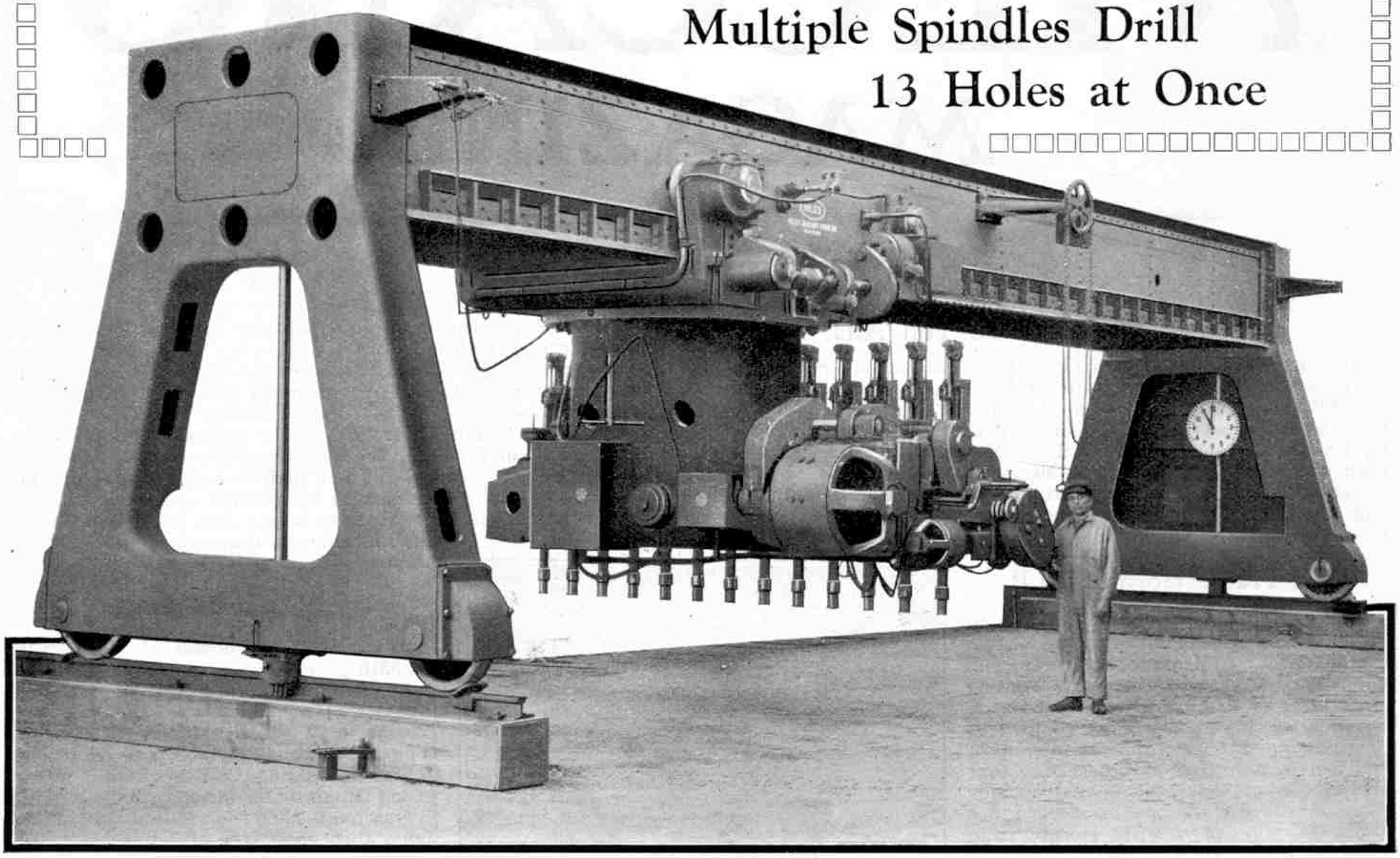
Edison is probably best known to the world in general as the inventor of the phonograph, and this is in some respects the most original of all his inventions. His very first model worked successfully, rather to his astonishment; and he is reported to have said that he was afraid of inventions that worked the very first time! With his characteristic tireless energy he developed the phonograph from a mere toy to a practical instrument that eventually led to the foundation of the modern gramophone industry.

As Edison grew older his interests widened, and his later inventions covered almost every branch of knowledge. For many years he took out patents at the almost incredible rate of two in every three weeks, and up to a few days before his death he remained keenly interested in the progress of a long series of experiments he had planned in the hope of producing a substitute for rubber from golden rod, a plant that grows readily in the United States.

The story of Edison's life and inventions will be told in a series of articles commencing in an early issue of the "*M.M.*"

Remarkable Drilling Machine

Multiple Spindles Drill 13 Holes at Once



The above illustration shows a general view, including housings, of the Multiple spindle Gantry Drilling Machine. The 13 spindles, which are at right angles to the girders, are driven by a 50 h.p. variable speed motor, having a speed range of from 500 to 1,500 r.p.m. We are indebted for our illustrations to Messrs. Niles-Bement-Pond Company, London.

THE enormous development of engineering that has taken place in the past 100 years or so has necessitated corresponding development in the machinery employed in preparing the component parts of machines, engines and structures of all kinds. Thus has been evolved the precision machine tool, without which the engineering operations of to-day could not be carried on.

We owe our modern machine tools to a small number of pioneers in the art of metal cutting, among whom may be named Maudslay, Whitworth, Clement, Fairbairn and Murray. Nasmyth said of Maudslay, who may be regarded as the father of the precision machine tool, that his character was to be seen in every piece of work he produced. He was a craftsman of the finest type, always striving after greater perfection of workmanship, and regarding first-rate work as an absolute duty. He expected an equally high standard from his workmen, and he would not allow any piece of work to leave his shop unless it fully satisfied his ideas of accuracy.

Even with the most highly-skilled craftsmen, however, it was an extremely difficult matter to produce a number of parts exactly alike in every detail. The human eye, hand and brain are ill-adapted for repetition work that must be accurate to a minute fraction of an inch. Maudslay realised this. He took the tool from the hand of the workman, and placed it in the grip of a machine which, when once adjusted to do a certain job, would repeat it as often as required without the slightest variation. Maudslay succeeded to a great extent in achieving his ambition to produce machine tools that should be largely self-acting and self-regulating, and which should make up for carelessness or lack of skill on the part of the workman. He is most commonly identified with the invention of the slide rest, which revolutionised lathe work in general.

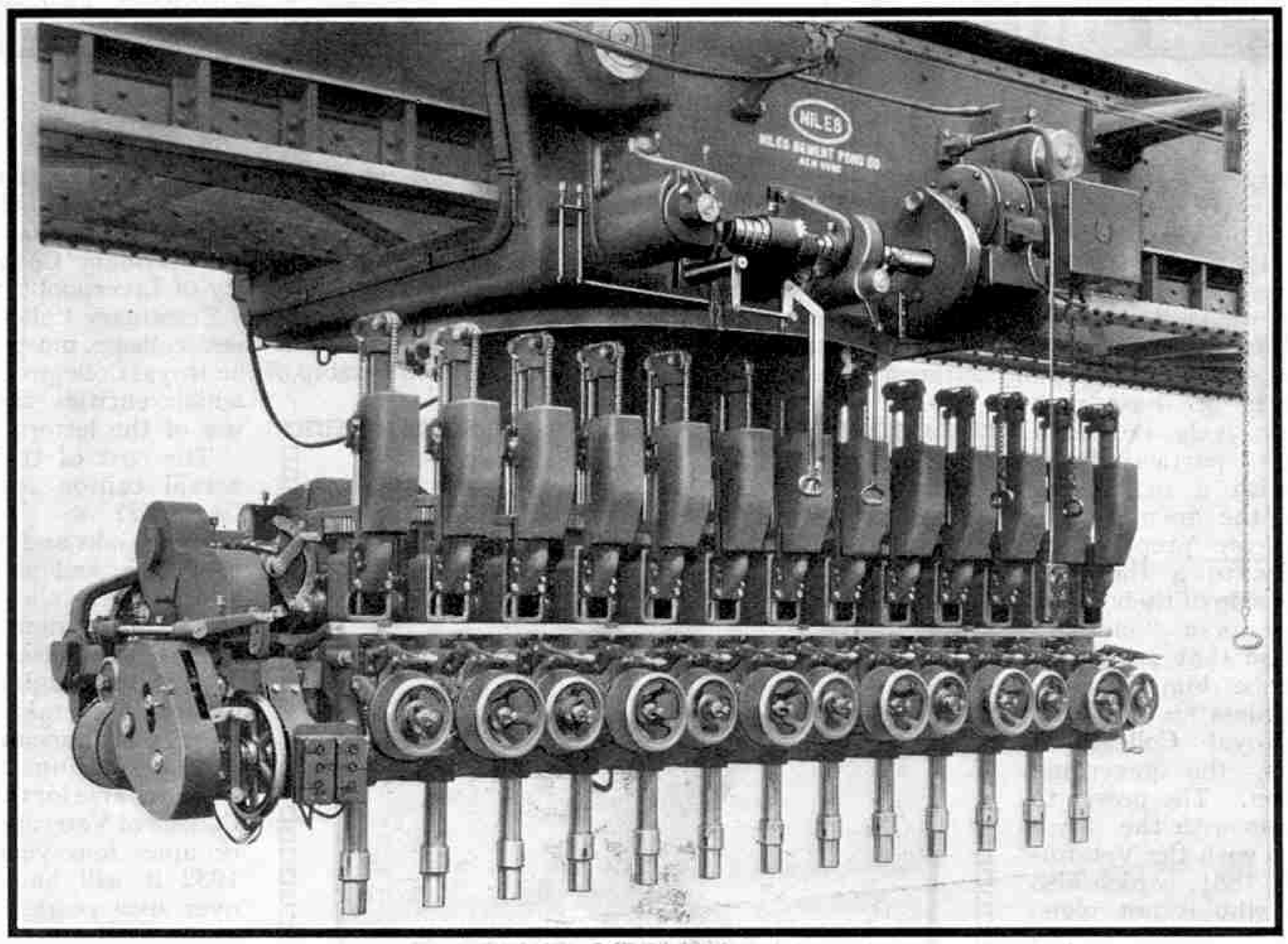
While these men were working on various engineering problems in England, progress along similar lines was being made in the United States, where in the year 1860 Francis Pratt and Amos Whitney formed a partnership for the manufacture of machine tools. Many people had theorised on the possibility of manufacturing various kinds of mechanisms made up of components that would be interchangeable. The idea had not been put into practice, however, and it was the aim of Pratt and Whitney to prove that the method of interchangeable manufacture was not only practicable, but also economical. They were able to demonstrate that rifles could be made on this basis, and the manufacture of sewing machines, typewriters, and a great variety of other mechanisms soon followed, all on the interchangeable system.

Among the most important of modern machine tools

are drilling machines, which are constructed in an astonishing variety of forms. There are all kinds of vertical, horizontal and radial drilling machines; and also multiple machines that have two or more drilling spindles in certain fixed positions, or in the same alignment.

A remarkable multiple gantry drill is shown on our cover this month, and in the accompanying illustrations. This drill was specially built for one of the largest American safe manufacturing companies by the Niles-Bement-Pond Company of New York and London. It is equipped with 13 spindles, and has sufficient power to drill 13 holes $1\frac{3}{4}$ in. in diameter, or to tap holes $1\frac{1}{4}$ in. in diameter, simultaneously.

As can be seen from the photographs, the drill consists of two double-webbed steel girders, riveted up, latticed and braced, spanning the shop bay, and supported at the ends by substantial cast iron housings; and a crossrail, on which are mounted 13 drill heads. The face of the crossrail is 19 in. The complete machine is mounted on a track, so that it can be traversed throughout the length of the shop bay. The track and the work-table for supporting the steel plates are not a part of the machine.



A closer view of the Drilling Machine showing the spindles parallel with the girders.

The spindles are of chrome nickel steel, mounted in independent cast iron heads on the crossrail. The heads are arranged in such a manner that all except one, which is fixed, may be moved independently or simultaneously along the crossrail by means of a screw extending the full length of the crossrail. There is a minimum centre distance of 8 in. between consecutive spindles, and the maximum distance between outside spindles is 12 ft. 8 in. The vertical adjustment is 13 in. The spindles are reversible by means of a 3 h.p. reversing motor and controller, and are equipped with ball thrust bearings protected by dust guards.

The spindles, which are 2 in. in diameter at the driving point, and $2\frac{1}{8}$ in. in diameter in bearing, are held positively in feed quills, the feed being positively connected by quick change gearing, giving four changes of feed to the spindles. Extra change gears are provided for tapping. A safety device is interposed in the feed gearing to come into operation in the event of any accident to the drills. This safety device is cut out for the tapping operation. Each spindle is provided with independent feed clutch, so that any one or more of the drills may be disengaged while the others are working.

Power rapid traverse in both directions is given to the spindles by a 3 h.p. motor. A double end clutch is provided at the operator's position, near the end of the crossrail. One end of this clutch has teeth to engage the feed, and the other end is of friction cone type to engage the rapid traverse. This arrangement of clutch makes it impossible to engage the feed and the rapid traverse at the same time, thus forming a safety device without interlocking levers.

The spindles are driven by a 50 h.p. variable speed motor, having a speed range of from 500 to 1,500 r.p.m. The motor is mounted on the crossrail, and directly connected by a train of gearing to a horizontal shaft extending the full length of the crossrail. The power is transmitted from this shaft to the spindles by means of bevel gears, vertical shafts, pinions and spur gears on each head. The spindle speeds for drilling range from 120 to 360 r.p.m. In addition a set of back gears is provided in the driving train, giving speeds for tapping ranging from 35 to 105 r.p.m.

The crossrail is supported by a carriage suspended from the steel girders on four semi-steel rollers equipped with roller bearings. These rollers run on a track provided on the girders, so that the carriage may be traversed on the track throughout the length of the girders. The crossrail is pivoted on the carriage, thus permitting it to be swivelled a full revolution, and making it possible to drill rows of holes along the edges of plates in any direction. A 5 h.p. constant speed reversible motor revolves the crossrail on the carriage, and traverses the carriage on the girder at a speed of 40 ft. per minute. The face of the crossrail is provided with a graduated scale along its full length for setting the drill heads. Clamping facilities are provided for both carriage and crossrail, and there are also stops on the carriage for each quarter turn of the crossrail.

The distance from the floor plate to the underside of the girder is 8 ft. $10\frac{1}{2}$ in.; and from the floor plate to the top of the girder is 12 ft. $6\frac{3}{4}$ in. The minimum distance from the centre of the drills to the inside of the housings is 2 ft. 10 in. It will be observed from the illustrations that the housings are of massive box section, bolted at the top to the steel girders, and supported on the shop track by flanged semi-steel wheels. The machine is traversed by a 10 h.p. motor mounted on the girder, and its power is transmitted through shafts, gearing, and tangent gearing to rack pinions engaging racks bolted to the rails on which the machine travels. The traversing speeds of the machine range (*Continued on page 977*)

XXVI.—A VETERINARY SURGEON

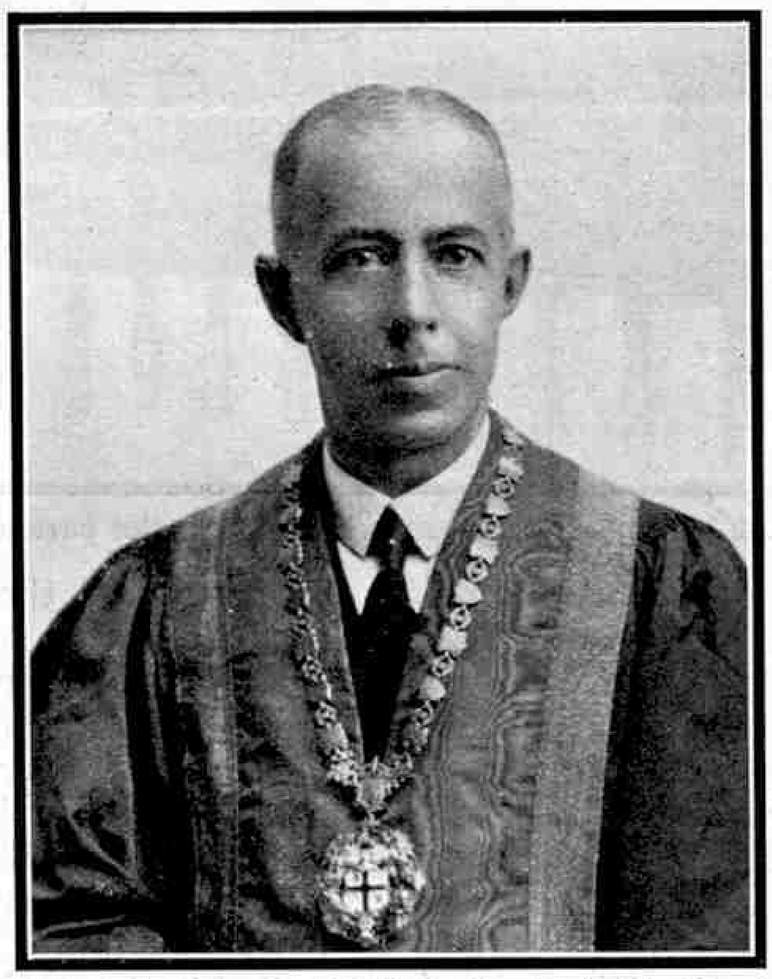
VETERINARY surgery is one of the few professions in which the number of entries has shown a considerable decline in recent years. This decline is probably due to the belief that the expansion in motor traffic and similar changes have reduced the prospects of success in the profession. The belief is a mistaken one, however, for the decline in importance of the horse is being at least partially counteracted by the growing demand for the services of the veterinary surgeon in other directions. The prospects of those now entering this comparatively neglected profession are bright, particularly if they approach it with a real liking for animals and for the open air life that it entails, and are prepared to devote their energies to a thorough study of the scientific side of their work.

Veterinary surgery is a "closed" profession in the sense that no person is entitled to describe himself as a veterinary surgeon unless he holds the diploma of the Royal College of Veterinary Surgeons, the governing body of the profession. The power to grant registration rests with the Royal College in accordance with the Veterinary Surgeons Acts of 1881, which also enacts that anyone who is not registered is not entitled to recover at law any fees that he may have charged for veterinary attendance or advice.

A good general education is essential for a veterinary surgeon, and those who intend to follow this career on leaving school should aim first at obtaining the matriculation certificate. It is not absolutely necessary to secure this certificate in order to enter the profession, as the possession of a School Certificate with four credits, or proof of having passed an examination of equal standing, is sufficient in certain instances. Those who wish to reach the higher ranks must take the matriculation examination, however, for this is the first step towards securing a university degree in veterinary surgery. Others also should take it unless they are prepared to remain at school in order to sit for the Higher School Certificate examination, for the training they receive will be of value to them in their later studies.

English, mathematics and one language, which may be Latin, or Greek, or French, German or any other approved modern language, must be included in the subjects of the chosen preliminary examination. A second language also may be taken, the alternatives to this being higher mathematics, geography and a branch of science. A sound elementary knowledge of chemistry, physics and biology also should be obtained. For this reason it is advisable to stay at school after passing the preliminary examination and to study these subjects to the Higher School Certificate standard, for preparation of this kind will form a valuable foundation for later instruction. It may be pointed out that a student cannot become a member of the Royal College of Veterinary Surgeons until he has attained the age of 21, and little is gained by taking up higher studies at the earliest possible moment.

President of the R.C.V.S.



Mr. G. P. Male, M.R.C.V.S., the President of the Royal College of Veterinary Surgeons, which received its Charter of Incorporation in 1844. Mr. Male is also Lecturer in Veterinary Hygiene at the University of Reading.

When a boy who intends to become a veterinary surgeon leaves school he may receive his professional education at one of five veterinary colleges. These are the Royal Veterinary College, London; the Royal (Dick) Veterinary College, Edinburgh; the Veterinary School, University of Liverpool; the Glasgow Veterinary College; and the Royal Veterinary College of Ireland, Dublin. All students who attend these colleges must aim at obtaining the diploma of membership of the Royal College of Veterinary Surgeons, which entitles the recipient to make use of the letters M.R.C.V.S.

The cost of training varies, but the actual tuition fees may be taken as from £27 to £30 per annum. The cost of books and instruments, examination fees and subscriptions to social and athletic clubs must be added to this, and students who are unable to live at home also will have the expense of suitable lodgings. The general cost of training, taking all these circumstances into account, may be placed at £150 per annum to £200 per annum.

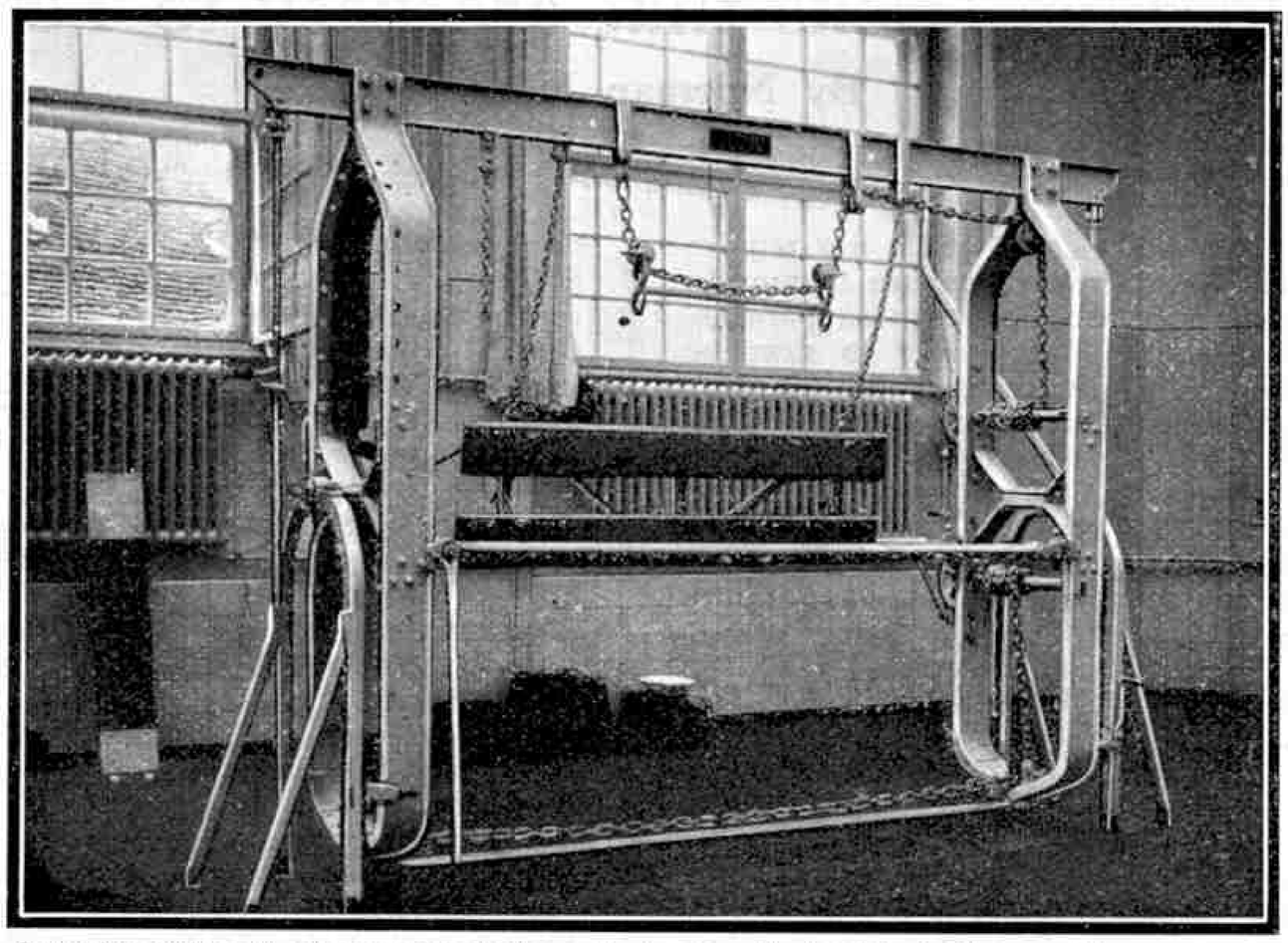
The course for the diploma of the Royal College of Veterinary Surgeons at present occupies four years, but in October of 1932 it will be lengthened to extend over five years. The student should apply to the Royal College for registration before commencing his course. In the first year, chemistry, physics, zoology and botany are studied. The scientific subjects underlying the practice of medicine—including anatomy, physiology, pathology, materia medica and hygiene—are dealt with in succeeding years, and in the final year the theory and practice of veterinary medicine and surgery are studied. Practical work naturally plays a great part in the training. A proportion of the student's time is spent in animal hospitals attached to the colleges, and experience with a veterinary surgeon should be gained during vacations.

Under certain conditions university graduates are excused the first year of the usual course of training, and this privilege also may be granted to matriculated students who have passed with honours an approved examination in chemistry, physics, botany and zoology. On the completion of each year of training, the student at a Veterinary College is required to pass an examination conducted by a Court appointed by the Royal College. Examinations of this kind are held twice yearly, in July and December; failure in more than one subject involves taking the entire examination a second time. When a student has satisfactorily completed the course and passed the requisite examination he is entitled to his diploma.

Membership of the Royal College of Veterinary Surgeons is a sufficient qualification for practice, but it also is advisable to take a degree in veterinary surgery, for although this is not in itself a qualification, the more advanced instruction given in preparation for it is of great value to a veterinary surgeon who is really keen and desires to make good in the profession. Degrees are granted by the Universities of London, Edinburgh and Liverpool. As

far as possible, the courses of training are arranged to run concurrently with the preparation for the diploma of the Royal College and the fees involved in the double course of study are slightly higher than if membership of the Royal College only is aimed at.

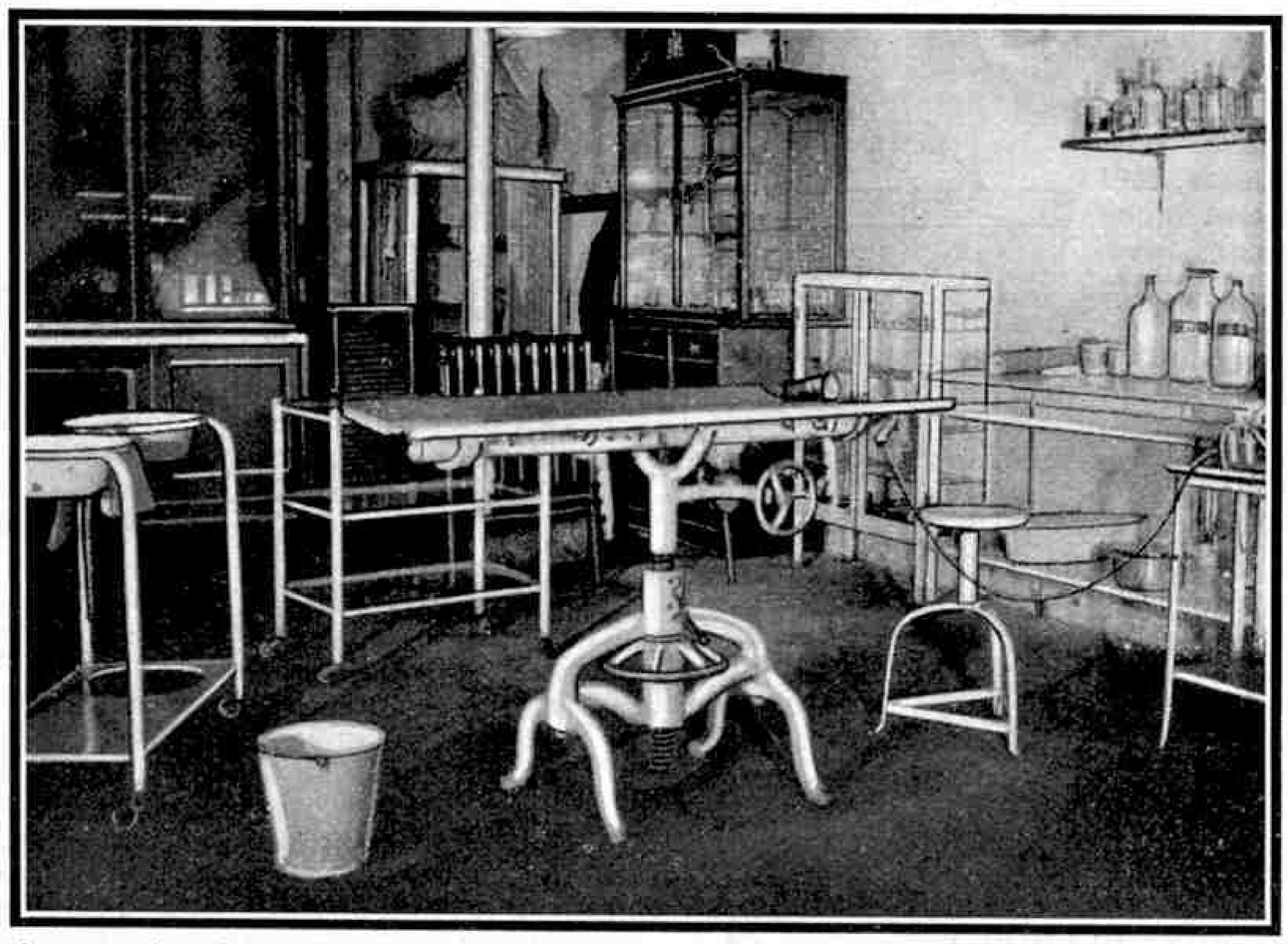
The cost of training may be reduced considerably by means of scholarships and bursaries. Some are tenable only at particular colleges, while others are granted by the Ministry of Agriculture and the Colonial Office. Full details of these scholarships may be obtained from the Registrars of the Universities and Colleges concerned, or from a list contained in a booklet, issued by the Royal College of Veterinary Surgeons, that deals with courses qualifying for the diploma and other degrees in veterinary surgery. This booklet may be obtained on application to the Secretary and Registrar, Royal College of Veterinary Surgeons, 10, Red Lion Square, London, W.C.1.



Operating table used when horses are the patients. For the two illustrations on this page we are indebted to the courtesy of Professor F. T. G. Hobday, of the Royal Veterinary College.

In general there are two courses open to the qualified veterinary surgeon. He may take up an official appointment or he may enter into private practice. In each case additional experience is advisable, and this should be gained by service in a veterinary hospital attached to a veterinary school, or as assistant to a veterinary surgeon already in practice. An alternative that is particularly useful for those who wish to take up an official post is to follow a course of post-graduate training. This may be taken up with a view to obtaining the diploma of Fellowship of the Royal College of Veterinary Surgeons or the Diploma in Veterinary State Medicine, an award that is intended as a qualification for those who propose to take up official appointments. Similar diplomas are granted by Liverpool and Manchester Universities and valuable post-graduate scholarships are awarded at these institutions, and also by the Royal College of Veterinary Surgeons and the Royal (Dick) College, Edinburgh, these being chiefly intended for those engaged in research work.

Private practice in large towns usually is more remunerative than in the country. It is more general in character, and certain branches, such as the treatment of smaller animals and domestic pets, appear to offer suitable opportunities for women practitioners. Veterinary surgeons who are particularly interested in horses probably would find profitable occupation in centres devoted to racing or hunting, while their services may be found useful in agricultural districts where machinery has not yet displaced horses. In the country veterinary surgeons are chiefly required for work in connection with farm animals, and it is probable that for many years the best openings for general practitioners in this profession will be found in cattle-raising areas. To-day strenuous efforts are being made to eradicate diseases that for centuries have affected cattle, sheep, pigs and other farm animals, and the services of fully qualified veterinary surgeons are required in connection with the schemes of control that have been introduced for this purpose under the Diseases of Animals Acts. The activities of the Government Departments concerned with the purity of food supplies also has added to the work that can only be performed by a fully qualified veterinary surgeon.



An operating theatre in the Royal Veterinary College, Camden Town, London, N.W.1. This illustration shows the table that is employed when operations on dogs are to be performed.

Turning now to official posts open to veterinary surgeons, a large staff of inspectors of various grades is maintained by the Ministry of Agriculture. Members of the Royal College are eligible for appointments as Assistant Inspectors. They serve a probationary period of two years and are then required to pass a special examination, from part of which they are exempt if they already hold the Diploma in Veterinary State Medicine. An appointment in this capacity carries an initial salary of £250 per annum, rising to £450 per annum, and promotion may be secured to the positions of Divisional and Superintendent Inspector, the maximum salaries of these being £600 per annum and £800 per annum respectively. A civil service bonus is paid to all members of the veterinary staff of the Ministry.

Veterinary inspectors are now maintained by local authorities in order to assist in the enforcement of the regulations of the Diseases of Animals Acts, while the Health Departments of many boroughs and county councils make use of the services of veterinary surgeons for inspector work in connection with the control of the quality of food supplies, especially meat and milk.

There are good prospects in the Royal Army Veterinary Corps for young men who are attracted by an Army career. Candidates for commissions in the R.A.V.C. must be members of the Royal College of Veterinary Surgeons and under 28 years of age. They are required to undergo a written examination and success in this is followed by the grant of a commission as Lieutenant on probation. Further technical instruction is given and certain examinations are passed before the appointment is confirmed. Promotion in the R.A.V.C. follows the usual course and on retirement, gratuities or retired pay are awarded, the nature and amount depending on the length of service.

There is a limited number of overseas appointments for veterinary surgeons. Posts of an official character in the Colonies are under the control of the Colonial Office, about 150 veterinary officers being employed. The work involved is largely administrative in character, being principally concerned with the enforcement of regulations, and tact and initiative are desirable qualities in those who take up appointments of this kind. The present tendency is to demand scientific as well as technical qualifications.

General veterinary work in our overseas Dominions is different in type from that at home and is more limited in scope. Large areas are covered by veterinary surgeons in practice, and there is little chance of establishing localised practices similar to those in this country. It should be pointed out that the demand for veterinary surgeons in Australia, Canada and South Africa, is supplied by colleges in those countries. There is more opportunity in New Zealand, but those who leave Great Britain in order to take up practice there, or indeed in any of our overseas Dominions, should first obtain several years' varied experience in rural practice in Great Britain.

Puzzle Your Sharp-Eyed Friends!

Bewildering Tricks that are Easy to Perform

By Norman Hunter

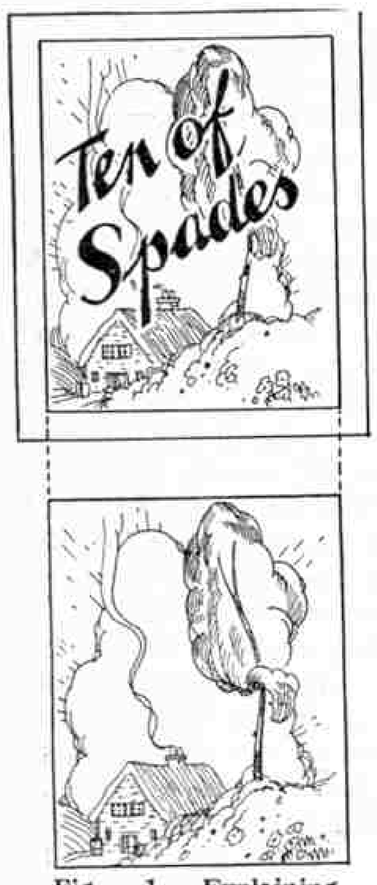


Fig. 1. Explaining "The Mysterious Picture."

CONJURING tricks that do not require skill for their performance frequently involve the use of expensive apparatus. The items that I am going to describe have been specially devised for "*M.M.*" readers who have little or no skill in sleight-of-hand, and who do not wish to spend much money on apparatus. The tricks are all easy to perform, and are highly effective; while the apparatus required is such as can be made at home quite cheaply.

The first trick is an effect that is always sure of applause. It is called:

THE MYSTERIOUS PICTURE

The conjurer displays a picture in a frame, showing both sides of the frame, and stands the frame with its back to the audience, leaning against a candlestick or some other object. Someone is now asked to pick a card from a pack of playing cards, and when the frame is turned round the name of the chosen card is seen written in a bold hand across the picture and underneath the glass. The picture in the frame is immediately handed round for examination, but nothing is found to explain the mystery.

How it is done. This first-class puzzler, if it is cleanly presented, will cause quite a sensation, but there is nothing difficult about it.

The frame is just an ordinary one and can be any size you like. It is well not to have it too big, however; about 8 in. by 6 in. is a convenient size. Take the picture out of the frame, and write across it with a brush and black paint or ink the name of a card, say, the ten of spades. Replace the picture in the frame. Now take a piece of thin glass of a size to fit loosely into the front of the frame on top of the glass already there. Take another picture, a duplicate of that in the frame, and stick it face downward on this loose piece of glass. Then paste a newspaper over the back of the picture and trim it neatly round the glass. Fig. 1 will make everything clear.

To perform the trick place the loose glass on the front of the frame and keep it there by pressure of one finger as you show the frame. It will appear to be just a picture in a frame. Lay the frame down on a newspaper for a moment, face downward, while you obtain a candlestick or some other object against which to lean the frame. Pick up the frame, leaving the loose glass on the newspaper, where it will be unnoticed owing to the fact that the back of it is also covered with newspaper. (Fig. 2). Stand the frame with its back to the audience, resting it against the candlestick. When the name of the chosen card is announced, turn the frame round and reveal the name written across the picture. Of course the frame may now be passed round for inspection, as there is nothing unusual about it that can be discovered.

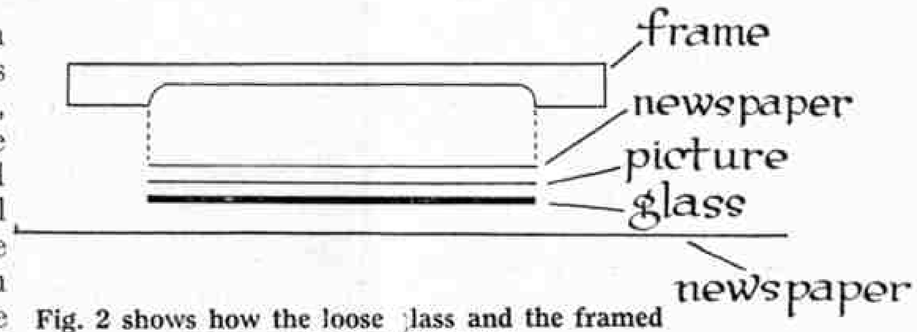


Fig. 2 shows how the loose glass and the framed picture are laid on the table.

But, you will ask, how does the performer know that the ten of spades will be the card chosen? Well, he manages to be sure of that by doing what conjurers call "forcing" the card. This can be managed in several ways, and the following is a good and easy method.

Have the ten of spades on top of the pack. Hand a paper knife to someone and ask him to push it into the pack anywhere he likes. Hold the pack in the left hand as he pushes the knife in, with your fingers on the top of the pack and thumb curled round the edge. When the knife is in, bring up your right hand and divide the pack bookwise at the point where the knife is. Draw the pack away from the knife and lift the top half of the pack away, so that the card under the knife may be taken. As you draw your right hand away, however, the fingers of the left hand that are resting on top of the pack press on the top card and cause it to slip off on to the lower half, and thus it is the ten of spades that is taken.

Now for a nice showy trick with handkerchiefs.

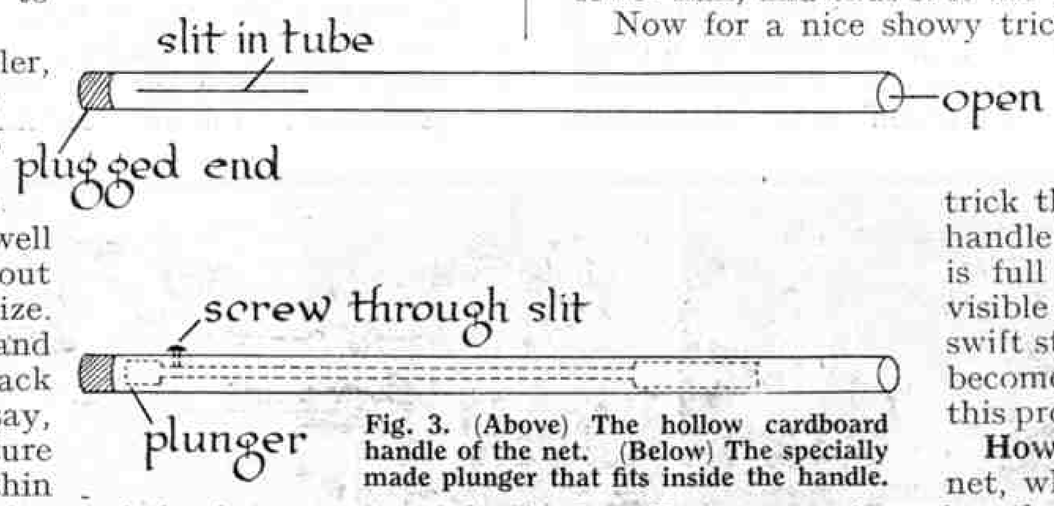


Fig. 3. (Above) The hollow cardboard handle of the net. (Below) The specially made plunger that fits inside the handle.

THE FLYING SILKWORMS

Announcing that he requires some silk handkerchiefs for a later trick the conjurer picks up a net on a long handle and tells the audience that the air is full of invisible silkworms spinning in visible handkerchiefs! He makes a few swift strokes with the net, and this suddenly becomes full of white silk. When taken out this proves to be six white silk handkerchiefs.

How it is done. The whole secret is in the net, which is quite easy to make. For the handle you require a length of tube measuring just over 1 in. in diameter, and about 30 in. in length. This tube can be made of cardboard, if you have no metal working tools. Near one end of the tube cut a slot about 5 in. long, running lengthwise in the tube. The end of the tube nearest the slot is then blocked with a short piece of wood. See Fig. 3.

A thin wooden rod is now cut, so that when it is dropped into the tube the end of it will be 7 in. below the open end. A piece of wooden rod 3 in. in length and of sufficient size to slide snugly and easily in the tube is now taken, and a hole 1 in. in length is bored in the centre of one end. Into this hole one end of the thin wooden rod is fixed. The other end of the thin rod also is fitted with a short piece of rod in a similar manner. The whole rod now forms a kind of plunger within the tube. The thick ends should be covered with felt or velvet, so that they will slide up and down in the tube without making any sound. A short round-headed screw is driven into the rod through the slit in the tube in the position shown in Fig. 3.

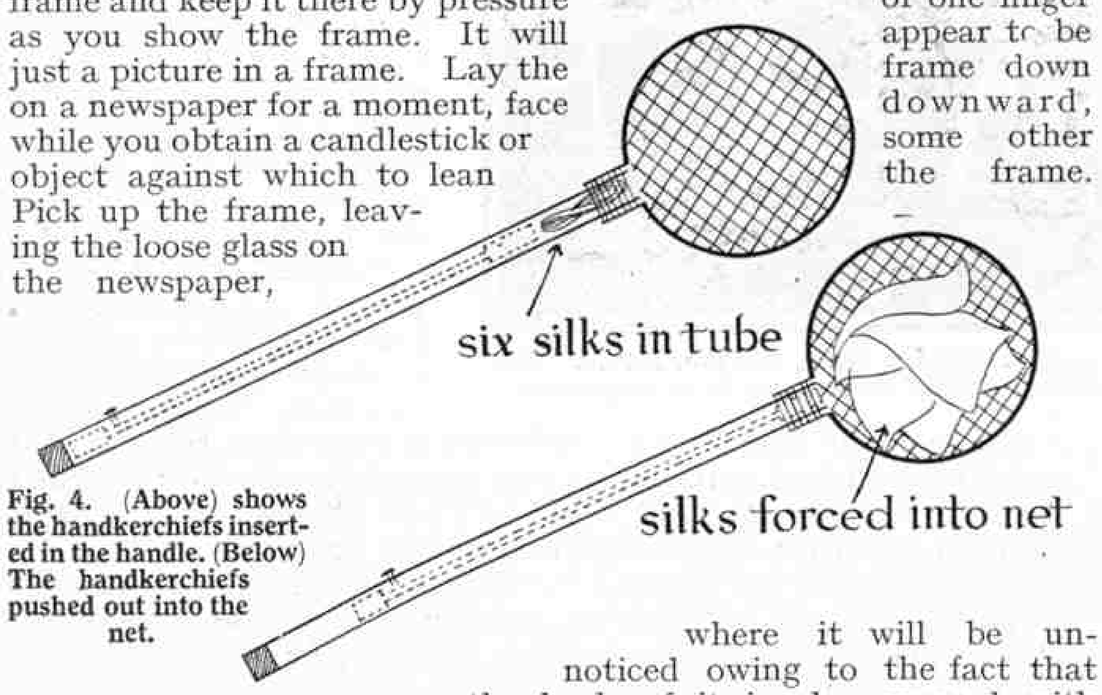


Fig. 4. (Above) shows the handkerchiefs inserted in the handle. (Below) The handkerchiefs pushed out into the net.

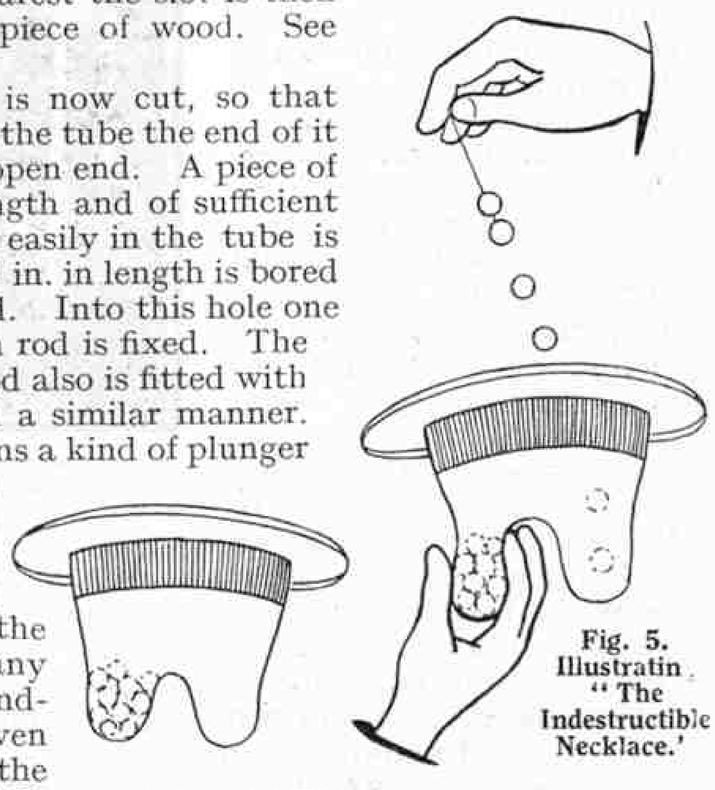


Fig. 5. Illustrating "The Indestructible Necklace."

It will now be seen that if six handkerchiefs are packed into the tube, the plunger being pushed right down to accommodate them,

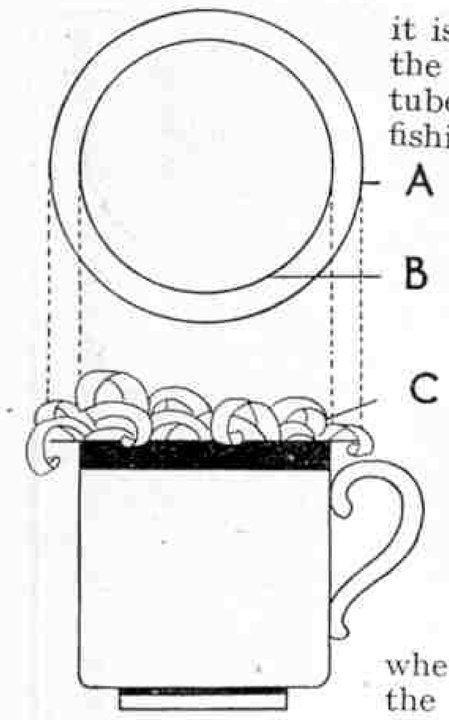


Fig. 6. (A) The thin outer disc; (B) the thick inner disc; (C) the shavings glued to the outer disc.

it is only necessary to push the screw along the slot to force the handkerchiefs out of the tube. The net, which is just an ordinary fishing net on a round wire frame, is fixed to the open end of the tube by bending the ends of the wire to lie alongside the tube, and binding them round with tape.

To perform the trick, pack the six silk handkerchiefs into the open end of the tube. Bring on the net and show that it is quite empty. Swing it about a few times, holding the handle in both hands, and with the thumb of the right hand on the screw projecting from the slot. Now make another swing with the net, and at the same time slide the screw along the slot, when the handkerchiefs will appear in the net (Fig. 4).

The best way to slide the screw along the slot is to grip the tube mid-way along with the left hand, and have the right thumb on the screw. Hold the right hand steady, and with the left hand drive the handle down through the right hand.

THE INDESTRUCTIBLE NECKLACE

For this piece of magic the conjurer takes a necklace composed of large wooden beads. Holding it over a hat, which has been shown empty, he cuts the string of the necklace and allows the beads to fall into the hat. He then drops the cut string into the hat with the beads, shakes up the contents of the hat, and turns it upside down. To everybody's amazement out drops the necklace with every bead threaded on the string, once more whole and complete! The hat is again shown to be empty.

How it is done. There is nothing unusual about any of the things used for this trick, but there are two necklaces both exactly alike. They should be composed of a few large beads, not a lot of small ones. The hat used is a soft felt, with the usual dent running down the crown. The softer the felt the easier will be the trick, and the hat should not have a lining.

Prepare for the trick by laying one of the necklaces in the hat on one side of the dent. You will find that if you grip the hat on the outside you can pinch the sides of that part of the hat together, and so conceal the necklace. Fig. 5 will show you how to do this. In this condition the hat may be shown apparently empty and held upside down.

The other necklace is now given to a member of the audience, who is requested to hold it over the hat and cut the string. The beads are cut in the empty side of the hat, and the string is dropped in with them. All you have to do now is to take the hat in your other hand, gripping the other side of the dent, and so hiding the loose beads. Turn the hat upside down and out will fall the complete necklace, presumably the original one restored.

You then show the hat with a flourish, and put it on your head.

REFRESHMENTS BY MAGIC

The conjurer has two cups and saucers which he shows to be empty, and if required passes round for inspection. He fills one cup with white paper shavings and the other with brown paper shavings. Then he places the saucers over the cups for a moment, and converts the brown and the white paper shavings into coffee and milk respectively, which are handed to the audience for their refreshment!

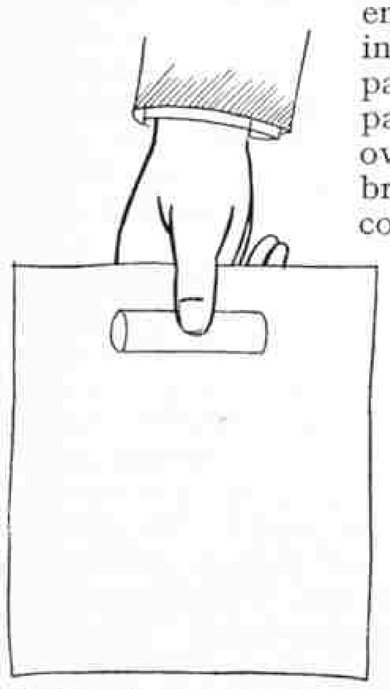


Fig. 10. Holding the sheet of paper with the tube hidden behind it.

How it is done. Both cups and saucers are unprepared. The shavings are contained in separate cardboard boxes, each measuring about 5 in. in width by 8 in. in length and 5 in. in height. The exact size is not important. Among the white paper shavings in one box stands a cup exactly similar to those to be used, and filled with milk. On top of this cup rests a disc of cardboard with white paper shavings stuck to the top of it. This disc of cardboard has another smaller and thicker disc stuck to its underside, so that when it is placed on top of the cup it will not slide off. The outer disc projects beyond the edges of the cup slightly all round, but this projection is concealed by the paper shavings that hang down. The cup with the disc in position looks exactly like a cup full of paper shavings. Figs. 6 and 7 will explain the details.

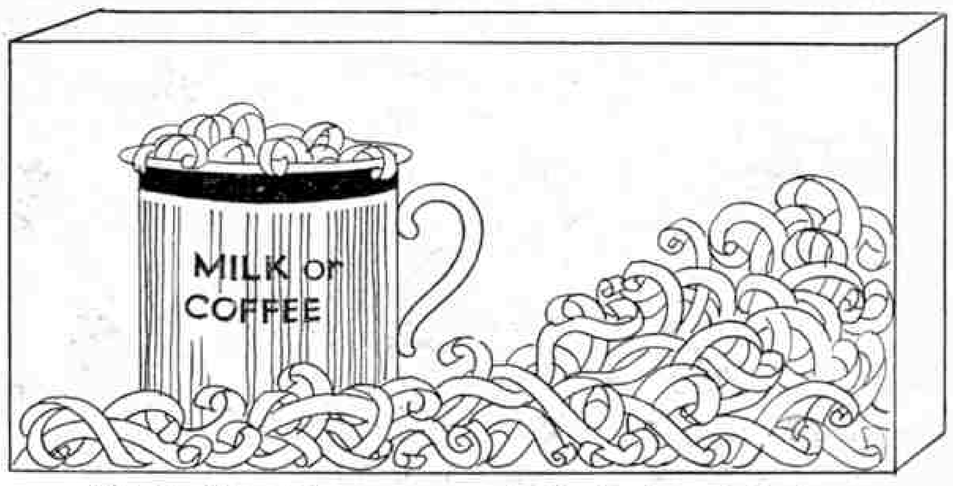


Fig. 7. One of the cups concealed in the box of shavings.

In the box of brown shavings stands another cup similarly prepared, but containing coffee, and with brown paper shavings stuck to the disc. The boxes holding the paper shavings should be covered with some fancy paper to make them look attractive.

To perform the trick first show the unprepared cups and saucers. Now take one cup and fill it with white shavings, placing the cup in the box with one hand and scooping the shavings in with the other. Then take the cup out of the box and shake the shavings out into the box, to show that everything is fair and above board. Again fill the cup, but this time leave it in the box and bring out the cup of milk with the shavings-covered disc in position. Place this, which the audience believe to be the cup of white shavings, in front of the box of shavings and place the saucer upside-down on top of the cup.

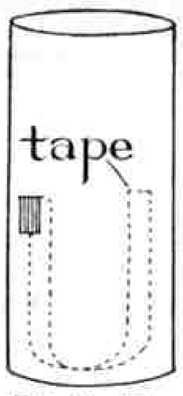


Fig. 8. The tape inside the fake tube.

Now take the other cup and do the same things with it as you did with the first one, scooping brown shavings up from the box, returning them, filling the cup again, and finally bringing out instead the cup of coffee with the disc and shavings on top. Stand this cup in front of the box and invert the saucer over it.

Make a pass, snap your fingers and then take off both saucers together, holding them with your thumbs on top and fingers underneath. Your fingers grip the discs against the saucers and lift them off with the saucers. Keep the bottoms of the saucers facing the audience, and lay the saucers, still upside down, on the corners of the boxes, allowing the discs to fall into the boxes. Take the cups and pour the milk and coffee into a glass jug to show that there is no deception about the liquid.

With the six white handkerchiefs produced by the "Flying Silkworms" trick you can perform another interesting piece of magic.

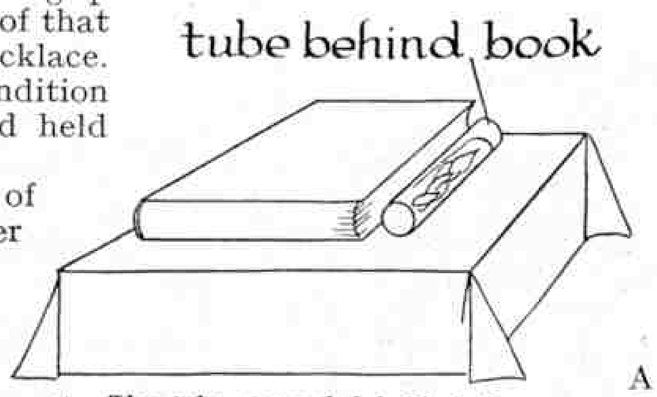


Fig. 9. The tube concealed behind the book.

THE INVISIBLE DYEWORKS

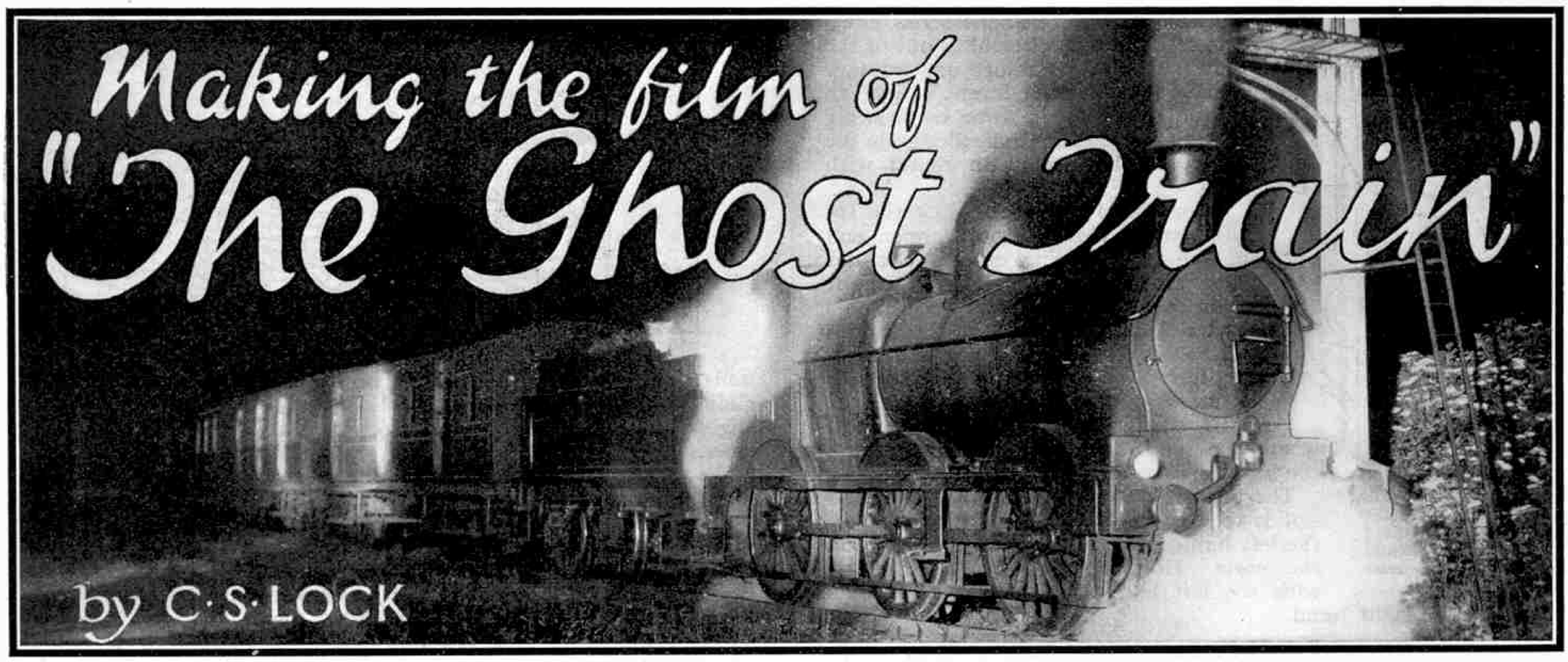
A sheet of paper is rolled into a tube, and the magician tells the audience that an invisible dyeworks is concealed inside. In order to prove his assertion he pushes the six white silk handkerchiefs through the tube, and they come out at the other end dyed various bright colours! The tube is unrolled and is seen to be empty.

How it is done. In addition to the six white handkerchiefs produced in the earlier trick you will require six others of the same size, but of various bright colours. Also you will need a sheet of stiff paper about 10 in. by 14 in., and a special "fake" as it is called.

This fake consists of a piece of cardboard postal tube 2 in. in diameter, and about 5 in. in length. Make two cuts across the middle of the tube, one on each side, and thread through them a length of white tape. Draw the centre of the tape to one end of the tube and stick the ends down securely to the outside of the tube.

(Continued on page 1019)

Fig. 11. The conclusion of the trick.



TING-a-ling-a-ling.

"Hello! Is that the Great Western Railway? This is the Gainsborough Pictures Ltd. speaking. We are going to make a 'talkie' film of Arnold Ridley's play '*The Ghost Train*.' You may know the story—it deals with your line, and as accuracy of detail is essential in all our productions we want your assistance. We shall need a derelict single platform station with double track in deserted country; complete use of the line and station for a week at least; a swing river bridge in picturesque surroundings; your famous '*Cornish Riviera*' express and largest locomotive; a second train with smaller locomotive and some newspaper vans for the '*Ghost Train*' itself; a signal box and ground frame near station with 'road' approach; plenty of water handy, and some special trucks for our electric generators; in the studio we want your help in furnishing the interior of a waiting room, a booking office with old furniture, and the reconstruction of a part of one of your corridor coaches. It is rather a tall order, I'm afraid!"

"Rather an unusual one, I admit, but I think we can help you. The matter shall be referred to the management, and no doubt you will confirm by letter in the meantime."

That was how the Gainsborough "*Ghost Train*" came to "Go Great Western."

* * * *

The story of the "*Ghost Train*," as adapted for the film, follows very closely the theme of the play which by a strange coincidence, was written at Bath within seven miles of Camerton, where the exterior scenes for the film were made. It deals with gun running in the West of England, where Russian smugglers, to cover the inland movement of arms, trade on the legend that the ghost of a train, wrecked years before at a river swing-bridge near by, is seen and heard thundering at night through the fictitious station of Fal Vale—a junction for Truro. The station master is in their pay, drives the train for them, and keeps unwanted visitors away from the neighbourhood by eerie tales of the ghost.

The hero is Teddie Morrison, of the Secret Service, who unravels the mystery in a most unrailway-like manner. He pulls the communication cord of the "*Cornish Riviera*" express, delays its arrival at the junction station on a very stormy night, and by so missing the last local connection from Fal Vale forces a half-dozen or so fellow passengers to be stranded all night without creating suspicion in the waiting room.

Morrison knows the "*Ghost Train*" is to run that night, and has arranged for it to be raided by coastguards as it stands hidden in a disused siding near the small quay side, where the arms are landed from the sea. The raid fails, and news of the get-away is flashed to him by wireless, which he picks up in the waiting room. As the "*Ghost Train*" roars and shrieks through the station, Morrison dashes across the line to the signal box, pulls the lever that opens the swing-bridge, and ghost and smugglers crash to their doom into the river.

The Platform Scene at the fictitious station of "Fal Vale" as it appears in the Film, showing the station buildings, station nameboard and lamp post erected for the occasion.

The making of a film is like the putting together of a jig-saw puzzle. It is taken in hundreds of pieces quite out of sequence, but to a definite schedule. When all the scenes have been taken, the various "shots" are fitted into their correct sequence, and the puzzle is solved. So with the "*Ghost Train*." To follow its production it will be necessary to follow its trail from the studio to Swindon, Camerton and Barmouth.

The first section of the film to be made was the recording of the noise of trains passing through Langley station on 14th May, between 10 a.m. and 12.30 p.m. This will be used for the noise of the "*Ghost Train*" rushing through Fal Vale station.

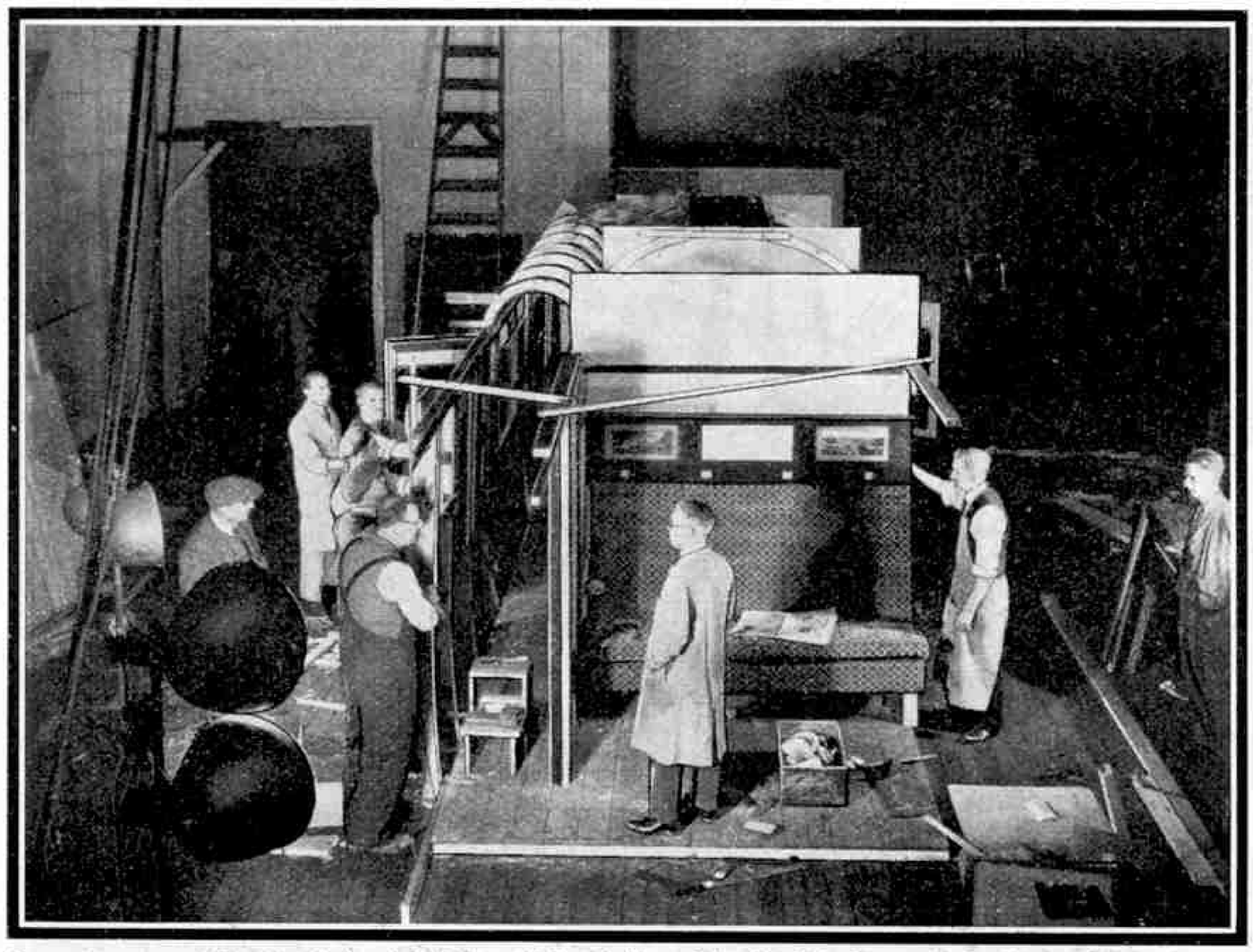
On 15th May a truck load of furniture arrived from the Great Western Railway Swindon stores. This was composed of a waiting-room table, six waiting-room seats, a fares list frame, and a ticket-issuing case. These articles were sent to the Gainsborough studios, together with a quantity of posters, publicity matter, and a set of legal notices, fares list, two 2-wheel trollies, a coal scuttle, a supply of specially printed tickets, ticket collectors' cancelling nippers, two guards' lamps, red and green flags, a guard's whistle and chain, uniform, and cap.

On 19th May the interior fittings of a part of a corridor "compo." coach arrived, together with diagrams from the Swindon carriage

and wagon shops, to help the studio carpenter to assemble the parts for the studio "shots" of the interior scenes in the train.

An S.O.S. received from the studio a week later was not unexpected. "Could the Great Western Railway arrange for one of their representatives from Swindon to come up?" The parts were all there—but even the versatile studio art director and staff of carpenters were at a loss to assemble them. An urgent letter to Mr. C. B. Collett, the Company's Chief Mechanical Engineer, brought relief to the situation, and the work of construction proceeded under the personal guidance of two representatives from the Carriage Department, who spent some interesting days in the studio.

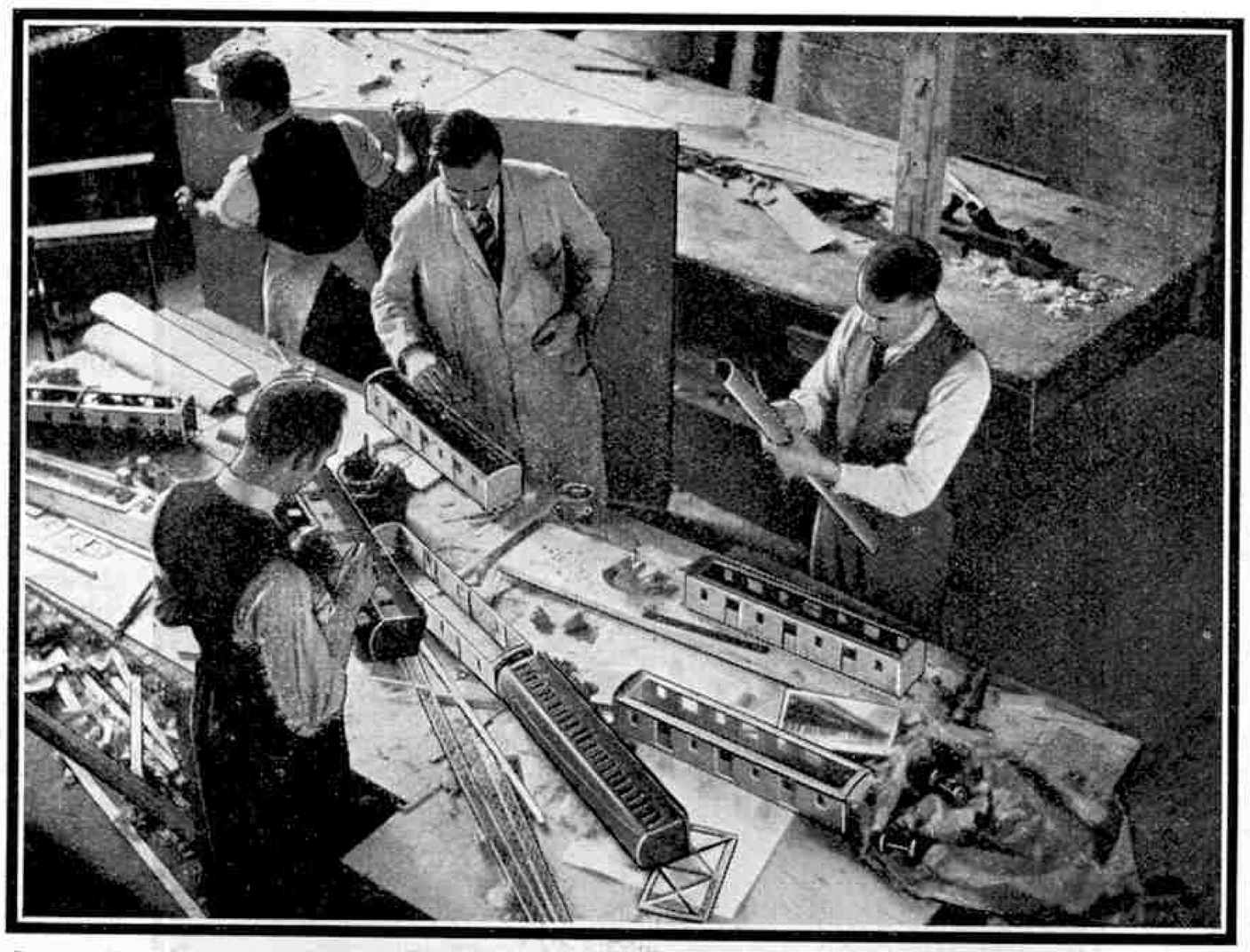
The first "shots" to be taken in the studio were of practically the last scenes in the film, the interior of Fal Vale waiting room and booking office. By far the greater part of the film has this setting for its background, and is a faithful reproduction of the desolate waiting room described in the book. Booking clerks will, no doubt, notice the extra large pigeon hole. This was made to permit Jack Hulbert, as Teddie Morrison, to get his head through during an altercation with his fellow passengers.



Carpenters assembling the "Cornish Riviera" Coach "set" in the Gainsborough Studio, under the supervision of representatives from the G.W.R. Carriage Department, Swindon.

The railway carriage "set" was the first to be erected in the Gainsborough studio. The first and third-class compartments and corridor were reconstructed on a slightly raised platform, to permit of rocking and moving as required.

In order to give the effect of a train in motion, a white screen, 12 ft. by 8 ft., was erected on the corridor side outside the set, at an angle of 45 degrees from the end corridor window, and on this was projected a scenic film from a cinematograph machine some distance away, enclosed in a soundproof cabin. The whole of the opposite side of the section of the coach was left open and "shots" were taken from this side, showing the passengers in the compartment in the foreground and the passing scenery in the background through the corridor windows. The scenic film had been previously taken from a carriage window between Reading and Didcot.



Constructing the model of the G.W.R. "Cornish Riviera" Express. The illustration gives a good idea of the immense amount of detail involved.

Sunday, 31st May, saw the *"Cornish Riviera"* express, drawn by the *"Tregenna Castle,"* steam out of Paddington two hours before its usual time, for Reading and Bramley, there to play, amid pastures new, its part in the film. The Basingstoke line was chosen on account of its nearness to London; because it gave occupation of the line for filming for some hours during Sunday afternoon; because the heavy rolling stock and locomotive could not work at Camerton on the Limpley Stoke-Hallatrow line (chosen for filming the exterior train and station "shots,") and because it was particularly desired to feature Britain's crack train in the film, for American circulation.

Camerton, on the Limpley Stoke-Hallatrow line, was chosen as the result of a chance conversation during a railway journey. The line, which exactly met the requirements of the film company, was closed altogether for passenger traffic a few years ago, and only one goods train passes over it each way on weekdays.

A small army of carpenters carried out alterations at Camerton station, and fake lamp posts, station buildings, and station name boards were erected. The film company also sent there, in sections, an exact duplicate of the exterior of the waiting room, etc., which had been used for the "shots" taken at the studio. Altogether five truck loads left Paddington, containing the cracked or broken windows and doors taken from the studio "set," so that every detail should be matched in reproduction of interior and exterior scenes. A few days later, a further six truck loads of equipment, generating lorries, lamps, etc., and other rolling stock were despatched, and by Thursday mid-day, 18th June, the whole of the rolling stock and apparatus for the filming at Camerton was assembled at that station. That night, "shots" were taken of the *"Ghost Train"* running through Camerton, or as it had now become, "Fal Vale" station. This operation provided the greatest thrill of the filming and held spellbound some 5,000 people who had journeyed from Bristol and Bath to witness it.

The next evening was occupied at Dunkerton Colliery which, for the purpose of the film, became the back of the quayside. Here the *"Ghost Train"* (composed of a standard 0-6-0 goods engine, two coaches and four newspaper vans) was seen being loaded with contraband of war, appropriately labelled "Eggs," "Tiger Sauce," and other commodities. Quickly the word was passed to Price (Julia's brother and one of the two principal villains) that the coastguards were on them. The smugglers boarded the train, repelling the coastguards, as they rushed up, with machine gun fire from the coaches as the train gathered speed.

Arnold Ridley took part in this scene and gathered together fifteen local cricket and Rugby international and county players to take the parts of coastguards. The filming finished just after 5 o'clock in the morning. A crowd of sightseers remained throughout the whole time. The interest taken in the making of this film was unprecedented in the history of the Gainsborough pictures.

By 9.30 p.m. the same evening filming was again in progress. This time "shots" were taken of Hulbert arriving in the signal

box and pulling the lever to open the bridge. The signal box was brilliantly lighted by [illegible] lights mounted on wooden trestles outside, as was also the station, which appeared in the background.

Sunday, 21st June, saw the filming of close-ups of passengers alighting from the "*Cornish Riviera*" express. As only the coaches were seen, the train composed of 60-ft. corridor stock and one "diner" with "Riviera" roof boards, was drawn by a goods engine.

Early in the afternoon Cicely Courtneidge, who plays the part of the old lady with the parrot, was filmed alighting with much difficulty, many packages, and much help, especially when she slipped down between coach and platform.

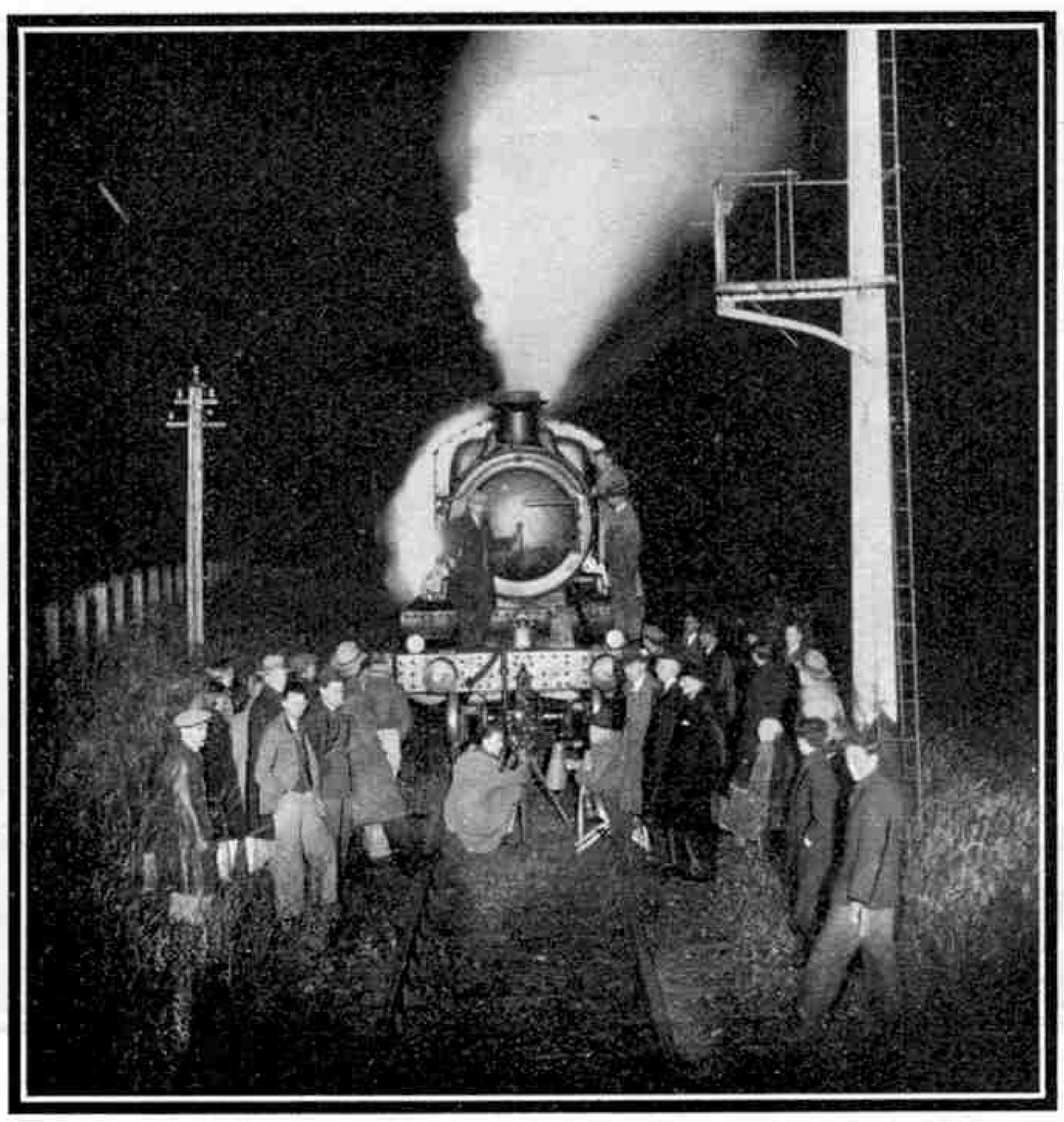
A faked rain storm was then "shot," the rain being supplied from an adjacent stream by the Radstock Fire Brigade.

At dusk on Monday a "43" class engine, the heaviest possible on the branch, and a goods engine, were brought into use at Dunkerton station for interior shots of the engine cab of the "*Ghost Train.*" Here Saul and Price were "shot" driving the train and their expressions recorded as they realised the disaster ahead of them at the swing-bridge.

A group of the Gainsborough Studio staff who produced the film of the "Ghost Train."

Next, Hulbert was "shot" jumping down on to the permanent way and racing back along the track for his hat. For this operation a light low flat-topped trolley, with rubber-cased wheels to deaden the sound, constructed at the studio, was used on the adjacent line, enabling the camera, microphone and operators to keep up with the actor. Hulbert's altercation with the guard, the latter showing his righteous indignation at so heinous a crime, while hustling him back to his compartment, was then filmed, and later was recorded what the driver and firemen said in the engine cab. As these men were Great Western Railway employees, their expressions were strictly to dialogue.

Numerous "shots" were taken of the "*Ghost Train*" from every conceivable angle, even from underneath, the latter being achieved by means of a clockwork camera placed between the running lines. At Dunkerton the approaching "*Ghost Train*" was filmed reflected in a large mirror placed between the lines, which will give the effect on the screen of the train charging right into the audience. The same night the scene of Price jumping from the "*Ghost Train*" engine, when he realised that the bridge was open and disaster inevitable, was taken. Actually, the engine was stationary, but to give the effect of rapid movement the rails were oiled, so that when the regulator was opened, the wheels slipped round without moving forward. In front of the engine was a second engine, which acted as a buffer and supplied the necessary steam, to give the desired effect of action.



An eerie scene! Getting ready the locomotive of the "Ghost Train" for the dash through "Fal Vale" Station.

A difficult "shot" from the railway point of view was that taken on Sunday night, 28th June, on the stretch of double line between Radstock and Mells Road. Complete occupation of this section was taken after the ordinary train service had finished, and all the catchpoints were clipped to permit two engines working in the same direction on adjacent lines. The "shots" were action pictures of Saul on the footplate, the real Great Western Railway driver being dressed as, and taking the part of, one of the film actors for the occasion. These "shots" were taken at speed as the "*Ghost Train,*" brilliantly illuminated and flashing dazzling electric headlights, passed and was re-passed by the film unit.

Filming finished on Tuesday, 30th June, when "shots" were taken from the driver's compartment of a rail motor approaching, passing through, and leaving the Box Tunnel. The same day the film unit returned to London after a stay of thirteen days and Arabian nights in the lives of the local inhabitants. Two camera-men, left behind, proceeded to Somerton to film the up and down "*Cornish Riviera*" express emerging from the tunnel.

Towards the end of July the rolling stock used at Camerton was worked to Barmouth in readiness for the last stage of the filming—scenes at the swing river-bridge and the "*Ghost Train's*" last plunge. Here "shots" were taken of the "*Cornish Riviera*" express running over the bridge on its way to Fal Vale, ostensibly after the delay. Then the "*Ghost Train*" on its way across the bridge *en route* to the disused siding for loading. Later, it was filmed coming in the reverse direction on its final run.

A cleverly-constructed looking glass obscured the actual bridge and a short part of the track, while not obscuring the scenery, and in this portion of the mirror was reflected a model of the bridge, open, and of the "*Ghost Train.*" The models, which had been constructed by Bassett-Lowke Ltd., from specially taken photographs, were erected on a stand near the cameras. At the appropriate moment the model was set in motion, and so timed as to take up the running of the real "*Ghost Train*" as it disappeared behind the glass to safety, while the model rushed headlong to destruction.

It now remained for the film company to accomplish the big task of fitting the "shots" into their correct sequence ready for presentation to the public.

* * * *

The interest of those readers who have seen the talking film of the "*Ghost Train*" will be increased by this story of how the film was made. For permission to reprint the account we are indebted to the courtesy of the "*Great Western Railway Magazine,*" while our illustrations are reproduced from photographs kindly supplied by Gainsborough Pictures Ltd.

The Last Voyage of Henry Hudson

A Tragedy of the Arctic

THE story of Arctic exploration contains many tragedies but none sadder than that of Henry Hudson.

The date of Hudson's birth is unknown, and we know very little about his early life. It is probable that he belonged to an influential family interested in developing trade with Russia, and if this is so, his early years would be spent in an atmosphere of commercial enterprise. One can imagine him standing on the banks of the Thames watching the great ships unloading their strange merchandise brought from foreign countries, and listening to the wonderful stories told by adventurers across the sea. It is at any rate certain that at an early age Hudson was fired with the spirit of adventure, and he probably sailed on several voyages before he undertook the first of the four Arctic voyages that have won for him immortal fame. Possibly Hudson served his apprenticeship with the Muscovy Company, which existed for the purpose of developing trade with Russia and in northern waters.

Hudson's grandfather's name appears on a charter granted in 1555 by Queen Mary to the Company of Merchant Adventurers. This company was organised by Cabot, who had suggested the possibility of discovering a north-west passage across the Polar regions to China. Subsequent to Cabot's suggestion the Muscovy Company established a profitable trade with Russia, and although the company became less eager to discover the north-west passage, a search for it was still regarded as desirable.

With this object in view Henry Hudson was placed in charge of the *"Hopewell,"* a vessel of 80 tons, with a crew of twelve. He sailed from Gravesend on 1st May, 1607, outward bound for China and Japan by way of the North Pole. He sailed up the east coast of Greenland and, meeting with the ice-barrier, turned off at about Franzjosef Fjord. From here he sailed east, skirting the edge of the ice to Spitzbergen round Prince Charles' Foreland, and northward past Hakluyt Headland, so named by him, until he reached 80° 23′. He named the most northerly point of Greenland "Hold with Hope." There he saw many whales, but found his passage blocked by ice; and after convincing himself that there was no passage to the north in this part of the Arctic, he sailed south. After touching at Bear Island and calling at Jan Mayen Islands, he returned home and dropped anchor in the Thames on 15th September.

This voyage had occupied three-and-a-half months, and its results were of enormous value to the Muscovy Company. Not only had Hudson established a record by reaching 83° 23′, but his voyage had opened up this region for whale fishing and walrus hunting, enterprises that proved of great commercial value.

In the following year Hudson made a second voyage, again attempting to reach China by way of the Arctic, but the voyage was doomed to failure from the outset, as it commenced two months too early. Hudson passed the North Cape, however, and reached the impenetrable ice-barrier, along the edge of which he sailed until he arrived at Nova Zembla on 27th June, 1608. He attempted to round Cape Tavin, hoping in this manner to enter the Pacific Ocean. He encountered stormy weather, however, which caused him to decide to "save victuall, wages and tackle by a speedie return, and not by foolish rashness; the time being wasted, to lay more charge upon the action than necessitie should compell." On his return to England Hudson met with a cold reception, for he had discovered nothing that could be regarded as likely to be profitable to the Muscovy Company, which refused to finance a third expedition. By this time, however, his daring voyages had spread abroad his fame, and it was not long before he was approached by the Dutch East India Company to undertake another voyage.

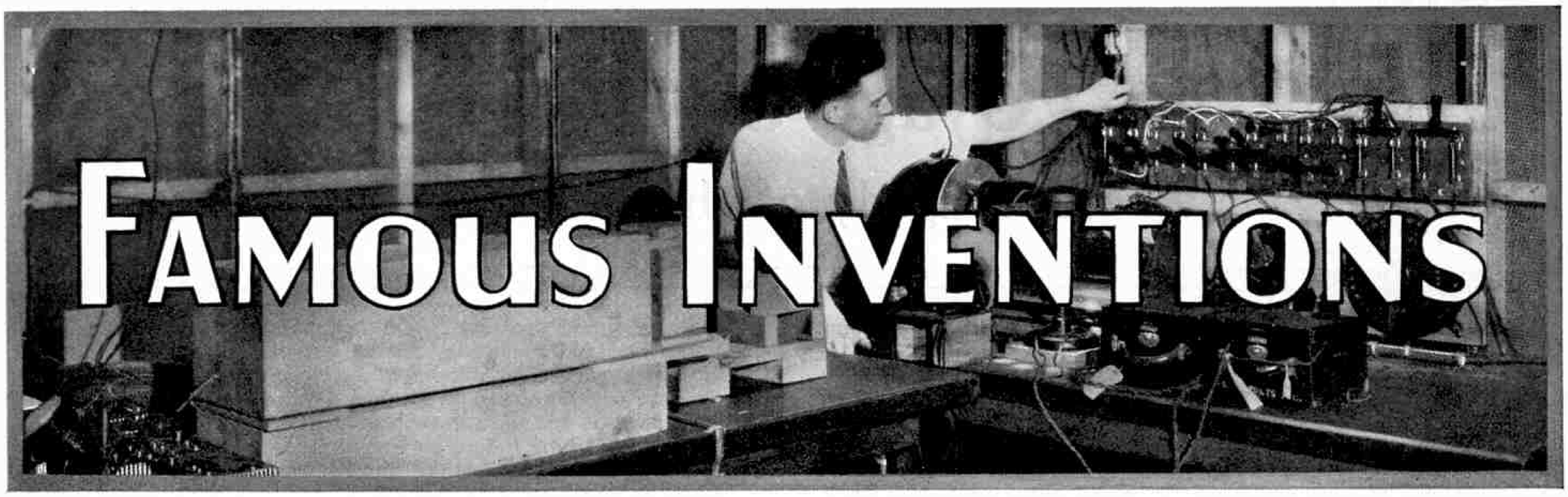
Early in April, 1609, he sailed from Amsterdam with two vessels, the *"Good Hope"* and the *"Half Moon,"* himself embarking in the latter vessel. The ships rounded the North Cape on 5th May, but by that time serious trouble among the crew had already developed. The men complained of the hardships they were called upon to endure, and Hudson therefore changed his course and sailed westward towards Newfoundland. He made direct for the mouth of the great river that now bears his name, and which at the time of his visit was British territory. When near the Newfoundland coast the crew of the *"Good Hope"* decided to return home. Hudson thus was left with the *"Half Moon,"* on which he had an unhappy time, for the crew practically made him sail wherever they wished. In spite of his troubles, he managed to make some important discoveries cruising up and down the east coast of North America and endeavouring to make friends with the Indians. He sailed for a considerable distance up the Hudson River, and concluded that he was the first to explore it. We now know, however, that the river had been discovered by Verra Zano in 1524, and already had been marked on maps.

The last voyage of Henry Hudson, as painted by the Hon. John Collier. Set adrift with his young son in an open boat, the great navigator was never heard of again.

On 17th April, 1610, Hudson sailed on his fourth and last voyage, which appears to have been financed by three private persons. His vessel was the *"Discovery,"* of 55 tons, equipped for a winter in the ice; and the object of the voyage was once more to try to find the north-west passage to China. Among the crew was a man named Greene whom Hudson had befriended on shore. Greene was of extremely dissolute habits, and it is difficult to understand why Hudson should have treated him almost as a son. This kindness on Hudson's part was to result in a sad ending.

After Greenland was reached the crew became troublesome. Bad weather was encountered, the mate was deposed, and the boatswain, Robert Bylot, was appointed in his place. Winter quarters were at last found at James Bay, and there the *"Discovery"* became locked in the ice for the winter. Food was scarce, and the evil character of Greene soon led to serious trouble. The gunner died, and the crew quarrelled as to who should have his grey cloak. Greene, using his influence with Hudson, obtained it for himself, although he did not receive any wages and therefore could not pay for the cloak as the others could have done. Soon afterwards Hudson quarrelled with the carpenter. Greene took the man's part, and Hudson was so angry at this that he took the gunner's cloak from him. From that moment Greene commenced to plan a terrible plot.

On 18th June, 1611, the ship got under way for the return voyage, but owing to contrary winds she ran into the ice. Three days later Greene and another man proposed to the crew that they should turn "the master and all the sicke men" adrift in the small boat and leave them to their fate. On the following morning the mutineers forced Hudson, his son, and seven (*Continued on page 977*)



XXVIII.—THE MICROSCOPE

IN the "*M.M.*" of June, July and August last we told the story of the development of the telescope, a magnifying instrument for viewing objects which are too far away to be studied by the human eye alone. This month we shall deal with the microscope, an optical instrument that functions in the opposite manner, and renders visible objects so minute that the unaided eye cannot see them.

The earliest form of microscope was nothing more than a single lens crudely shaped from rock crystal, and it dates back to very early times. It is not known when Man first discovered the magnifying power of a lens. It is probable that among the ancient peoples familiar with glass there were some observant enough to notice this phenomenon, but lacking scientific knowledge they no doubt regarded it merely as a curiosity. Lenses of rock crystal were used by the ancient Greeks as "burning glasses" to kindle fires. The lens was held toward the Sun so that the rays passing through the glass were converged upon the material laid for the fire, and thus ignited it. There is a story that when the Romans attacked Syracuse, Archimedes, the famous Greek mathematician and inventor, set fire to many of the Roman war vessels by concentrating rays from the Sun upon them with "burning glasses."

The invention of spectacles in the 13th century indicated a knowledge of the magnifying power of lenses, but the single lens, or simplest form of microscope, remained a mere curiosity until about 400 years later. Early in the 17th century the first practical telescope was produced, and about the same time the utility of the simple microscope was recognised.

Gradually microscopes came into increasing use, and in spite of their inefficiency and limited magnifying power, valuable work was done with them. Probably the most brilliant of the 17th century microscopists was Anton van Leeuwenhoek, a Dutch scientist who made nearly 30 instruments ranging in power from one capable of magnifying the diameter of an object 40 times, to one that magnified 160 times. Each microscope consisted of one double convex lens ground by Leeuwenhoek himself, mounted between two silver plates each with a small hole in the centre and fastened together by small rivets. With the aid of his microscopes Leeuwenhoek was able to confirm the discovery of the circulation of blood that had been made by William Harvey, an English physician, and he was probably the first man to see bacteria, the minute germs that are the source of disease.

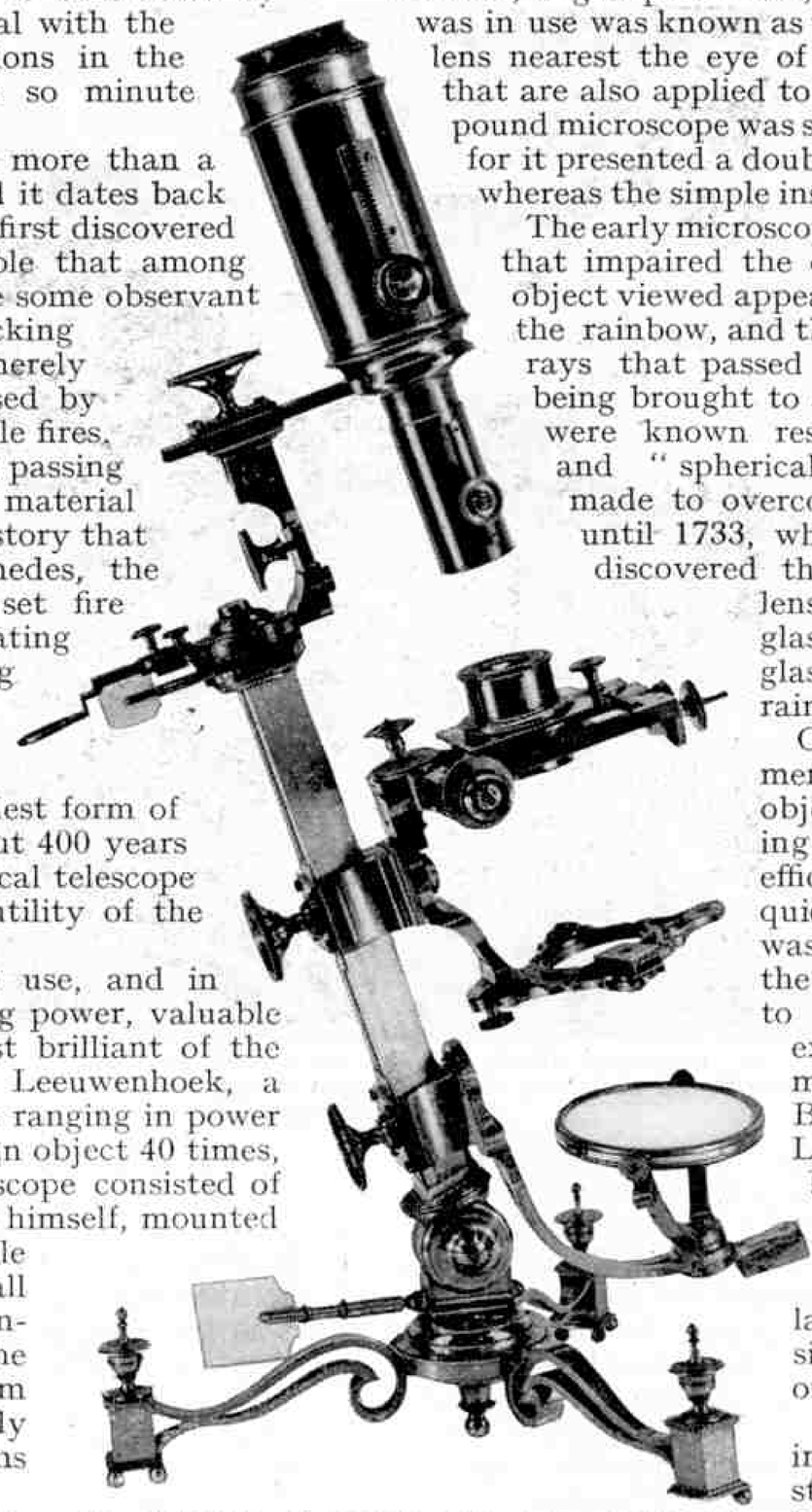
Various experimenters are credited with producing the first improved microscope consisting of two lenses mounted close together on a common axis, so that they caused objects viewed through them at close range to appear greatly magnified. Zacharias Jannsen, a spectacle maker of Middelburg, is believed to have produced a microscope of this kind in 1590, but his instrument was very imperfect and the image seen through it was greatly distorted. In spite of its crudeness it aroused much interest, and in 1619 it was shown to James I by his astronomer Cornelius Drebble. Hans Lipperhey, also of Middelburg, who produced the first practical telescope in 1608, and Galileo, the famous Italian mathematician and astronomer, are mentioned by various writers as the inventors of the first practical microscope.

Microscopes having a single lens or a number of lenses grouped together were known as "simple" microscopes, and an improved type of instrument called the "compound" microscope was developed in which the lenses were separated into two groups. The lens, or group of lenses, nearest the object when the microscope was in use was known as the "object-glass" or objective, and the lens nearest the eye of the observer as the "eyepiece," terms that are also applied to similar lenses in a telescope. The compound microscope was superior to the simple type of instrument, for it presented a doubly magnified image of the object viewed, whereas the simple instrument only magnified the image once.

The early microscopes suffered from the same serious defects that impaired the efficiency of the early telescopes. The object viewed appeared to be surrounded by the colours of the rainbow, and the image was distorted owing to the light rays that passed through the margin of the object-glass being brought to a focus before the others. These faults were known respectively as "chromatic aberration" and "spherical aberration." Many attempts were made to overcome them, but little progress was made until 1733, when an Essex man, Chester Moor Hall, discovered that by making an object-glass of two lenses, an outer convex lens of crown glass and an inner concave lens of flint glass, refraction free from the halo of rainbow colours was obtained.

Object-glasses made to Hall's arrangement became known as "achromatic" object-glasses, the term achromatic meaning "without colour." When their efficiency became realised they were quickly adopted for telescopes, but it was many years before the principle of the achromatic object-glass was applied to the microscope. One of the earliest experimenters to construct an achromatic objective for a microscope was Bernado Marzoni, Curator of the Physical Laboratory of the Lyceum of Brescia. Marzoni was also an amateur optician, and in 1808 he successfully constructed an achromatic objective that he exhibited at Milan three years later, and for which he was awarded a silver medal by the Royal Institute of Science.

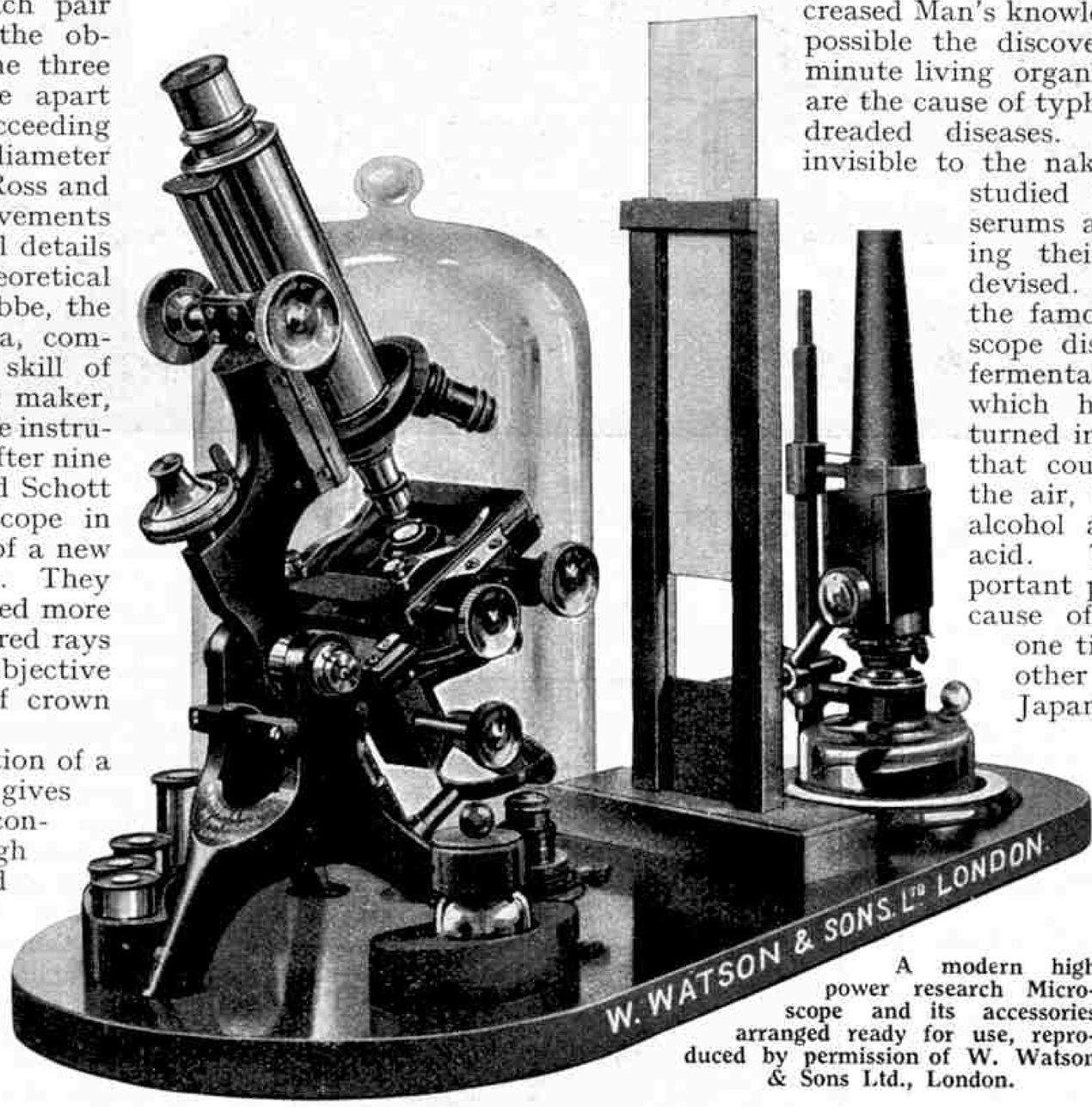
During the years that followed many improvements were made in the construction of the microscope. The more important of these were the work of Joseph Jackson Lister, F.R.S., whose son, Lord Lister, became famous by his discovery of antiseptic surgery. The numerous improvements he introduced included the graduated lengthening of the tube carrying the objective and eyepiece, and a combination of lenses, called a condenser, to concentrate the light upon the object when examination by artificial light was being made. Lister was a great microscope enthusiast, and being unable to find an optician skilled enough to make lenses to his formula, he set to work to grind his own. Before long he was able to produce lenses that were superior to any made up to that time. In 1829 he made an achromatic objective that consisted of a double convex lens of crown glass and a concave lens of flint glass cemented together, one side of the double convex lens fitting against the curved surface of the concave lens.



An elaborate Compound Microscope made for King George III, which, by rotating the body through 180 degrees could be used as a Simple Microscope. For this and the lower illustration on the opposite page we are indebted to the Royal Microscopical Society.

One of the most earnest workers in giving effect to Lister's ideas was Andrew Ross, a microscope maker in London. In 1831 Ross constructed an improved achromatic objective that consisted of three pairs of lenses, each pair similar in construction to the objective made by Lister. The three pairs were a short distance apart from each other, and each succeeding pair was of slightly larger diameter than the one preceding it. Ross and others effected many improvements in the optical and mechanical details of the microscope, and the theoretical investigations of Professor Abbe, the great mathematician of Jena, combined with the mechanical skill of Dr. Schott, a German glass maker, did much to make it a valuable instrument of scientific research. After nine years of experiment Abbe and Schott produced in 1884 a microscope in which the lenses were made of a new glass called "fluor" glass. They claimed that this glass focussed more effectively the different coloured rays of light passing through the objective than did objectives made of crown and flint glass.

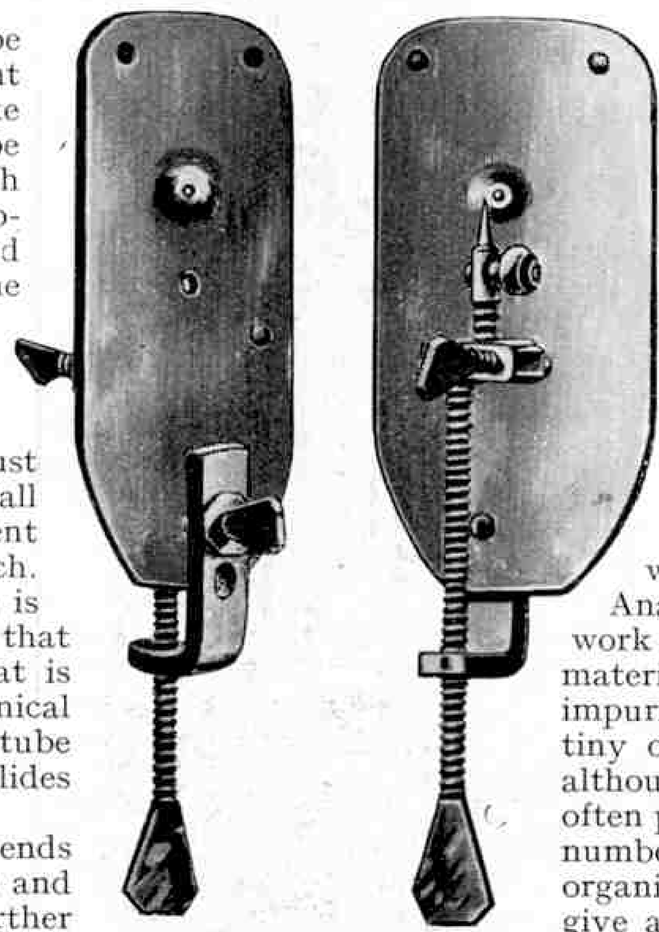
The accompanying illustration of a Watson "*Bactil*" microscope gives a good idea of the general construction of a modern high power research microscope and its arrangement when in use. The chief features of the instrument are the mirror, substage, stage and body, and all are held by a strong three-legged stand called the limb. The mirror is carried on a short arm near the base of the instrument and is used when examining an object by artificial light. The mirror receives the rays of light from the adjacent lamp and reflects them upward to an achromatic combination of lenses called the condenser, and contained in the substage. The condenser passes the light rays up through the stage and focusses them so that they converge upon the object on the slide rest. The slide rest is carried by a movable stage that enables the object to be viewed in many different positions without disturbing it.



A modern high power research Microscope and its accessories arranged ready for use, reproduced by permission of W. Watson & Sons Ltd., London.

The body of the microscope is an inclined tube to the bottom of which is screwed an attachment containing the combination of lenses that make up the objective. The body carries a sliding tube called the "draw tube," to the upper end of which is screwed the eyepiece. In adjusting the microscope for use the objective and eyepiece are moved nearer or farther away from each other and the stage by a few turns of milled head screws that control "coarse" and "fine" adjustments. The coarse adjustment is worked by a rack and pinion, and the fine adjustment is operated by a special mechanism that can adjust the position of the body by extremely small amounts. In some microscopes the fine adjustment can set the body to within 1/34,000th of an inch. The sliding tube of the "*Bactil*" microscope is interchangeable with a mechanical draw tube that permits the greater extension of the body that is necessary with some objectives. The mechanical draw tube consists of a long fitting carrying a tube moved by rackwork and an inner tube that slides in the ordinary way.

The power of a compound microscope depends on the power of the objective and the eyepiece and the distance between them, and increases the farther they are apart. A modern high power research microscope will magnify up to 2,000 diameters, and will reveal objects only a few microns in diameter. A micron is about 1/25,000th of an inch.


The crude form of Simple Microscope made and used by the Dutch scientist Anton van Leeuwenhoek, in the 17th century.

The microscope reveals a magnified image of the object under examination only as long as the eye of the observer is applied to the instrument. By using a camera in conjunction with the microscope, however, a permanent record is obtained that can be studied closely at any time. An additional and important advantage is that a photograph taken in this way often reveals a great deal of fine detail too minute to have been seen by the eye although aided by the magnifying power of the microscope.

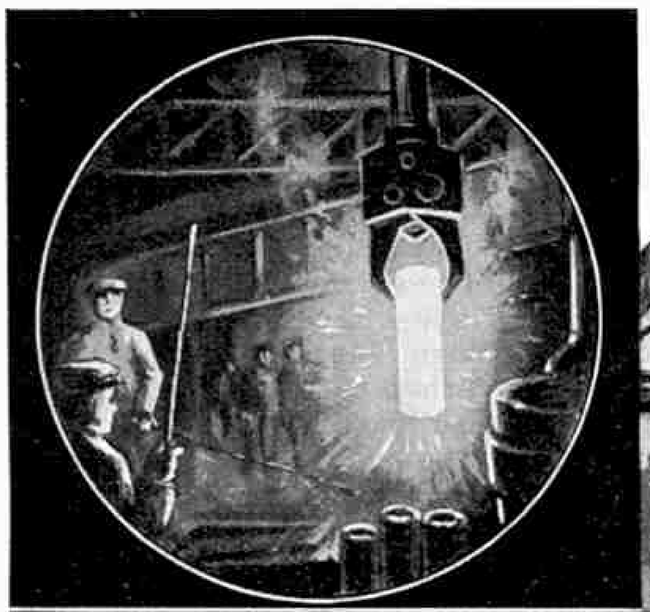
During the past 60 years the microscope has enormously increased Man's knowledge of Nature. It has made possible the discovery of the various forms of minute living organisms called "bacteria" which are the cause of typhoid, tetanus, and many other dreaded diseases. These microscopic germs, invisible to the naked eye, have been carefully studied through the microscope, and serums and other means of counteracting their deadly influence have been devised. In the hands of Louis Pasteur, the famous French chemist, the microscope disclosed some of the secrets of fermentation. It was the means by which he discovered how wine was turned into vinegar by a minute fungus that could draw all the oxygen from the air, bring it into contact with the alcohol and in this way turn it into acid. The microscope played an important part in Pasteur's search for the cause of a silkworm disease that at one time spread through France and other silk-producing countries except Japan. He discovered that the disease did not begin in the egg or the caterpillar, but in the moth, and with the aid of his microscope he examined hundreds of moths and succeeded in finding a few that were free from disease, and these were used for breeding new stocks.

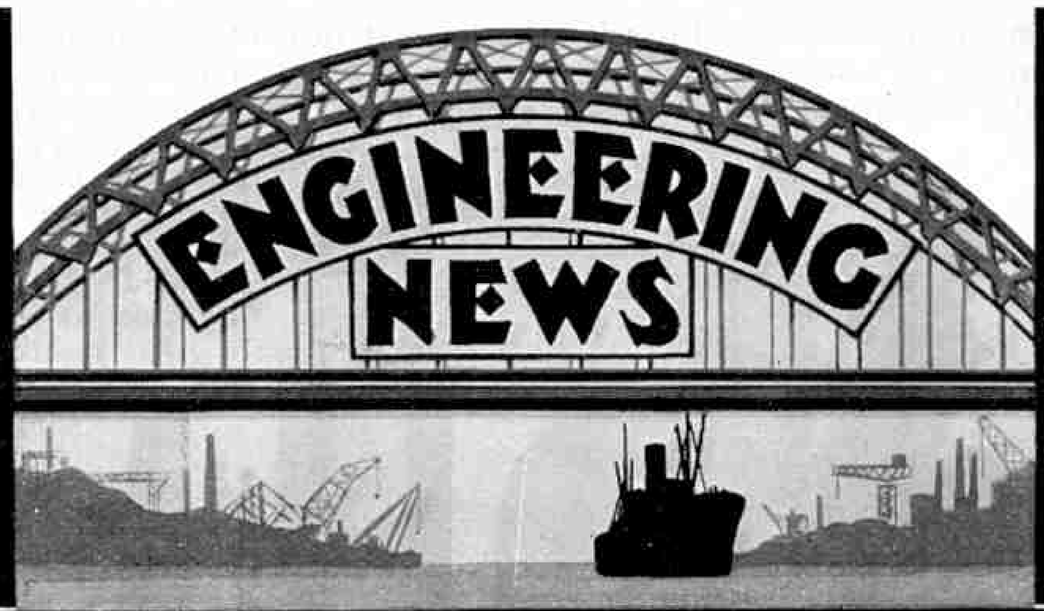
The microscope may be adapted to detect particles that actually are too small to be seen, even with the aid of the most powerful instrument. For instance, very tiny particles suspended in a liquid may be detected by passing a powerful beam of light through the fluid, at right angles to the direction of vision. Light reflected from the particles then passes into the microscope and reveals their position and number. The effect is similar to one that may be seen in a darkened room, full of floating specks of dust, into which a ray of bright sunshine is allowed to enter. The path of the ray is then marked by a cloud of dancing dust particles, which are only seen because they reflect the light. In the absence of particles to reflect light in this manner, even the most powerful beam passing through the atmosphere would be invisible. The device by means of which particles smaller than any that can be seen may be detected is called the ultra-microscope.

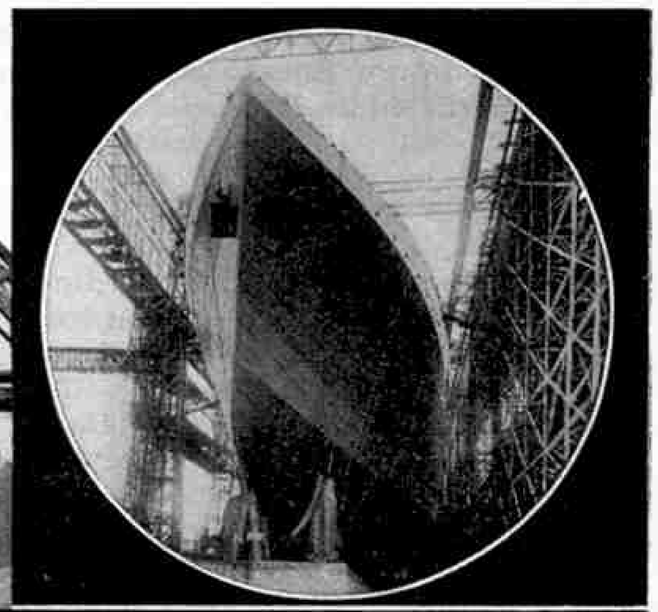
A special form of this instrument using only ultra-violet light has been devised. It may be used to detect extremely minute particles, for the wavelength of the rays is less than that of ordinary light, and they are scattered by particles that would have practically no effect on visible light. As ultra-violet light has no effect on the human eye, an ultra-microscope making use of it must be fitted with a camera.

Analysts find the microscope invaluable in their work of detecting adulteration in foods, and various materials, and waterworks authorities use it to detect impurities in the water stored in their reservoirs. The tiny organisms that are usually present in the water, although so small as to be invisible to the unaided eye, often produce marked effects by reason of their enormous numbers. There are cases on record where certain organisms have existed in such great quantities as to give a distinct taste to the water.

The microscope is also used extensively in metallurgical work, and by its aid many thousands of photomicrographs are prepared each year to assist in the study of the structure of steel and other metals. They are of particular value in the case of alloy steels, and important knowledge regarding the micro-structure of these has been gained by the study of photomicrographs taken with magnifications of 5,000 to 8,000. It is now recognised that the microscope is capable of providing information about metallic structures that cannot be obtained by ordinary chemical analysis.







Large American Irrigation Scheme

Efforts are now being made to supply arid regions in the south and southwest of the United States with water in order to make them suitable for the growth of fruit, vegetables and cereals. The most recent scheme concerns an area of 91,000 acres in Texas that at present yields only cactus, grasses and similar products. Water is to be brought to this area from the Rio Grande by means of a canal 90 miles in length, and as its climate is favourable it is expected that the district will become very productive.

Water will reach most of the irrigated land by gravity flow, but low lift pumps will be required in order to carry it to an area of 25,000 acres. The flow of water in the first section of the canal, 32 miles in length, will be sufficiently rapid to enable it to be used for the generation of hydro-electric power, and a station to develop 4,000 h.p. is to be constructed.

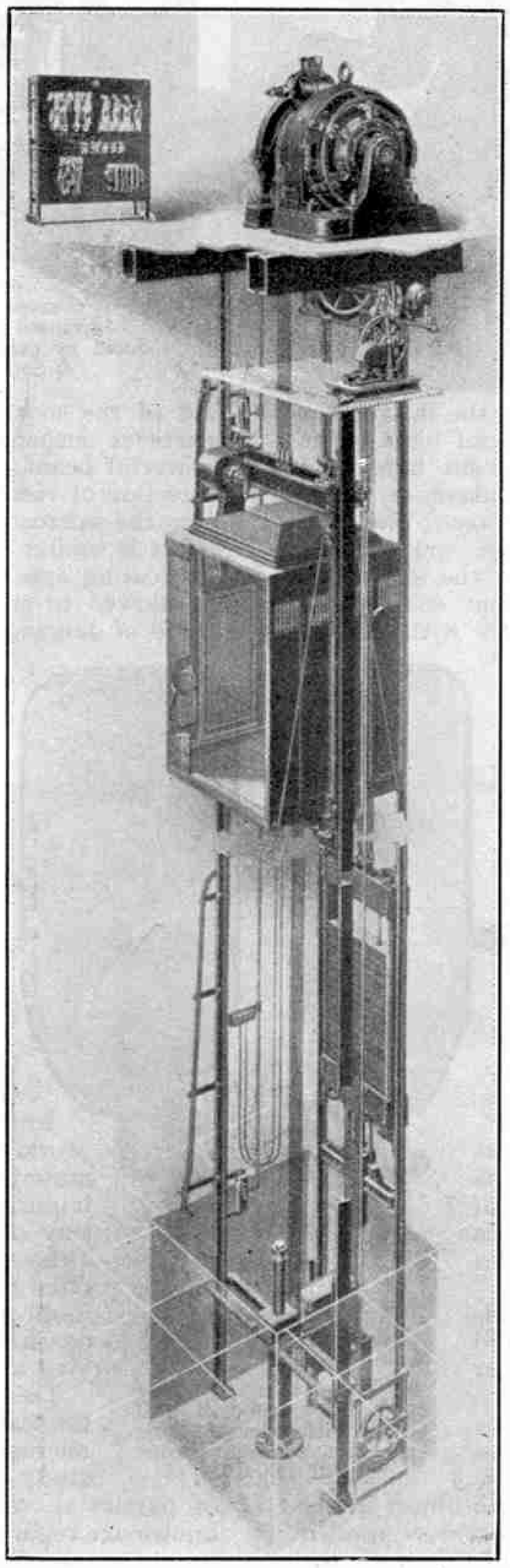
One of the most interesting features of the work is the intake system, which is at a point about 40 miles north of Eagle Pass. There a channel has been cut through rock at a depth of 10 ft. below the low water level of the river. This channel, which is lined with concrete, is 40 ft. in width at the base. Water will flow through it at the rate of 1,800 cu. ft. per second, and will be controlled by means of three gates set in a triple-tubed reinforced concrete tunnel. Special arrangements have been made to free the water in the intake channel from silt.

The canal itself will be 32 ft. in width at its base and the maximum depth of the water in it will be 10 ft. Sections cut through rock will have a surface width of 26 ft., and in other portions this width will be increased to 42 ft. Large streams across the path of the canal will be diverted into underground culverts. It is estimated that 12,000,000 cu. yds. of earth and 700,000 cu. yds. of rock will be excavated during constructional work.

Automatic Swedish Power Station

A power station now being erected at Vargön, on the River Gotha, in Sweden, has been designed to operate under automatic control, and when completed and in working order will not require the attendance of an engineer. The generator in the station is to be of the open air type, and will be the first of this kind to be used in Europe, although similar generators are fairly common in the United States. Two turbines are being fitted. They are designed to operate under a normal head of water of 14.1 ft. and will turn at a speed of 46.9 r.p.m., developing 15,200 h.p.

Two other power stations recently have been completed at Trollhättan and Lilla Edet, also on the River Gotha. The water for the three stations comes from Lake Vener, the largest lake in Sweden, and when the new plant is in operation, practically all the energy stored in the lake will be utilised.



Photograph illustrating the working of a modern gearless traction passenger lift of the type described in the accompanying paragraph. Reproduced by courtesy of Waygood-Otis Ltd.

New Ship Canal Across Central America

Although all the traffic between the Atlantic and Pacific Oceans can now readily be dealt with by means of the Panama Ship Canal, it is probable that in future years the waterway will prove inadequate. Preparations are already being made to cope with the difficulty that will then arise, and a special commission was appointed in 1929 to survey the possible route for a second ship canal to cross Central America.

The commission has decided to recommend the construction of a canal 173 miles in length across Nicaragua from Greytown, on the Atlantic coast, to Brito, on the shore of the Pacific Ocean. From Greytown the proposed canal would reach Lake Nicaragua by way of the San Juan River. After traversing a stretch of the lake 70 miles in length, the waterway then would follow the courses of waterways flowing east.

It is interesting to recall that it was proposed to construct a canal across Nicaragua before the United States Government took over the task of completing the Panama Canal. Survey work actually was begun, and one of the engineers employed was Commander Peary, later to become famous as the discoverer of the North Pole. One advantage of the proposed route is that deep cuttings will not be necessary, while drillings have shown that there will be no danger of earth slides similar to those that created so much difficulty when the Culebra Cut was being made as part of the Panama Canal works.

How Modern Passenger Lifts Work

The illustration on this page is a sectional photograph of a modern lift shaft, and shows the car and its counterweight in addition to the driving motor. The installation makes use of what is called the vee-sheave or traction drive. A single continuous cable is employed, this passing over grooves on the sheave and connecting the car and the counterweight. Friction holds the cable securely in the groove of the sheave, and when this rotates the cable turns with it and raises or lowers the gear. When the gear is to be stopped, a brake similar to that of a motor car is automatically applied to the drum shaft on the motor as soon as the current is switched off.

In the usual system of control the handle returns to a central position when released by the attendant and operates the main switch by means of a flexible cable running up the shaft. An alternative is what is called push button control. This method makes the services of an attendant unnecessary, pressing buttons fixed in the car and on each landing automatically starting or stopping the lift as required.

Amphibious Tank for British Army

A remarkable amphibious tank has been produced by Vickers-Armstrong Ltd. The new machine overcomes obstacles on land in a similar manner to that of previous vehicles of this type, and can be propelled across streams too deep to be forded. In general external appearance it is similar to ordinary tanks, except that it is fitted with special wooden floats designed to support the machine when in water, and to act as mudguards when it is travelling over land.

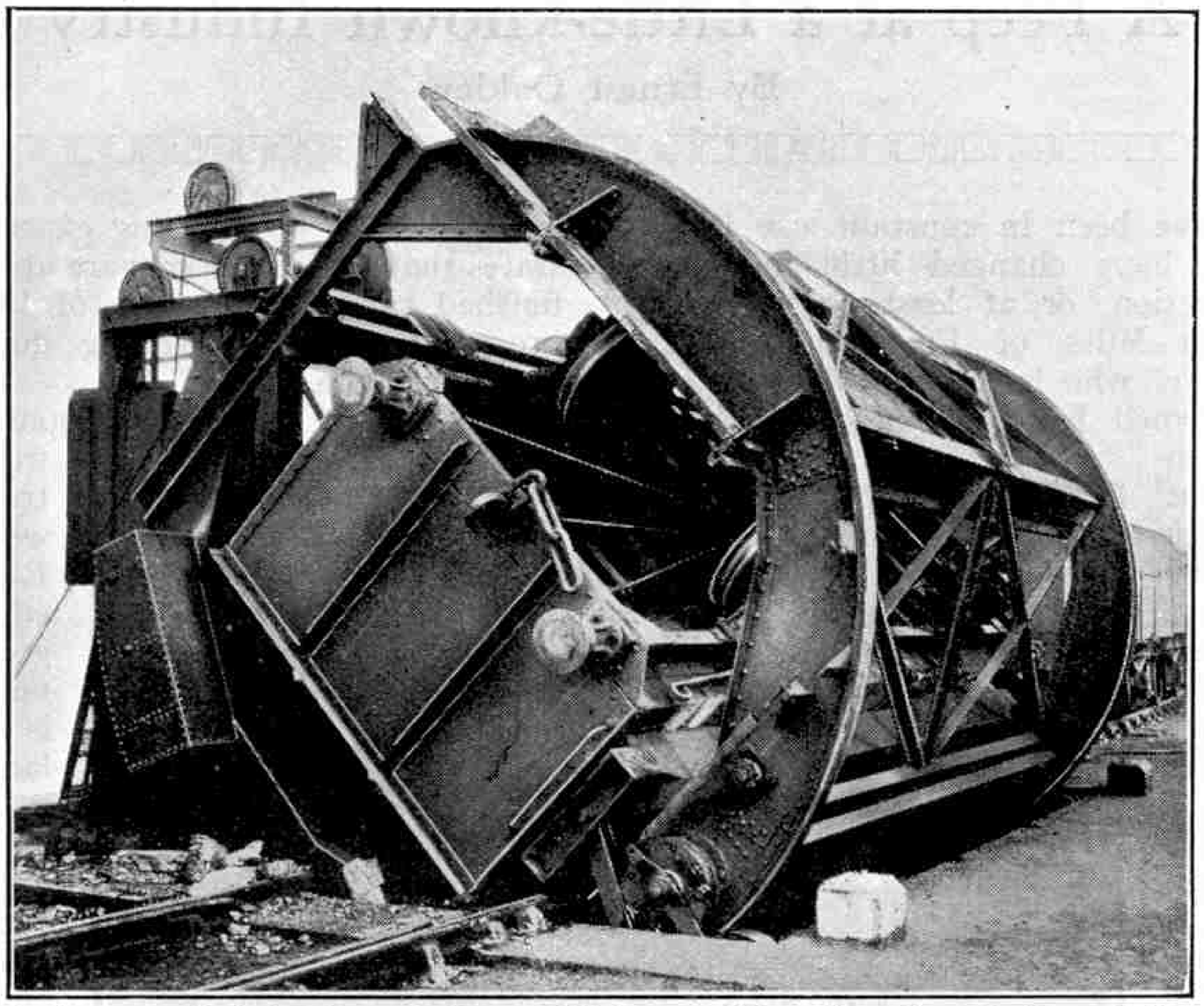
The new tank has a total weight of 2 tons, 15 cwt. It is 13 ft. in length and 6 ft. in height, and is capable of crossing a ditch five feet in width. When travelling on level roads it has a speed of 40 miles an hour, and on hills with a gradient of 1 in 3 this is reduced to 6 m.p.h. The amphibian has a speed of 6 knots in water. It is driven by a small propeller that is completely protected and it is interesting to note that its crew can fire at troops on the banks of streams in which it is cruising.

The whole machine is covered with special armour plate, 9 mm. in thickness, that is claimed to be equivalent to ordinary steel plate 13 mm. in thickness. The new type of plate used cannot be pierced by rifle bullets, even at point-blank range, and is proof against armour-piercing bullets fired from distances of 150 yards or more.

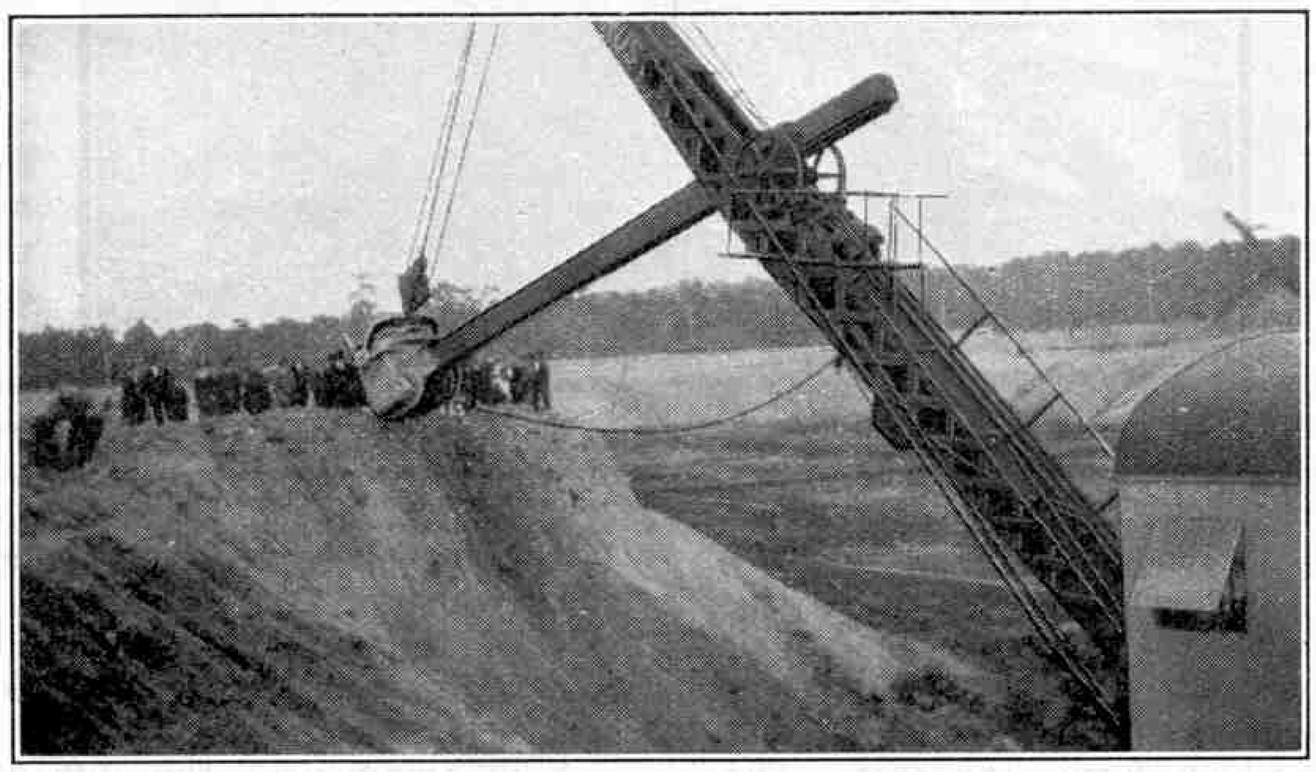
Amphibious tanks were first thought of in 1917 by Colonel Fuller, an army expert on tanks and tank warfare, and an experimental machine was built and tested by him on the Welsh Harp near London, in October, 1918. A second machine was completed in 1922 and was subjected to exhaustive tests. Rough usage on land caused the joints to become strained and the machine eventually filled with water and sank. In the new type, special elastic watertight joints have been designed in order to overcome this difficulty.

Discharging 2,289 Tons in 11 Hours

An unloading record was made at Manchester a short time ago when a cargo of 2,289 tons of iron pyrites brought from San Juan in the "*Lilburn*" was discharged in 11 hours. The vessel was berthed at the Irwell Park Wharf of the Manchester Ship Canal, and four cranes were employed. On the first day they worked from 8 a.m. until 5 p.m., and on the second from 8 a.m. until 11 a.m. This made a total of 44 crane hours, the average discharge of each crane being 52 tons per hour.



A rotary wagon tippler in action. Appliances of this type are widely used on railways for the mechanical handling of coal at locomotive depots and in large industrial plants and power houses.



A large bucket elevator at work. These machines are extensively used in irrigation schemes and in canal construction.

West African Bridge 2,136 ft. in Length

A new steel bridge across the lagoon at Lagos, Nigeria, has now been opened. This is 2,136 ft. in length between the abutments, and its width between parapets is 58 ft., allowing for a roadway 38 ft. in width in addition to two ample sidewalks. The structure contains 8,800 tons of steel and the cost of construction was £426,000. The bridge chiefly consists of spans 20 ft. in length erected on steel screw piles braced and sunk to various depths below the bed of the lagoon. The maximum depth reached by the piles is 80 ft. Two of the spans are 98 ft. in length between bearings and give clear openings 84 ft. 9 in. in width to allow the passage of shipping. The height from the decks of these spans to normal low water level is 25 ft.

The new bridge replaces an older structure called the Carter Bridge. This was not suitable for carrying modern wheeled transport, and it had been found necessary to fix a maximum weight of five tons for vehicles making use of it.

New Sea Wall at Douglas

Work is now rapidly proceeding on the widening of the promenade at Douglas, in the Isle of Man. A new concrete sea wall is being built parallel to the existing one and about 100 ft. seaward of it, and the intervening space will be utilised for a new wide road, a track for omnibuses and a promenade. The wall itself will be about 1,000 ft. in length and 26 ft. in height. At the base its thickness will be 11 ft., but this will be only 4 ft. at the crest.

Excavation to bed rock would have been difficult and costly, for this is from 10 ft. to 20 ft. below the surface of the existing beach. The wall therefore is being built on a concrete foundation, 40 ft. in width, laid down at a depth of about 6 ft. It is faced with pre-cast granolithic blocks, each of which weighs two tons. Owing to the rough seas that are frequently experienced at Douglas, ordinary methods of placing the face blocks in position could not be used. Each was bolted to the block below until the concrete at the back had set sufficiently to hold it in place, therefore, and the bolt holes were then filled with grouting. It is estimated that 86,000 tons of Manx slate grit and clean quarry rubbish will be required to fill up the space between the old and new sea walls.

Bridge to Improve Canadian Highway

Work is to commence shortly on a bridge across the Frazer River at a point south of Vancouver, British Columbia. The construction of the bridge will shorten the road for international traffic along the Pacific Coast, and also will improve communications between Vancouver and a rich farming area south of the Fraser.

The new structure will cross the south or main arm of the river. The south end of the bridge will be on the mainland and the north end will be on Lulu Island, a broad expanse of alluvial land in the estuary of the Frazer River. A new bridge across the north arm of the stream completes the connection to Vancouver.

The length of the bridge itself will be 1,117 ft. and its width 35 ft., giving room for four lines of traffic in addition to a sidewalk 5 ft. in width. Long timber trestles and earthen embankments will carry the roadway over the tidal flats. A lift bascule is to be provided over the channel followed by shipping in the river. This will leave a clear horizontal opening 300 ft. in width, and will give a vertical clearance of 160 ft. above high water level. The estimated cost of the bridge is £600,000.

Ladder-Making at 100 Years of Age

A Peep at a Little-known Industry

By Ernest Oakley

LADDERS, which have been in constant use from very early times, have changed little in their methods of production, or at least that is the opinion of Mr. James Miles of Freemantle, near Southampton, Hampshire, who is known all over the country as the "Uncrowned King" of ladder-makers. He has been engaged in the industry for the past 90 years, and will shortly celebrate the anniversary of his 101st birthday. The art of making ladders was taught to Mr. Miles by his father, who in turn had been tutored by his father.

When I saw this grand old man a short time ago he was busily engaged in completing a 40-rung ladder, which was urgently required by a leading shipping company in Southampton. It was then that I received my first lesson in ladder-making, and this, with my tutor's permission, I am able to pass on to *"M.M."* readers.

The rungs, which are the all-important part of a ladder, were made from a solid block of sweet chestnut wood, which had grown to 18 in. in diameter. This was broken up into appropriate shapes with a cleaver, a chopper-like instrument, which ensures that the grain in the rungs will run only one way. After a sufficient number of these small blocks had been fashioned, they were placed by a shaping horse, a peculiar instrument that is shown in one of the accompanying photographs.

Mr. James Miles of Freemantle, near Southampton, who will shortly celebrate his 101st birthday, has been making ladders for the last 90 years. In this photograph he is seen on the "shaping horse," using a draw knife for shaping a ladder rung.

This machine, which is home-made, consists mainly of a piece of solid oak, which forms the seat. The section manipulated by the operator's feet acts as a grip on the rough rung. A slight movement of the feet will release the fashioned piece of wood. In this way the hands are left free to shape the rung with a draw-knife, a very sharp tool with two handles, which is about 13 in. in width. It works on the same principle as the ordinary hand plane. It requires a great deal of skill and judgment to use this tool, however, which removes the rough surface of the wood. The difficulty for the amateur is to get both ends of the rung exactly alike, but Mr. Miles states that skilled workers are able to produce these half-finished rungs at the rate of 130 an hour. The final process consists of planing down the rungs with a rounded plane.

The ladder poles, or supports, have to be made from young elastic fir trees of a suitable length, which are imported from Russia. These are favoured because of their quick growth and consequent fine grain. English timber is of absolutely no use for ladder-making owing to its very coarse graining. These trees of the right quality and maturity are cut down the centre and halved by means of a circular saw, and then a foot rule and pencil come into play and the holes for the rungs are marked out all along these pieces of wood, on the smooth side. The holes are commenced with an ordinary five-eighth bit, and then comes into play a new tool called an awker, which may be described as something like a small garden trowel, but with razor-like edges and a very fine point. This scoops out the holes and keeps them of a uniform size. With experience it is possible to fashion 35 holes in well under a quarter of an hour. A jarvie is the next instrument brought into use, and this, which is made in the shape of the rounded side of the support, removes the bark of the tree. An ordinary jackplane provides the final smooth surface.

Now commences the difficult task of fitting the rungs and supports together to form the finished article. As no nails, screws or glue are used, readers may wonder how such ladders can be made so firm and trustworthy.

First of all the rungs are lightly dropped into the holes of one of the poles or uprights, and then the other support is placed on the opposite end of the rungs. At each extremity of the now roughly fashioned ladder an iron cramp is placed, and these cramps are tightened

simultaneously. This results in the rungs being forced right through their holes in the uprights. When the rungs have been jammed in as tightly as possible, the cramps are removed and the projecting pieces of rungs are sawn off. It is necessary to be very careful in this process, or there is a grave likelihood of the ladder being thrown right out of shape, and it will then have to be scrapped. This occurs when a rung does not fit exactly on the same level in each support. Final planing and various small finishing touches follow, and the ladder is then ready for sale.

Commencing to make the holes in the uprights to take the rungs of a ladder.

This is the description of an ordinary builder's ladder, but there are many other patterns, which are made on a very similar principle. Among the varieties is the fruit ladder, which has rungs 3 ft. wide at the bottom and decreasing to 11 in. in width at the top. The wide lower portion prevents the ladder from upsetting when a fruit picker is in an awkward position, and has to bend over to pick fruit. Then there are the "inside-out" ladders, which have the rounded portion of the supports innermost, and are used extensively in thatching. This facilitates kneeling when at work, and the outside portion of the ladder acts as a guide line to the worker. There are also window-cleaners' ladders, and the popular form of folding and extending ladders.

The tallest ladder Mr. Miles has been called upon to make recently was fitted with 90 rungs, but years ago he made one with 111 rungs, which is some considerable height in one piece, when the fact that there is usually 8 in. space between each rung is taken into consideration. The distance between each rung varies in different towns, however, and rests with the local building inspectors. It is interesting to note that the long ladders made specially for fire brigades are manufactured by companies in the north of England who specialise in this type of work.

The life of a ladder is much longer than is generally supposed, and recently Mr. Miles was shown one that he had constructed 32 years ago, and which was still in a good state of preservation.

Mr. Miles with a 15-rung handy ladder that he had just completed.

Mr. Miles' little factory, which he works in conjunction with his grandson, Robert Haylor, can turn out ladders at the rate of four or five a day, and all the work is done entirely by hand. There is such a large demand that they are kept constantly busy. In addition to being distributed all over the country, much of their handicraft is shipped abroad. The Southern Railway Docks Scheme, which aims at making the borough's dockland the largest in the country, swallows up much of their produce.

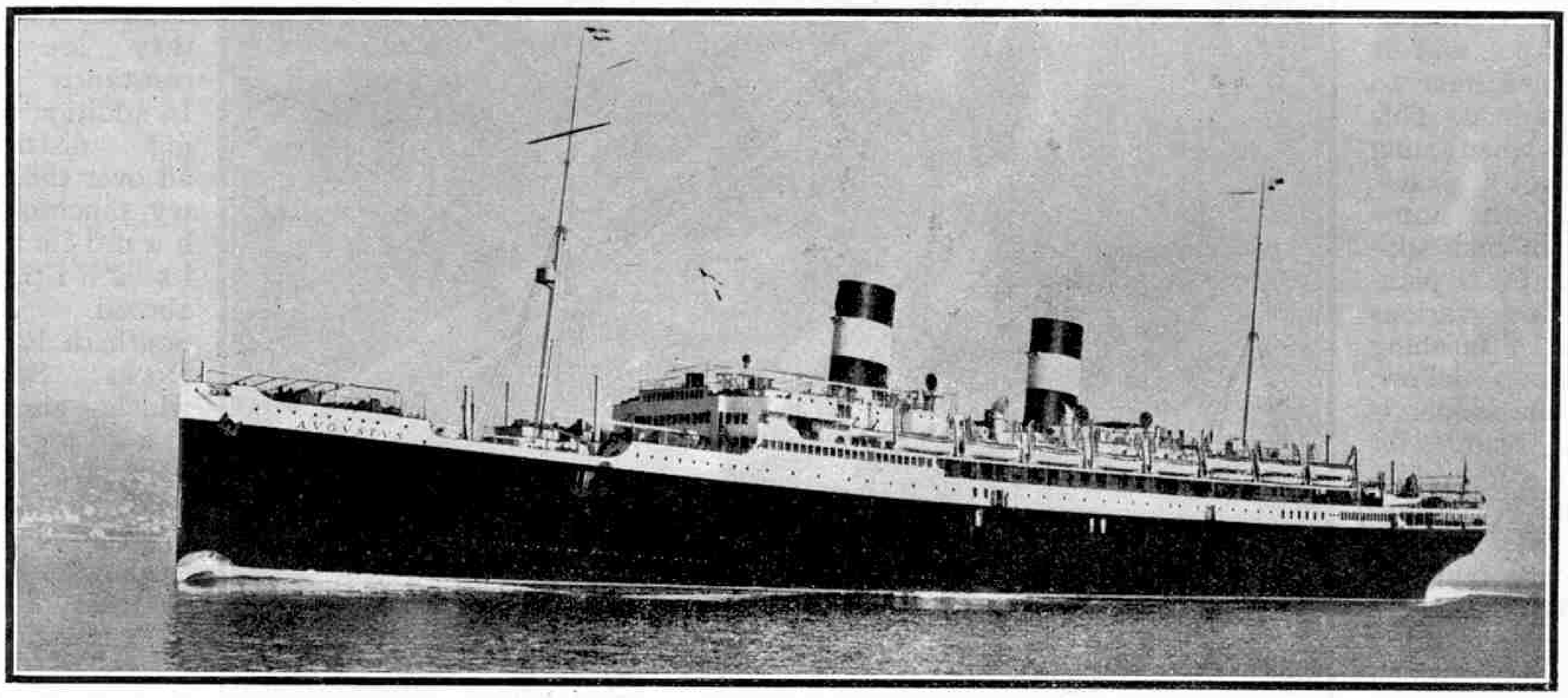
Readers may be interested to know that Mr. Miles was the youngest of a family of 21. When he was quite small his parents moved to Ashford, Kent, and subsequently to a house in the middle of a great wood, where Mr. Miles learned his trade. After moving all over the country making ladders, in much the same way as knife grinders, etc., wander from place to place, he settled down in Freemantle 40 years ago.

It is hard to realise that this upright, active and alert man was born a century ago, and that he has worked every day since he could walk. Although he has never been to school, and can neither read nor write, he has his own system of keeping "accounts," and has on occasions employed more than 20 men. He has very keen eyesight, can hear well, and has a marvellous memory for dates and names. He travelled in the first third-class coach that ran on the old South Eastern Railway, and twice he went to the Derby in a dog-cart drawn by a Dalmatian and a Scotch collie.

When I asked Mr. Miles if he could tell me how to live to be a centenarian, he laughingly replied: "No I can't, sonny. But I can say that I never smoke, at least except for a cigar now and then on important occasions, and I never worry about anything. Those are things I don't do, but I have worked hard and still work, and that's the thing to keep you fit."

Oil Engines for Ship Propulsion

The Largest Motor Vessel

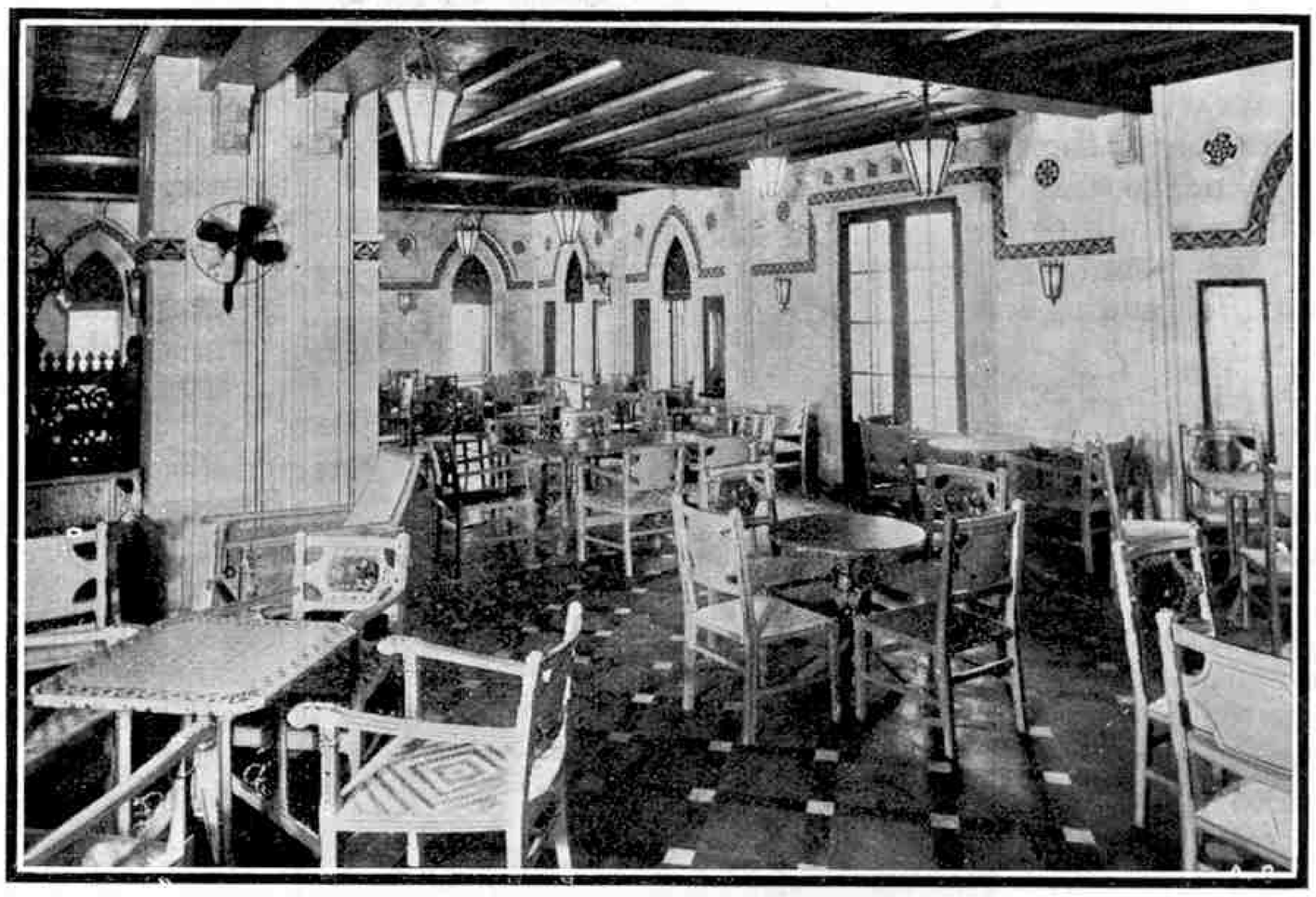


DURING the period in which the steam engine was struggling into efficiency, inventors never lost sight of the possibility of producing an engine that should be self-contained—in other words an engine needing no boiler.

Towards the end of the 17th century various inventors expended a great deal of ingenuity in the attempt to design an engine that would develop power by the explosion of gunpowder inside a cylinder. All these attempts failed to produce a practicable mechanism, and gunpowder was abandoned in favour of certain gases and inflammable liquids. Probably the first man to achieve any real success along these lines was a Frenchman named Lenoir, who about the year 1860 produced an engine that developed power by the explosion of a mixture of gas and air in a cylinder, thereby driving forward a piston which, through suitable mechanism, revolved a shaft. This engine was more interesting than efficient, and it was left to Dr. N. A. Otto to produce, in 1876, a really efficient gas engine, from which the gas engines of to-day have been developed.

The difficulties to be surmounted in the utilisation of liquid fuel were even greater than in the case of gas, but gradually the various obstacles were overcome, and in 1884 Gottlieb Daimler brought out a practical petrol engine from which are descended the engines that to-day are providing motive power on land, on sea and in the air. These engines utilise the spiritous products of petroleum, which are vaporised at ordinary temperatures in a carburetter. There is also another type of engine operating on the same principle, but utilising kerosene or lamp oil or crude petroleum. These fuels are heavier than petrol and require a higher temperature to convert them into vapour. When vaporised they are just as effective as petrol for power production, and in addition they have the advantage of being cheaper. Engines of this latter type are known as oil engines, as distinct from petrol motors using the lighter fuel.

One of the most efficient of present-day oil engines is that known as the "Diesel" engine, for which a patent was taken out in 1895 by Dr. Rudolph Diesel. This engine had many advantages that rapidly brought it into favour for certain types of work. It had the merit of simplicity on account of the absence of boilers, vaporisers, carburetters or sparking mechanism; and the fuel it utilised was comparatively difficult to ignite and therefore much less liable to lead to fires or explosions than the very inflammable petrol.



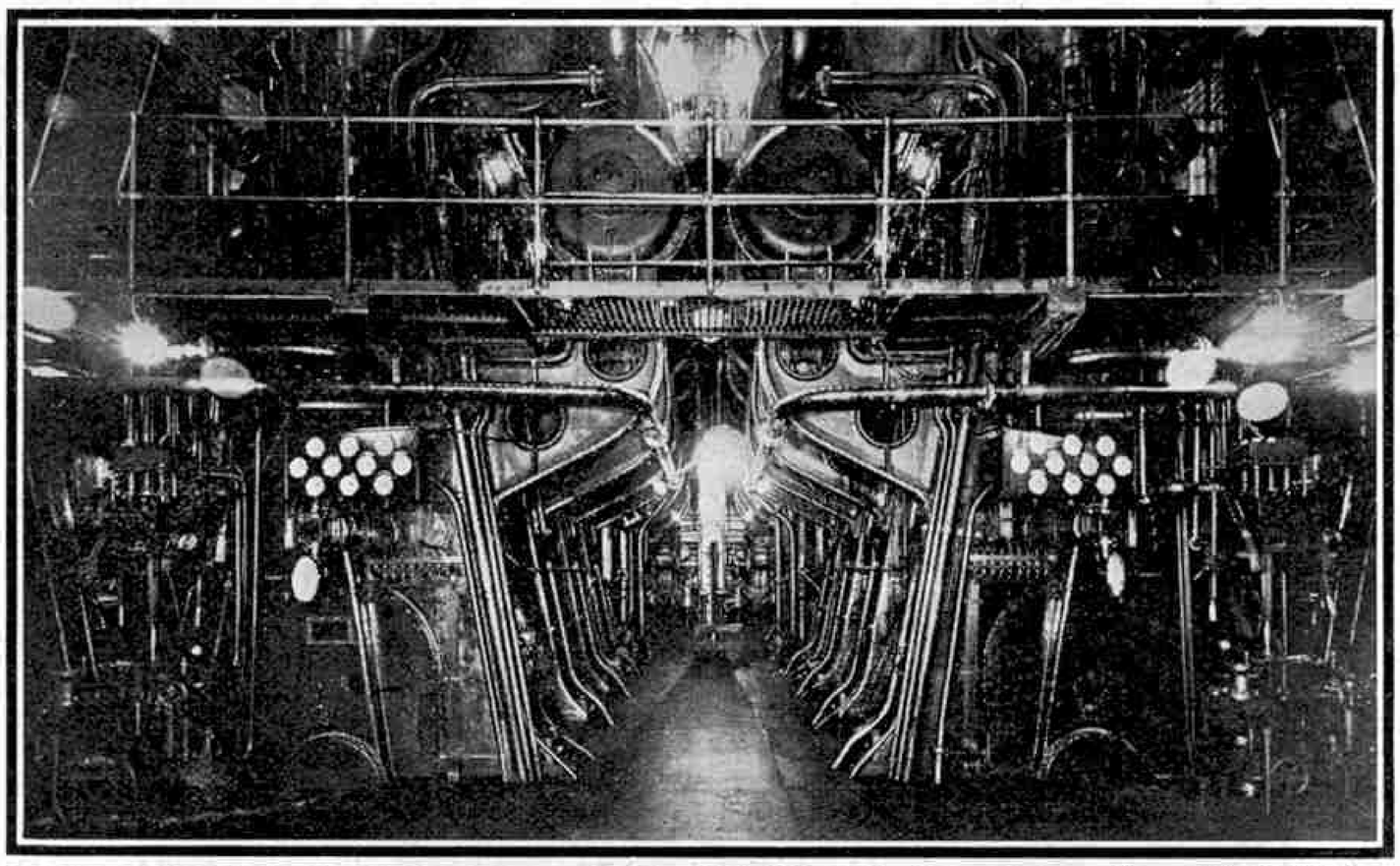
The top illustration shows the M.V. "Augustus," the largest motor vessel afloat. The two funnels accommodate the exhaust silencers of the main engines, and give the vessel the normal appearance of a steamship. The lower photograph is of the tastefully decorated tea lounge.

The Diesel engine differs from other self-contained engines—or internal combustion engines as they are called—in that the charge taken in during the suction stroke consists of pure air only, which is compressed to somewhere about 500 lb. per square inch. The air is thus raised to a temperature sufficiently high to ignite the oil fuel. The latter is sprayed into the cylinder at the end of the compression stroke by a blast of compressed air from a separate reservoir, maintained at a pressure of from 100 lb. to 150 lb. per sq. in. in excess of the maximum pressure in the cylinder. It is important to notice that in the Diesel engine the

fuel is not exploded, as in the petrol motor, but is burned.

When the Diesel engine was introduced it was realised immediately that, if it could be adapted to ship propulsion, it would bring about a great saving in many directions. The number of men required for running the engines would be greatly reduced, as stokers and coal trimmers would not be needed; and there would also be a very large reduction in the amount of space required for carrying fuel. The original Diesel engine had certain defects, however, which delayed its application to marine propulsion. Most of these difficulties have now been overcome, and to-day the marine Diesel engine is being installed in vessels of all types, and is so successful in its performance that it is now a formidable competitor to the steam engine.

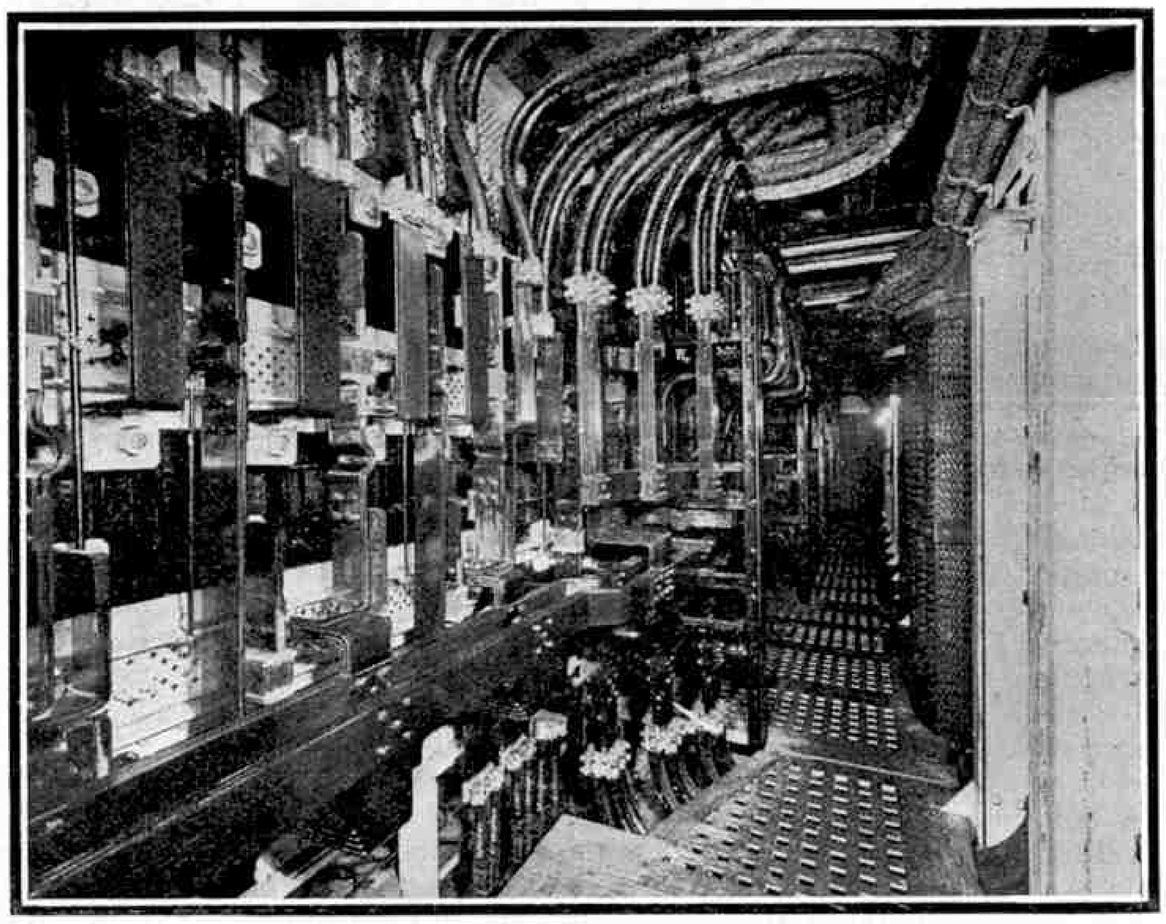
A splendid example of the possibilities of engines of the Diesel type for ship propulsion is provided by the Italian ship "*Augustus*," belonging to the Navigazione Generale Italiana, which, although built in 1927, is still the largest motor vessel afloat. Her gross tonnage is 32,650, as compared with the 26,840 tons of the "*Brittanic*," the largest British motor ship. The other principal dimensions of the "*Augustus*" are length overall 710 ft. 6 in.; length between perpendiculars 664 ft. 6 in.; width 82 ft. 6 in.; draught 30 ft.; engine power 25,000-28,000 S.H.P., and speed 19 knots.



View facing toward the stern in the motor room of the M.V. "Augustus," showing a portion of the 28,000 h.p. propelling engines.

The "*Augustus*" was built at Genoa-Sestri on the slips of the Societta Ansaldo. Her hull is divided into 13 watertight compartments, in order to ensure stability and safety. She is fitted with gyro-compass, submarine signalling apparatus, and an unusually powerful wireless installation, and has 36 lifeboats, of which two are motor vessels equipped with wireless. A section of the water ballast tanks is utilised as additional bunker space for the storage of fuel oil for the engines, in addition to the regular bunker tank capacity of 2,500 tons, giving a total of 4,200 tons. The fuel consumption per 24 hours is roughly 120 tons. The main propelling motors are situated amidships, and the auxiliaries in a room just forward of the main engine room.

The passenger accommodation allows for a total of 2,210, made up as follows—first-class 302, second-class 338, intermediate second-class 166, third-class 1,034, and 370 deck passengers. Of the 302 first-class cabins, 112 are single-berth cabins and 111 have adjacent bathrooms. The officers and crew number 500, thus making the total number of persons on board to 2,710.



A rear view of the switchboard from which the ship's electricity supply is controlled.

Among the principal attractions of the ship is the open-air swimming bath on the sports deck, fitted with a sliding roof for bad weather. The passengers' public rooms are luxuriously decorated, mostly in various antique styles. The great hall is decorated in the style of the Renaissance period; the entertainment saloon in the style of the princely palaces of Palermo; the dining saloon in the decorative art of Piedmont at the end of the 18th century; the children's nursery in 18th century baroque, and the tea lounge in 13th century style. There is a large tennis court, surrounded with netting to allow the use of tennis balls instead of the usual rubber rings used in deck tennis; and a well-equipped gymnasium with dressing rooms and showers caters for the physical well-being of the passengers. General ventilation is by the "Thermotank" system, and there is steam heating throughout.

The four main propelling motors are double-acting two-cycle engines of the M.A.N. type, built by the Maschinenfabrik Augsburg-Nurnberg firm in conjunction with the Italian licensees, Cantieri Officine Savoia. Each engine has six cylinders of 28 in. bore and 4 ft. stroke, and at 120 r.p.m. develops 6,250 S.H.P., but is capable of developing 7,000 S.H.P., giving a maximum total of 28,000 S.H.P. on the four propeller shafts. Compressed air for the fuel injection is supplied from a compressor driven by each motor.

The auxiliary machinery motors are of the Diesel M.A.N. four-cycle single-acting type, eight in number, placed in a compartment forward of the main engine room. Three of these, giving 750 h.p. at 120 r.p.m., drive three 600 kw. generators supplying the current necessary for the three turbine blowers that effect the scavenging of the main engine cylinders after the power stroke. The blowers operate at between 1,800 and 2,450 r.p.m., and two are capable of supplying normal requirements.

The four other auxiliaries, developing 600 h.p. each, drive 280 kw. generators for the supply of current for lighting and for deck machinery. In addition to the compressors driven direct from the main engines there are two electrically-driven and one steam-driven compressors. The compressed air used for starting up is stored at a pressure of about 426 lb. per sq. in. in special tanks having a capacity of 6,000 cu. ft., and placed athwartships along the bulkhead separating the main and auxiliary engine rooms.

Forward of the auxiliary engine room, and much smaller, is another compartment containing the two oil-burning boilers for the supply of steam for the Thermotanks for ventilation, heating and kitchens. In the same compartment are installed also the fire pumps and the pumps for boiler supply, drinking water and other purposes. The auxiliary motor exhausts, which are fitted with silencers, are led into the foremost funnel, as also are the boiler uptakes. The main engines each have two exhaust silencers, one in the engine room and the other in the after funnel. The two funnels give the vessel the normal appearance of a steamship.

On her trials the "*Augustus*" attained a speed of 19 knots, each motor developing 6,250 h.p. at 120 r.p.m. Under the conditions of the contract the motors were then opened out to full speed for 24 hours, during which period they attained nearly 20 knots.

Although the "*Augustus*" is still the largest motor vessel afloat she is not the fastest ship of this type. This distinction is held by another Italian liner, the "*Victoria*," owned by the Lloyd Triestino Line. The "*Victoria*" is a quadruple-screw vessel driven by four C.R.A.-Sulzer single-acting two-stroke cycle Diesel engines, and has a service speed of 20.5 knots. During her trials she attained the remarkable speed of 23.26 knots. She was built in 1930 and placed in commission in June 1931, and maintains a service between Adriatic ports and Alexandria that formerly was operated by two steamships.

A Record Run on The "*Cheltenham Flyer*"

In the article on page 882 of last month's "*M.M.*," reference was made to the brilliant running of the G.W.R. "*Cheltenham Flyer*" on Wednesday, 16th September, when the locomotive No. 5000, "*Launceston Castle*," with a load of six coaches, weighing with passengers and luggage close upon 200 tons, covered the distance of 77¼ miles from Swindon to Paddington, start to stop, in approximately 58 minutes. The particulars of this run as supplied by the G.W.R. were only scanty, and many regrets have since been expressed that no one had timed this remarkable run in detail. It is gratifying to discover, therefore, that Mr. C. J. Mount, who travelled on the "*Flyer*" that day, made a full and careful record of the running. His detailed log, given in this month's "*Railway Magazine*," reveals some astounding feats of speed.

A very rapid start was made and 60 m.p.h. was attained within two miles of leaving Swindon. Shrivenham, 5.7 miles, was passed in 6 min. 15 secs., a gain of 13 secs., as compared with the run on the Monday of that week. Speed continued to rise steadily until a maximum of 90 m.p.h. was touched near Wantage Road, and the 67.3 miles from Shrivenham to Acton were covered in 47 min. 5 secs., giving an average speed of 85.8 m.p.h.! Adverse signals at Acton checked the speed and occasioned a loss of half-a-minute. The concluding stage into Paddington was taken very cautiously and the train, after merely crawling down the length of the platform, finally came to a stand 58 min. 20 secs. after leaving Swindon. Half-a-minute may be fairly allowed for the check at Acton, so that the net time would be only 57 min. 50 secs.—a truly marvellous performance.

"*The Flying Scotsman*"

During the period of the summer services when "*The Flying Scotsman*" ran each week-day non-stop between London and Edinburgh in both directions, eight "Pacific" locomotives were employed to maintain the service and together they covered an aggregate of 37,728 miles. Eighteen drivers shared in this exceptional link of service. The winter schedule of this famous train includes stops at Grantham, York and Newcastle.

New Locomotives on the S.R.

Two more three-cylinder 2–6–0 locomotives of the "U.1" class have been turned out from Eastleigh and are now in service. They bear the numbers 1906 and 1907.

S.R. Trial of Train Control System

The Southern Railway are experimenting with a new method of automatic train control that is known as the "Strowger-Hudd" system. This system operates by magnetic induction quite independently of human assistance. A powerful electro-magnet fixed between the rails acts upon a receiver carried between the leading wheels of the engine and the driver is automatically informed whether signals are "on" or "off." For instance, when a distant signal at "clear" is passed, a hooter in the engine cab gives a short blast. If the signal is at danger, however, a continuous blast is sounded and the brakes are automatically applied.

An engine of the "King Arthur" class—No. 774, "*Sir Galeris*"—has been fitted with the "Strowger-Hudd" apparatus and a number of successful tests have been carried out on the S.R. main line in the neighbourhood of Byfleet.

It is claimed that the system is simple and inexpensive, and that its adoption would make special signalling during fog unnecessary and ensure greater safety.

Gun runners in the Gainsborough film, "The Ghost Train," attempting to get away. As described on page 952 of this issue, they are frustrated by the opening of the bridge ahead of them and their train plunges into the river.

L.M.S.R. Locomotive News

The 4–6–0 express engine No. 6159, of the "Royal Scot" class, has received the name "*The Royal Air Force*."

Crewe works have turned out further 4–4–0 passenger engines (Class "2") which are numbered 652 to 656. From Horwich works two more 0–6–0 shunting tanks have been sent out. Their numbers are 16760–1.

Two more L.N.W.R. locomotives have been altered to work on the Midland Division. They are No. 5334, "*Newcomen*," a 4–4–0 of the "George the Fifth" class; and No. 5668, "*Pegasus*," a 4–6–0 of the "Prince of Wales" class.

Among recent withdrawals for scrapping are two 2–4–0 engines of the "little Jumbo" class with 6 ft. driving wheels:—These are No. 5102, "*Cuckoo*," and No. 5104, "*Woodlark*."

G.W.R. Tank Engines Built at Swindon

The first five of the new 0–6–0 tank engines have just been completed at Swindon and are about to be put into traffic. They are numbered 5400 to 5404. Twenty of the improved 2–6–0 "Mogul" tender engines of the new "93" series are on order. The first five are now being erected and will be ready for service early in the new year.

The four-cylinder 4–6–0 express engine No. 4043, "*Prince Henry*," has lately been through the repairing shops at Swindon, where it received new outside cylinders with outside steam pipes similar to those on the "Castles." No alteration has been made to the boiler or cab.

"Mountain" Locomotives for the P.L.M.

A new and enlarged series of 4–8–2 "Mountain" type locomotives has been introduced recently on the Paris, Lyons and Mediterranean Railway. The "Mountain" type was adopted by this railway several years ago in order to cope with the formidable gradients on the main line.

The new locomotives are 4-cylinder compounds, having high-pressure cylinders with a diameter of 17¾ in. and a stroke of 25½ in., and low pressure cylinders with a diameter of 26¾ in. and a stroke of 27½ in. The driving wheels are 6 ft. 6¾ in. in diameter. The huge boiler has a total heating surface of 3,648 sq. ft. and a grate area of 53 sq. ft. The weight of the engine empty is about 110 tons.

One of the locomotives and trains used when filming "The Ghost Train." This train represents the "Cornish Riviera Express" and is standing at a station on a disused branch line near Bath, where a number of scenes in the film were shot. The station was altered to represent "Fal Vale," where part of the action of the film takes place. (See page 952).

Locomotive Standardisation on the S.R.

At the time of the amalgamation of the L.S.W.R., the L.B.S.C.R., and the S.E.C.R. into the Southern Railway in 1923, Mr. R. E. L. Maunsell, as Chief Mechanical Engineer, found himself in charge of a great variety of locomotives of many different types and classes. In the interests of economy and efficiency, he at once adopted a policy of standardisation to be applied in all new construction. He determined to build as few types as were necessary to operate the different services on all parts of the S.R. system, and to construct all classes with as many interchangeable parts as possible. Standard classes of all types have since been designed and put into service.

The most powerful express locomotives are the 4–6–0's of the now famous "Lord Nelson" class, having four cylinders of 16½ in. diameter and 26 in. stroke, and driving wheels 6 ft. 7 in. in diameter. The 16 engines of this class that have been built are named after famous naval commanders.

Slightly less powerful, but splendidly efficient, are the more numerous "King Arthurs," which also have the 4–6–0 wheel arrangement, but only two cylinders of 20½ in. diameter and 28 in. stroke. The driving wheels are of the same size as those of the "Lord Nelsons." This class is known as the "N.15" and comprises 74 engines, all bearing names associated with King Arthur and his Knights of the Round Table.

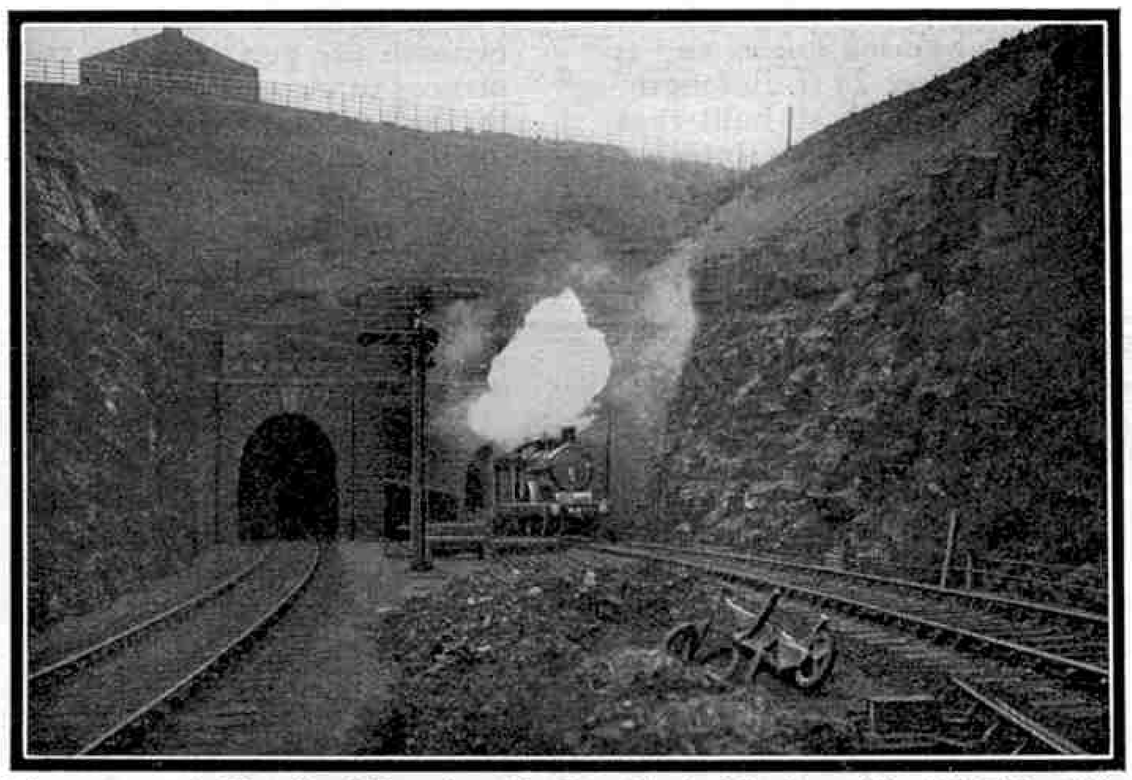
A number of engines of practically identical design have been built but with smaller driving wheels. Some of these have 6 ft. wheels and belong to the heavy mixed-traffic Class "H.15." Others, intended for heavy goods work, have 5 ft. 7 in. driving wheels and their Class is "S.15." The engines of these two classes do not carry names.

In the popular "Schools," or "V" Class, some 4–4–0 express engines have been built which rank as the most powerful locomotives of this wheel arrangement in this country. They have 6 ft. 7 in. driving wheels and three cylinders of 16½ in. diameter and 26 in. stroke. Ten of these engines are in service and are called after well-known Public Schools. Twenty more of the class are on order.

Locomotives of the 2–6–0, or "Mogul," type, are favoured by Mr. Maunsell for numerous services, and four different classes of the type are now standard. All engines of these classes are of the same general design and carry boilers of the same dimensions. The differences lie in the size of the driving wheels and in the number and size of the cylinders. Class "N" are designed primarily for goods traffic, although they are also employed to a considerable extent on passenger trains, and have driving wheels 5 ft. 6 in. in diameter. They have two outside cylinders, with a diameter of 19 in. and a stroke of 28 in. Class "N.1" engines are almost identical but have three cylinders of 16 in. diameter and 28 in. stroke. The smaller cylinders reduce the overall width and permit these engines to work on certain routes where those of the "N" Class cannot be used.

The engines in Classes "U" and "U.1" are employed for the most part on passenger traffic. They have 6 ft. driving wheels, but differ in that "U" engines have two cylinders, while "U.1s" have three. Their cylinder dimensions are the same as those of the "N" and "N.1" classes.

Some goods tank engines of the 2–6–4 type with three cylinders are now on order and will belong to Class "W." The engines of Class "Z" are powerful 0–8–0 shunting tanks with three cylinders (16 in. diameter and 28 in. stroke), and driving wheels 4 ft. 8 in. in diameter. Eight of this Class are at work, performing shunting and marshalling duties in the most important goods yards on the Southern Railway.



The entrance to Woodhead Tunnel on the Great Central Section of the L.N.E.R. This is situated on the main line between Manchester and Sheffield. There are two bores and the tunnel, which is 3 miles 13 yd. in length, is the longest on the L.N.E.R.

New Anglo-French Train Ferry

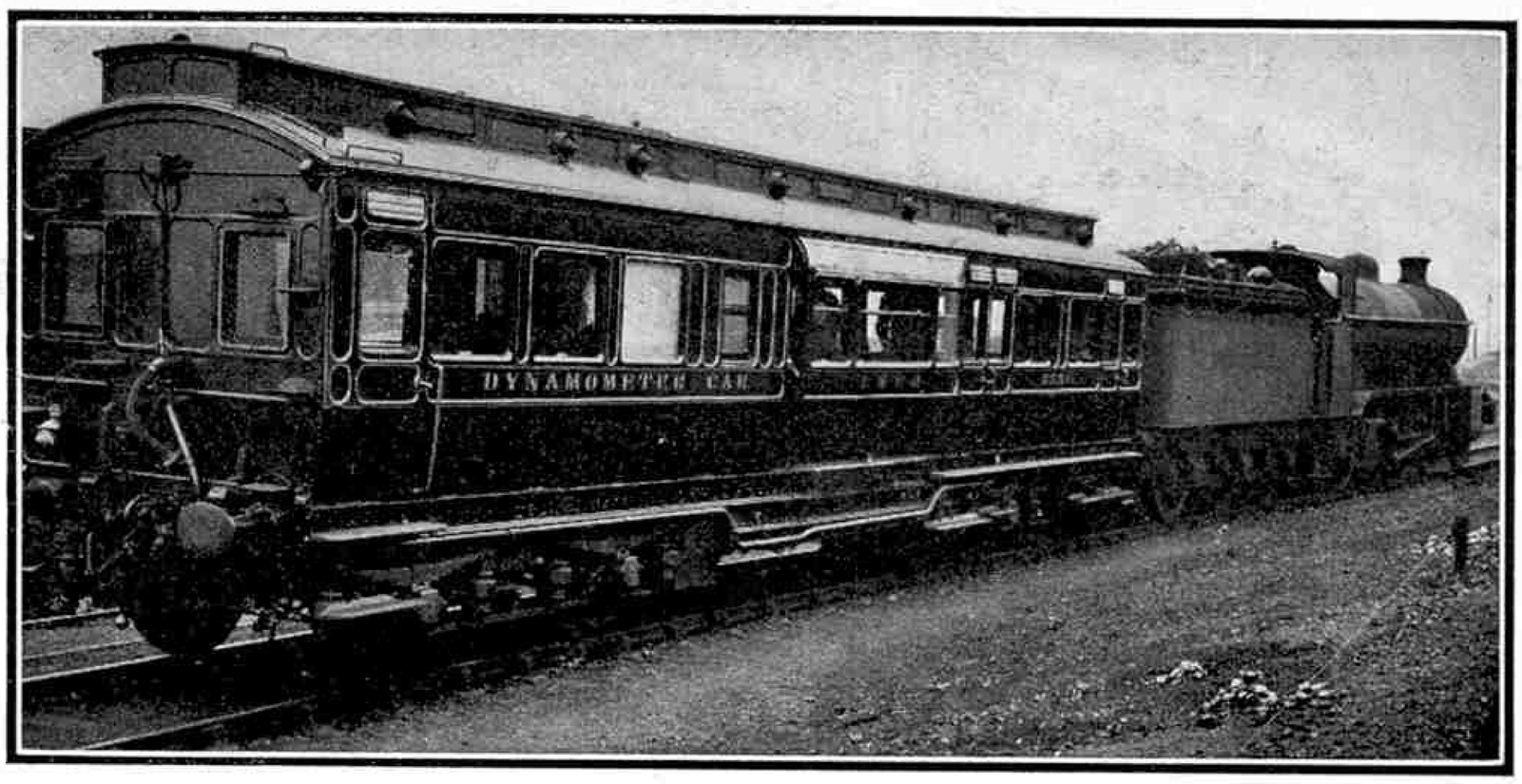
Negotiations have been proceeding for some time past for the establishment of another train ferry service between England and the Continent, in addition to the one that has operated for several years between Harwich and Zeebrugge. It was proposed to inaugurate such a service between Richborough, on the coast of Kent, and Calais, but owing to certain difficulties an alternative scheme has been adopted and early in November a new train ferry service was started between Harwich and Calais. It is being operated by the Great Eastern Train Ferries Limited, of London, the company that runs the train ferry between Harwich and Zeebrugge. This older service has worked with great success and it is expected that the new train ferry will also provide much-needed facilities and attract a large amount of traffic.

Some other train ferry schemes are under consideration, including one for a service between Varberg, in Sweden, and Immingham, in England.

Mysteries of the Dynamometer Car

How New Locomotives are Tested

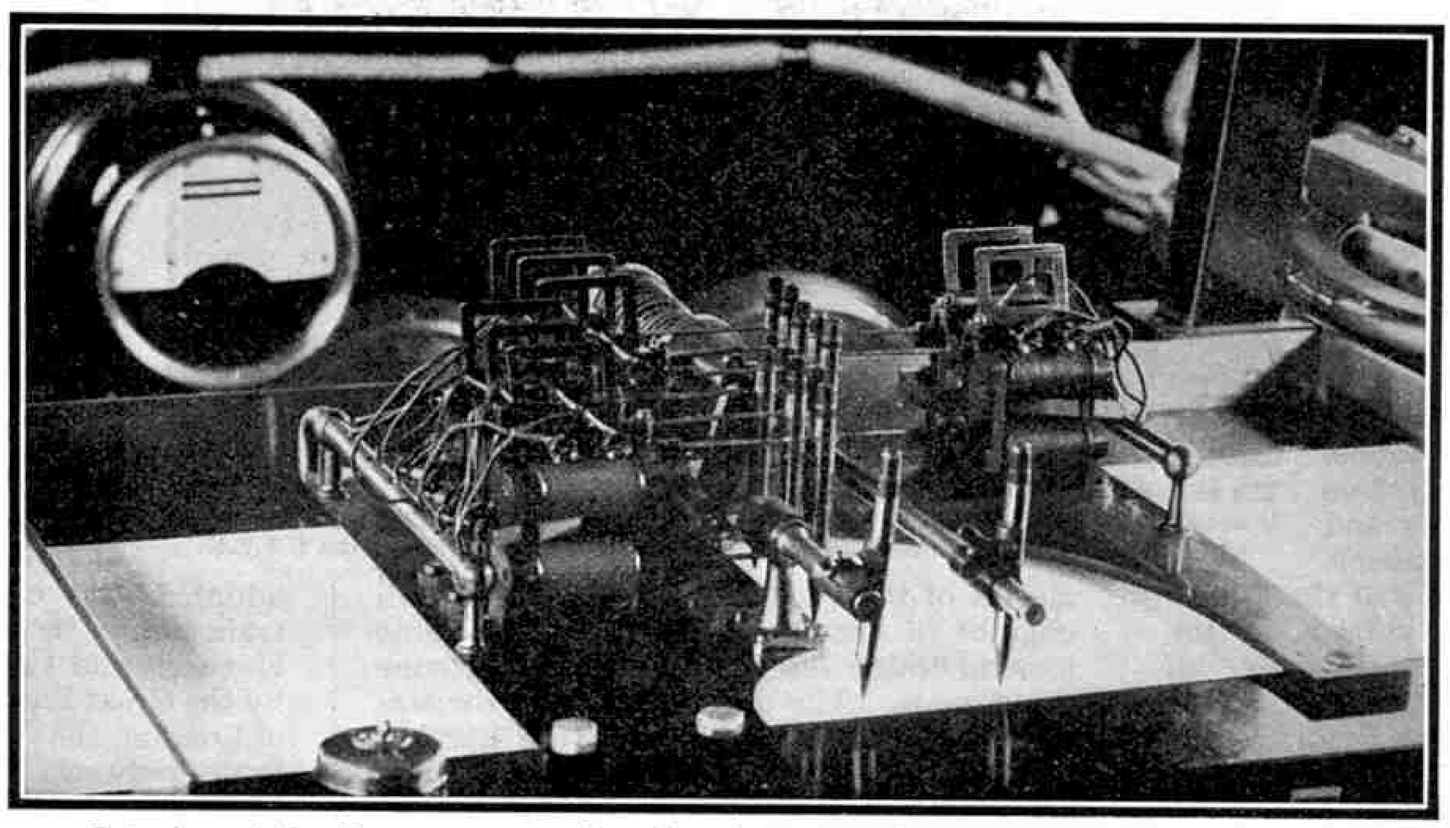
As soon as a locomotive of new design is ready for service, it is put through a series of severe tests with the object of determining how it will acquit itself in everyday running, and of discovering its strength and its weaknesses. Comparisons are made with locomotives already in service in regard to fuel and water consumption and general engine and boiler performance. The medium through which these and many other tests are made is the "Dynamometer Car." Some readers no doubt will have seen such a car in actual service, while those who were fortunate enough to visit the British Empire Exhibition in 1924 may recall the coach, somewhat resembling a saloon, that was fitted up in a mysterious manner. That vehicle was a typical dynamometer car, completely equipped with the apparatus that is required for taking records on a test journey.



L.N.E.R. Dynamometer Car ready for the run, attached to one of the 2-8-0 mineral engines of the G.N. Section.

The body of the car is mounted on two 4-wheeled bogies and is divided into three compartments, the largest over 25 ft. in length. This compartment is fitted with plate-glass windows so built that the best look-out possible can be obtained from the interior. Behind the main compartment are cupboards for stores, two lockers, and a battery of accumulators for the electrically-operated instruments. The third compartment is equipped with a table and benches for the crew, which consists of five engineers. The dynamometer car is usually placed at the head of the train immediately behind the tender of the locomotive to be tested, that is, between the engine and the leading van.

The most important recording device of the car is a long spiral spring of the finest possible workmanship, which is fitted beneath the floor and connected to the coupling of the locomotive ahead. This huge spring works on roller bearings, and is so delicately adjusted that it registers accurately the exact pulling power of the engine at every stage of the run, or as the engineers say, records the "drawbar pull."



Interior of the Dynamometer Car showing central recorder and metal fingers.

A technical description of the apparatus would make rather tedious reading, and it is sufficient to note that the attachments to the spring are coupled to a bar running longitudinally with the car and across the instrument table. The pull on the drawbar is recorded by an instrument known as the "integrator," and the gearing of the whole apparatus is so arranged that one complete revolution of the roller represents 330,000 ft. lb. of work. An electric counter tots up the revolutions, which are recorded by an electro-magnetic pen. Also beneath the floor of the car is a heavy additional wheel that can be raised clear, or lowered so that it runs along the rail, as required. This wheel is constructed to such a diameter that it makes 440 revolutions for every mile that it runs, and it also provides the motive power for the operation of several of the recording instruments.

Connected with the wheel and the spring is the central recording instrument, an uncanny-looking device, which consists principally of a number of moving metal fingers each holding a stylographic pen.

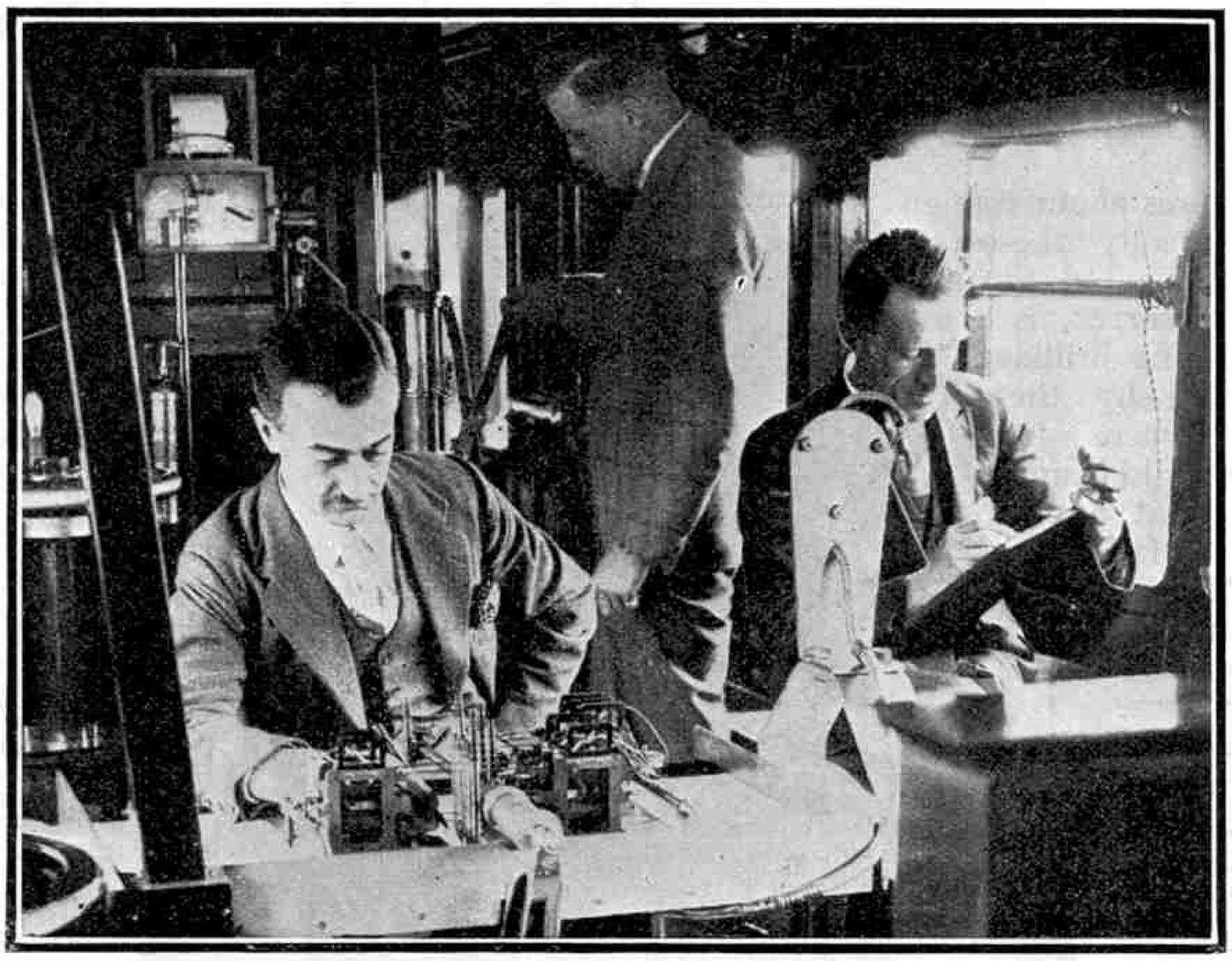
At the commencement of each test, a thick roll of paper, 12 in. in width, is threaded through this central recorder beneath the pen. As the train leaves the station the wheel commences to move, the spring begins to register, and the pens, guided by their metal fingers, write the story of the journey in the wandering lines of a graph on the paper roll, which is made to move across the recording machine. Each of these lines has a particular meaning. There is, for example, a line of speed recorded by a clock, electrically connected with the speed pen. As the paper that moves across the recorder is driven by the special wheel just referred to, it passes the pen point at a rate proportionate to the speed of the train. Wheel and clock thus combine to give automatically what may be called a "speed trail," which can be read off in miles per hour by means of a scale measurement.

The wheel records also the distance travelled, and the spring beneath the floor gives the power exerted by the engine from second to second, a separate metal finger and pen recording the deflections of the drawbar in a sinuous line.

On the footplate of the engine ahead of the car an inspector travels, and supplements the information automatically recorded by means of a portable telephone, which is connected by a cable over the coals in the tender to a loud speaker fitted inside the roof of the car. Such particulars as steam pressure, cut off, opening of regulator and height of water in gauge glasses are continually passed through this telephone to the car engineers,

who note them down on the moving chart.

Among the most important of the engine's efficiency tests are those classed as "indicating." Readers probably have often heard the expression "fitted with indicating shelter" used in connection with locomotive reports, and particularly relating to new engines. The explanation is that observation is being made of the locomotive's behaviour from the front of the engine. The work here is the hardest of all. In the narrow space afforded by the hut-like shelter erected on the buffer beams, the draughts coming through the chinks in the shield nearly freeze the occupant's back, while the front part of his body is almost roasted by the heat given off by the smoke-box!

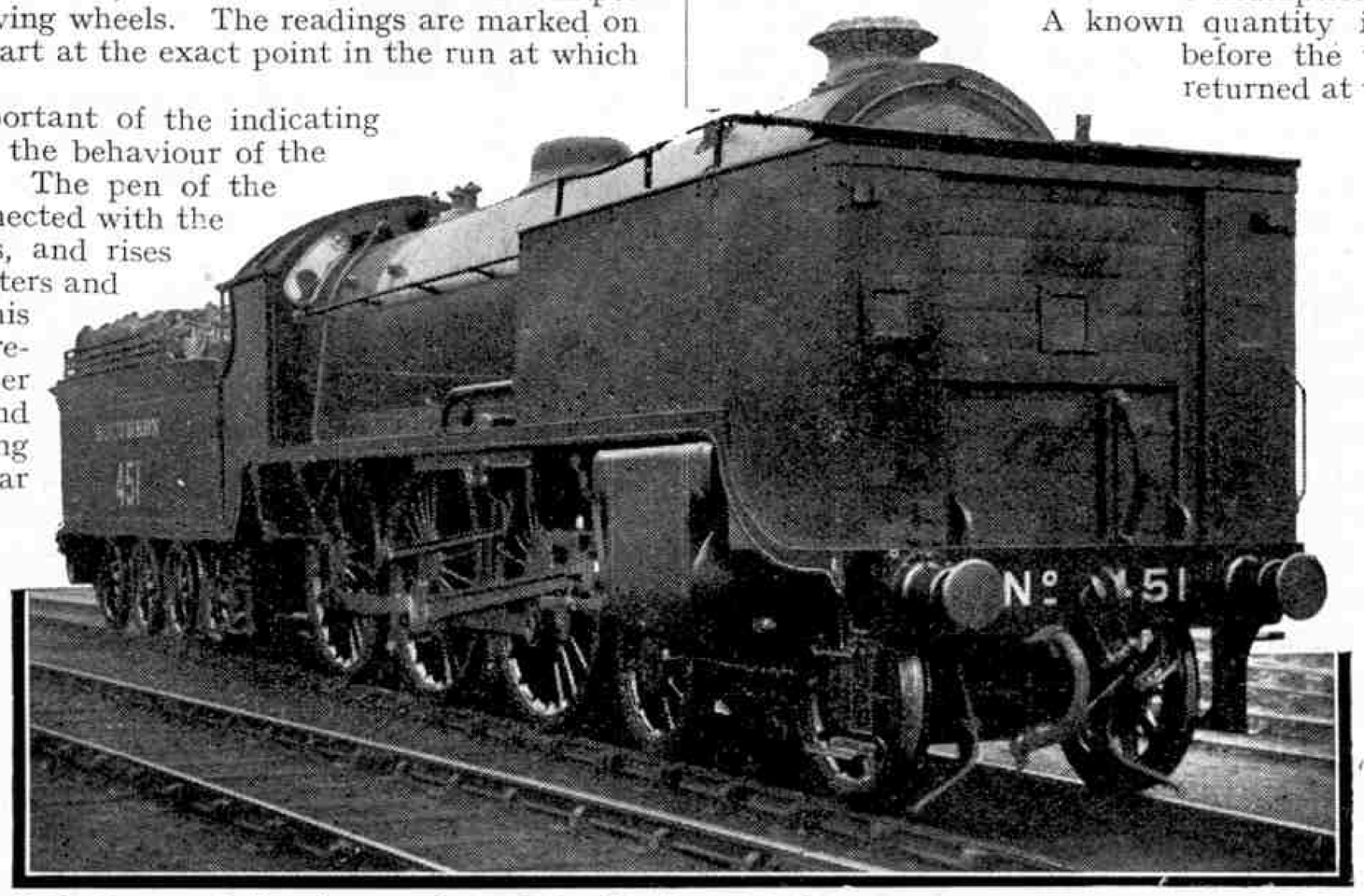


The dynamometer car staff engaged with the recording instruments during a trial run.

Instruments known as "U" type manometers are used for recording vacuum and pressure in the smoke-box, and an apparatus known as a 6-station pyrometer gives the temperatures of the superheater and smoke-box. The operation of this latter apparatus depends on the fact that when two dissimilar metals are brought into contact, and the ends in contact are hotter than the other ends, a small electro-motive force is generated. By attaching wires to the cold ends and leading them to a meter, the difference in temperature between the hot and the cold ends can then be read.

A separate telephone line is led direct to the dynamometer car, and through this the engineers in the shelter transmit all special readings regarding the temperature of the steam in the superheater, the vacuum and pressure in the smoke-box, the effects of the draught through the boiler tubes, and the number of revolutions per minute made by the driving wheels. The readings are marked on the dynamometer car chart at the exact point in the run at which they are taken.

One of the most important of the indicating tests is the recording of the behaviour of the steam in the cylinders. The pen of the indicator is directly connected with the interior of the cylinders, and rises and falls as the steam enters and expands inside them. This up-and-down motion is recorded on a piece of paper that moves backward and forward on the indicating cylinder chart in a similar manner to the forward and backward motion of the piston in the engine cylinder. The drawing produced represents roughly the shape of a boot, and so long as the engine continues to use the steam steadily and evenly the same drawing is produced with each successive cycle of the cylinder's motions.



"Sir Lamorak," a locomotive of the Southern Railway 4-6-0 "King Arthur" class, fitted with an indicating shelter as described in this article.

The importance of the indicating tests will be understood when it is stated that from the charts produced it is possible to calculate definitely the exact horse-power exerted by the engine at any point on the run.

Inside the dynamometer car itself, three engineers watch and control the ever-moving strip of paper beneath the mechanical fingers of the central recorder, note down messages from their colleagues ahead; and separately record by other instruments the direction of the wind, the wind pressure, the temperature of water in the tender (by means of ordinary mercury thermometers), and other details about the journey, for subsequent comparison with the corresponding results obtained from similar tests made on other trains.

At the end of the run the coal, water and oil consumption is carefully ascertained, and so exhaustive are the tests that samples of the ashes are taken from the ash pan for subsequent analysis in the laboratory.

Only the coal actually used in the run is determined, for the fire is made up with unmeasured coal before starting and as nearly as can be gauged a similar quantity is placed in the fire-box at the end. The tender with its tank full of water, which was weighed before the start, is weighed again at the end of the run, the tank having been refilled to the previous level, and the difference between the first and second weights represents the weight of coal consumed.

The water consumption is checked by a special indicator fitted to the tender and worked from the ordinary indicator float. This indicator is carefully marked up by measuring the water as it passes into the tank through a specially tested water meter. A certain quantity of water is used in watering the coal, and this, of course, must be deducted from the total water consumption before the quantity used in the engine boiler is known. The quantity involved is checked by determining the amount passed by the coal-watering cock in a given time. A record of the total length of time that the cock is open is kept on the footplate, and this gives the required figure.

The oil consumption is easily ascertained. A known quantity is issued to the driver before the trip, and the surplus is returned at the end. All oil cups and lubricators are filled with unmeasured oil before the trials and again at the end of the run, the difference between the quantity remaining and that issued to the driver thus representing the actual consumption.

When all the data possible have been obtained, the engineers have an elaborate system of calculations to work out in order that a complete report of each journey may be made.

Innumerable conclusions are drawn from the calculations, any weakness in the performance of the locomotive en route being quickly located. In addition, the driving of one driver and that of another can be compared. The necessary quantities of fuel and lubricants for efficient working become known, and a definite check on the actual conditions to be met with on every yard of the way is obtained. Each dynamometer car record is therefore of great value and is carefully preserved for comparison purposes.

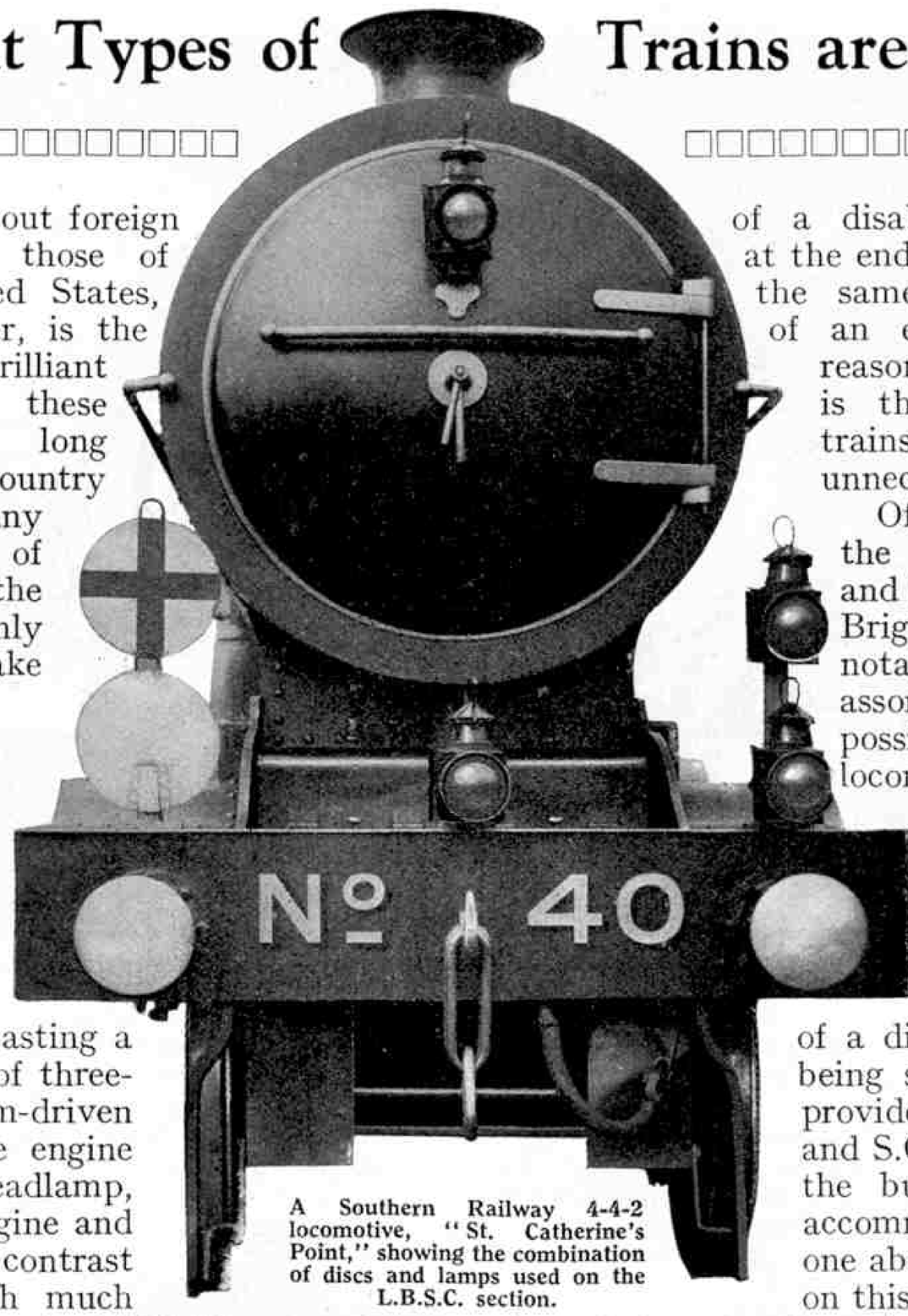
As already mentioned a portion of the dynamometer car is equipped with a table and benches to enable the engineers to take their hasty meals, for, as may be imagined, on long distance tests there is little time for obtaining food.

(Continued on page 977)

Engine Head Codes Past and Present

How Different Types of Trains are Distinguished

ONE of the first features about foreign locomotives, especially those of Canada and the United States, that strikes a British observer, is the immense headlamp. The brilliant beam of light provided by these lamps is necessary where long stretches of more or less wild country are crossed, in order that any obstruction, such as a fall of rock or a tree, or cattle on the line, will be shown up plainly in time for the driver to take the necessary precautions. Present-day headlamps are generally less bulky than those carried in former years, but they are extremely efficient. Readers may remember the Southern Pacific locomotive illustrated in the *"M.M."* for last January, the headlamp of which is capable of casting a beam of light for a distance of three-quarters of a mile. A steam-driven generator is mounted on the engine to supply current to the headlamp, and to other lamps on the engine and in the cab. This is in striking contrast to British practice, in which much less powerful equipment is the rule. Notable exceptions are the high-pressure locomotive "No. 10000" of the L.N.E.R., which has electric headlamps, and the L.M.S.R. "Decapod," No. 2290, which has an acetylene lamp or searchlight fitted for use in connection with its special duties on the Lickey Incline.

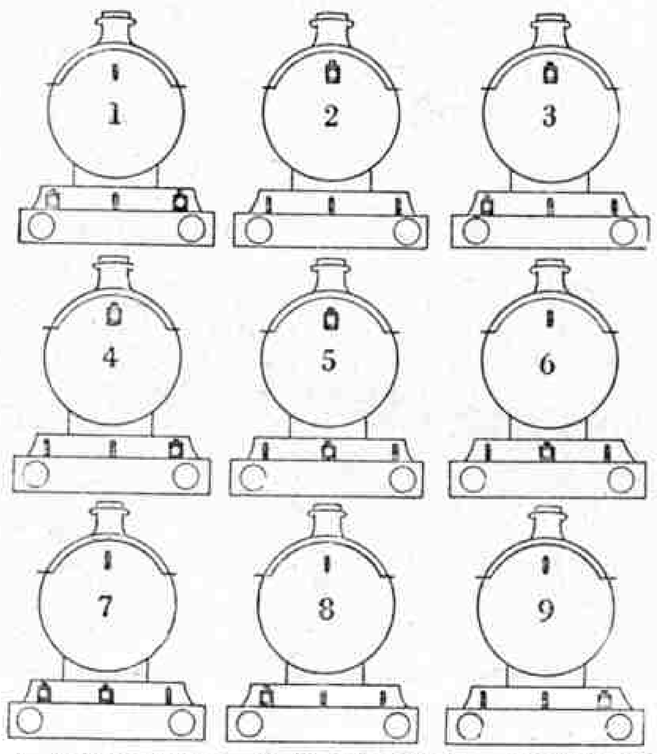


A Southern Railway 4-4-2 locomotive, "St. Catherine's Point," showing the combination of discs and lamps used on the L.B.S.C. section.

In spite of their modest proportions, the oil lamps carried on British locomotives serve a very useful purpose, for by the manner in which they are arranged at the head of the locomotive they indicate to the signalmen, and the traffic staff generally, the nature of the train. In order to secure uniformity in headlamp arrangements, what is known as the Standard Head Code was adopted in 1918, and this is generally used on our railway systems. The Southern group, however, adheres to the practice of using white discs instead of lamps. Some variations occur here and there, but the whole system is now much less complicated than was formerly the case. One arrangement of headlights may indicate two or more classes of trains. A breakdown train or a light engine going to the assistance of a disabled train, carries headlights at the ends of the buffer beam in exactly the same manner as the locomotive of an express passenger train. The reason for grouping these together is the necessity for giving such trains a clear road, and avoiding unnecessary delays.

Of the systems that went to form the Southern group, the London and South Western and the London, Brighton and South Coast were notable for the wonderfully varied assortment of head codes it was possible to see displayed upon their locomotives. Plain white discs, discs with a black cross, discs with a dark centre, square white boards with horizontal black stripes, and diamond-shaped boards were all to be seen, a combination of a disc, a board and several lamps being sometimes used at once. To provide a little variation, the L.B. and S.C. made the lamp brackets over the buffers extra long in order to accommodate two discs or two lamps one above the other. The photograph on this page of an L.B.S.C. locomotive is sufficient to show the possibilities in this direction, for it presents a formidable array of lamps and discs.

On the L.S.W.R. it was the practice to use white discs and diamond-shaped boards by day, while at night white and green lights respectively took their places. Not content with using discs with black crosses in addition, the L.S.W.R. fitted extra brackets on their locomotives, one on each side of the smoke-box front at about its horizontal centre line. These, with the four brackets in the usual places, made a total of six head code positions for one board alone, so that when we consider the positions and the different kinds of boards used, the number of indications possible will be apparent. The smoke-box brackets are in use to-day on the Southern Railway, and extra brackets are placed at the rear of tenders so as to correspond with them; but the codes now used are much simplified from those in use in former years.

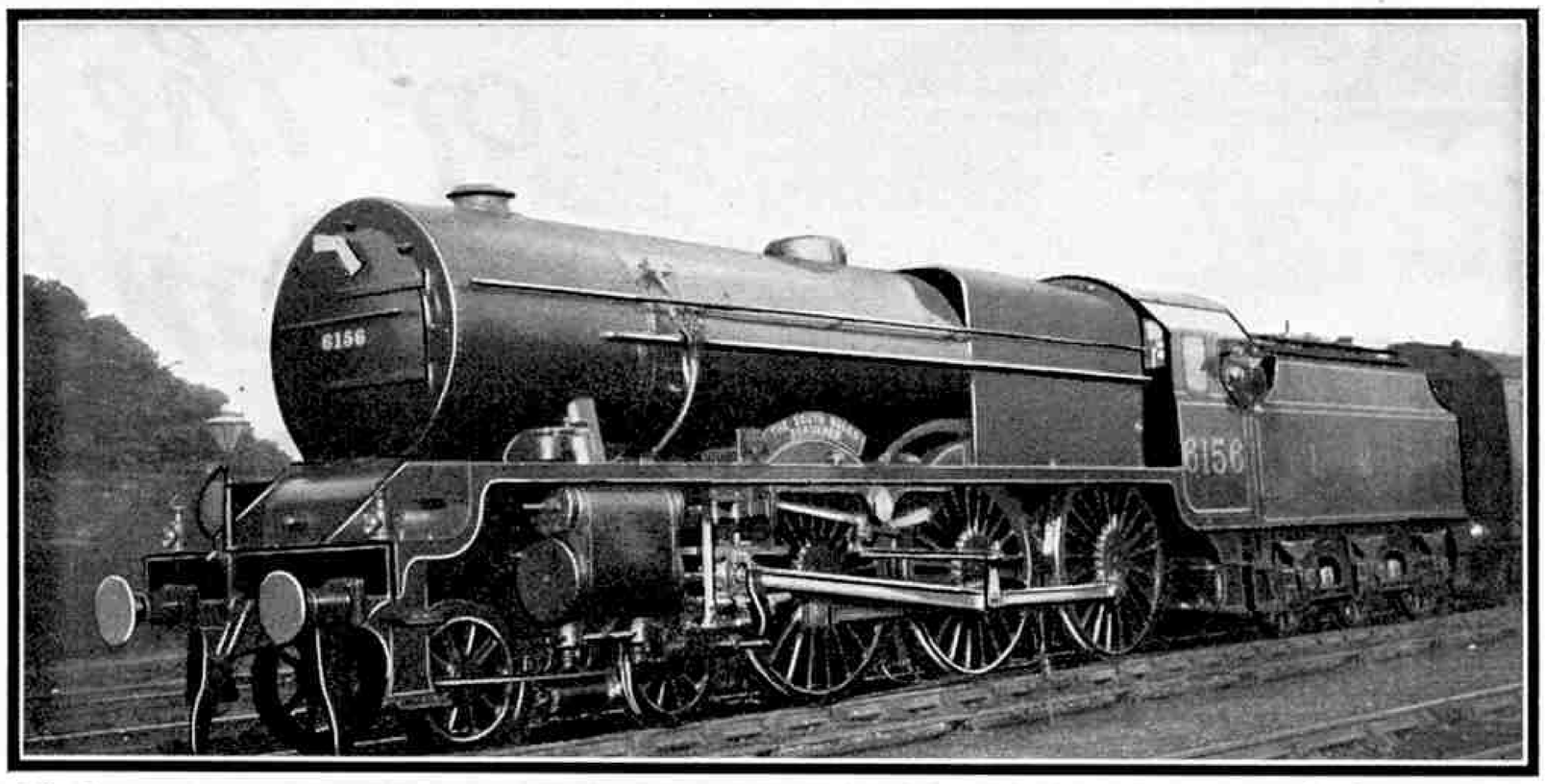


1. Express train. 2. Stopping train. 3. Train of coaching stock carrying livestock or perishables. 4. Perishable train of goods stock, or express cattle or goods train, Class A. 5. Express cattle or goods train, Class B. 6. Engine or engine and brake only. 7. Goods train through to destination. 8. Through goods train stopping intermediately. 9. Ordinary goods train stopping intermediately.

Readers may wonder what was the reason for all these various codes. A glance at a railway map will show that the Southern Railway is formed of a very

complicated network of lines, and that the Brighton section especially had a large number of alternative routes between different centres on their system. This explains why so many codes were employed, as they served to indicate the particular route a train was to take, and they are still used for this purpose.

Another line using discs was the Great Eastern, now included in the L.N.E.R., where they are still in use. This railway, however, did not employ the varied assortment of discs, boards and diamonds that were in favour on the Southern lines.



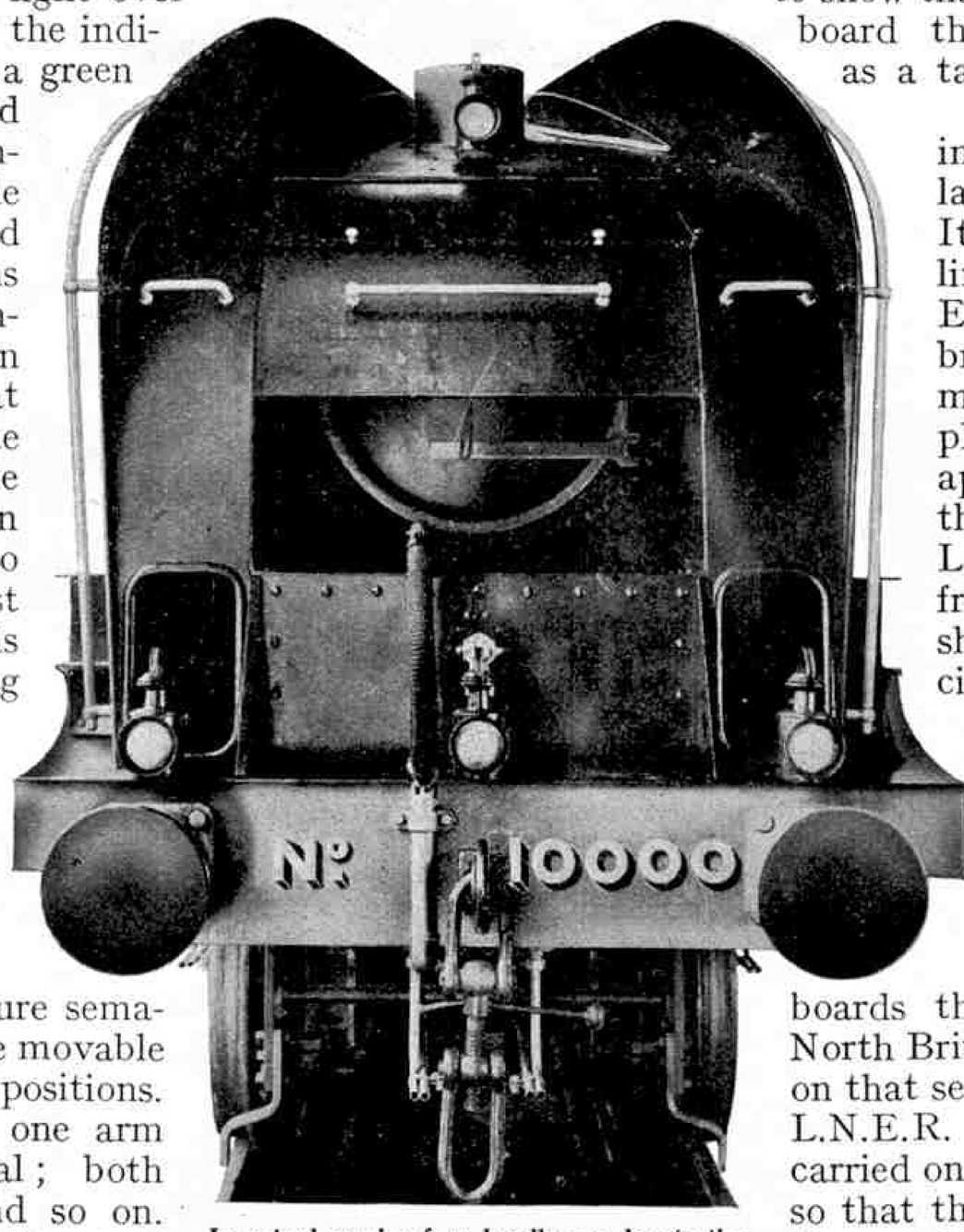
Photo] *[J. J. Cunningham*

L.M.S.R. 4-6-0 locomotive No. 6156, "The South Wales Borderer," carrying the semaphore type of route indicator as used on the C.R. and G.S.W.R. sections.

Green lights, as well as purple, were largely employed years ago, but their use has grown gradually less owing to the possibility of mistaking green lights for "all clear" signals. The former London and North Western Railway at one time used diamond boards and green lights to some extent, while "urgent express goods, cattle, meat or vegetable trains requiring unusual dispatch" carried by night one green light over the left-hand buffer and one white light over the right-hand buffer. By day the indication was an oval board with a green cross upon it, a different board again from any we have mentioned. These special head code indications were only to be used "in cases specified by instructions from the District Superintendents." A unique decoration that may be mentioned was that carried by the engines on the L.N.W.R. service at one time operated from Broad Street, on the North London Railway, to Mansion House, over the West London and District lines. This took the form of a metal ring painted white, projecting from a small socket fitted about half-way up the side of the chimney.

The old Caledonian Railway had a most distinctive method of route indicating. This took the form of a miniature semaphore with two arms, which were movable and could thus assume various positions. There might be, for instance, one arm vertical and the other horizontal; both horizontal or both vertical, and so on. The semaphore was carried at the foot of the chimney, and being painted white had a most striking appearance. This railway also followed the peculiar practice of carrying lamps at the side of the cab to indicate the class of train, while at night a lamp replaced the semaphore that did duty in the daytime. This semaphore is still in use on the Caledonian section under the L.M.S.R. regime, and it has been extended also to the former Glasgow and South Western line. Scottish locomotives taking charge of trains at Crewe in order to work them through to Glasgow often have the semaphore in position on leaving Crewe, so that it is possible to observe this original form of indicator on English lines.

A curious practice was in vogue on the former Highland Railway when a special or second portion was following a regularly booked train. The engine of the latter, for the information of signalmen and others, carried a canvas screen bearing the words "Engine Following." Among other indications of this nature may be mentioned the custom of using a board lettered "L.V.", signifying "Last Vehicle," in order to show that the train was complete. This board thus served the same purpose as a tail lamp.



In actual service four headlamps denote the Royal Train. In this case, however, L.N.E.R. "No. 10000" displays four lamps on the occasion of being photographed, in accordance with North Eastern custom.

The Royal Train is distinctive in that it carries four headlamps, one on each bracket. It was also the practice of some lines, notably the old North Eastern, to place lamps on all brackets of their latest locomotives when these were being photographed. This custom apparently is still in vogue in the North Eastern area of the L.N.E.R., as the accompanying front view of "No. 10000" shows. There are also the semicircular boards bearing the name of the train that are carried on the smoke-box of the locomotive hauling the *"Flying Scotsman."* These appear to have been developed from the similar but smaller destination boards that were used on the former North British Railway, and are still in use on that section of the L.N.E.R. Another L.N.E.R. peculiarity is that the lamps carried on their engines are painted white, so that they show up plainly in the daytime against the dark-coloured smoke-box of the engine. The L.M.S.R. use aluminium-painted tail lamps similarly.

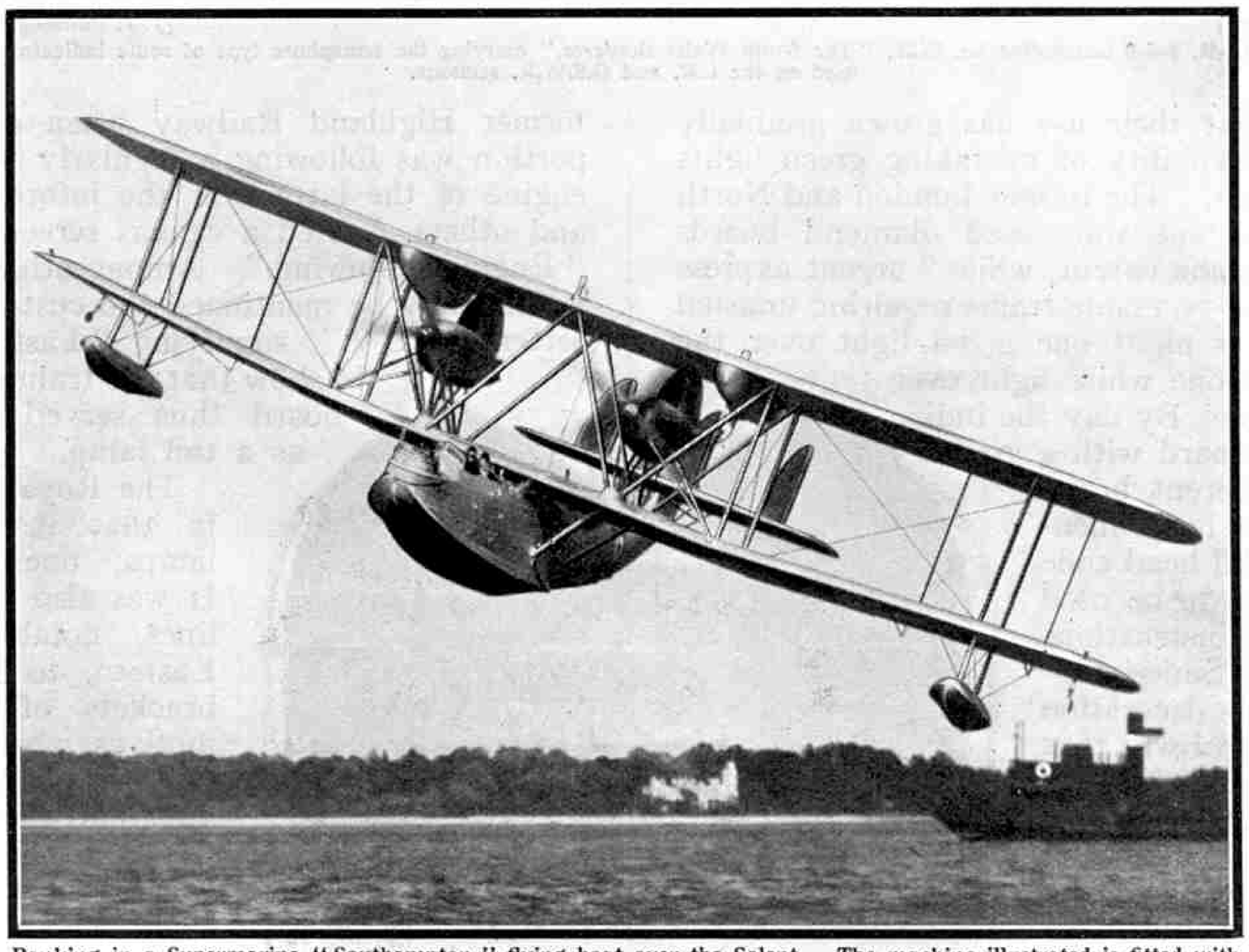
Air News of the Month

Electric Eye for Flying in Fog

One of the chief difficulties of flying through fog is that the light from beacons installed at aerodromes is so widely scattered by the tiny drops of moisture in the atmosphere that it is difficult to judge its direction and the distance of its source. In a system developed by the General Electric Company of New York, the photo-electric cell is used in order to overcome this difficulty.

The cell employed in this device is mounted near the tail of the machine. A rapidly revolving mirror reflects light from windows on opposite sides of the aeroplane to the cell, and this is connected to an instrument on the board in front of the pilot that tells him on which side the intensity of the light affecting it is the greater. The pilot follows the direction of flight in which the scattered light is equally intense on the two sides of the machine, for then he must be flying in line with the airport at which the guiding light is installed. A second instrument measures the absolute intensity of the light affecting the cell, and tells him whether he is approaching or going away from the landing ground.

A photo-electric cell that responds to any kind of light would be useless for fog flying purposes. The pick-up device in the aeroplane therefore is tuned to light flickering at the rate of 1,000 times per second. Light of this kind is obtained by installing at the airport a special neon tube that is lighted and extinguished 1,000 times a second by using alternating current of this frequency. Changes in the intensity of the light from this neon tube are too rapid to be apparent to the human eye, but the photo-electric cell in the aeroplane responds to them and transmits the signal they convey to the instruments before the pilot.



Banking in a Supermarine "Southampton" flying boat over the Solent. The machine illustrated is fitted with Rolls-Royce "Kestrel" engines, but normally Napier "Lion" engines are employed. We are indebted to the Supermarine Aviation Works (Vickers) Ltd., for permission to publish this photograph.

New Type of Wire Rope for Aircraft

Aircraft engineers have always made great use of flexible wire rope, known popularly as "cord." This rope is frequently required to pass round pulleys, and quickly becomes worn and frayed. It is claimed that "Trulay" cord, a new type recently invented, is more serviceable than the old-fashioned kind, and that it has a much longer life. During a test a section of this cord was subjected to 19,560 reversals round a pulley, but only three of the strands broke; while in another trial five broken wires were found after only 5,400 reversals of a length of standard cord.

The secret of the strength of the new cord is that every wire and strand is preformed into the natural position that it will take up when eventually made into a rope. There is no internal stress in "Trulay" ropes, and when one is cut the strands do not fly apart as do those of an ordinary wire rope. Another important feature is that the pieces of a broken strand remain in their correct positions and do not damage those that continue to take the strain.

Flying Boat's Long Non-Stop Flight

A non-stop flight from Gibraltar to Plymouth, a distance of 1,230 miles, was made a short time ago by a Saro A.7 flying boat. This flight was accomplished during a return cruise to Port Sudan, on the African shore of the Red Sea, in which 8,324 miles were covered with a crew of six on board.

The new Saro A.7 has been produced for the Air Ministry, which is considering the advisability of adopting a new machine as a type intermediate in power between the twin-engined and the large triple-engined boats at present in service. The cruise formed part of the official trials to which new flying boats are always submitted, and the route from England to Port Sudan was chosen in order to obtain information with regard to the behaviour of the machine in tropical waters. While anchored at Algiers during the cruise, the machine successfully rode out a gale of extreme severity.

The Saro A.7 is a biplane and is constructed throughout of metal. The machine has an all-up weight of 24,000 lb., while the upper plane has a span of 88 ft. The maximum height of the machine is 18 ft. 10 in., and the three Bristol "Jupiter" engines with which it is equipped are fitted in nacelles under the upper plane. Further details and performance figures are not yet available, but we hope to include them in the "*M.M.*" when they have been released for publication.

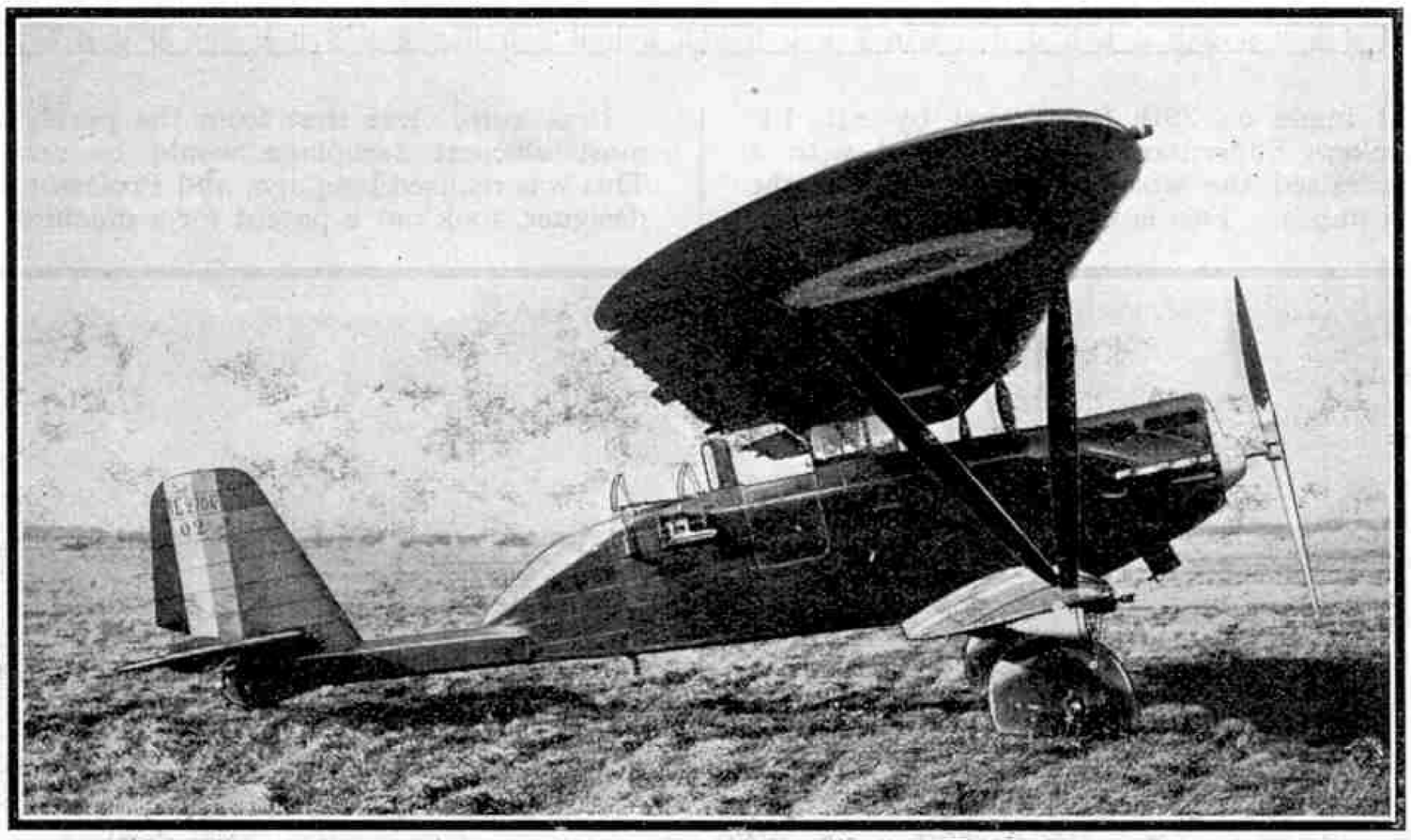
Flying Upside Down for Six Miles

Flg. Off. Bullmore recently flew an Avro machine upside down for a distance of about six miles. He flew from Burntisland, on the Fife Coast, across the Firth of Forth to Granton, Edinburgh, taking 4½ minutes to complete the journey.

An Unusual French Aeroplane

The Breguet 27 illustrated on this page is a machine of original design produced by the firm directed by M. Louis Breguet, one of the pioneers of French aviation. In this aeroplane air resistance has been greatly reduced by eliminating all flying wires, while the range of visibility has been increased. So far only two machines of this type have been produced, the second being a multi-seater fighter machine, known as the Breguet 410, of which details are not yet available.

The Breguet 27 is probably the only French aeroplane designed as a general-purpose machine. It is a two-seater biplane with unequal wings. The upper wing, which has a span of about 59 ft. 9 in., is of medium thickness and is built up on two spars of corrugated sheet steel. The lower wing is 24 ft. 11 in. in span, and is built on a single box spar. This wing is of the cantilever type and requires no external bracing. Duralumin sheeting is used to cover both planes.



The novel Breguet 27 general purpose aeroplane described on this page. Our photograph is published by courtesy of the Société des Ateliers d'Aviation Louis Breguet.

The most unusual feature of the new type is the fuselage. This is built round a steel girder that carries the engine mounting in the front, and the empennage, or tail unit, at the rear. In front it is normal in appearance, but it is cut off immediately behind the two cockpits with which the machine is equipped, the steel girder protruding from it to form a short outrigger. The fixed surfaces of the tail unit carried on the end of this are of cantilever construction and require no external bracing. The overall length of the machine is 32 ft. 2 in.

The cockpits are more comfortable than those of most machines, for they are separated from the structural members of the fuselage. Adjustable seats are provided, in addition to windscreens and arm rests, and dual control apparatus is fitted, together with accommodation for the usual armament.

The undercarriage is of the divided type and oleo-pneumatic shock absorbers are employed. The two wheels are carried in separate steel forks and are provided with wheel brakes. The customary tail skid has been replaced by a swivelling tail wheel that is fitted also with an oleo-pneumatic shock absorber.

Any type of engine developing between 450 and 600 h.p. may be used in the Breguet 27. The engine mounting forms a separate unit of the machine, and is separated from the cockpits by a fireproof bulkhead to which is attached an automatic fire indicator and extinguisher. The fuel is carried in the lower wing and is pumped up to the engine in the normal manner.

When fitted with a Hispano-Suiza 12 H.b engine equipped with silencers the Breguet 27 has a maximum speed at sea level of 134.5 m.p.h., while at a height of 11,450 ft. this increases to 139 m.p.h. At an altitude of 19,680 ft. the speed drops to 124.5 m.p.h. The machine can reach a height of 11,480 ft. in 11 min. 58 sec., and 19,480 ft. is attained from ground level in 29 min. 16 sec. The ceiling is 25,900 ft. The aeroplane requires a run of about 323 ft. to take off, and when the brakes are applied has a landing run of 344 ft. At sea level the slowest speed that can be maintained with safety is 64 m.p.h.

Non-Stop Flight from Japan to America

The Pacific has been crossed non-stop for the first time, by two American airmen, Clyde Pangborn and Hugh Herndon. These airmen flew from New York to Tokyo in stages in July and August of this year, and early in October returned to the United States in one long flight from Sabushiro Beach, Japan, to Wenatchee, Washington, the distance of 4,465 miles being covered in 41 hr. 31 min.

A reindeer sledge and its modern rival in the far north of Europe. The machine illustrated is a Junkers "Junior" light monoplane fitted with skis. Photograph reproduced by courtesy of Junkers Flugzeugwerke A.G.

The airmen dropped their landing gear immediately on leaving Japan and were compelled to alight on the fuselage of their machine. The skill of the pilot prevented serious damage to the aeroplane itself.

Timing Record Aeroplane Flights

When timing an aeroplane that travels at a speed of 400 m.p.h., it is useless to employ an ordinary stop watch, for a machine travelling at that speed covers 120 ft. in one-fifth of a second, and comparatively large errors would be introduced by the slightest delay in pressing the trigger of the watch. Instead of stop watches, photographic methods therefore were used in timing the flight of Flt. Lt. Boothman, the winner of the Schneider Trophy in September, and also in measuring the speed attained by Flt. Lt. Stainforth in his successful attempt to beat the existing world's speed record.

Two cinematograph cameras were employed, one being stationed at each end of the course. At the back of each camera, counters illuminated by 12-watt lamps were mounted, and the images of these were projected through lenses on to the film. The cameras were used to give continuous photographic records of the passage of the machine at the starting and finishing points, and when the films were developed the numbers shown on the counters at the beginning and end of the flight also were revealed. The counters used were electrically operated. They were controlled by means of a tuning fork that made 618.3 vibrations per second, and at each vibration made and broke an electric circuit that actuated the dials.

Photographs were taken shortly after the aeroplane to be timed rose from the water to begin the flight, the cameras being set in motion simultaneously by means of a switch in order to give the readings of the counters at what may be called the zero hour. Photographs also were taken as the machine passed the cameras, and differences in the readings of the counters enabled the number of vibrations of the tuning fork made during the run to be counted. As the period of vibration of the fork was known, it was then easy to calculate the time occupied and thus to arrive at the speed attained.

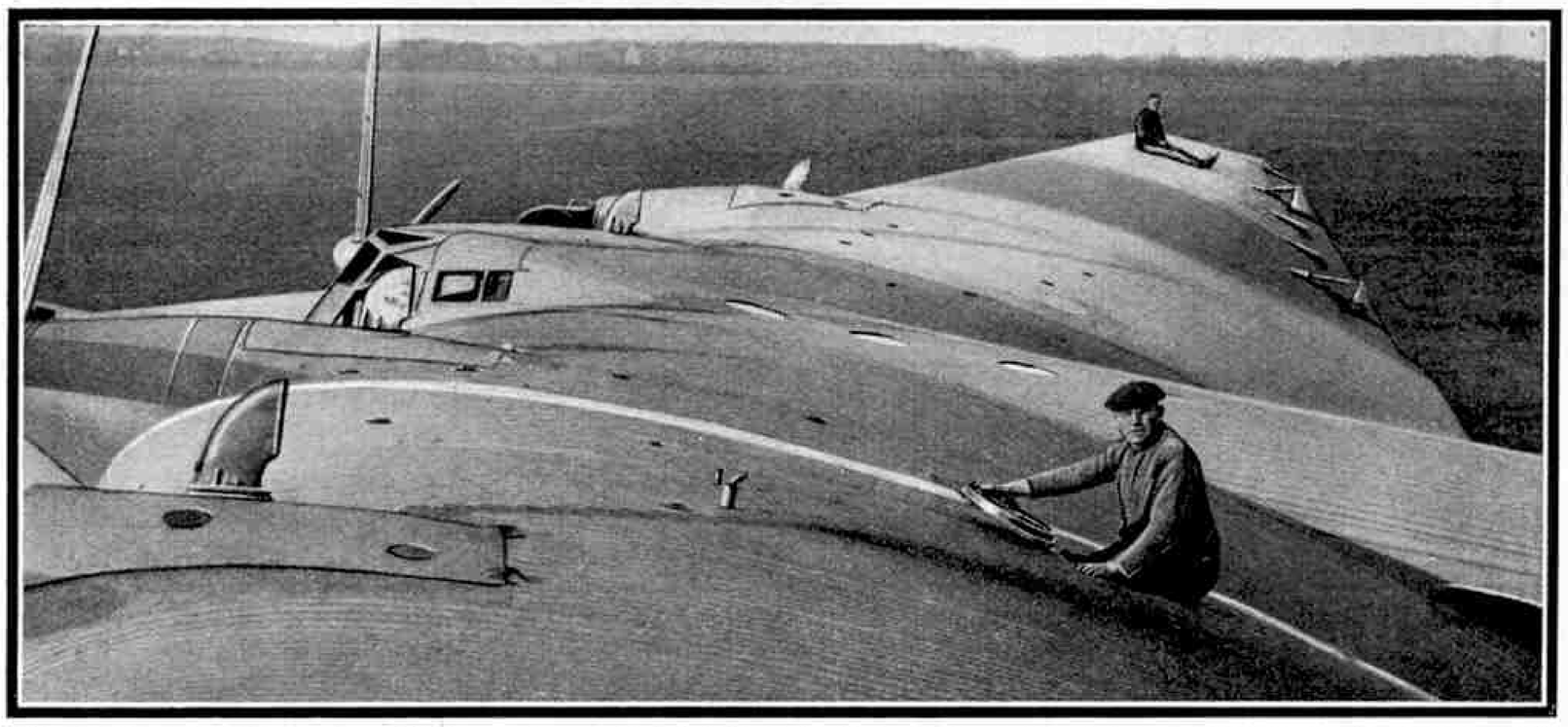
"Furies" for No. 25 (Fighter) Squadron

Before the end of this month No. 25 (Fighter) Squadron, which at present employs machines of the Armstrong Whitworth "Siskin" type, is to be re-equipped with Hawker "Fury" intercepter fighters. The only other squadron now equipped with this aircraft is No. 43 (Fighter) Squadron stationed at Tangmere.

The World's Largest Landplane

Giant Monoplane with Engine Rooms in the Wing

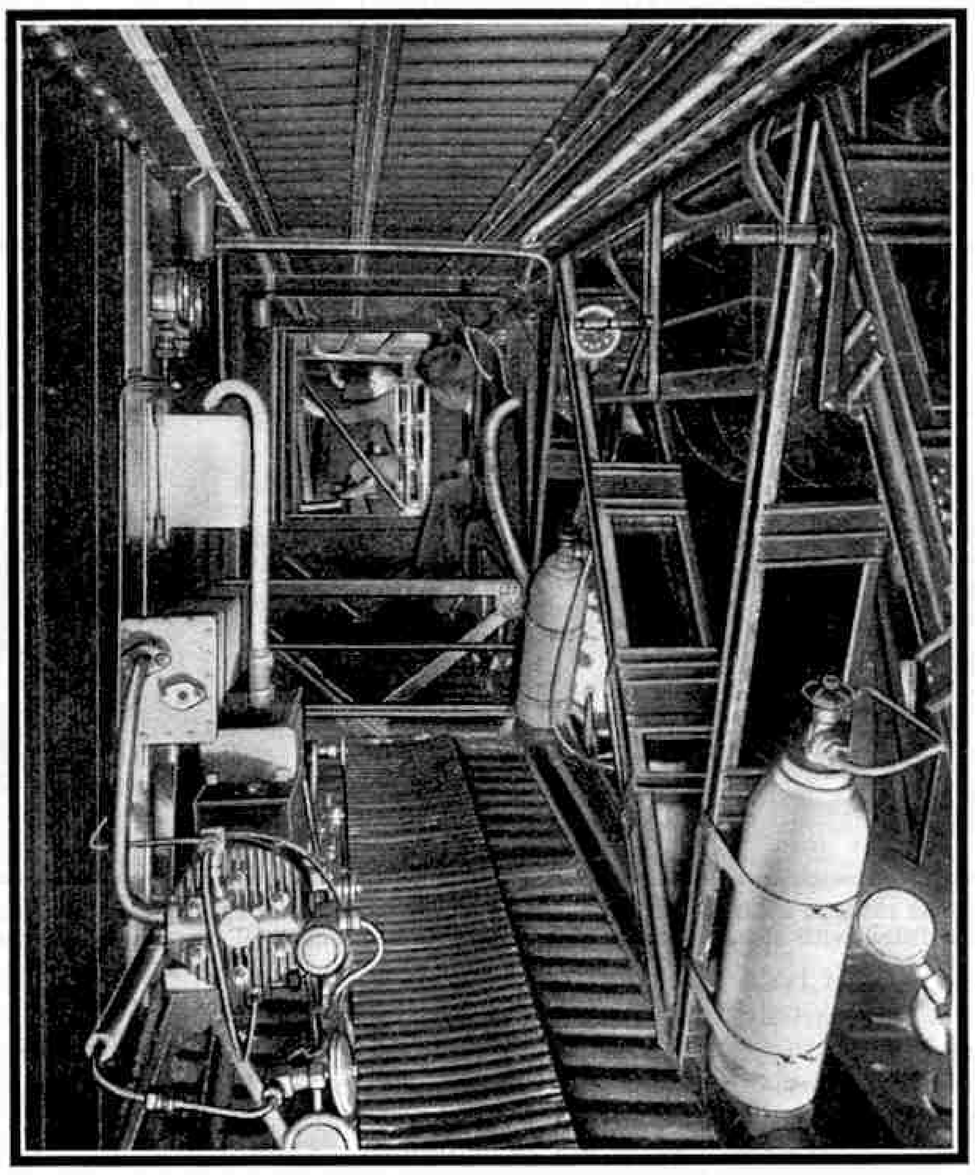
THE remarkable flight made on 29th September by Flt. Lt. Stainforth in a Vickers Supermarine S.6 B, fitted with a Rolls-Royce engine, raised the world's speed record to the wonderful figure of 407.5 m.p.h. This is no less than 49.8 m.p.h. greater than the record established only two years ago by Sq. Ldr. Orlebar. Part of this increase is due to greater engine power, but improvements in streamlining and the general design of the seaplane itself also have contributed to it. The aim of the designer of any aeroplane is to obtain a smooth flow of air past the machine, and in his efforts to achieve this he pays special attention to the shape, not only of the wings, but also of every constituent of the machine.



The great span of the Junkers G.38 is well suggested in this photograph of the upper surface of the wing. We are indebted to the courtesy of Junkers-Flugzeugwerke A.-G. for our illustrations.

The only parts of an aeroplane that are effective in giving lift are the wings. Other portions, such as the fuselage, the undercarriage and the engines, practically represent dead weight that is to be supported by the wings, and they cause serious disturbance in the flow of air past the machine when in flight. Almost the only resource of the designer of aircraft is to cover them with cowlings in order to smooth out the airstream as much as possible, for then the drag or resistance their presence introduces is at a minimum. Another device that is occasionally adopted is the fitting of what are called retractable undercarriages. These can be pulled up to lie flush with the fuselage, just as the legs of a bird in flight are tucked against its body. In that position they offer practically no resistance to the airstream, and they are let down when it is necessary to land.

Part of the power of the engines of an aeroplane is required to push the non-lifting surfaces through the air. How great a proportion this may be was shown in recent wind tunnel experiments carried out with a certain wing that is capable of attaining a speed of 160 m.p.h. when fitted with engines developing 300 h.p. Measurements show that the addition of the fuselage, landing gear, tail unit, engines and radiators increase the power required to maintain this speed to no less than 715 h.p. If the wing were fitted with engines of 1,200 h.p. its maximum speed would be about 270 m.p.h., but this would be reduced to 194 m.p.h. by fitting the wing with the parts necessary to convert it into a complete aeroplane.



A view in the gallery running transversely through the wing. The engines are housed in rooms in the wing itself, and a mechanic can be seen at work in the engine room at the end of the gallery.

It is quite clear that from the purely flying point of view the most efficient aeroplane would be an "all-wing" monoplane. This was realised long ago, and Professor Hugo Junkers, a German designer, took out a patent for a machine of this type in the early days of flying. Others have tried to plan aeroplanes on similar lines, but have not found it easy to work out their ideas in a satisfactory manner. The chief problem is that of providing space in which to house the engines, and to accommodate pilot, passengers and cargo. These must be carried in the wing of such a machine, and this must be a very large one if it is to be thick enough to hold the necessary equipment and provide cabin room. The extent of the difficulty may be realised from the fact that at present the wings of an average aeroplane with a span of nearly 100 ft. are only 4 ft. in thickness at their roots.

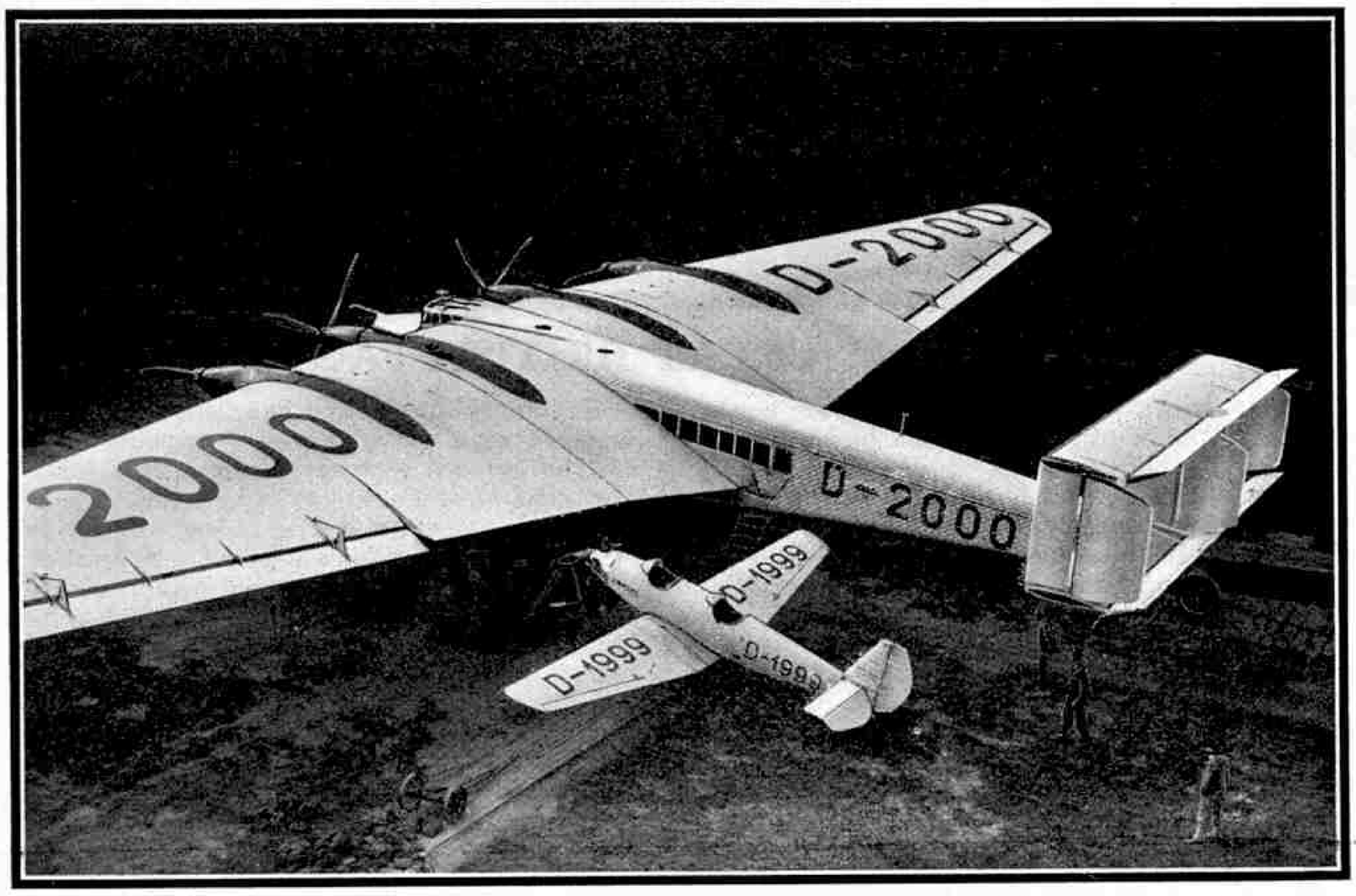
An American designer, Mr. V. Burnelli, has tried to overcome this difficulty by building a very thick central part of aerofoil section, and attaching wings of normal thickness on each side of it. The middle part carries the engines and cargo and accommodates pilots and passengers, but its shape enables it to contribute to the lift of the machine. Light supports carry the tail surfaces, and the tail wheel is placed in the rear of the thick central section of the wing instead of immediately below the rudder, the usual place for it in machines of normal design. The tail of Mr. Burnelli's aeroplane therefore does not come near the ground at any time.

Among other efforts to approach the ideal all-wing machine may be mentioned the Westland-Hill "Pterodactyl," the aeroplane without a tail. This was described and illustrated on page 558 of the "*M.M.*" for July, 1931. A machine of somewhat similar type has been completed in Germany by Dr. H. Kohl. An interesting feature of this aeroplane is that there are three wheels in the undercarriage, these being placed in streamlined nacelles that project only a very short distance below the wing.

The most consistent efforts to build an all-wing aeroplane have been made by Junkers-Flugzeugwerke A.-G, a famous German company that has produced many interesting machines. The aeroplane designed in accordance with the latest ideas of the firm on this method of construction is called the Junkers G.38, and is a

monoplane. It is a giant machine and is actually the largest landplane in the world. It has a wing span of 144 ft. 4 in., a length of 75 ft. 6 in., and a height of 21 ft. 4 in. Its weight when fully loaded is no less than 24 tons and the enormous wing, with its area of 3,130 sq. ft., quite overshadows the fuselage. The machine provides accommodation for 30 passengers, and if there were room for them, would be capable of carrying 80 persons.

The interior of the wing is very striking in appearance. Corridors run from the fuselage towards the wing tips and these are so lofty that the crew can walk upright along them. Berths for passengers are placed in the wings, and rooms for the engines and accommodation for the crew also open out from the corridors. One of our illustrations shows a view along one of these gangways, and to those only accustomed to ordinary aeroplanes, this will suggest the interior of a submarine, or even the engine room of a ship, rather than a scene inside the wing of a flying machine.

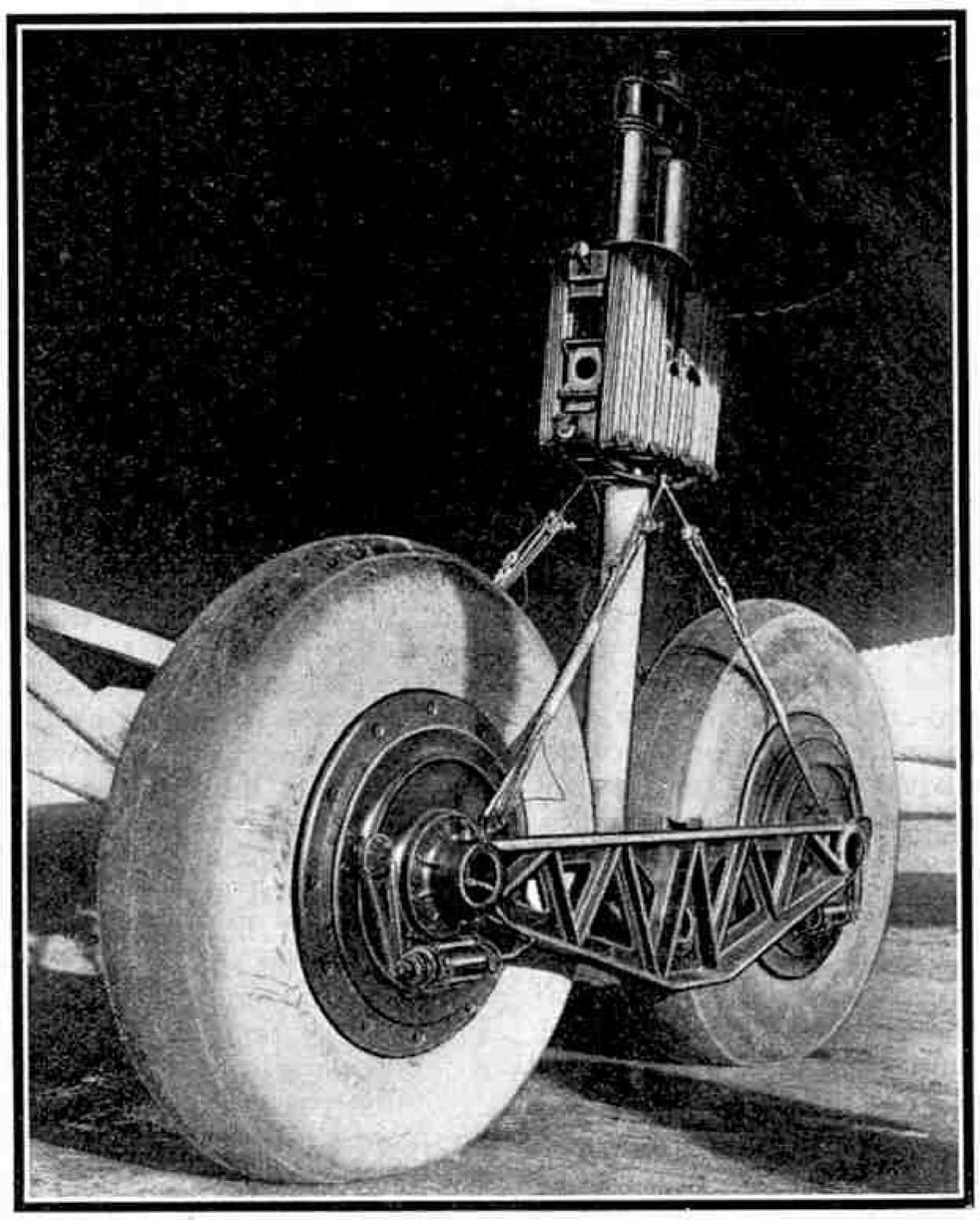


A Junkers " Junior " low wing light monoplane completely dwarfed by the giant G.38 standing alongside.

The leading edge of the wing of the Junkers G.38 has a decided sweep back from the centre, but the trailing edge is quite straight, and is at right angles to the fuselage. Ailerons extend along one half of each side of the wing, and these are so hinged that they produce an effect similar to that given by the Handley Page slots. Like the rest of the machine, the wing is covered with corrugated duralumin sheet, and the aeroplane therefore has the appearance that has long been characteristic of the products of the Junkers Company.

The power units installed in the giant aeroplane are four 780 h.p.–850 h.p. Junkers L.88 water-cooled engines. The position in which they are carried makes it necessary to use long cardan shafts in order to drive the propellers, but also gives the advantage of accessibility. Extensive adjustments and repairs may readily be made during flight, and as the machine is capable of maintaining height with any two engines out of commission, it should be practically unnecessary to make a forced landing.

The fuselage is of normal rectangular section and is constructed on the monocoque principle. This means it is built up on rectangular formers, made of light metal. Special stiffening members are employed, and the fuselage is covered with corrugated duralumin sheet. An unusual feature of the construction is that a biplane tail unit is employed, for most monoplanes are provided with tail units having only one horizontal plane. The unit is mounted above the fuselage, to the top members of which the lower of the two planes is secured. There are three rudders, the middle one of which is fitted with a fin. The two outer ones are mounted at the ends of the tail planes, and all three are of the balanced type.


One of the undercarriage units of the Junkers G.38. The streamlined covering has been removed in order to show the giant tyres, more than 5 ft. in diameter, and the shock absorber.

An undercarriage of the divided type is fitted on the aeroplane and each of the units is provided with two wheels, placed in tandem. They are sprung in a pivoted frame, each unit being fitted with a vertical compression leg that runs up to the wing. Compressed air wheel-brakes are fitted and both units are covered by streamlined nacelles of the type now often called spats. The compression leg also is well streamlined.

There is accommodation for two pilots in a totally enclosed cockpit constructed above the leading edge of the wings, while immediately behind this is a central control room. The machine weighs about 32,500 lb., or approximately 13 tons, while when fully loaded the weight is 59,300 lb., or about 24 tons. The disposable load is 26,500 lb.

The Junkers G.38 is not merely a costly experimental machine built to test a method of construction. It is definitely a commercial aeroplane, and has been in operation for some months on the Berlin-London air service of Deutsche Luft Hansa, the well-known German air line company. Before being taken over by this company, the machine made a flight round Europe during which calls were made at the principal cities of most of the European countries.

The most striking feature of the G.38 is its performance, which is claimed to be the best in the world. The cruising speed is 105 m.p.h., and the maximum is 133 m.p.h. With 30 passengers and a full crew the machine would be capable of making the journey between London and Winnipeg by way of Greenland and Hudson Bay in two stages. It also could make non-stop flights from London to Cairo, Berlin to Baghdad, or Madrid to Moscow, with the same number of passengers. The machine's pay load for short journeys is 17,000 lb. This represents a carrying capacity of 80 passengers, but as already pointed out, sufficient room could not be found for this number.

An interesting comparison may be made between the G.38 and the Dornier " *Do.X*," the world's largest flying boat, which recently completed a flight to America. On a flight of 1,250 miles the " *Do.X* " could carry a load of about 2½ tons, while the Junkers machine would have a capacity of nearly six tons. If a flight of 2,500 miles were to be attempted by each machine, only the crew, fuel and provisions could be accommodated in the " *Do.X.*," but the G.38 would be able to take 25 passengers. The accommodation provided in the Junkers machine also is more luxurious than in any other aeroplane yet constructed. The lounges, sitting rooms, and sleeping quarters are roomy, and passengers are as comfortable as those in the most modern long distance express trains, while travelling at much greater speed. The G.38 in service between Berlin and London already has proved popular with travellers by air.

A PEEP AT A GREAT BRITISH FACTORY

THE death of Edison has drawn attention to his pioneer work in the invention of the phonograph, for which he took out his first patent in 1877. Edison's first model phonograph worked, greatly to his astonishment, and he is recorded to have said that he was always afraid of things that worked the first time. With his typical tireless energy he developed the phonograph from a toy to a practical instrument, and thus laid the foundation of the enormous and world-wide gramophone industry of to-day.

It is difficult to realise the extraordinary rapidity with which the gramophone industry has developed. Perhaps the best method of forming some idea of this growth will be to consider briefly one of the world's great gramophone factories, that of the Gramophone Co. Ltd., at Hayes, Middlesex. In 1906 the first turf on the site of the factory was cut by the famous tenor, Edward Lloyd; and in May, 1907, the late Dame Nellie Melba laid the corner stone of the factory. At that time it would have required a great stretch of imagination to believe that the site would one day cover 58¼ acres, and that that first small factory would be the forerunner of buildings that now have a total floor space of over 1,100,000 sq. ft. The site is bounded on the south by the main line of the Great Western Railway, to which the company has private sidings, and the factory is a familiar landmark to all travellers by that route.

The Head Office, which has been enlarged several times and now has a floor space of over 80,000 sq. ft., accommodates the directors, executive and departmental chiefs; the bookkeeping, costing and purchasing departments; the reception rooms for the artists who come to record, and the large recording studios. The factory is divided into three main sections—the machine factory, in which are made motors, soundboxes and other metal parts; the cabinet factory, which furnishes all woodwork; and the record factory, which turns out more than 25,000,000 records annually. Samples of all the raw materials entering the factory are sent to the testing laboratories for approval before the consignments are accepted and allowed to enter the company's stores or timber yards.

Albert Sandler, the popular violinist of wireless fame. Photograph reproduced by courtesy of the Columbia Graphophone Co. Ltd.

In the machine factory, a vast ferro-concrete structure, are made the well-known "His Master's Voice" gramophone motors, turntables and soundboxes, together with a great variety of electrical fitments for use on electrical reproducing instruments. The tools used in this factory for "pressing" and "cutting" are first designed in the drawing office and afterwards manufactured in the tool department, which is considered by experts to be one of the best in the world. The tools made are of every conceivable variety, from the dies that press a turntable from the flat metal plate, to the tiny cutters that make the thread of the smallest screws found in certain parts of the soundboxes. In the metal pressing department, turntables, tone-arms, and other shaped metal parts are made.

In the automatic screw department are made all parts that have a thread or gear, and also the immense number of actual screws that are used in the manufacture of gramophones and accessories. The machines are arranged in batteries and, being entirely automatic, carry out a series of operations untouched by hand. The parts produced in all the different sections of the machine factory are collected and taken to that portion of the assembly department responsible for putting them together. It is of absorbing interest to watch the assembling of a soundbox, for instance, and to note how deftly and systematically the many parts, some of them exceedingly small, are handled. At other benches gramophone motors may be observed "growing" at extraordinary speed.

The cabinet factory is responsible for all the woodwork used in "His Master's Voice" products. There are two timber yards, in which enormous stocks of oak, walnut, mahogany, chestnut and poplar are stored for seasoning. A feature of the cabinet work is its built-up construction, in which a veneer of oak, walnut or mahogany is applied to a cross-band veneer of poplar, which in turn is applied to a core of several pieces of chestnut. There are thus five layers of wood, each having its own characteristics, which are to a considerable extent compensating. After final inspection each cabinet is dipped bodily into the requisite stain. This is a supreme test, yet so well seasoned is the timber and so perfect the jointing that the number of rejects for warping or "creeping" of the wood is almost negligible. The next step is undertaken by the polishing department, and then comes the addition of the metal fittings and the reception of the tone chamber, motor and soundbox.

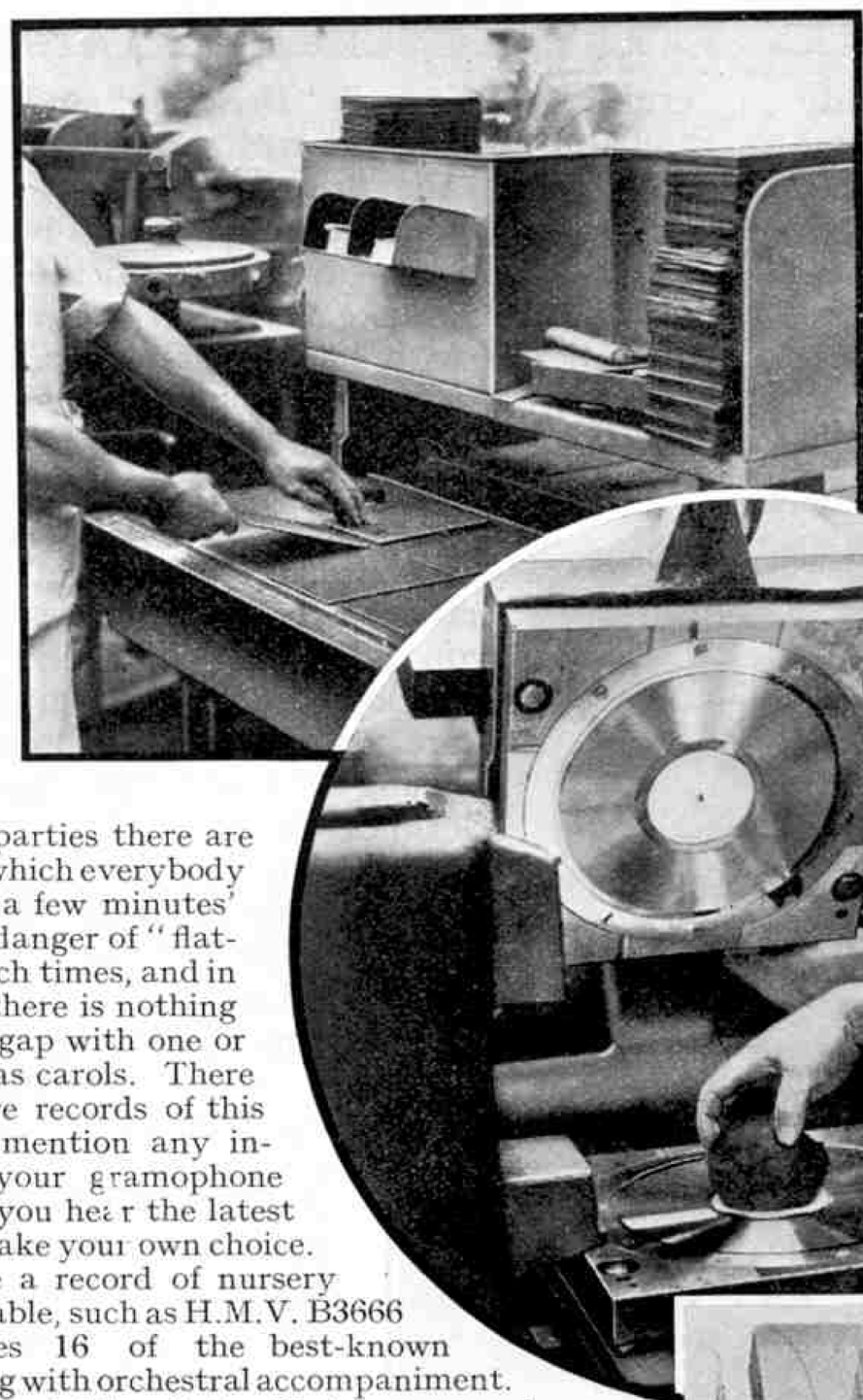
In the record factory the remarkable discs that give such perfect reproductions are made from most unprepossessing materials such as shellac and vegetable black. This mixture is "thermo-plastic," that is to say, it becomes soft above a certain temperature, but hardens on cooling. It is therefore rolled hot, but as soon as it has cooled it is broken into "biscuits" of equal size and weight. Two of these biscuits are sufficient to make a 10 in. record, three being required for a 12 in. disc. From the mixing factory the biscuits are delivered to the record pressing department, where large ranges of semi-automatic presses convert them into the familiar shining discs. The labels are affixed to each side of the record as it is pressed, and the order in which the pressing operation is carried out is as follows. First, the metal moulds or matrices are fixed in the top and bottom plates of the press. Label No. 1 is placed over the centre pin, face downward on the lower matrix, and label No. 2 face upward in the centre of the upper matrix. The necessary quantity of biscuit, made hot and plastic, is placed on top of label No. 1; the press is closed, and a pressure of 70 tons is applied. Almost immediately a cold water jacket reduces the temperature, the record is hardened and, on the press being opened, appears in its finished state, except for the buffing and polishing of the edges.

The finished records are carefully examined for any possible defect, and are then passed on an endless conveyor to the record store, an immense building of six floors, having a floor space of 106,800 sq. ft. Its steel shelves, if placed end to end, would reach for many miles, and in it are stored millions of records on a system so perfect that any one can be selected instantly. A feature of the record store is an elaborate installation of roller conveyors traversing every floor. The system commences in the record inspection department on the ground floor, from which the boxes containing the records are brought to the upper floors of the record store, and from there distributed to the proper sections of the store for definite orders for daily dispatch. The spacious dispatch department has efficient arrangements for loading cases on to lorries or direct on to railway trucks. It is interesting to note that the wood used in the manufacture of packing cases amounts to nearly 3,000 tons per annum.

An important part in the work of the factory is played by the research department, which is controlled and staffed by men who are experts in their particular branch of science.

The Gramophone at the Christmas Party

Music plays an important part in the programme of every Christmas party, and the gramophone has already established itself as an ideal source of music for dancing. In most cases its share in the proceedings ends there, however, which is a pity. The various recording companies cater excellently for Christmas music, and I strongly advise all who propose to give parties to consider the inclusion of some of these records. Let me give a few examples. No party is complete without "Musical Chairs," and a good orchestral record makes this ever-popular game far more exciting than the piano accompaniment that is usually provided. A splendid record for this purpose is H.M.V. C2075 (4/-), on which the New Mayfair Orchestra plays a series of lively tunes, with sudden stops at the most unexpected places and of just the right length to allow of the necessary re-arrangement of chairs and players.



In the course of all parties there are short intervals during which everybody is glad to sit down for a few minutes' rest. There is often a danger of "flatness" developing at such times, and in order to prevent this there is nothing better than filling the gap with one or two records of Christmas carols. There are so many attractive records of this type that I will not mention any individually. Consult your gramophone dealer, and he will let you hear the latest ones, so that you can make your own choice. For the small people a record of nursery rhymes is specially suitable, such as H.M.V. B3666 (2/6), which includes 16 of the best-known rhymes, excellently sung with orchestral accompaniment.

Then there are the special descriptive Christmas records, such as "*An English Christmas,*" H.M.V. C2078 (4/-). This describes a typical Christmas eve, with the waits singing outside, hanging up the stockings, and the arrival of Father Christmas, cheery as usual, although he does grumble a bit about careless people who neglect to have their chimneys swept! Then comes Christmas morning, and the exciting moment when the presents are discovered. Finally there is a brief visit to church, and singing of some of the favourite Christmas hymns. Another amusing record on similar lines is "*Christmas Eve—The Twins Hang Up their Christmas Stockings*" on Columbia DB5083 (2/6). There are many other good records of this type, and again I advise a visit to your dealer.

Pressing a "His Master's Voice" record. The material is rendered plastic on a hot plate (Above) and then placed on the matrix (Centre). The press is closed, pressure and cooling are applied automatically, and the press-man removes the finished record (Right). Photos by courtesy of the Gramophone Co. Ltd.

Apart from items of purely Christmas interest, a short recital of gramophone records often forms a pleasant break in the round of games and dances. Almost any of the records of Layton and Johnstone, Mr. Flotsam and Mr. Jetsam, and Alexander and Mose are suitable. I can recommend also two records by Bransby Williams, "*The Caretaker,*" with "*The Green Eye of the Yellow God*" on the other side (Col. DB388, 4/6), and "*The Showman*" (DB9299, 4/6). Another amusing item is the humorous sketch "*Sandy Buys A Wireless Set*" (Broadcast, 1/-). The Broadcast shilling records are certainly remarkable value for money. Although they are only 9 in. in diameter they play as long as the average 10 in. record. I suggest the following two for trial, not as being exceptionally good, but as average examples of Broadcast quality. "*In A Monastery Garden*" and "*In A Persian Market*" by Ketelby (291); and "*Les Millions D'Arlequin*" by Drigo, and the "*Londonderry Air*" (708), all played by Herbert Griffiths on the Stoll Picture Theatre organ.

Records Worth Buying

Albert Sandler and his orchestra provide a particularly charming "*Fantasia on Irish Airs*" (Col. DX 293, 12 in., 4/-). The tunes chosen are all old favourites, ranging from lively jigs to the beautiful "*Londonderry Air.*" Old English tunes in the form of a march are played with splendid swing and sparkle by the Grenadier Guards Band (Col. DB 644, 10 in., 2/6), and real Scottish bagpipe music comes from the Pipers and Drummers of the Scots Guards (Winner 5217, 1/6). For those who enjoy brass band music two records can be recommended, one by the Wingates Temperance Band (Regal MR 412, 1/6), with cornet and trombone solos, and the other by the Black Dyke Mills Band (Winner 5386, 10 in., 1/6), with a stirring descriptive hunting fantasia on one side and a first-rate cornet solo on the other.

Other records that are certain to be popular are the sparkling "*Pique Dame*" overture by Suppé, played by the famous Vienna Philharmonic Orchestra (H.M.V. C1677, 12 in., 4/-); the "*Parade of the Tin Soldiers*" and "*Wood Nymphs*" by the Coldstream Guards Band (H.M.V. B3951, 10 in., 2/6), and a selection from "*The Gipsy Princess*" by De Groot and the New Victoria Orchestra (H.M.V. C2274, 12 in., 4/-). There is also an amusing record by the Grenadier Guards Band of "*The Parade of the Elephants*" and "*The Old Frog Pond*" (Col. DB597, 10 in., 2/6), in which the stately steps of the elephant and the croaking of the frogs are quaintly represented.

Among recent vocal records worth special notice are two by Paul Robeson, "*River Stay 'Way From My Door*" and "*Rockin' Chair*" (H.M.V. B3956, 10 in., 2/6), and "*Water Boy*" and "*Steal Away*" (H.M.V. B2187, 10 in., 2/6); and two by Peter Dawson, "*Father O'Flynn*" and "*When the Guards Go Marching By*" (H.M.V. B3838, 10 in., 2/6), and the "*Song of the Tinker*" and "*Gipsy John*" (H.M.V. B3809, 10 in., 2/6). Another good disc contains "*The Changing of the Guard*" and "*The Roman Road*" by Malcolm McEachern (Col. DB630, 10 in., 2/6).

Alexander and Mose continue their amusing duologues, and "*Fish Sauce*" and "*Auto-Suggestion*" (H.M.V. B3925, 10 in., 2/6) are distinctly good, especially where Mose leaves his car alongside a dustbin and absent-mindedly gets into the wrong "tin" by mistake! "*Two Different Men*" and "*New Words for Old*" are mirth-provoking ditties by the popular Mr. Flotsam and Mr. Jetsam (Col. DB624, 10 in., 2/6).

A striking novelty is provided by the singing of Karl Reich's canaries (H.M.V. B3958, 10 in., 2/6). Professor Reich has been engaged for some 15 years in training canaries to reproduce exactly the notes of the nightingale, by rearing them from the fledgling stage to the sound of tame nightingales.

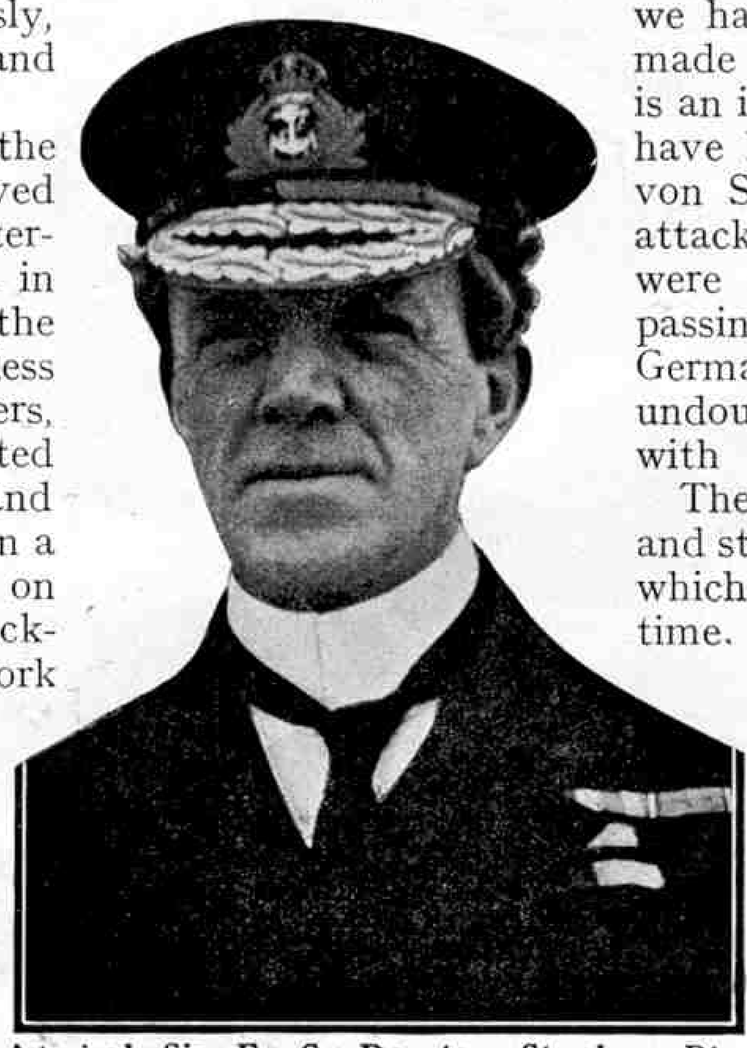
Cinema organ records continue to increase in numbers, but not to the same extent in quality. A good record by Sidney Gustard from the Gaumont Palace Cinema, Chester, which has one of the best variety organs in the country, gives us on one side Kreisler's popular "*Caprice Viennois*" and on the other the well-known "*Serenade*" by Toselli. What might be described as "miscellaneous" instrumentalists are now receiving more serious attention from the recording companies than used to be the case. Recent recordings include two mandoline solos by Giuseppe Gargano, "*Waltz Serenade,*" Thomé, and "*Capriccio,*" Arienzo, (Col. DB635, 10 in., 2/6). Gargano is undoubtedly a supreme master of his instrument, and he plays with a rhythmic swing that is irresistible.

The Battle of the Falkland Islands

A Gun-Against-Gun Fight to a Finish

ON the 8th December, 1914, took place the only British naval victory of the War fought out in the good old Nelson manner of gun against gun. It was indeed a straightforward struggle between ship and ship, without the use of the submarines, torpedoes and aeroplanes that have come to be regarded as essential features of modern naval warfare. To this country it was a battle of enormous importance, for in it Admiral Sturdee avenged the defeat of Admiral Cradock at Coronal a month previously, and deprived the Germans of the command of the seas off South America.

The disastrous defeat of Cradock by the German Admiral von Spee was received in England with amazement and consternation. Lord Fisher, who was then in control at the Admiralty, tackled the situation with characteristically ruthless energy. He ordered two battle cruisers, "*Invincible*" and "*Inflexible*," to be fitted out with the utmost possible speed, and they sailed on 11th November, 1914, on a mysterious mission. It is said that on receiving Lord Fisher's orders a certain dockyard admiral reported that, even if work were to be carried on day and night, the cruisers could not be made ready before 14th November. Fisher's reply was brief: "Either they go or you go"; and the ships went!



Admiral Sir F. C. Doveton Sturdee, Bt., K.C.B.

On leaving home waters, "*Invincible*" and "*Inflexible*" avoided all the usual trade routes, altered their course whenever they sighted shipping, sent no wireless messages, and in fact did everything possible to avoid their position becoming known. They steamed across the Atlantic to a secret rendezvous 30 miles off the Brazilian coast, where they found waiting five other British cruisers—"*Carnarvon*," "*Kent*," "*Cornwall*," "*Glasgow*" and "*Bristol*"—which had already been in the South Atlantic. Admiral Sturdee took command of the squadron, which made for the Falklands, steaming in extended formation, each vessel 10 miles distant from its neighbour, in order to form a great sweeping net that made it impossible for Von Spee's squadron to slip through if it happened to be in the same waters.

Unknown to Sturdee, Von Spee also was making for the Falkland Islands, where in the ordinary course he would have arrived two or three days before Sturdee. But by one of those curious turns of fortune that make war so fascinating he stopped to load up his ships with coal from a captured British vessel, and thus reached the Falkland Islands on the morning after the arrival of the British squadron. Von Spee's fleet consisted of two armoured cruisers "*Scharnhorst*" and "*Gneisenau*," both armed with eight 8.2 inch and six 5.9 inch guns, and eighteen 22-pounders, and with a reputation for first-class gunnery; and three light cruisers "*Leipzig*," "*Dresden*," and "*Nurenburg*."

The German fleet was sighted about 8 o'clock on the morning of the 8th December. The old battleship "*Canopus*," which previously had been the sole defender of the Islands and was lying on the mud in the harbour in order to make a better gun platform, promptly opened fire with her 12-inch guns. In the meantime the German fleet had sighted the tripod masts of the battle cruisers inside the harbour, and realising that we had ships greatly superior to their own, made off to the eastward at full speed. It is an interesting speculation as to what would have happened if, instead of running away, von Spee had continued on his course and attacked the British ships, either while they were still in the harbour or as they were passing out through the entrance. If the German Admiral had done this Sturdee undoubtedly would have been confronted with a very difficult situation.

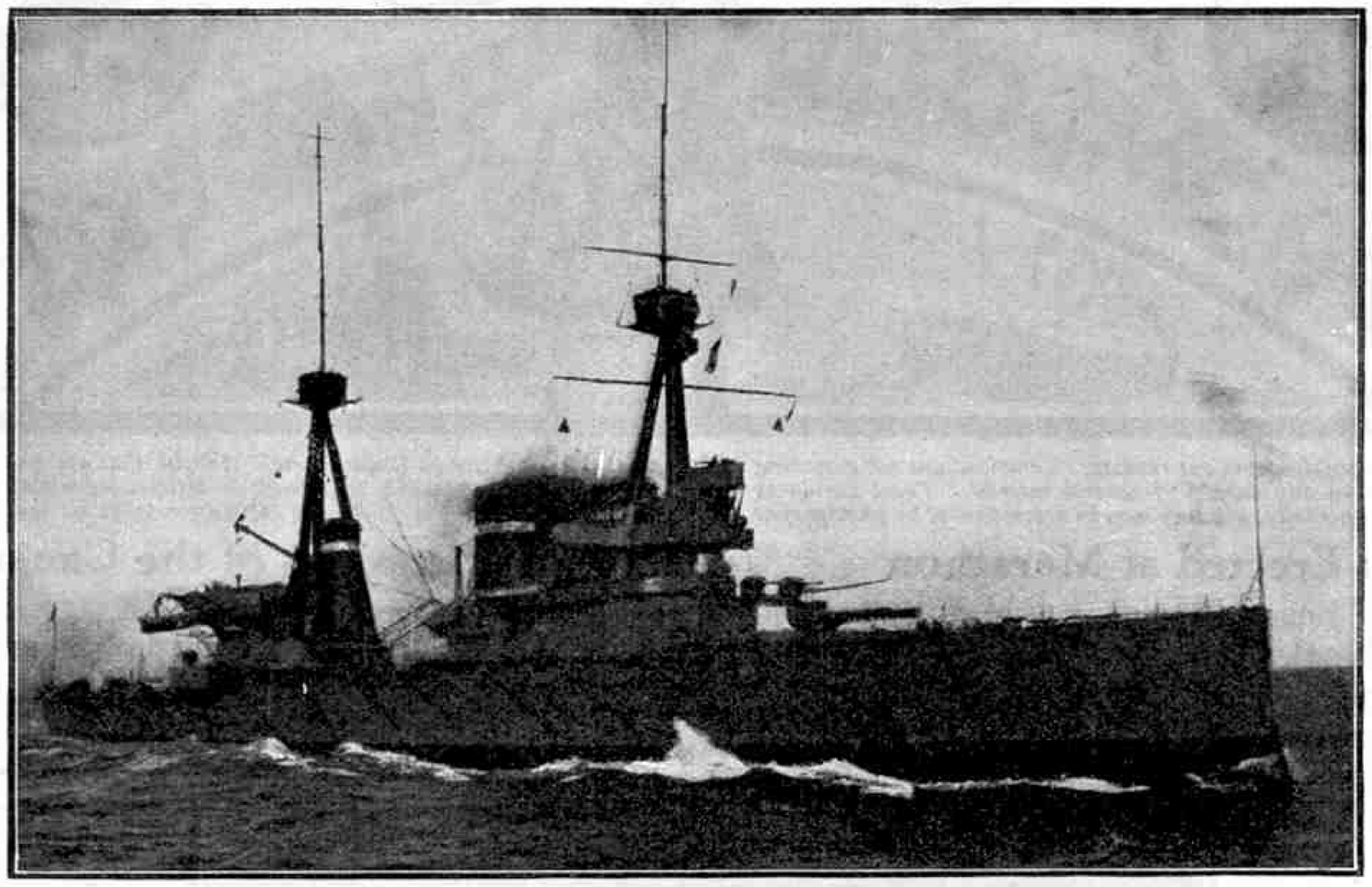
The British fleet immediately ceased coaling and started to raise steam; while the "*Kent*," which happened to have steam up at the time, was sent to investigate. Soon afterwards the "*Glasgow*" followed, and in a very short time the remainder of the squadron had left the harbour. The chase that followed was long and stern. The British ships had only had an hour-and-a-half in which to raise steam, and the Germans had a start of 20 miles. The British stokers worked like madmen, and the cruisers were pushed along as they had never been before. In the meantime the gun crews, having seen that every detail of their guns was in order, quietly waited.

After about two hours Sturdee decided that he was near enough to give the order for the two battle cruisers and the "*Glasgow*" to attack. The distance, which was about 17,000 yards, was too great, however, and the chase continued for about half-an-hour. The attack was then renewed, and Von Spee ordered his ships to scatter. The British battle cruisers concentrated their fire on the "*Scharnhorst*" and the "*Gneisenau*" at a distance of about 16,000 yards. The enemy opened fire, and the subsequent fighting was of intense severity, the ships in the meantime approaching to within about 10,000 yards of one another. The German vessels were hit several times, and the "*Scharnhorst*," on fire forward, with her third funnel shot away, and some of her guns put out of action, endeavoured to slip away under cover of a dense cloud of smoke in which at that time the "*Invincible*" was shrouded. This effort was unsuccessful, however, for the British cruiser, emerging from her smoke, renewed the attack fiercely. The "*Scharnhorst*" fought on steadily, but by 3.40 she was on fire from end to end. About a quarter-of-an-hour later, with her flag still flying she rolled over and sank beneath the

icy waters, taking with her every soul on board, including Admiral von Spee.

By 5.30 the "*Gneisenau,*" which had suffered terribly from the battering of the "*Inflexible,*" stopped firing. Her shells were exhausted and she was on fire from end to end. Half-an-hour later she heeled over and followed the "*Scharnhorst*" to the depths of the Atlantic. Survivors to the number of 188 were rescued from the "*Gneisenau.*"

When Von Spee gave the order for his ships to scatter, the "*Leipzig,*" "*Nurenburg*" and "*Dresden*" turned away to the south west, followed by the "*Glasgow,*" "*Kent*" and "*Cornwall.*" The enemy vessels fled at their utmost speed, but the British cruisers were not to be baulked of their prey, and, as the result of almost superhuman efforts on the part of their stokers, gradually overhauled the Germans. The "*Kent,*" an eleven-year-old vessel designed for a speed of 22 knots, on this occasion actually achieved a speed of 23 knots. Gradually the British cruisers came within range and opened fire. Soon after 7 o'clock the "*Nurenburg*" sank, and the "*Leipzig*" followed a couple of hours later. The "*Dresden,*" which was the only one of the German fleet that succeeded in escaping, was destroyed in Chilean waters on 14th March, 1915.



H.M.S. "*Invincible,*" one of the two battle cruisers rushed from England to avenge the defeat of Admiral Cradock.

The Battle of the Falkland Islands not only avenged Admiral Cradock, but, what was far more important, ended the danger from German raiding warships. From that time until the end of the War the British Navy controlled all sea routes outside the North Sea and the Baltic Sea, except as regards submarines. The vital importance of this clearing of the seas is shown by the fact that, between the outbreak of war and 31st January, 1915, German cruisers and armed merchantmen operating in various waters sank or captured more than 280,000 tons of shipping.

Voyage of Henry Hudson—(*Cont. from p. 955*)

other men, to enter the boat. This was then sent adrift, and Robert Bylot took over command of the "*Discovery,*" which hoisted sail and was soon out of sight. Nothing was ever heard of the small boat or its occupants, but as they were without food their fate was certain.

The "*Discovery*" arrived in England in the following September. Before leaving the Arctic some of the mutineers, among them the man Greene, were killed in fighting with eskimos, and others died subsequently of starvation. The story of the mutiny soon leaked out, and the survivors were thrown into prison, tried, and convicted for their inhuman conduct.

As a result of Hudson's voyages a great whale fishery sprang up at Spitzbergen. This industry had a direct effect on polar exploration for, through the voyages of the whalers, knowledge of the islands in the Arctic and of the varying conditions of the ice was greatly increased. Other Dutch traders followed up Hudson's investigation of the Hudson River in 1609 and they established a fort on what is now known as Manhattan Island. The fort developed into the city of New Amsterdam and finally became known as New York.

A memorial to the famous explorer, in the form of a fine stained glass window, was presented in 1928 to the Church of St. Ethelburga the Virgin in Bishopsgate, London, by the Hudson's Bay Company. In this small church 324 years ago Hudson and his crew received the Sacrament before setting out from Gravesend in the "*Hopewell,*" on their first voyage of exploration.

The Dynamometer Car—(*Cont. from page 967*)

Equipment is also provided on the car for the staff to spend the night aboard, if necessary. When tests are being made with freight trains that journey from colliery sidings to the shipping bunkers at the docks, or with an experimental locomotive on a stretch of the line specially selected for its quietness in some country district miles from anywhere, the staff are indeed glad to avail themselves of the facilities for food and rest.

The apparatus of the car is very valuable and delicate, and an attendant is always aboard night and day, except when the strange coach is safely stowed away and locked up in the carriage sheds.

The nature of the work of the dynamometer car and the close application necessary for the proper production of accurate results make it one of the greatest honours of the service to be appointed to serve as one of its crew.

A locomotive travelling at high speed receives many jolts and jars owing to irregularities of the track, and the length of its career is therefore largely dependent on the condition of the track. An ingenious instrument has been invented by a French railway engineer that acts as an inspector of the permanent way.

The track register is placed on the floor of a railway carriage immediately above the wheels and records oscillations in three directions—movements parallel to the track, transverse movements, and vertical movements. A record is also made of the quarter-mile posts and the stations passed, this record being controlled by an operator who presses a pneumatic bulb when one or the other is sighted. In this manner the irregularities of the track are quickly and accurately located.

The movements are recorded by three needles, working through sheets of carbon, which mark a thin strip of paper mounted on a drum rotated by a geared clockwork mechanism. The result is a chart something similar to that of a recording barometer, composed of lines of varying amplitude. Each portion of the record can be interpreted at a glance by the engineers, and any portion of the track requiring attention is easily picked out at the end of the journey. This instrument, which is known as the Hallade track register, often reveals defects that are not visible to the eye.

Remarkable Machine—(*Continued from page 947*)

from 4 ft. to 16 ft. and from 40 ft. to 160 ft. per minute. The greater of these speeds is used in traversing the machine considerable distances, and the slower speed is used for short distances, or for setting the machine. On the housing there is a dial registering feet and inches for setting the machine, and hand adjustment for setting is provided.

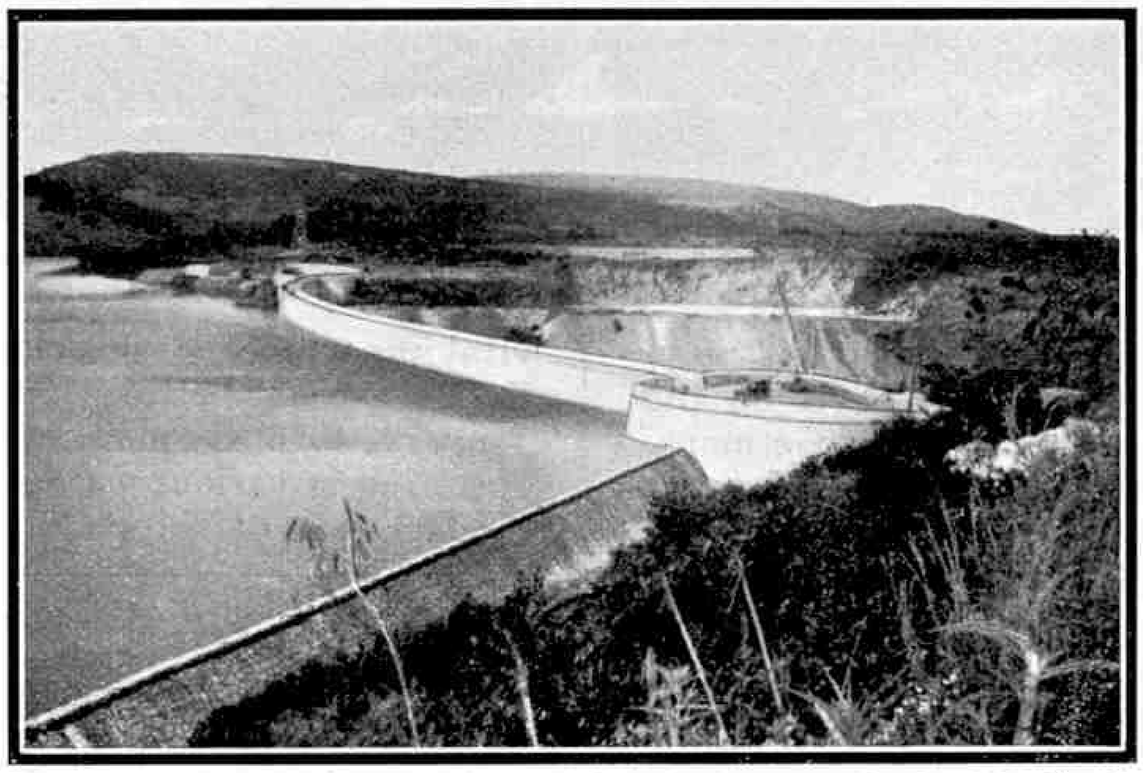
All drive gears are of carbon steel. The motor pinions are of either rawhide or steel, as conditions may demand, and all drive bearings are bushed with bronze. Adequate provision is made for lubricating all running parts.

The question of fatigue and facility of handling has been given careful consideration in designing the machine, and all motors are controlled and operated from the most convenient position for the operator.

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

Giant Dam Erected at Marathon

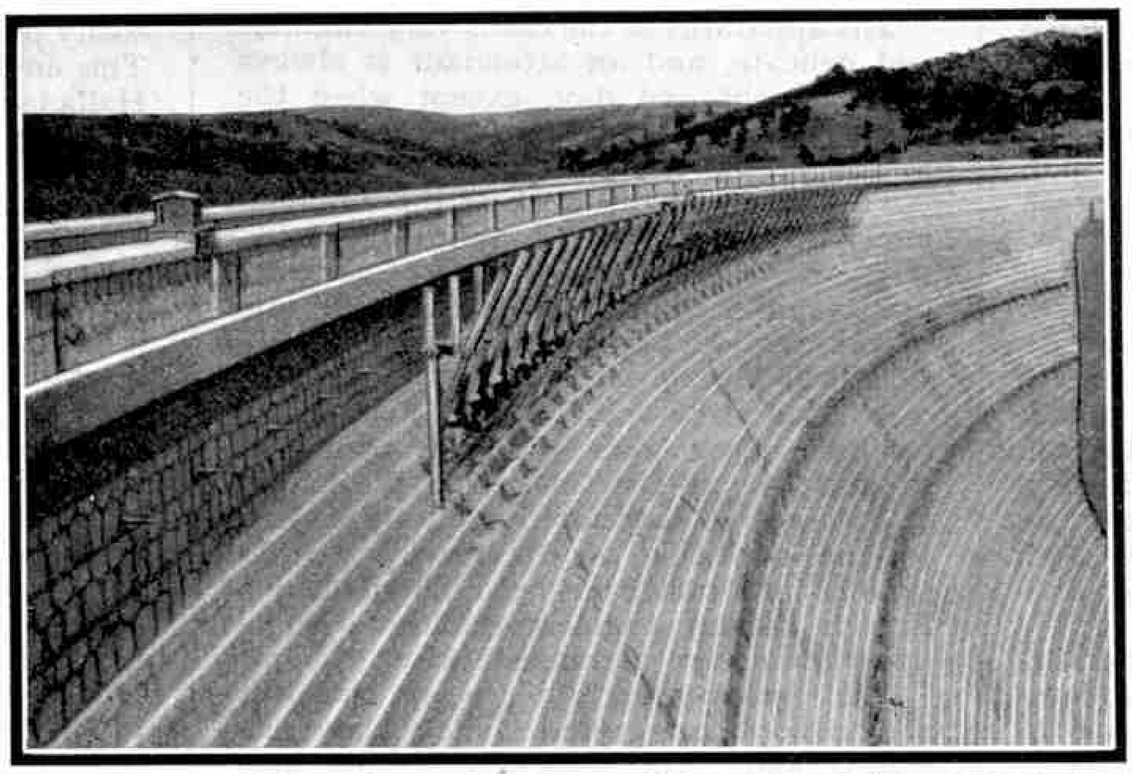
A great dam has been erected at Marathon, the scene of the famous battle in 490 B.C. between the Athenians and the invading Persians. Marathon is about 25 miles from Athens and the dam has been built just below the junction of two streams that flow down from the surrounding mountains. Behind it there is now a great lake from which the water supply of Athens and its seaport, Piræus, is obtained. The work was begun in 1926 and was completed last year. The dam is curved, the convex side being upstream. It is nearly 1,000 ft. in length, and towers to a height of 174 ft. above the bottom of the valley it crosses. At its base it is 154 ft. in width, and it gradually tapers upward until it is only 5 yds. in width at the crest.



The great lake behind the dam recently erected at Marathon, near the site of the historic battle between the Athenians and the Persians in 490 B.C. The spillway may be seen in the foreground. Our photographs were taken by M. Souyoudjoglou, Athens.

The dam is very imposing in appearance, for the sloping outer face has been built up in a series of 56 giant steps, and these are faced with glittering white marble. It is interesting to note that a reproduction of an ancient Greek temple has been built at the foot of the dam as a memorial of the victory gained by the Athenians at Marathon nearly 2,500 years ago.

The average depth of the water impounded by the structure is 131 ft. and a capacious spillway has been provided in order to divert surplus water into the bed of the stream below the dam. The water is taken from the great artificial lake through a tunnel 8 miles in length that leads to the previously existing reservoirs at Helidonou. B. G. PAPACONSTANTINO (Athens).



The down-stream side of the Marathon Dam, which rises to a height of 174 ft. in a series of 56 giant steps built of marble.

Impressions of the Canary Islands

During a short visit to the Canary Islands I was greatly interested in the means of transport employed there, for these differ in many respects from those with which I am familiar. They are varied in character and modern methods are largely used, of course. For instance, in Santa Cruz de Teneriffe, the capital of the islands, up-to-date electric tramcars come right down to the Mole, and on the roads may be seen quite a number of motor cars, ranging from Fords to Rolls-Royces. I saw very few motor lorries, but was greatly interested in the mules and donkeys employed to draw carts, and in the camels that were to be seen swinging along the roads.

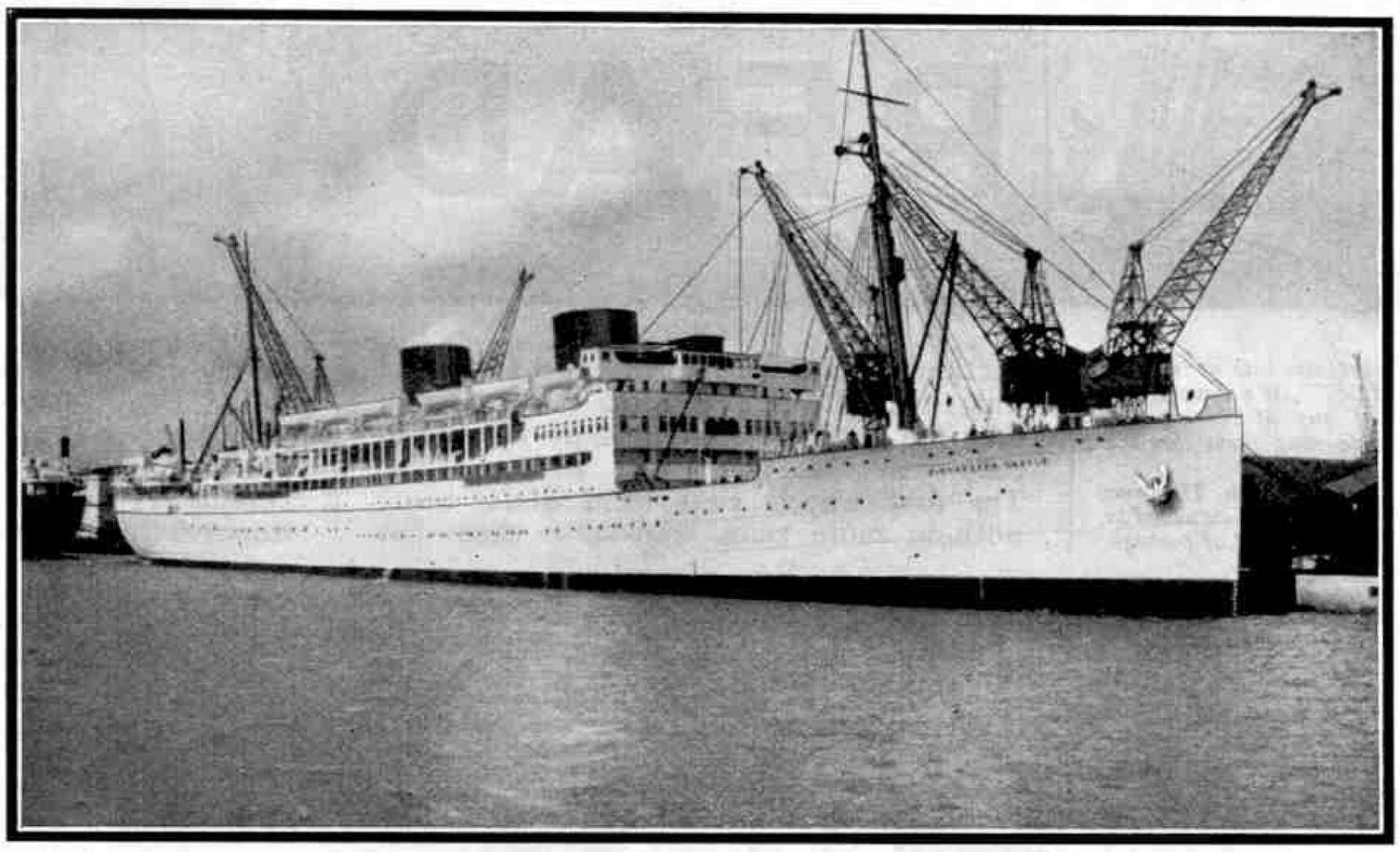
I went out to Oratava, where the famous Botanical Gardens are situated, in a car that was driven at a breakneck pace. This vehicle formed a remarkable contrast to a cart drawn by oxen, and accompanied by natives dressed in their national costumes, which I was fortunate enough to see on the way.

Oratava is a port from which bananas grown in the neighbourhood are despatched overseas. I remained for some time to see how the fruit was handled. The great bunches were carefully packed and rolled down the steps of the quay into surf boats, and it was wonderful to see the manner in which these went through the surf on their way to the vessels waiting offshore to receive their cargoes.

C. H. LEES (Bristol).

An Interesting Day at Southampton Docks

Recently I travelled from Ryde to Southampton in the S.R. paddle steamer *"Southsea."* The route up Southampton Water was that followed by liners, and on the way we passed the 20,000-ton Hamburg-American vessel *"Deutschland,"* outward bound for Hamburg. Nearer the docks I could make out the familiar grey hull of a Rotterdam-Lloyd liner from the Dutch East Indies, and the light buff funnels of the *"Alcantara,"* a 22,000-ton motor vessel of the Royal Mail Line.



The new motor vessel, "Winchester Castle," of the Union Castle Line, in Ocean Dock, Southampton.

As the *"Southsea"* turned into Ocean Dock, I saw for the first time the new motor liner, *"Winchester Castle,"* of the Union Castle Line. She is a vessel of 20,000 tons, and made a splendid picture, the sun shining brightly on her light grey hull. Our little vessel threaded her way through the dock, passing a 20,000-ton liner, the *"Orford"* of the Orient Line; the *"Berengaria,"* the giant Cunarder; and on the left the cruising liner *"Arlanza,"* a 14,000-ton vessel belonging to the Royal Mail Line, could be seen.

I inspected the *"Berengaria"* and was greatly impressed by a placard informing visitors that five times round the first-class deck was a distance of a mile, and also by the magnificence of the Imperial Suite. This is a miniature flat with five apartments and a crossing in it costs more than 300 guineas.

A striking view of the floating dock at Southampton. This is the largest in the world and was built to accommodate the giant liners on the North Atlantic service.

I then went across to the largest floating dock in the world, built in 1924 at Newcastle and afterwards towed to Southampton. The size of the dock gives a splendid idea of the length and depth of the modern ocean giants that are accommodated in it for underwater repairs and painting. I asked how much it cost to fill the tanks in order to sink the dock to a depth of 36 ft., and to raise it again with a liner of more than 50,000 tons in it, and was astonished to learn that this would be nearly £12,000. When a vessel due for repairs has entered the dock, and those in charge of operations are satisfied that she is resting on an even keel and is safely shored, it takes four hours to pump out from the tanks of the dock the enormous weight of water that keeps the structure submerged.

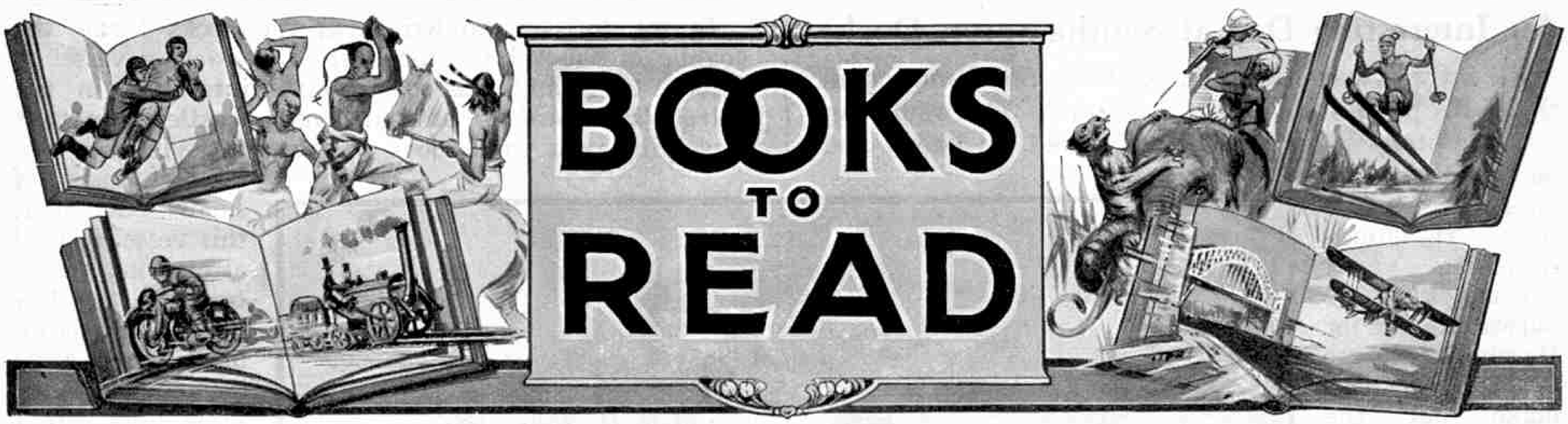
In my further wanderings at the docks I saw the coaling of the White Star liner *"Calgaric,"* a vessel of 16,000 tons, and was particularly interested in the *"Armadale Castle,"* an old Union Castle liner that was lying in a small dock by herself. With her two high funnels of small diameter, this vessel formed a remarkable contrast to the low built modern motor vessel belonging to the same line that I had seen previously. I also saw the great 150-ton floating crane, which was moored near the *"Berengaria,"* but before I could continue my explorations the siren of the paddle steamer in which I had reached Southampton called me back, as the time for returning down Southampton Water to Ryde had arrived. W. R. H. TEMPLE (Greenock).

In a Gun Turret on H.M.S. *"Hood"*

During Navy Week at Portsmouth I was present in a gun turret on H.M.S. *"Hood"* during a firing demonstration. Most of the space within the turret is occupied by the breech ends of the 15 in. guns. Behind each of these is a small platform for the gun crew, and in the centre is a shaft up which come shells from the magazine.

To commence the demonstration, a sailor opened the breech of his gun by turning a lever. In the meantime a signal from the magazine showed that a shell was ready. An officer pressed down a pedal and up roared the shell cage with its load, to stop near the breech of the gun. In war-time the shell would then have been rammed into the barrel as far as possible, and bags of cordite would have been pushed in after it, while the gun-layer trained his guns in accordance with orders received from the control tower. When all is ready the guns are fired electrically, and I was told that they recoil two feet, the men having to jump quickly out of their way. Smoke and fumes are then blown out of the barrel and the breech block and the inside of the gun cooled by means of powerful jets of water. Although many operations are involved, a gun can be loaded and fired in 16 seconds.

The turret was turned round while I was inside, the guns being trained by the gun-layers while this was being done. D. BOWERMAN (Marlborough).



On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/- should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

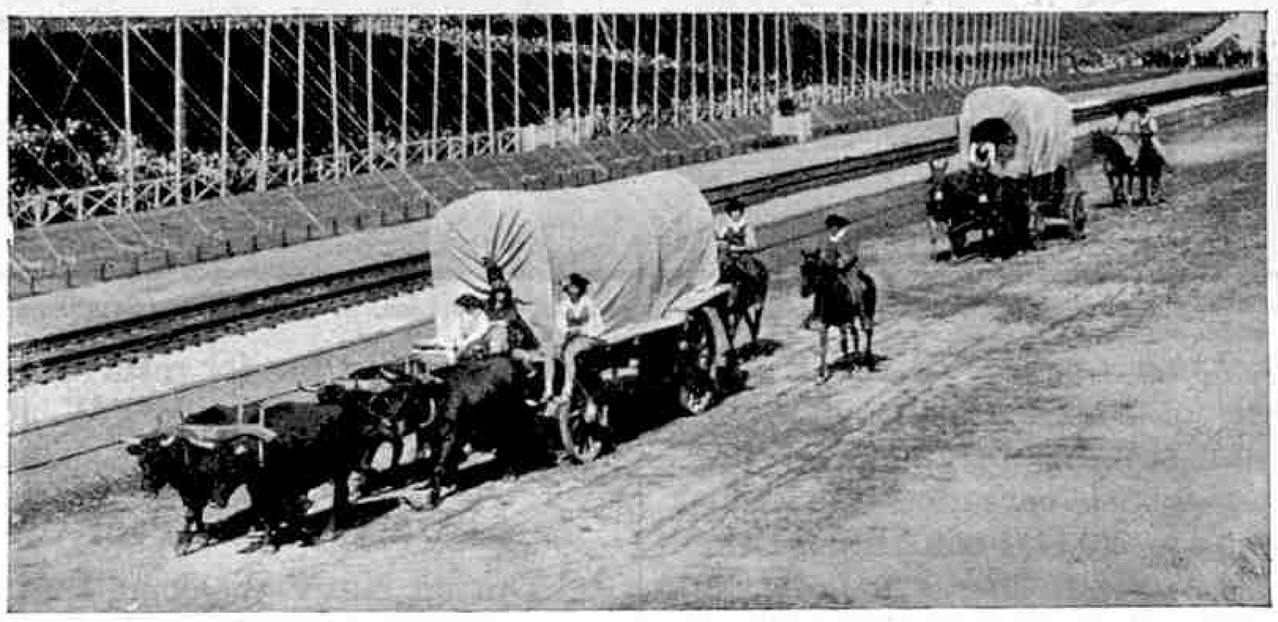
"The Romance of Transport"

By Ellison Hawks. (Harrap. 7/6)

The story of transport is to a large extent the story of civilization, and Mr Ellison Hawks, the Editor of the "*M.M.*," tackled a tremendous task in setting out to deal with it in a single volume. He has succeeded in the only way possible—that is, by a process of careful selection and condensation. The story is one that might easily have become an uninteresting collection of dates and events, but the author has avoided this danger and has produced a succession of fascinating word pictures, in which the romance of travel through the ages is spread out before our eyes.

Starting from the earliest days of transport, when Man had to depend entirely on his two legs and his own broad back, we are shown how the idea developed of making use of various four-footed creatures. The camel, for instance, was employed as a beast of burden as far back as 6,000 B.C., or even earlier, and all through the centuries up to the present day it has padded its way across the deserts of Asia and Africa, grumbling always, but carrying its loads with unfailing regularity. The mule, too, has an astonishingly long history as a load carrier, and the Great War showed that it had lost none of its usefulness, and certainly none of its innate wickedness of disposition! The most important of all beasts of burden is of course the horse, and its story is bound up with almost all forms of transport up to the coming of the railway and the motor vehicle.

The greatest leap forward in the history of transport came with the invention of the wheel. Egyptian illustrations show that at a very early date an attempt was made to improve sledge transport by the introduction of rollers between the runners and the ground, with the object of reducing friction. We do not know when the wheel was invented, but it seems fairly certain that the idea was suggested by the use of rollers in this and other similar ways. The first wheels were solid discs, being nothing more than transverse slices cut from the trunks of large trees. The spoke may have originated from the ancient practice of inserting a lever through a hole in the disc wheel to give assistance on a rough road, or with an exceptionally heavy load.



Oxen transport of the far-west in the days of the covered wagon. **(See next page).**

The Romans were probably the first people to realise the immense importance of transport, and after every conquest of new territory they concentrated their energies upon the building of good roads.

A Hathi Tractor hauling a heavy howitzer through a stream. **(See next page).**

The story of the Roman roads in Britain is one of extraordinary interest, and it is gratifying to find that Mr. Hawks deals with it in detail. After the Romans left Britain their roads were neglected, and as the years went on they fell into utter decay. When the country began to settle down after the coming of the various invaders from the Continent, some attempt was made to provide a system of roads, but the efforts were hopelessly inadequate.

The descriptions that the author gives us of journeys in what we so light-heartedly call "the good old days" make one wonder that anybody dare travel by road at all! Vehicles frequently collapsed completely as the result of the strain imposed by the terrible road surface, and there was always the danger of attack by highwaymen. Between the years 1760 and 1792 no less than 900 Turnpike Acts were passed, but still the roads remained bad at their best in summer, and frequently impassable during the winter months. Modern road-building on intelligent lines may be said to have begun with Metcalf, a blind Yorkshireman, who realised that there were two essentials for a road, a solid foundation and a hard surface. Further progress in road-making was made by Telford and McAdam, who between them produced durable road surfaces that proved adequate to meet all requirements until the arrival of the heavy motor vehicle. The tremendous wear and tear produced by such vehicles has brought about still further improvements in road surfacing, but the ideal material for motor roads has yet to be discovered.

The canal, which at one time played such an important part in our national transport, was shorn of its glory by the railway, and to-day, with the exception of one or two waterways like the Manchester Ship Canal, it plays a very minor part. During recent years various suggestions have been put forward with the object of reviving canal transport, but so far little progress has been achieved.

The story of the development of mechanical transport by rail and road is one of extraordinary interest, and the author shows us how one problem after another was solved by the genius of successive inventors. The railway and the motor vehicle have completely revolutionised world transport, and progress still continues. Recent developments suggest that possibly the steam locomotive is approaching the end of its wonderful career, and that it will be replaced by electrically-propelled engines of greater power, speed and efficiency. It is rash to prophesy, however, and it is not unlikely that some development in design may give the steam locomotive a further lease of life.

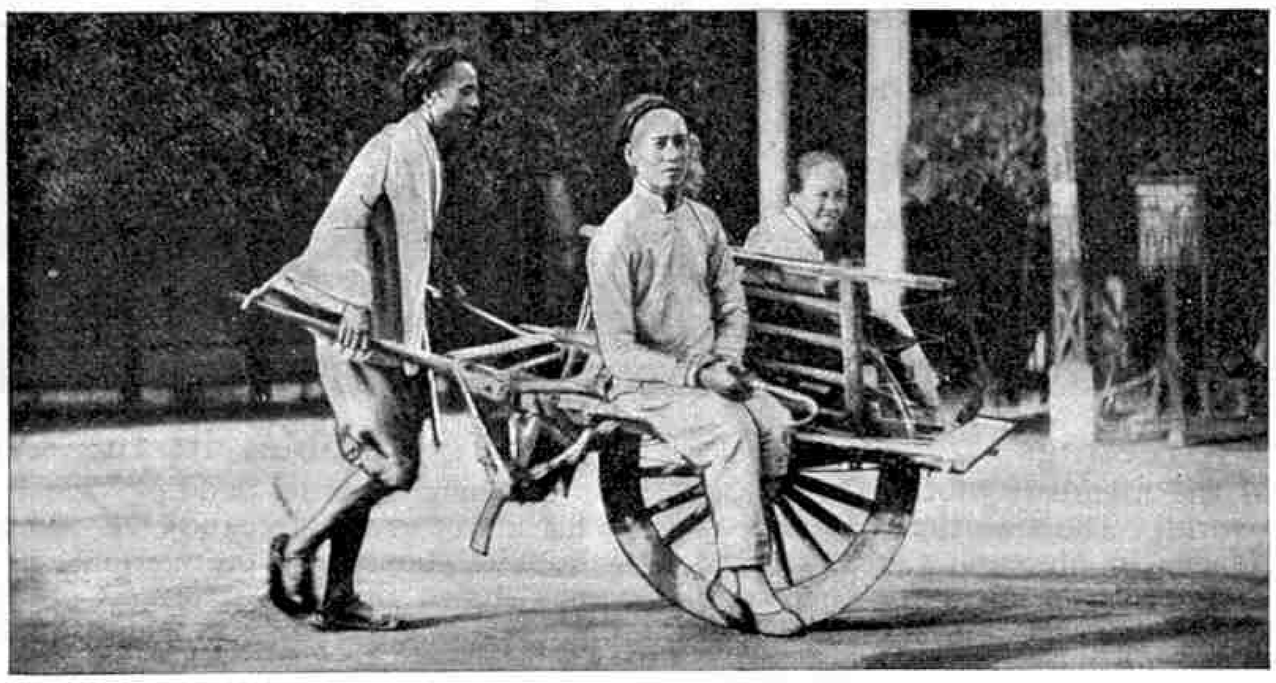
Ocean transport affords the author

another opportunity of condensing history into small space without loss of interest, and it is probable that many readers will consider this section one of the most interesting in the book.

Finally we come to the latest phase—transport by air. The development of the aeroplane was undoubtedly speeded up enormously by military requirements during the Great War, and since the Armistice civil aviation has extended in a most astonishing fashion. To-day it is quite a simple matter to have breakfast in London and lunch in Paris, Brussels or Amsterdam; and perhaps it will not be very long before we are able to spend one week-end in England and the next in Australia, Cape Colony or Japan!

The interest of this remarkable volume is greatly enhanced by the large number of illustrations. These have obviously been selected with the utmost care, for they fit in perfectly with the various sections of the text. The combined result is a volume that can be recommended without reservation, and a more acceptable Christmas gift will be difficult to find.

(REV. J. H. MARTIN).

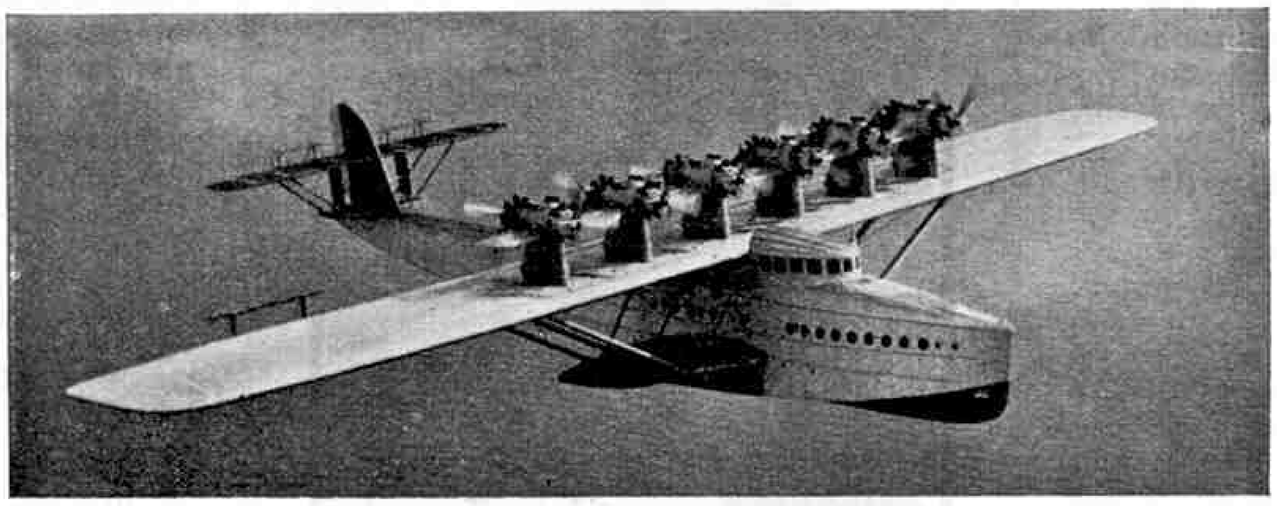


Transport in China—passenger-carrying wheel-barrow. (See below).

"The Boy's Own Annual"

(R.T.S. 12/6 net)

Each year for more than half a century *"The Boy's Own Annual"* has been a welcome feature in the life of contemporary boyhood, and the new volume—the 53rd—is well up to standard. Its 864 pages include stories and articles of first-rate quality, and of a variety sufficient to satisfy the most exacting reader. While the serial stories do not open up any particularly new ground, they are well written and full of exciting adventures. The inevitable school story is there, and quite a good one too. The "Behind the Scenes" series that commenced in the previous volume is now continued, and includes such interesting topics as "Overhauling London's Buses," "How the Film gets its Voice," and "Down River on a London Steam Tug." The articles of the "How to Make" type, and those on coin and stamp collecting and outdoor sports, seem to be even better than in former volumes. The illustrations as usual are numerous and good, and the photogravure plates include full-page portraits of Don Bradman, Lord Burghley and Sir Malcolm Campbell.



The famous Dornier X, illustrative of the air liner of the future. (See below).

"Empire Annuals for Girls"

(R.T.S. 7/6 net)

It comes rather as a surprise to note that this annual has reached its 23rd year. There is certainly no sign of lack of vigour, for the new volume is full of spirited tales of adventure and school life of the type that appeal specially to younger girls. The illustrations are attractive, and as a Christmas gift book the volume would be hard to beat.

"Empire Annual for Boys"

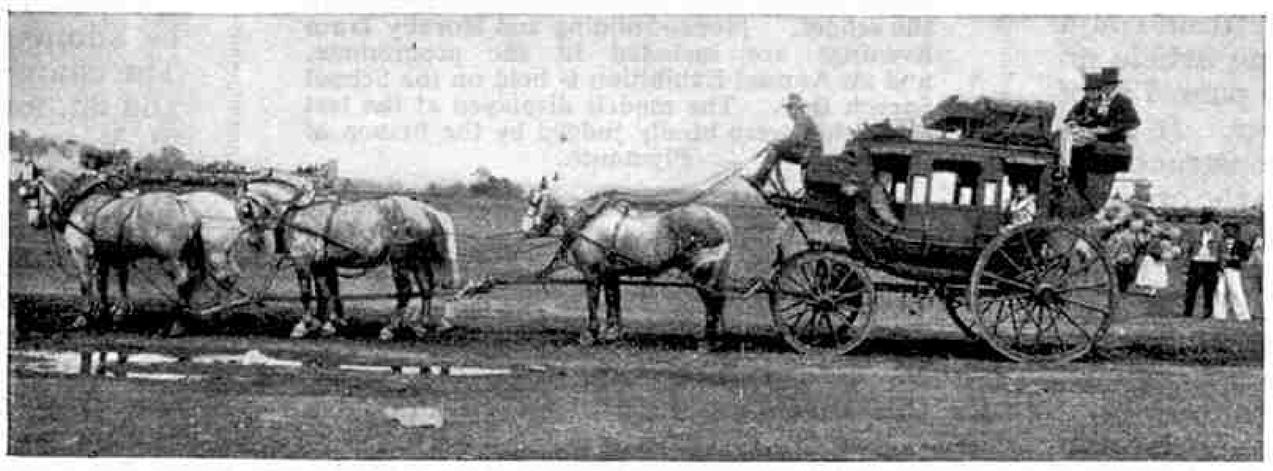
(R.T.S. 7/6 net)

This popular annual contains a collection of tales of adventure, sport, discovery and school life that form just the right sort of reading for a keen, active boy. The new volume is planned on similar lines to its predecessors. The stories cover adventures in all parts of the world, and are well illustrated, the coloured plates being specially attractive. The general articles also are of unusual interest.

"The Girl's Own Annual"

(R.T.S. 12/6 net)

"The Girl's Own Annual" still holds its special place in the affections of the average girl. This year's volume shows that the publishers are not prepared to live on reputation, for it embodies many new ideas and shows signs of development in various directions. The serial stories are well up to standard, and while thoroughly modern do not go beyond the bounds of reasonableness. The short stories are if anything even better in quality. There are many practical articles on hobbies of various kinds and the making of things useful and ornamental, and outdoor sports are given their full share of space. The volume is well illustrated and produced, and in fact forms an ideal gift book for any girl. It is remarkable how this Annual continues to retain its great popularity in spite of the many changes that have taken place since its introduction.



The stage-coach of the western prairie of North America. Scenes of this kind are reminiscent of "Buffalo Bill," cow-boys and Red Indians. The illustrations on these pages are from "The Romance of Transport" reviewed on the previous page.

"The Schoolboy's Annual"

(R.T.S. 3/6 net)

The main feature of this annual is the tales of school life, sport and adventure. Secret service, hidden treasure and an occasional burglar form some of the material that goes to make up the thrilling yarns, which are freely illustrated. There are also articles on conjuring, making puzzles in wood and wire, and other interesting topics. In addition to the numerous black-and-white illustrations there are four coloured plates depicting incidents in outdoor sport.

"Twenty-Six Radio Stories" (3/6 net)

"Tony D'Alton's Wireless" (2/- net)

By ARTHUR RUSSELL. (B.O.P. Office)

In *"Twenty-Six Radio Stories"* Mr. Russell has drawn upon a fertile imagination to produce yarns that make excellent reading and will be enjoyed even by those who know nothing of the mysteries of wireless. His operators hobnob with pirates and other dangerous people in thrilling and up-to-date circumstances, and the reading of one story whets the appetite for the next. The illustrations add considerably to the interest of the book.

"Tony D'Alton's Wireless," which is intended for rather younger readers, consists of a series of adventures in which wireless plays an all-important part. The background of school life affords a pleasant setting for the action, which never flags through lack of humour or incident.

"Only One in the World"

By DAVID KER. (R.T.S. 2/6 net)

Mr. Ker's name has been familiar to boys, and particularly to readers of "The Boy's Own Paper," for many years, and he can always be relied upon for an exciting story.

All the blood-curdling adventures and hair-breadth escapes in this thrilling book from his pen turn on the existence of a rare coin regarded as a talisman by a savage sheik in the Sahara. The coin was believed to be the only one of its kind in the world, and a millionaire collector commissioned an English lad to go out to Africa and procure it. The remarkable situations in which this lad found himself in the course of a few days following his arrival at Oran are amazing, but they are just the right material for a thoroughly enjoyable boy's yarn. The book contains a splendid frontispiece in colour.

Christmas Greetings

"A Merry Christmas" to all the members of the Guild and Meccano Clubs throughout the world. The traditional Christmas spirit is always strongly in evidence in Meccano Clubs, for the hobby is wonderfully effective in bringing boys together, and their enjoyment of it is a splendid means of establishing friendships that are not easily dissolved.

It always seems to me that Christmas offers to clubs unusual opportunities of enlisting the aid of new and enthusiastic members. It is then that a very large proportion of recruits to the great army of Meccano boys first take up the hobby, and in every club throughout the world plans should be made to give a cordial welcome to beginners. It is not necessary to enter upon an elaborate recruiting campaign. Satisfied members are the best agents for a Meccano club, and if every member determines to persuade at least one new Meccano boy to join the club, the effect will be magnificent.

Model-building Opportunities

The Christmas season is the happiest time of the year in a Meccano Club because it brings leisure time in which to indulge in model-building. New-comers are keen to learn how to make use of their Outfits to the best advantage, and older members, most of whom probably have added to their Outfits, also are eager to take full advantage of the opportunities that the holidays give them. Both will be attracted by model-building competitions, therefore, particularly if these are novel. Ideas for such contests may easily be obtained from various quarters, notably the *"M.M."* itself. Last month I drew attention to the value for this purpose of the *"Secrets of Engineering"* series, published at intervals throughout the year; and many other features of the Magazine also could be employed in a similar manner. For instance, a house-building competition could be organised and an interesting article on this subject was published on page 736 of the *"M.M."* for last September. It lends itself to a wide variety of constructional methods and gives full play to the originality and resource of the Model-builder.

Other ideas for competitions or for really interesting Model-building may be obtained from the "Suggestions Section," the descriptions and photographs of new models, or the monthly announcements of model-building contests. For example, details of a competition that is particularly suitable for this time of the year appear on page 993 of the present issue.

Such a competition as the one I have just mentioned may give rise to models of the humorous type, for a Meccano creature well provided with joints may be made to take up almost incredibly ludicrous attitudes. Even if a serious contest on these lines is not organised, great fun may be obtained at social events by giving members a few Strips, Brackets and Nuts and Bolts, and asking them to construct in a short time a simple representation of some bird or animal. The desperate struggles of competitors to produce original models from limited resources will provide as much amusement as examination of the results themselves!

Meccano Club Presidents

No. 9. Mr. P. H. Rowland

Mr. P. H. Rowland is President of Queen Elizabeth's School (Crediton) M.C. The club is one of the most popular societies formed in the school. Model-building and Hornby Train Evenings are included in the programme, and an Annual Exhibition is held on the School Speech Day. The models displayed at the last exhibition were kindly judged by the Bishop of Plymouth.

Hobbies in the Club Programme

Although model-building must always remain the central feature of every Meccano club, the good effect of introducing other hobbies should not be overlooked. Experience over many years has shown that the strongest clubs, both in membership and in enthusiasm, are those in which an all-round programme is pursued. An interesting example of the value of additional hobbies is given by the Harwich M.C. The illustration on the opposite page shows the officials and members of this club, and leaves no doubt that they form a very cheery group. The excellent spirit prevailing in this club, and in others working on similar lines, is largely due to the skilful use of a variety of hobbies to stimulate interest.

The list of hobbies suitable for Meccano clubs is a long one, and includes fretwork, woodwork, stencilling, carving, leatherwork and other activities. Many of these may be turned to good account in making club rooms more homelike and attractive in character. The value of others is appreciated when an exhibition is held, for good prices may then be realised for articles produced during the session, to the great advantage of club finances.

Coming Events

The first Annual Exhibition and Entertainment of the Reading M.C. will be held on 9th December, 1931, at Palmer Hall, West St., Reading. The Exhibition will be open from 6.0 p.m. to 9.30 p.m. The price of admission is 6d., and tickets together with a descriptive booklet, price 3d., may be obtained from local Meccano dealers.

The Annual Exhibition of the Exhall (Coventry) M.C. will be held on 31st December, 1931, and 1st and 2nd January, 1932. The Exhibition will be held in the Co-operative Rooms, Upper York St., and will be open from 7.0 p.m. to 10.30 p.m., except on 2nd January, when visitors will be admitted from 2.30 p.m. to 10.0 p.m. The charge for admission is 6d. for adults, and 3d. for school children. All interested in Meccano are cordially invited.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested in becoming members should communicate with the promoters whose names and addresses are given below:—

AUSTRALIA—Ken Dowling, Waverley, 72, Hare Street, Echuca, Victoria.

CANADA—G. Lunn, 6392, De Laroche Street, Montreal.

ESHER—R. G. Lane, "The Squirrells," Manor Road South, Hinchly Wood.

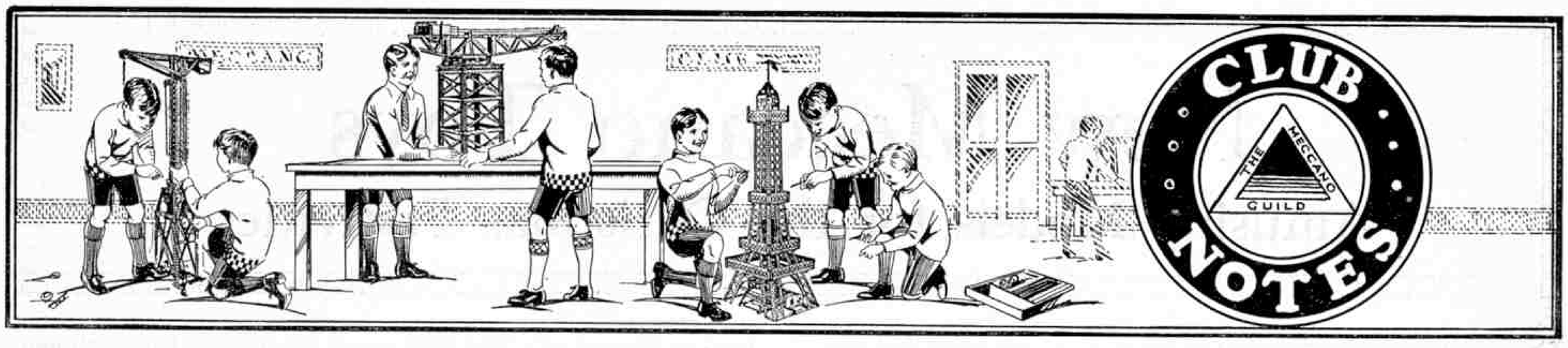
GRIMSBY—Maurice A. Conroy, 185, Columbia Road.

LIVERPOOL—Wm. G. Anthony, 35, Smeaton Street, Kirkdale.

LONDON—A. A. Goodman, 17, Cranwich Road, Stamford Hill, N.16.

NEW ZEALAND—Alan Abel, 530, Evans Bay Road, Killbirnie, Wellington.

WOODBRIDGE—Claude R. Jolly, Glebe Farm, Blaxhall, Woodbridge, Suffolk.



Chiswick Crusaders M.C.—Removal to the new club room, the Crusader Hall, has now been completed. No cupboards are available, but members have solved the storage problem by bringing strong wooden boxes to contain their Outfits. Model-building Competitions, Talks by members and Debates have been arranged. The Model-building Contests include special contests to develop speed, and blindfold competitions on the lines explained in the "Secretary's Notes" in the "*M.M.*" for September last. An Exhibition of models is to be held during the first week in January and active preparations for this are being carried on. A Social Evening to be held near Christmas also has been arranged. Club roll: 12. *Secretary:* H. P. B. Betlem, 139, Park Road, Chiswick, W.4.

St. Peter's (Wolverhampton) M.C.—Recent activities have included a Musical Evening, to which parents were invited, when members themselves contributed largely to the programme. A Lecture on "*Rowing*" given by the Rev. J. Du B. Lance, B.A., Leader of the Club, was of special interest, for the lecturer rowed in the Cambridge Eight. The Stamp Collecting section recently formed has proved very popular. A Football team has been organised and other outdoor events have been visits to the G.W.R. Works at Oxley and the Goodyear Factory. Club roll: 32. *Secretary:* R. F. Mann, 25, Queen Street, Wolverhampton.

Kendal M.C.—Models constructed at meetings are being reserved for exhibition in the Spring. They include excellent models of a Battle Cruiser and Stephenson's "*Rocket*," in addition to a series of the "Simplicity" type. A satisfactory layout for the club's Hornby Railway has been devised and track working is now carried out regularly. Club roll: 11. *Secretary:* A. Brown, 29, Crescent Green, Kendal.

St. Columba's (Sunderland) M.C.—For their Annual Outing members crossed the Tyne by steam ferry and visited Whitley Bay and St. Mary's Lighthouse. By kind invitation of the Leader, Mr. S. Willis, B.Sc., a Picnic was spent at his home at Penshaw, where members enjoyed games in the garden. An excellent programme of Model-building and other activities is now being followed. Club roll: 20. *Secretary:* D. Ferguson, 3, Edward Burdis Street, Southwick.

King Edward VI Grammar School (Birmingham) M.C.—Membership has increased in a satisfactory manner. Meetings are well attended and excellent reports appear in the School Magazine. Lectures and demonstrations are given by members. One of these was on the "*Two-Stroke Motor Engine*," and in this the lecturer assembled a small engine from a box of parts. A special study is now being made of clocks. Mr. W. B. Chivers, Leader of the club, has dealt with their history and their mechanism is being illustrated by means of Meccano models built by senior members. Model-building activities also are being actively pursued. Club roll: 75. *Secretary:* A. D. Horton, The School, Aston, Birmingham.

Plymouth M.C.—Each meeting is devoted to a special type of model, and at recent evenings Meccano Traction Engines, Motor Lorries, Aeroplanes, Tramcars, Ships and Cranes have been constructed. New members are required and Meccano boys wishing to join should apply to the secretary for full details. Club roll: 6. *Secretary:* G. J. Symons, 6, Holland Road, Peverell, Plymouth.

Barton-on-Humber M.C.—Excellent progress is being made and a varied programme of Model-building Evenings, Hornby Train Nights and Play-reading and Lectures has been arranged. "Contractors' Nights" calling for originality in construction are favourites with members. The club is fortunate in having the support of Mr. H. Stanley, the local Meccano dealer, who exhibits models in his shop window. Those built by members and shown in this manner have included an excellent Motor Cycle and Sidecar. Club roll: 13. *Secretary:* H. Wood, 37, Castle Dykes West, Barton-on-Humber.

Middlesbrough M.C.—At the first meeting of the session discussions concerning the programme that had commenced during Summer were satisfactorily concluded. The attractive meetings already held have included a Model-building Night, when a Simplicity Contest attracted among other models several Aeroplanes and a Dirt Track Motor Cycle; Table Tennis Evenings; and Balloon Nights when exciting games of hand-ball were played with a balloon. Club roll: 55. *Secretary:* D. Allick, 20, Wellesley Road, Middlesbrough.

A cheery group of officials and members of the Harwich M.C., a large and enterprising organisation that was affiliated in January 1925. Its membership is now 75, and model-building, lead modelling, mat-making and printing, and other activities are carried on under the guidance of a large number of enthusiastic Leaders and Assistant Leaders.

Hucknall Toc H M.C.—This club has now been affiliated to the Guild. The club has full use of the Toc H rooms, and meetings are held weekly. Members have been divided into four sections on a competitive basis, and model-building activities have begun well, an excellent model of a Travelling Gantry Crane having been constructed. Club roll: 22. *Secretary:* K. W. Thorpe, Kenilworth, Sandy Lane, Hucknall, Notts.

AUSTRALIA

Sandgate (Queensland) M.C.—Recent Model-building Contests have been won by members exhibiting models of a Locomotive and a Motor Truck and Trailer. A Lecture on "*Railways of the World*" by Mr. A. J. Wilkins, Leader of the club, was greatly enjoyed. A visit has been paid to the General Post Office at Brisbane, and very successful "Simplicity" Model-building Contests have been held. Good progress is being made and further interesting meetings have been arranged. Club roll: 9. *Secretary:* J. R. Sheridan, Sandgate Street, Deagon, Sandgate.

GERMANY

Berlin M.C.—The club has now secured affiliation to the Guild and is making excellent progress. Members have already built a large number of simple models, and are now working at more ambitious schemes. For instance, three members are constructing an Electric Locomotive. A Blindfold Model-building Contest, as suggested in the "Secretary's Notes" in the September "*M.M.*," has been remarkably successful and has aroused great interest. A further interesting item in the programme was a talk on "*The Invention of the Steam Engine*," given by Mr. R. Herrmann, Leader of the club. Club roll: 17. *Secretary:* L. Salbreiter, Berlin, Nassauischestr, 25.

INDIA

Kognolkar (Nowgong) M.C.—In a novel competition introduced in this club members submitted stories written by themselves, the prizes being awarded to the most original. A Library has been started and arrangements are being made to issue a Club Magazine. A special club badge to be worn by members has been designed. Club roll: 7. *Secretary:* R. M. Kognolkar, Nowgong, C.I.

NEW ZEALAND

Dunedin Hobbies M.C.—Lectures have been given on "*Lighthouses*," "*Early Balloon Ascents*," and "*The Modern Torpedo*," and an interested visitor has given a talk on "*Modern Lubricating Oils*." The Aviation Section is making steady progress. Excellent scale models of well-known types of aircraft have been constructed and flying models are now claiming attention. Mr. Lewis of Models Ltd., the New Zealand agents of Meccano Ltd., recently visited the club, and his suggestions in regard to the programme were greatly appreciated. A Hornby Railway section has been formed, and it is hoped that incorporation with the Hornby Railway Company will be secured. A Recruiting Campaign is being carried on and the secretary would be pleased to hear from boys who wish to join the club. Club roll: 25. *Secretary:* R. W. Millis, 28, Clifford Street, Dalmore.

Kaiapoi Methodist M.C.—To the regret of members, Mr K. Winterbourn has been obliged to resign the Leadership. A pipe was presented to him as a token of appreciation of his excellent work for the club. The new Leader is Mr. P. Wells, and Rev. O. Burnet has been re-lected President. Model-building activities continue, members having constructed a Meccano Loom, which is to be exhibited in a local shop window. Club roll: 11. *Secretary:* L. Allison, North Road, Kaiapoi, Canterbury.

Sumner (Christchurch) M.C.—Interesting models recently constructed have included a Combination Lock Safe, specially designed by Mr. B. W. Collins, Leader of the club, in which club funds are to be kept. A series of meetings are being held at the homes of members. At these papers are read by members and competitions are arranged; afterwards Games are organised and Gramophone records played. The meetings add greatly to the social attractions of the club. In conjunction with Christchurch M.C., members visited Linwood Locomotive Depot to inspect the sheds and machine shops. The club's second birthday was celebrated by a "Feast Night." Club roll: 22. *Secretary:* I. C. Booth, 41, Head Street, Sumner, Christchurch.

Wellington M.C.—The club was visited by Mr. Lewis, of Models Ltd., during his tour of New Zealand. The interesting chat given by Mr. Lewis included an explanation of the working of the extensive Hornby Train Layout recently exhibited at the Auckland Show. Arrangements have been made to exchange club magazines with the Dunedin Hobbies M.C. and to co-operate with that club in organising programmes. In order to encourage members to support the "*Meccanitian*," the club magazine, special prizes are awarded each month for the best contribution. Club roll: 17. *Secretary:* J. E. Barnsley, Jnr., Newport Terrace, Seatoun Heights, Wellington.

SOUTH AFRICA

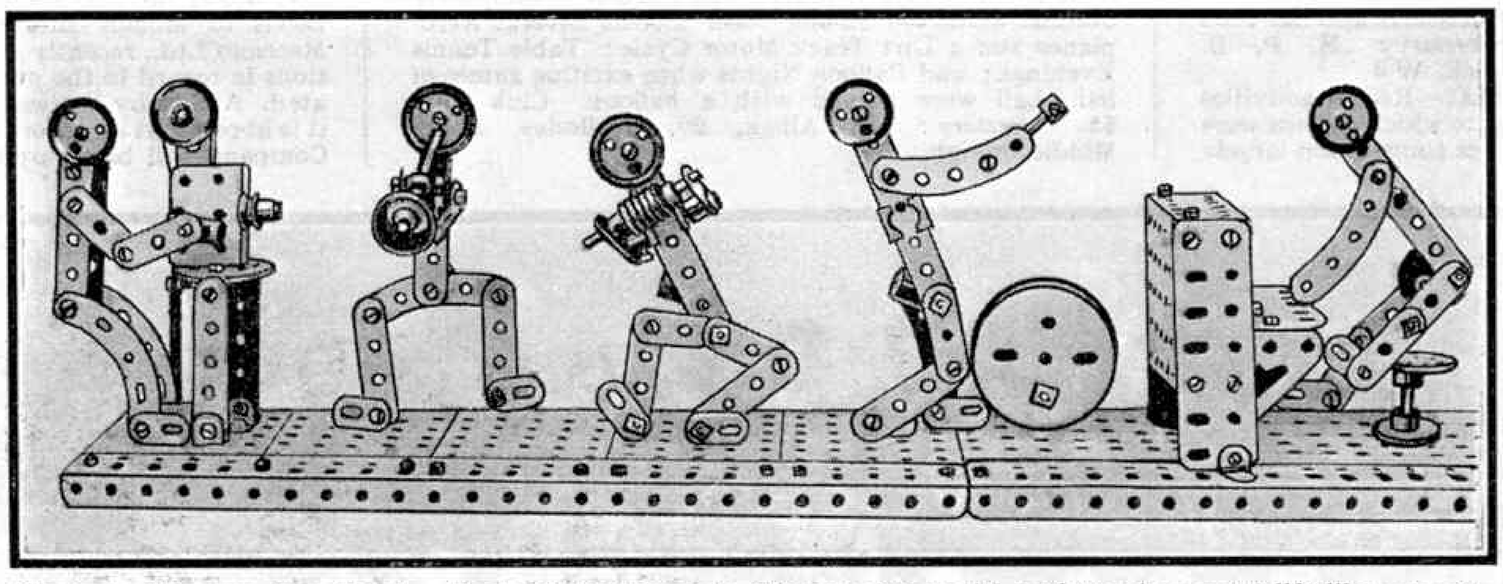
Turffontein Intermediate School M.C.—Many interesting meetings have been held. These were devoted to Model-building, which is the chief activity of the club; Talks on "*Duikers and Stembucks*" and other attractive subjects; and social functions, at one of which prizes were presented by Mr. E. J. Butler, President of the club. Football and Table Tennis are the chief recreations of members. A joint Sports meeting with the Malvern M.C. was very successful and the two clubs regularly exchange visits. Club roll: 44. *Secretary:* J. J. Pienaar, P.O. Box 1011, Johannesburg.

New Meccano Toys

Amusing Models for the Christmas Festivities

IN this article we describe the construction of some novel Meccano toys that will provide many hours of enjoyment for model-builders and their friends. Each of the models is simple to build from the instructions given.

The first model to be dealt with is entitled "Filming a Meccano Jazz Band," and was designed by C. T. Glover, of London. The band consists of a trumpeter, concertina player, drummer and pianist. The trumpeter, judging by the extended condition of his cheeks, is interested solely in storing up an adequate supply of wind! The concertina player, however, is energy personified, for when the model is set in motion he throws his instrument about with wild abandon, in the true manner of his species! The drummer, meanwhile, sways gracefully forward and bangs on his drum, the pianist completing the quartet by striking the keys in an ecstacy of enthusiasm. The camera man is seen at the left of the stage turning the handle of his camera.



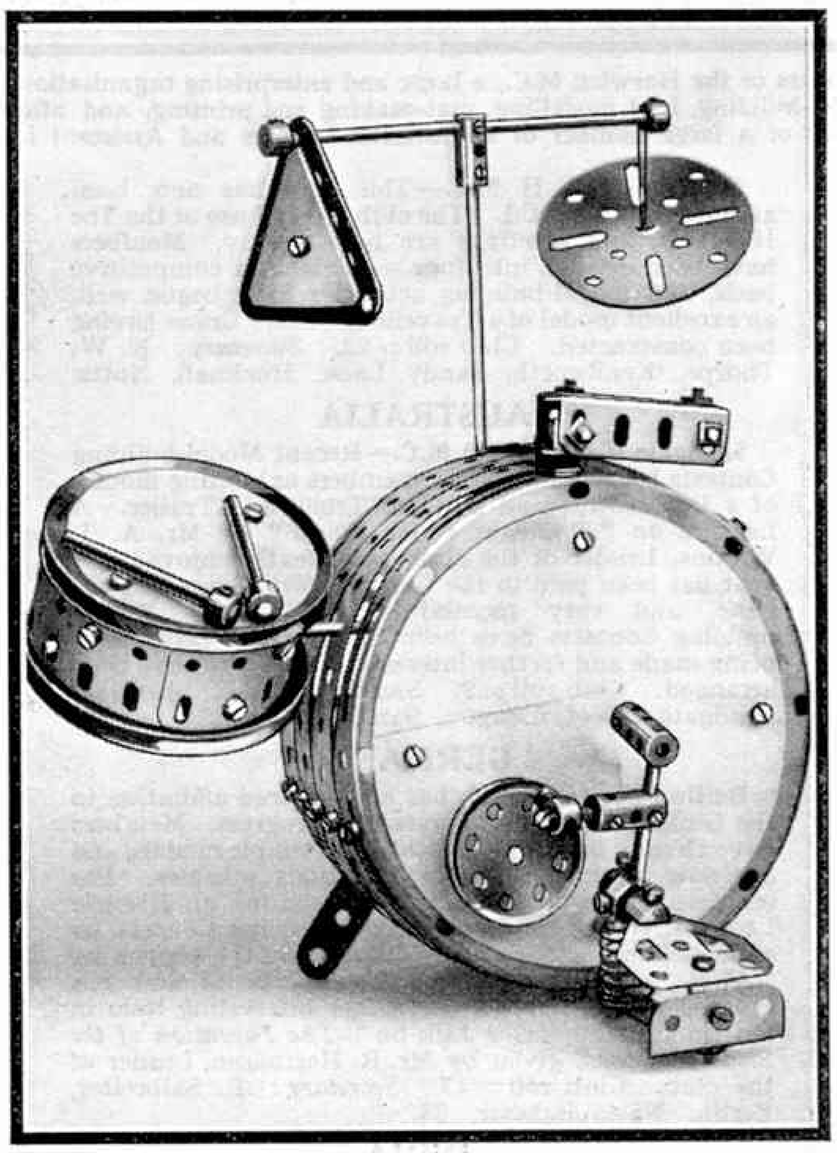
Filming a Meccano Jazz Band. Each of the figures in this amusing model performs in a most life-like manner. The model is easy to build, and may be driven by hand, or by any of the Meccano power units.

The figures are mounted on the stage in front of a paper or cardboard "backcloth," which hides the operating mechanism of the model. If desired the backcloth may be painted to represent scenery.

The camera man's legs are formed from Curved Strips, and his body consists of two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips surmounted by a 1″ Loose Pulley for a head. The camera consists of a Channel Bearing, with a $\frac{1}{2}''$ fast Pulley for a lens and a 1″ Pulley on a Strip for the film spool, the whole being mounted on a tripod composed of a Bush Wheel and three $2\frac{1}{2}''$ Strips.

The mechanism controlling the movements of the figure is constructed as follows. The crank handle of the camera is mounted on a Rod that passes through the backcloth, and is connected by Bevel Gearing to a Rod that runs the length of the model behind the backcloth. This Rod may be driven either by an Electric Motor or a Clockwork Motor.

The construction of the trumpeter is clearly shown in the illustration, but it should be mentioned that the arms are $2\frac{1}{2}''$ small radius Curved Strips attached to a Double Bracket bolted to the body. The trumpet is a short Rod with a $\frac{3}{4}''$ Flanged Wheel secured to its end, and the ends of the Curved Strips forming the arms are attached to the Rod by passing bolts through the end holes of the Strips and inserting them in a Collar. The body of the trumpeter is rocked backward and forward by means of an Eccentric mounted on the main operating shaft behind the backcloth. The Eccentric is connected to the body of the trumpeter by a Strip of suitable length.



A realistic jazz drum outfit constructed from Meccano parts.

The arms of the concertina player consist of Cranks in the end holes of which a Rod is free to slide. The Rod carries a Worm representing the concertina. A Coupling is attached pivotally to the bottom extremity of the body, and is fixed to the end of a Rod that passes through the backcloth and is geared with Bevels to the operating shaft, in a manner similar to that adopted with the camera man.

The drummer is worked in the same manner as the concertina player, and his instrument is represented by a Boiler End capped by a Wheel Flange.

The front and back of the piano consist of $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates, and the sides and top are Flat Girders. The keyboard also is represented by a Flat Girder. The bottom extremity of the pianist's body is attached pivotally to the plain hole of a $\frac{3}{8}''$ throw Eccentric, which is mounted on a Rod that is driven from the operating shaft. A $1\frac{1}{2}''$ Strip bolted to the Eccentric strap completes one leg and the other leg is made up from two $1\frac{1}{2}''$ Strips bolted together and fixed to the body by the bolt attaching the latter to the Eccentric.

The model may be driven either by hand or mechanical power. If the latter method is chosen, the interest of the model will be greatly enhanced by the addition of a "penny in the slot" mechanism. The mechanism should be arranged so that on the insertion of a coin the figures commence to work, and continue for a short period before again coming to rest.

We come now to a model known as the "Joy Wheel Dancer." This little contrivance is the work of James Wilson of Aberdeen, and is set in motion by turning the Crank Handle with which it is fitted. Rotation of the Crank drives the Hub Disc, the movement of which in turn causes the "dancer" to perform highly amusing dance steps.

The figure of the dancer is supported on an 8″ Rod that is vertically journalled in the centre holes of two $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips bolted to the underside of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates forming the base. The Rod does not revolve, and is secured in the boss of a Crank bolted to the upper $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip in which the Rod is journalled. Held by the same bolts as the Crank is a $1\frac{1}{2}''$ Angle Girder, which is secured on the underside of the upper $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The $1\frac{1}{2}''$ Angle Girder forms a bearing for one end of a Crank Handle and a $2\frac{1}{2}''$ Rod, the other end of the Rod being journalled in the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate of the base framework. Two Collars, placed one against the $1\frac{1}{2}''$ Angle Girder and one on the inside of the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, keep the Crank Handle in place.

A 57-teeth Gear on the Crank Handle meshes with a $\frac{1}{2}''$ Pinion on the $2\frac{1}{2}''$ Rod, on which is a further 57-teeth Gear meshing with a $1\frac{1}{2}''$ Contrate Wheel. The Contrate Wheel is lock-nutted on the ends of two $\frac{3}{4}''$ Bolts passed through the Hub Disc in positions diametrically opposite. The Hub Disc thus revolves freely on its Rod.

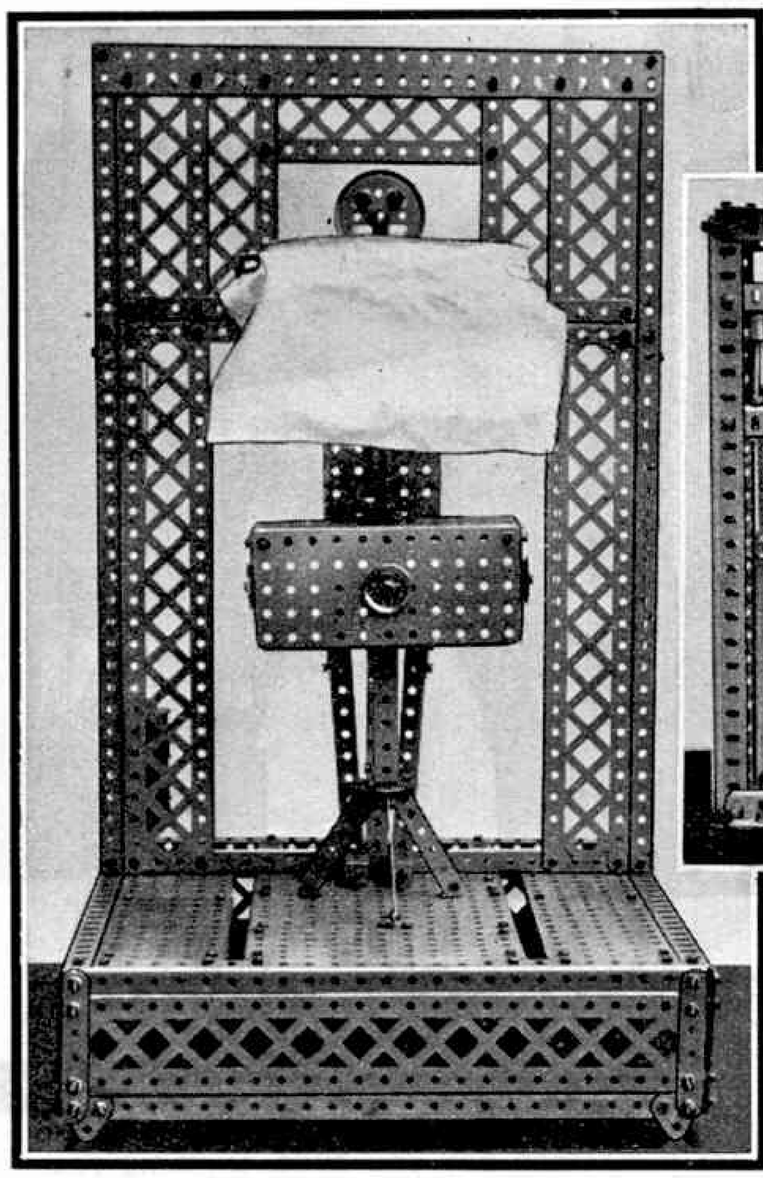
The dancer is pivoted on a $2\frac{1}{2}''$ Rod journalled in its sides as shown in the illustration, the Rod being held in place by Collars.

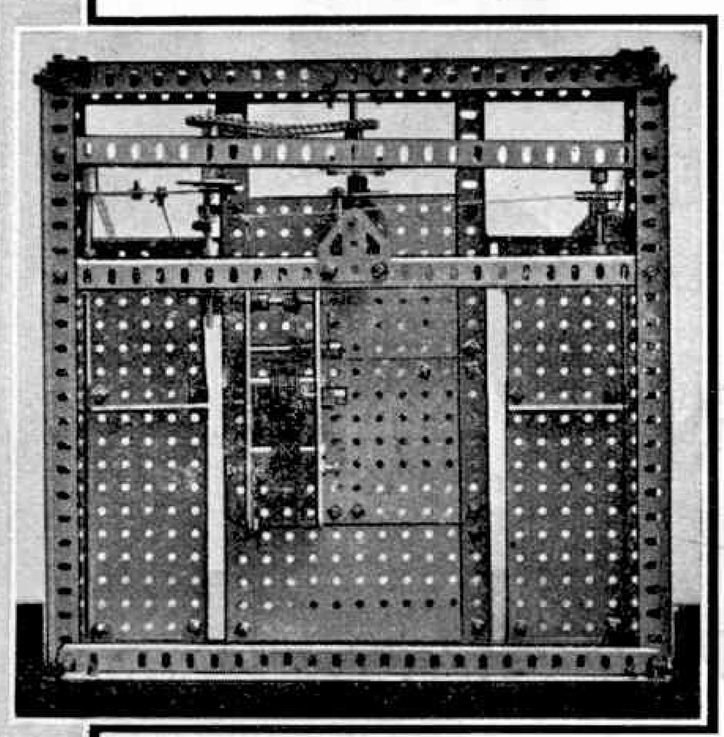
The outer end of the $2\frac{1}{2}''$ Rod is secured in a Coupling fixed on the top of the vertical 8″ Rod. The feet, Flat Brackets, must be adjusted so that they just clear the Hub Disc. To the Hub Disc are bolted 2″ Strips in positions diametrically opposite, and spaced from the Disc by two Washers. The Strips form "trips" that engage the toes of the dancer.

The head of the figure is formed by a 1″ loose Pulley bolted to a $1'' \times \frac{1}{2}''$ Angle Bracket secured in the centre hole of a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The arms are pivoted at the shoulder only, on bolts passing through the $3\frac{1}{2}''$ Strips and $1\frac{1}{2}''$ Strips, and lock-nutted. The legs are pivoted at the hips on lock-nutted Bolts. The knees also are jointed by lock-nutted Bolts.

When the Crank Handle is turned the Hub Disc is rotated, but the dancer remains stationary. As the Disc revolves, the 2″ Strips forming the trips engage the dancer's toes, and in so doing cause the legs to jerk backward and forward as though the figure is actually dancing!

James Wilson is also the originator of the Meccano Conjurer illustrated here. The model offers no greater constructional difficulties than the Joy Wheel Dancer, and when completed forms an excellent means of entertaining one's friends.





(Left) The Meccano conjurer performing a mystifying vanishing trick. (Above) Underneath view of the base of the model, showing the electric motor and mechanism.

When the model is set in motion the conjurer goes through the entire routine of performing a mystifying trick, in which an imitation candle and candlestick (formed from a $1\frac{1}{2}''$ Rod secured in a fast Pulley) is made to disappear and reappear in a most magical manner! This interesting performance is repeated just so long as the mechanism is operated by means of the 6-volt Meccano Motor employed for the purpose.

The conjurer holds a cloth stretched between his hands, and when the model is set in motion the cloth is gradually lowered in front of the table until the candlestick is completely hidden from view. Simultaneously with the lowering of the cloth the conjurer nods his head as though to focus the attention of the audience on what he is about to do. As the motion of the model continues, the cloth is slowly raised again and uncovers the table, which is now seen to be quite bare, the candlestick and candle having vanished! If the motion of the model is further continued, the complete cycle of operations is repeated.

The framework of the model does not need description, but it should be noted that the conjurer's legs are not attached to his body (a Flanged Plate) and that a small space is left between the top of the table and the bottom of the Flanged Plate. The purpose of this will be seen later.

The mechanism of the model is concealed in the base. The Motor armature shaft carries a $\frac{1}{2}''$ Pinion that engages a 57-teeth Gear Wheel held on a short Rod journalled in the Motor sideplates, and carrying also a second $\frac{1}{2}''$ Pinion driving a second 57-teeth Gear on a Rod that carries also a Worm. The Worm drives a 50-teeth Gear secured on a 1″ stroke Crankshaft.

Attached to the crank pin of the Crankshaft is a piece of Cord, which passes over a Pulley on a Rod journalled in the base of the model, and is then arranged to work the conjurer's arms in the following manner. A second piece of cord carries a counterweight composed of eight Flanged Wheels, and is guided over a $\frac{1}{2}''$ loose Pulley attached to an $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket that is bolted to a $12\frac{1}{2}''$ Angle Girder, to which the body of the conjurer (a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate) is attached by two $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. The $12\frac{1}{2}''$ Angle Girder is bolted across the Braced Girder framing forming the back of the model. The cord then goes under a further $\frac{1}{2}''$ loose Pulley held on a $\frac{1}{2}''$ Bolt that is fixed in a suitable position. Next the cord travels over a 1″ fast Pulley on a $3\frac{1}{2}''$ Rod, journalled in the top holes of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate representing the conjurer's body, and is finally attached to a $3\frac{1}{2}''$ Strip pivoted on the $3\frac{1}{2}''$ Rod. This Strip forms one of the conjurer's arms.

The free end of the Cord already attached to the Crankshaft in the base of the model is now to be attached to the counterweighted cord, attachment being made immediately behind the figure of the conjurer, near the point where the counterweighted cord is tied to the $3\frac{1}{2}''$ Strip. The other arm also is formed by a $3\frac{1}{2}''$ Strip, and the forearms are made by bolting a $2\frac{1}{2}''$ Strip to each of the $3\frac{1}{2}''$ Strips; the joint must be quite rigid.

The cloth is stretched between the conjurer's hands by means of a $5\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, the cloth being nipped between $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets forming the hands, and the ends of the Double Angle Strip. The arms should be adjusted so that the cloth drops naturally over the front of the table.

As already mentioned, a space is left between the conjurer's body and the top of the table, and the purpose of this is to allow a Crank, secured on an $11\frac{1}{2}''$ Rod at the back of the conjurer, to sweep across the top of the table. The Crank carries a 1″ Reversed Angle Bracket, to which is bolted a Flat Bracket that in turn is secured by means of a Collar to the lower end of the Rod that represents the candle. The $11\frac{1}{2}''$ Rod is journalled in $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets placed in a convenient position at the back of the figure, and at its lower end carries a $\frac{3}{4}''$ Pinion, which engages the mechanism in the base as will be described later.

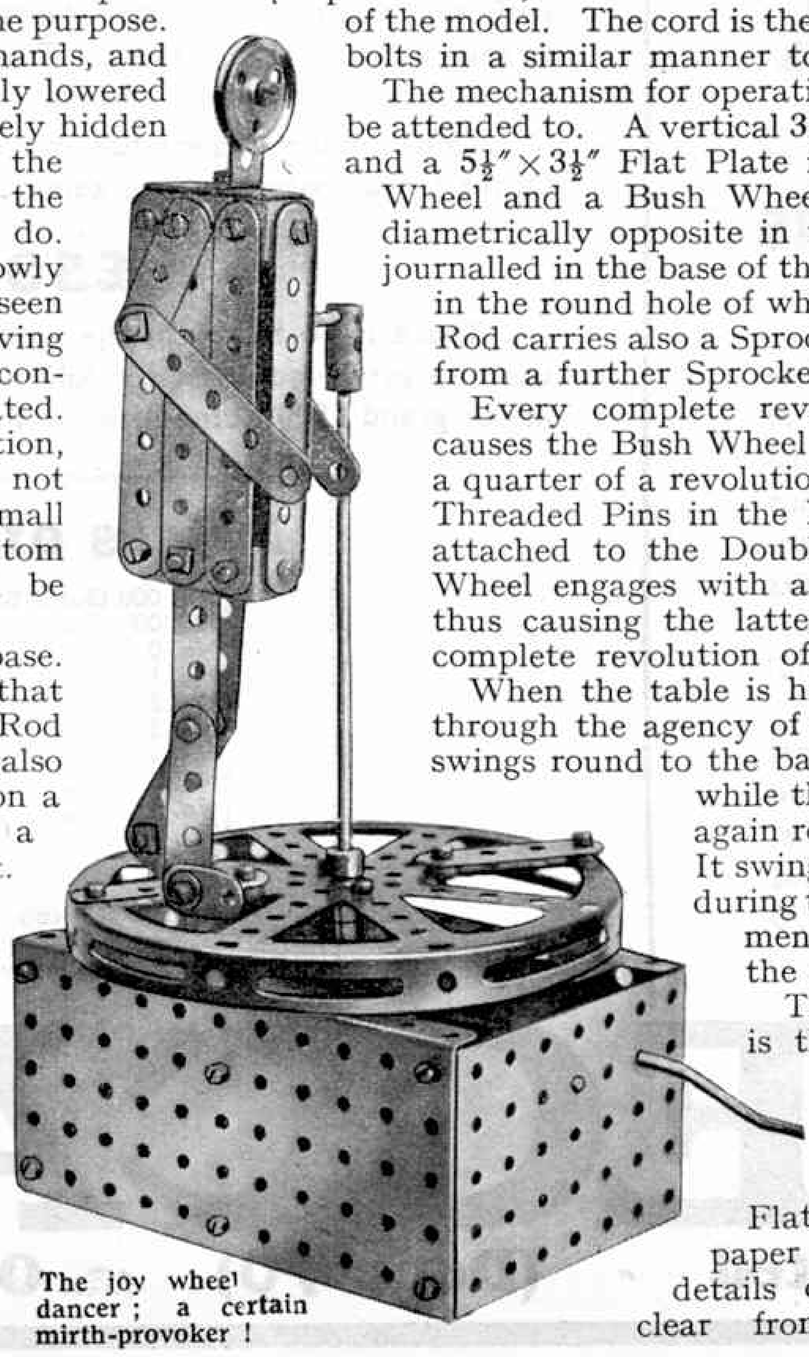
The conjurer's head (a fast Pulley) is pivoted on a $3\frac{1}{2}''$ Rod secured in a Collar bolted to the Flanged Plate that forms his body, and during the performance of the trick the head is made to nod by means of a piece of cord, one end of which is attached to the crankshaft in the base of the model. The cord is then passed over $\frac{1}{2}''$ loose Pulleys held on bolts in a similar manner to the cord that operates the arms.

The mechanism for operating the disappearing candle may now be attended to. A vertical $3\frac{1}{2}''$ Rod, journalled in a Flat Trunnion and a $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate in the base, carries a 50-teeth Gear Wheel and a Bush Wheel. Four Threaded Pins are bolted diametrically opposite in the Bush Wheel, and a second Rod journalled in the base of the model carries a Double Arm Crank, in the round hole of which a Threaded Pin is secured. This Rod carries also a Sprocket that is driven by Sprocket Chain from a further Sprocket on the Crankshaft.

Every complete revolution of the Double Arm Crank causes the Bush Wheel and 50-teeth Gear Wheel to revolve a quarter of a revolution, through engagement of one of the Threaded Pins in the Bush Wheel with the Threaded Pin attached to the Double Arm Crank. The 50-teeth Gear Wheel engages with a $\frac{3}{4}''$ Pinion on the $11\frac{1}{2}''$ Axle Rod, thus causing the latter to revolve a half turn for every complete revolution of the Double Arm Crank.

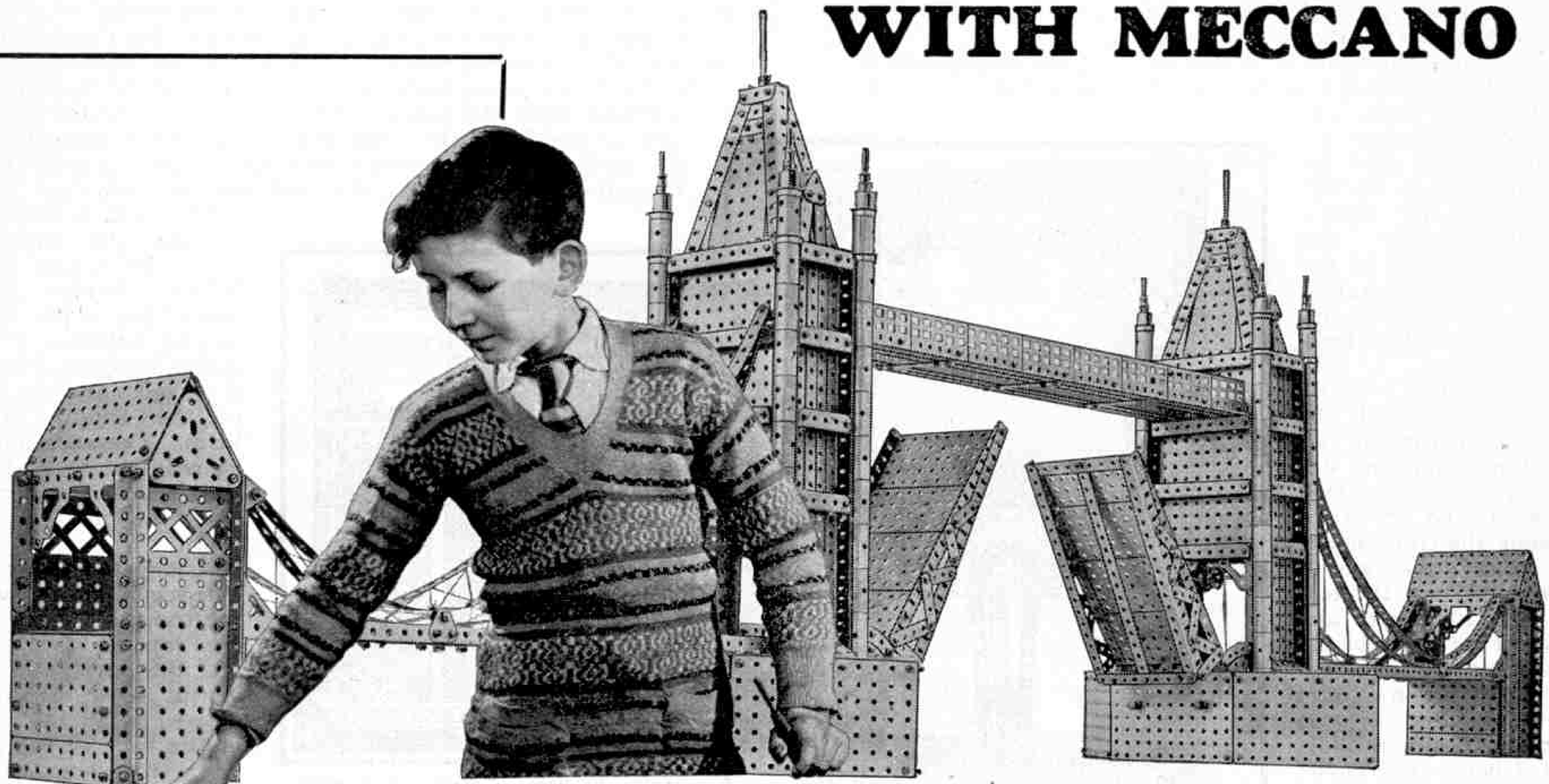
When the table is hidden by the cloth, the candlestick, through the agency of the Crank on the driven $11\frac{1}{2}''$ Rod, swings round to the back of the conjurer, where it remains while the cloth is raised; when the table is again revealed the candlestick has vanished. It swings back to its former place, however, during the next cycle of operations, the movement of the swinging Crank occurring while the cloth is in front of the table.

The remaining model to be dealt with is the ingenious jazz drummer's outfit shown on the opposite page. It was designed by A. Weldon of Peterborough. The big drum comprises two Hub Discs, joined by Flat Girders bent to shape, and stiff paper is used for the diaphragm. The details of the other items will be quite clear from a study of the illustration.



The joy wheel dancer; a certain mirth-provoker!

BOYS! BUILD ANYTHING YOU WANT WITH MECCANO



SEND FOR THIS FREE BOOK

Write to-day for this fine new book. It contains a number of thrilling articles, profusely illustrated, describing many famous engineering feats. In addition, the full range of Meccano Outfits is shown, and there are illustrations of many wonderful Meccano models.

We will send you a copy, post free, in return for the names and addresses of three of your chums. Write your own name and address clearly, and add No. 70 after it for reference.

A DIFFERENT MODEL EVERY DAY!

When you are a Meccano boy you build anything you want—with your Meccano Outfit. To-day, it may be a working model of a Travelling Crane ; to-morrow, a Motor Car chassis ; the day after, a Traction Engine. Day in and day out there is something different to build.

Meccano models are real engineering models in miniature, because they are built with real engineering parts—Nuts and Bolts, Girders, Plates, Gear Wheels, Pinions, Cranks and scores of others. These parts can be used over and over again to make any number of different models.

Think of the endless fun you can have with Meccano, and make sure you get an Outfit for Christmas. You cannot beat Meccano Engineering for fun !

£500 in Prizes!

There is no hobby in the world more thrilling than Meccano model-building, but the interest is increased ten-fold when you are building a model that may win a prize in our grand £500 Competition. Full particulars are given on page 988.

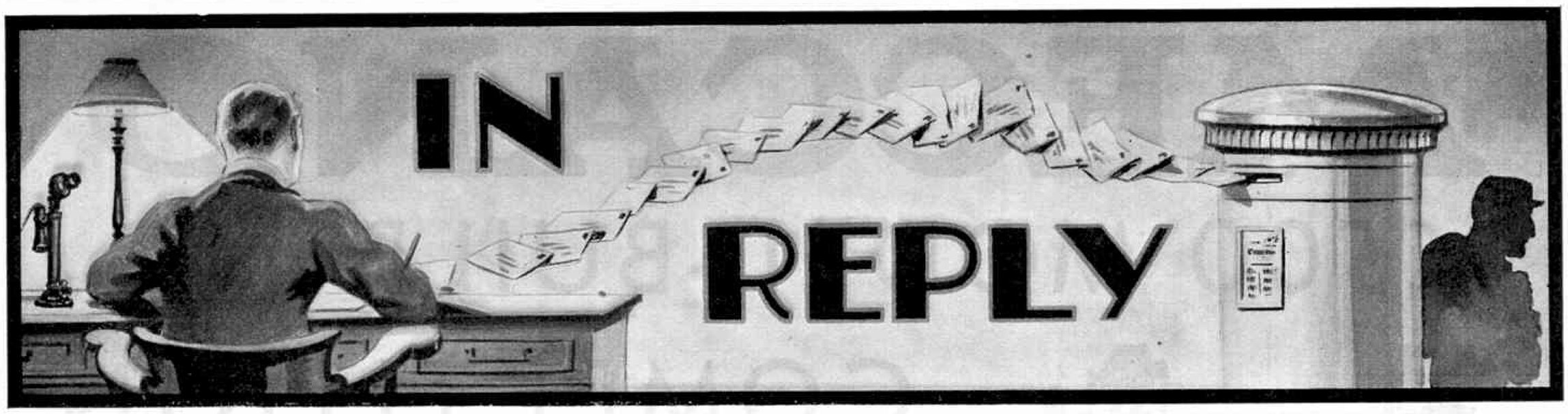
Prices of Meccano Outfits

No. 000	Outfit builds	162	models	Price	2/6
No. 00	,, ,,	189	,,	,,	3/6
No. 0	,, ,,	343	,,	,,	5/–
No. 1	,, ,,	573	,,	,,	10/–
No. 2	,, ,,	629	,,		16/–
No. 3	,, ,,	687	,,	,,	27/6
No. 4	,, ,,	753	,,	,,	52/6
*No. 5	,, ,,	798	,,	,,	70/–
†No. 5	,, ,,	798	,,	,,	100/–
*No. 6	,, ,,	844	,,	,,	125/–
†No. 6	,, ,,	844	,,	,,	155/–
†No. 7	,, ,,	889	,,	,,	450/–

*Carton †Enamelled Cabinet

MECCANO

Meccano Limited - (Dept. 70) - Old Swan - Liverpool



PROBLEMS AND IDEAS OF INTEREST TO ALL MODEL-BUILDERS

THE MECCANO AEROPLANE CONSTRUCTOR PARTS

All model-builders will be greatly interested in the Aeroplane Constructor Outfits, the most recent development of the Meccano System. The contents of the two Outfits that have been introduced enable a great variety of models of various types of aircraft to be constructed, including monoplanes, biplanes, seaplanes, flying boats and amphibian machines. The secret of this wide range lies in the application of Meccano principles to the design of the parts included in the Outfits. These may be obtained separately and will be found useful for incorporation in Meccano models.

The two Propellers, Aeroplane Constructor Parts Nos. P34 and P35, are excellent examples of parts that may be used for general purposes. They are fitted with standard Meccano bosses, and thus may be used in any Meccano model in which a small propeller is required. Other instances are the Radial Engines, Aeroplane Constructor Parts Nos. P43 and P46, which are solid die cast representations of real aero engines. They also may be used in Meccano models with excellent effect, and the employment of other parts included in the Aeroplane Constructor Outfits will add greatly to the realism of models of many types. A copy of the illustrated Meccano Aeroplane Constructor Parts list giving details of all the separate Aeroplane accessories may be obtained from any Meccano dealer or direct from Meccano Limited, Binns Road, Old Swan, Liverpool.

MECCANO SILENT GEARING

From time to time we have been asked by model-builders how silent gearing may be constructed in Meccano. For example, many readers are interested in the use of the Meccano Electric Motor as the driving force for a gramophone turntable. As the armature shaft of the Motor runs at approximately 3,000 r.p.m. a considerable reduction is necessary in order to obtain the required turntable speed of about 80 r.p.m. Although Meccano Gear Wheels and Pinions are very efficient units in power transmission, their use is inevitably accompanied by a certain amount of noise. This may be reduced by careful lubrication, but where a completely silent drive is required it is necessary to employ other types of gearing.

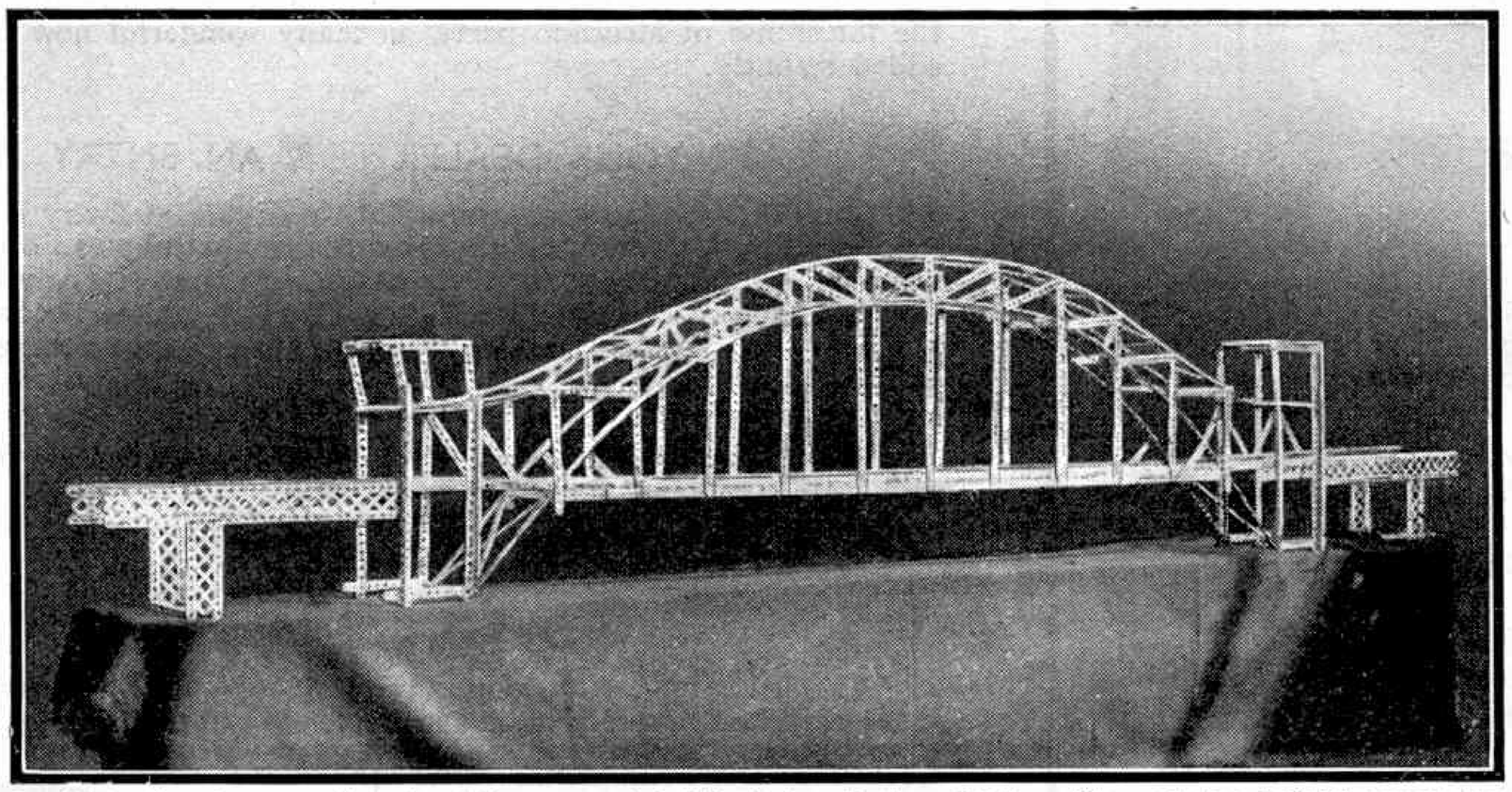
Speed reduction may be obtained by making use of several stages of pulley and cord drives but the tendency of this type of gearing to slip makes it unsatisfactory where considerable torque has to be transmitted. Endless belts composed of Meccano Spring Cord in place of the ordinary Meccano Cord give a better drive that is both quiet and positive.

Another form of silent drive may be constructed from Meccano Rubber Rings or Dunlop Tyres and Meccano Pinions and Wheels. For instance, a silent drive that will give a reduction of approximately 4 : 1 may be obtained by fitting to a 3″ Pulley a 3″ Rubber Ring, the edge of which presses against the flange of a ¾″ Flanged Wheel mounted on the armature shaft. The Meccano Dunlop Tyres also may be used in this manner, the " treads " of the Tyres providing a good grip. With a little experiment several interesting types of gearing giving a variety of reduction ratios may be devised.

IMPROVED PENDULUM CONNECTION

As its name indicates, the Pendulum Connection, part No. 172, is intended for use as a flexible joint between the pendulum and the pallet shaft of a Meccano clock, and is employed for this purpose in the Meccano Super Model No. 14, Grandfather Clock. It consists of a length of springy brass strip, and on its introduction it was immediately realised that it would also prove useful as a contact brush in Meccano electrical gear. As many readers will know, the part was employed in this manner in the Electric Engine described in the Suggestions Section of the "*M.M.*" for June, 1930, and in the Four-cylinder Electric Engine similarly dealt with in our issue for November, 1930. In these models it is necessary to mount the Connection so that it is insulated from the remainder of the model. It was clamped between two Washers secured by a Bolt to an Angle Bracket, therefore, and the Angle Bracket in turn was secured to the frame of the model by means of a Meccano 6-B.A. Bolt and Nut, and an Insulating Bush and Washer.

Model-builders will be interested to know that the Pendulum Connection has now been modified in order to make a much simpler method of fitting possible. A hole of 6 B.A. clearance to accommodate a Meccano 6 B.A. Bolt has been drilled in one end of the Connection. When the part is to be used as a contact brush insulated from the remainder of the model, a 6 B.A. Bolt is passed through the hole and an Insulating Bush is pushed on to the shank of the Bolt, which is passed through a perforation in the part to which the Bush is to be secured. A second Insulating Washer is then fitted, followed by a 6 B.A. Nut, and when the assembly is tightened up the Connection is clamped firmly in position. A Connection and 6 B.A. Bolt fixed in this manner are completely insulated from the remainder of the model, and a wire lead may be attached to the 6 B.A. Bolt in order to connect the brush in circuit. For this purpose, the Bolt should carry a Terminal (part No. 306).



Our illustration shows a well-designed Meccano model of the Sydney Harbour Bridge. The model is a faithful reproduction of the original, and is capable of supporting the combined weight of three people, thus affording striking proof of the capabilities of the Meccano system.

The best suggestion for a new Meccano part sent in during the month of October, was submitted by Jan Hers, Potchefstroom, S. Africa, and the prize of 10/- has therefore been awarded to him. The winning idea was for a coupling member for converting " plain bored " parts to the " threaded " type.

BIG END BEARINGS IN MECCANO

In Meccano models of steam and petrol engines, some form of bearing must be provided at the " big end " of the connecting rod, which is coupled to the crankshaft. In actual engineering this bearing consists of D-shaped pieces of metal, provided with perforated lugs, that are bolted together round the crank pin of the engine, the inner face of the bearing being lined with anti-friction metal.

There is no part in the Meccano system that is specially designed for use as a big end bearing, but there are a number of parts that perform this function very efficiently. In a model where a Strip is used as the connecting rod, two Cranks bolted back to back form an excellent big end bearing. The Cranks should be so placed that the holes in their bosses coincide with the end perforation in the Strip. If a Meccano Axle Rod is employed as a connecting rod, a Coupling may fulfil the function of a big end. The Coupling is secured to the end of the Axle Rod, and the crank pin of the engine passes through the end transverse bore of the Coupling. A bearing of this type may be improved by securing a Meccano Grease Cup in the end transverse tapped bore of the Coupling, in order to lubricate the Crank-pin.

When the Meccano Crankshaft is employed, a useful form of big end bearing may be built up as follows. The Axle forming the connecting rod is held in place in a Coupling by means of two setscrews, and a 1½″ Strip and a Washer are slipped on to the shank of each set-screw. The setscrews are driven home and a ½″ Bolt passed through the end transverse bore in the Coupling, and also through the corresponding perforations in the 1½″ Strips, secures these in position.

The free ends of the 1½″ Strip are placed on the cranked portion of the Meccano Crankshaft and maintained in a central position by means of a Spring Clip mounted between two washers. In assembling this big end unit, the 1½″ Strips should of course be placed on the Crankshaft before they are attached to the Coupling; otherwise it will be impossible to slip the Strips on to the " cranked " portion.

USING THE MECCANO BALL BEARING

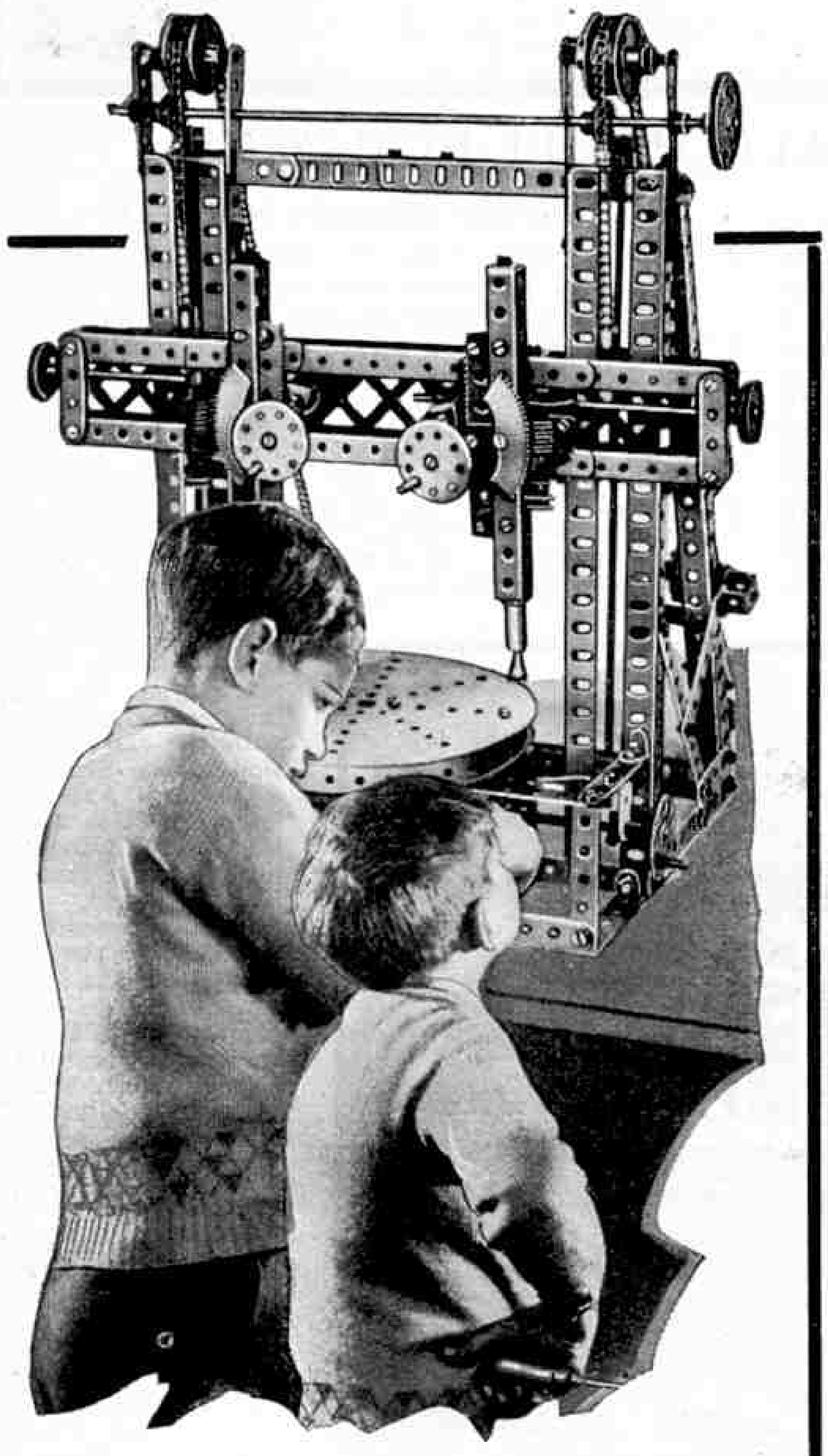
The Ball Bearing unit consists of a Ball Casing and two Ball Races, one of which has sprocket teeth cut in its rim so that it may be driven by means of Sprocket Chain. In small models the Chain drive is liable to take up too much room, and it is better to substitute a Meccano 3½″ Gear Wheel for the toothed Ball Race, and drive the 3½″ Gear by means of a ½″ Pinion.

LOCOMOTIVE CHIMNEY.—A Meccano Chimney Adaptor makes an excellent locomotive chimney. When a tall chimney is required, a Sleeve Piece can be slipped over the Chimney Adaptor and a ¾″ Flanged Wheel secured on top of the Sleeve Piece by means of a short Rod. (*Reply to W. Cox, Wellingborough*).

BUMPER.—Your design for a bumper is interesting, but it is possible to build such a large variety of excellent bumpers with standard Strips, Brackets, etc., that a special part is really unnecessary. We are not losing sight of your idea, however. (*Reply to E. Feasey, London, S.E.7*).

MECCANO

£500 MODEL-BUILDING COMPETITION



Every year thousands of new Meccano models are designed and built by Meccano boys. We wish to encourage these inventive boys, and with this object we have planned a new Model-building Contest that is to be the biggest we have ever organised. There will be a large number of Cash Prizes of a total value of over £300. In addition, Meccano Outfits and other Meccano products to the value of £200 will be awarded, making a grand total of £500.

In order to compete for these splendid prizes all that is necessary is to build an original model, and send us a photograph or sketch of it, together with any explanation that may be necessary in regard to the special points in its design and mechanism.

Before commencing to build their models, competitors should obtain the latest list of Meccano parts, as many wonderful new parts have been added recently.

ASK YOUR DEALER FOR AN ENTRY FORM

Each entry must be accompanied by an official Entry Form, obtainable free from any Meccano dealer. Overseas competitors can obtain their forms from the Meccano agent for their particular country. Any competitor who has difficulty in obtaining an Entry Form should write for one direct to Meccano Ltd., enclosing a 1½d. stamp to cover return postage. Full details of the Contest, together with a complete list of the prizes that are to be awarded, appear on the Entry Form.

Start work on your model to-day. You may be one of the fortunate competitors to win a place in the big Prize List!

Closing Date for All Sections: 31st March, 1932.

SECTIONS AND AGE LIMITS

To ensure that each competitor will have an equal chance, regardless of his age, the Contest is divided into five separate Sections as detailed below.

Section A—For competitors over 18 years of age on 31st March, 1932.

Section B—For competitors over 16 and under 18 on 31st March, 1932.

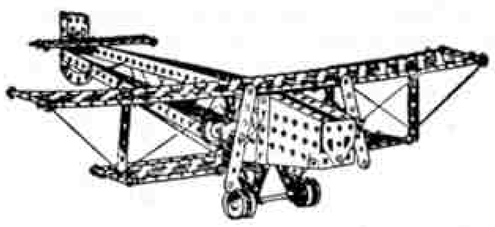
Section C—For competitors over 12 and under 16 on 31st March, 1932.

Section D—For competitors over 10 and under 12 on 31st March, 1932.

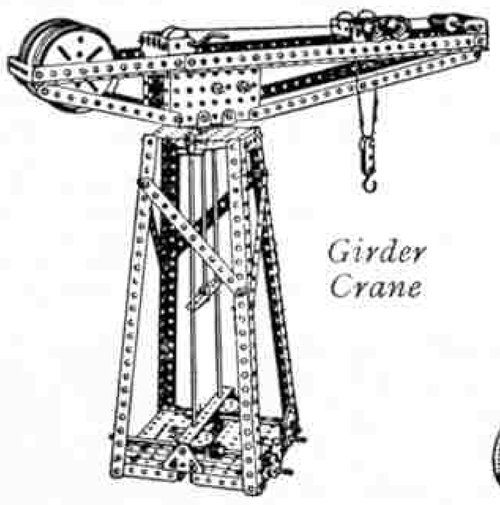
Section E—For competitors under 10 on 31st March, 1932.

MECCANO LIMITED,
OLD SWAN, LIVERPOOL.

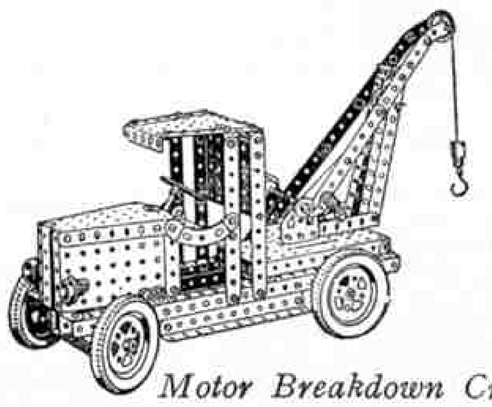
£500 IN PRIZES



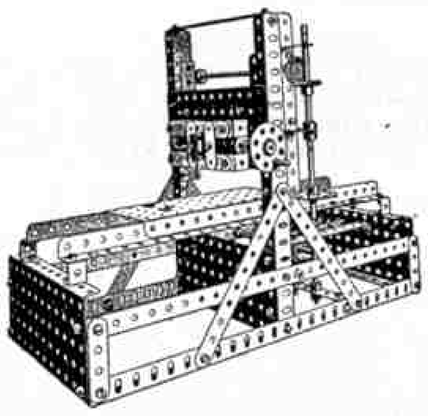
Aeroplane



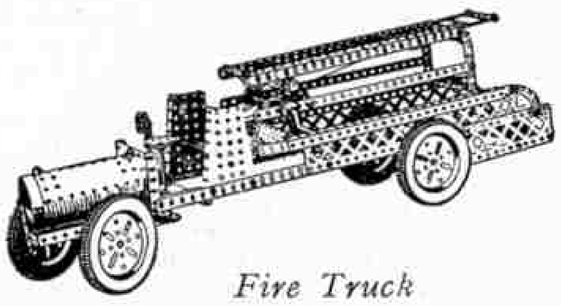
Girder Crane



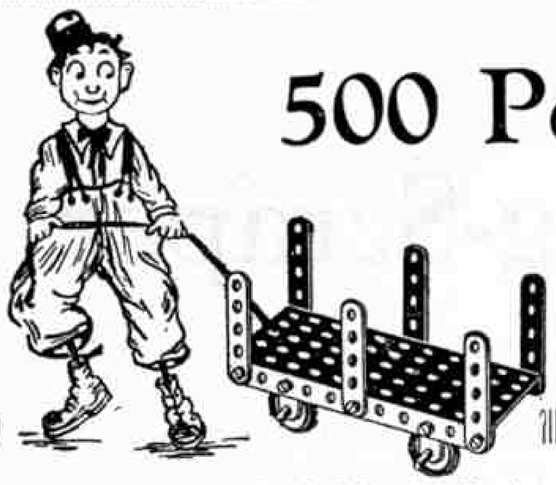
Motor Breakdown Crane



Planing Machine



Fire Truck



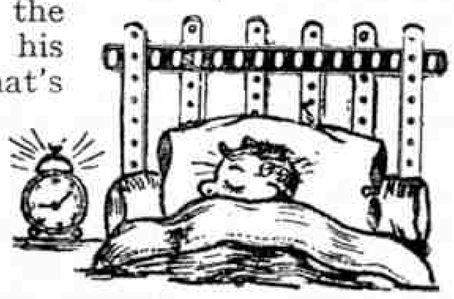
500 Pound Model-Building Contest

"How to Win a Big Prize"

By Pawl the "Office Boy"

HELLO everybody! Merrie Christmas to you awl. Although I've bean on the editorial staf of the "*M.M.*" for a long time, this is the first okkashun on wich I have had the pleshur of contributing to its pages, and having a chat with its 100,000 reeders awl over the world. This is how it awl came about.

The other day that August person, the Editor of the "*M.M.*," pressed the water-cooled push-button on his shining ebony desk, thus causing the ofice boy (that's me!) to thrust his face in at the dore of the Editorial sanktum.



". . . Me in my bed."

"Cum in," sed the Editor, grashusly pushing forward a chair, and I accepted his invitashun, bowing low in the customary curtius manner adopted by all members of the illustrius profeshun of ofice boys. I had a feeling of aw mixed with fear that the Boss had suddenly gon Eccentric (triple throw), for he usually says "Get out" in a very rude manner.

"Pawl," says the Editor, offering me a cigar, "Having noted yore skill as a Meccano model-bilder, I have come to the delusion that you are the ideel person to give a few useful hints and tips to competitors in the £500 Model-bilding Contest."

"Do I understand," says I, off-andedly flicking ciggar ash awl over the Ed.'s carpit, "that for the benefit of young model-bilders I am to pore forth tit-bits of intelligents regarding the bilding of Meccano models edible for, and likely to win prises in, this remarkable contest?"

"Exactly," says he, "I want you to tell every Meccano Boy about the biggest Meccano Contest that has yet been organized."

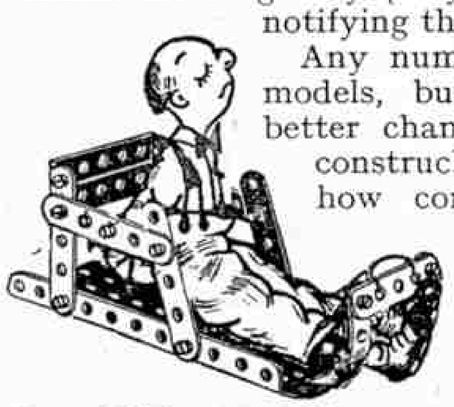
"I'll endeavour to do my best," I says, and then I Bolted. A second later my stentorian voice boomed with a Rubber Ring through the corridors of the Editorial edifice in Binns Road, demanding paper, pens, and ink. These being produced by the assistant ofice boy, I proceeded to Strip off my cote and to role up my Sleeve Pieces, and penned the following article. (The Boss says the spelling is simply awful, but I don't think he could spell acomodashun himself. Anyway, he is only a Double Armed Crank and the tips I am giving are jolly good wuns. But reed on, dear reeder, and judge for yoreself).

". . . Good, sturdy construkshun."

"Grand £500 Model-bilding Contest"

Every Meccano boy and girl, young or old, is hereby notified that by making good use of their Meccano Outfits between now and the 31st March, 1932, they have a splendid chance to bag a fine prise in a big Model-bilding Contest in wich Mr. Hornby is giving away £500 worth of prises, including £250 in cash. There is shure to be an overwelming number of entries, for all Meccanoites wil want to have a finger in this golden pie! That is all to the good, however, for the lucky prise-winners will feel doubly prowd of sucsess in the face of so much competishun.

All a competitor has to do is to think out sumthing new and original and then bild it neatly in Meccano. Then he has to rite a clear descripshun of the muddle—sorry, I mean model—and to get a fotograf or a drawing of it, and send it together with the descripshun and Entry Form to this office. That is all their is to do and having dun this competitors can forget all about the £500 Contest for a munth or too untill one foggy, wet, and dismal morning they (may) find letters on their breakfast tables notifying them that they have wun valuable prises!



". . . Think out sumthing new and original."

Any number of parts may be used in bilding models, but a simpul wel-bilt model stands a better chance of winning a prise than a badly-construckted scrappy-looking model, no matter how complikated the later may be. Good sturdy construkshun will wey heavily in favour of any model.

Models that actualy wurk and wich may be put to sum practical use wil attract the atention of the judges more than models that are not intended to work. For eggsample, a Meccano model glass kutter that wont kut glass is not likely to win a prise in this Contest. Neither is a motor car that will only run backwards!

Competitors should remember when describing or fotographing models that the judges have never seen the model and no nothing at awl about it, and they should describe or illustrate models so that awl the details may be fuly understood by the judges.

Rite on wun side of clean paper only. Wun entry in a recent contest looked like an announsement of a sale. It advertised farming mashinery, etc., by aukshun, and a free lunch at noon to those who atended the sale! The judges were just grabbing there hats and cotes from the Corner Bracket to go to the sale (and the lunch!) when they aksidentally saw from the other side of the announsement that it had a model sketched on it and was an entry for the competishun! Reeders, imagin there disappointment!

Don't forget to rite yore abode on the Entry Form. If you win a prise the postman won't be able to deliver it, if he only has your name or age to go by.

Sum competitors in Meccano Contests put funny names on there models. One in a resent contest was corled "a tournament of olden time," but to me it looked like a mixtur of a corkscrew and a steam shovel! Another fellow chose as his title the "old oaken bucket," wich was ridickerlus for a model made of "shining steel and brass"! The name given to a model is not everything, however, as the boy who called his "Hope" discovered when he did not win a prise!

Sum of the competitors would make good commedians. Wun competitor pointed out that he had maid his model "out of his head." Another sent a photograf of the underneath part of a motor car and entightled it "Worm's eye view"—the opposite, I suppose to a "bird's eye view."

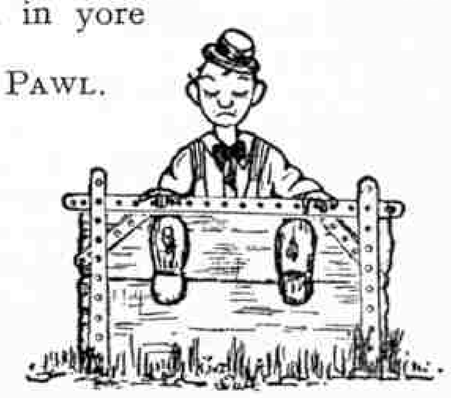
Many of the best prise-winning models, if they are sootable, will be inkluded in future Instruckshun Manuals, and other Meccano publickashuns that we have in mind, so that a competitor's model may be re-bilt again and again by boys in awl parts of the wurld. This in itself will be regarded by most Meccano boys as sufficient reward for the laber involved.

There is just wun moor thing I want to say to you awl befour I conklude. The job of picking the winners is always a very difikult wun, for thousands upon thousands of entries, with the acumpunying fotografs or drawings, have to be carefully skrutinized and the models' good points eggshamined. Meccano boys are found in every country of the wurld and of course there entries are ritten in many diferent langwages. Those in Duttch, Spannish, Eyetalien, French, etc., have first to be transmitted into English in our forin corespondance department befour the judges can deel with them. Now the wun last thing I want to say to you awl is to ask you to help the judges by filing up yore Entry Forms korrecktly, and by riting lejibly. If the judges cannot reed wot you have ritten, they get mad, and then the model stands a poor chance of bagging a prise.

Well, I've sed all I can about this £500 Model-bilding Contest, and in my o'Pinion I've earned my Grub-Screw for the week, so I will finish. Now don't forget, Meccano boys, awl over the world! Role up in yore thousands and send in yore models for this grand Contest.

Yours truly, PAWL.

P.S. Since riting the above I have seen the staf artist and perswaded him to make sum drawings to illustrate my article. He seems to have got hold of the rong idea, however, and has drorn a lot of ridickerlus picktures (including me in my bed) with wich opinion you will coincide.



". . . Models wich may be put to sum practical use."

A Novel Excavating Machine

The "Henderson" Cable Drag-Scraper

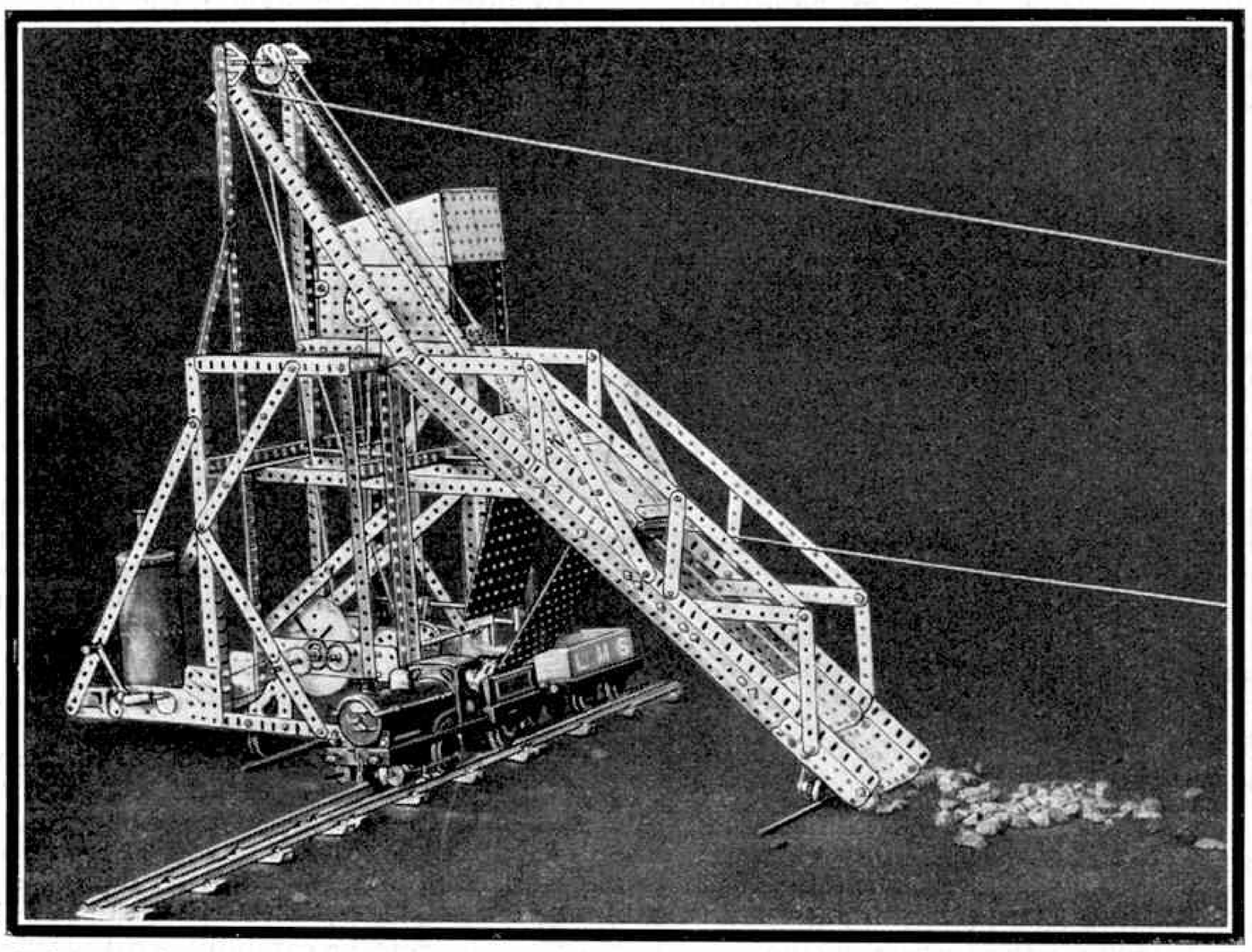
THE most remarkable feature of Meccano is the manner in which it enables actual machines and mechanisms of all kinds to be reproduced with every important detail of the original. There is thus no limit to its possibilities, and this is the reason for its ever-growing popularity with model-builders in all parts of the world.

One of the most interesting models that have come to our notice recently is a workable reproduction of a new type of excavating machine, known as a cable drag-scraper. The actual machine, which is illustrated on the next page, is a product of John M. Henderson & Co. Ltd., Aberdeen, and the model was built by D. L. Medd, also of Aberdeen.

After examining the model we came to the conclusion that other Meccano model-builders would be interested in it, and in this article we give details of its construction, together with a description of the real machine and the manner in which it works.

The cable drag-scraper is a simple and effective machine for certain kinds of excavation work, and also for storing and reclaiming coal and other bulk materials. The particular drag-scraper with which we are concerned in this article is really an experimental machine of a new type, and was designed specially for the purpose of carrying out a big excavation job in order to construct a new water outlet and sluice gate for draining the agricultural area surrounding King's Lynn, Norfolk. For this work the machine has proved entirely satisfactory.

The task is one of peculiar difficulty. The original channel was constructed many years ago, and in course of time has become gradually filled up with silt and enormous quantities of clayey mud. In order to clear the channel it was necessary to remove over 135,000 cu. yd. of this material and to convey it to a neighbouring dumping ground.



A close-up view of D. L. Medd's fine model, showing details of the mechanism and head pulleys. Note the bucket about to discharge its load down the chute to the wagons beneath.

The channel to be excavated was about 300 ft. across at the widest point, near the outlet sluice, and had to be excavated to a depth of 35 ft. below the bank, the depth of silt being from 20 to 30 ft. Owing to the fact that a large percentage of clay was present in the silt, pumping operations, which normally might have been employed on a job of this kind, could not be resorted to. Further, the fen-like nature of the ground banned the use of ordinary heavy dragline excavators for even when mats and caterpillar tracks were tried the ground would not sustain the weight of a dragline. It was therefore finally decided to employ a drag-scraper.

One of the principal advantages of this machine is that its use obviates the necessity of second handling of the excavated material, for the drag bucket excavates, conveys and deposits its load direct into waiting tipping wagons.

The machine consists of a bucket or scoop of special form without a bottom. This is hauled backward and forward by means of wire ropes. When travelling forward the bucket digs into the material and fills itself, after which it travels forward holding the same material till it is stopped. When the hauling machine is reversed, the bucket travels backward and leaves its load behind.

On one side of the ground to be excavated there is a head carriage, built of steel sections and plates and arranged to travel on a rail track of 22 ft. centres, laid parallel to the channel to be dug. An electrically-driven double drum winch is mounted on this carriage, and operates the in-haul and out-haul ropes, which drag the bucket backward and forward. The front of the head carriage is in the form of a steep ramp built of steel plates fitted with removable wearing strips. The bucket is fitted at its front with skids, and when the full bucket reaches the carriage it travels up the ramp and is allowed to come to rest on a horizontal grid, through which its contents are discharged into trucks passing underneath. When the bucket has discharged its contents it is travelled back for another load.

A small ballasted tail carriage runs on a double narrow gauge track on the other bank of the channel, and carries the return pulley for the out-haul rope. Hand travelling gear is fitted for moving the head carriage along the rails, while the tail carriage is moved along by a pinch bar. The in-haul and out-haul drums of the winch are driven by an electric motor of 50 b.h.p., which runs continuously. The drums are engaged by friction band clutches, and each is fitted with a brake applied automatically by a weight and so adjusted as to maintain at a suitable tension the rope that is being overhauled, thus preventing the ropes getting entangled or rubbing the material.

The machine is operated from an elevated cabin by one man who, in addition to the electric switch and motor starter, has only two clutch control levers, which he simply moves backward and forward one with each hand. The levers are interlocked in such a manner that it is impossible for both clutches to be engaged at the same time.

The capacity of the bucket is 1 cu. yd., and as the train wagons also hold 1 cu. yd. each bucket load fills a wagon. A train of wagons hauled by a petrol-driven locomotive is run under the head carriage and moved forward as each bucketful is discharged through the grill. A second narrow gauge track runs behind the head carriage, so that a regular circulation of wagons can be maintained between the drag-scraper and the tip. The in-haul speed is approximately 225 ft. per minute, and the out-haul speed 450 ft. per minute, the same power being expended in each direction.

Although the machine is of an unusual type, no trouble has been experienced with it, and apart from one or two minor adjustments to the bucket skids and the grill, no repairs have been carried out. The usefulness of the machine will be realised from the fact that it is capable of handling 2,500 to 3,000 cu. yd. of material per week of 60 hours, or an average of 42 to 50 cu. yd. per hour.

John M. Henderson & Co. Ltd. make other types of drag-scraper machines in some of which the tail-mast is arranged to travel radially on a circular track. Various forms of power plant are fitted according to the requirements of the work to be done.

The drag-scraper is a particularly good subject for the attention of Meccano model-builders, as will be apparent from the accompanying photographs of D. L. Medd's fine model. There is little

need to dwell in detail on the construction of the model, for its most important features are shown clearly in the illustrations.

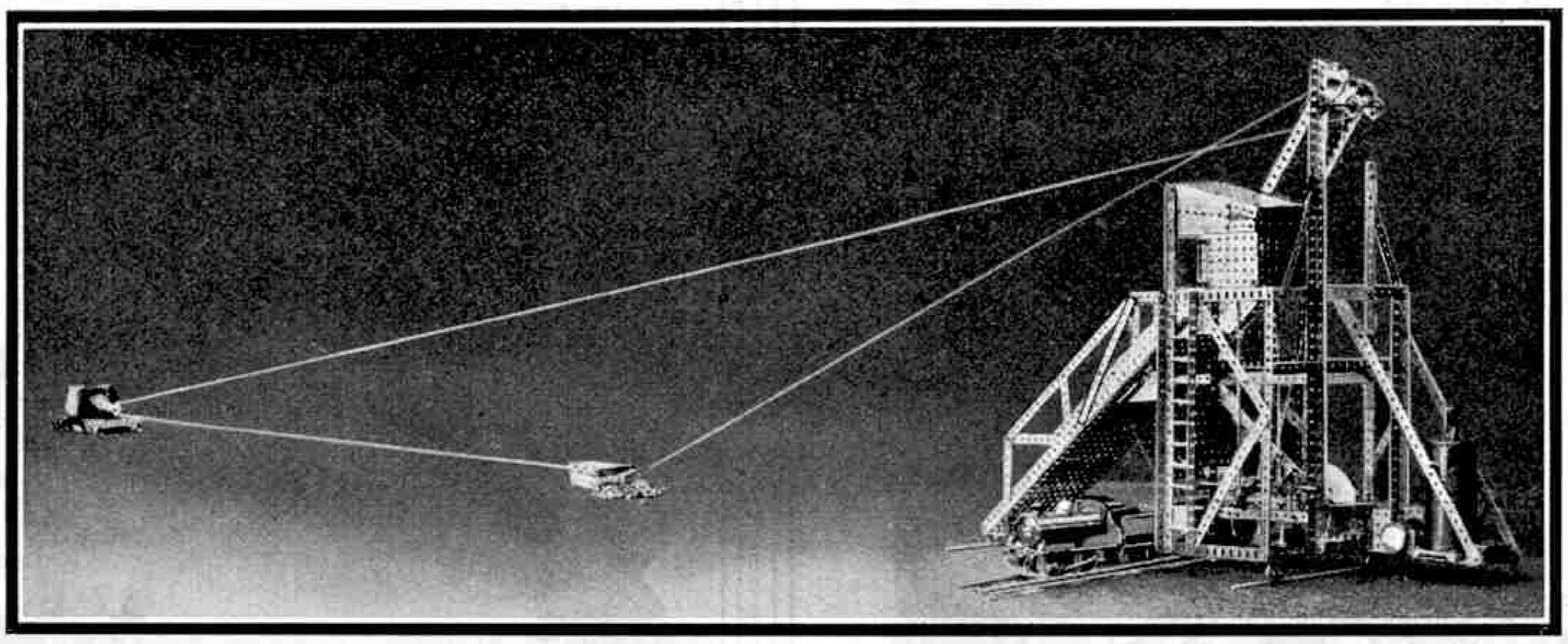
So far as the working of the model is concerned, it follows very closely the operation of the actual machine. It is driven by a Meccano Steam Engine, and will actually collect, convey and deliver material to the miniature wagons of a Hornby model railway system. It is fitted with reversing gear operated from the elevated operator's cabin, and is equipped also with brakes that are arranged so as to be applied automatically when the machine is reversed, in order to keep under suitable tension the rope that is being overhauled.

The bucket is pulled backward and forward by means of a double drum winch built up from Pulleys, and when the pulling-in drum is in gear the automatic brake is applied to the out-haul drum, so that it slips just sufficiently to allow the bucket to slide smoothly over the ground. When the bucket is being pulled outward the brake is applied automatically on the pulling-in drum.

The head carriage of the Henderson Cable Drag-Scraper, with the bucket about to ascend the ramp. The tall structure in the background is a ile-driver. For this photograph we are indebted to the courtesy of John M. Henderson & Co. Ltd.

It will be noticed from the illustration of the model that Strips and Plates form the major part of the construction which, considering the unusual working of the model, is remarkably simple. Details of the ramp, and the chute down which the excavated material descends to the waiting railway wagons, are clearly shown in the photographs.

Meccano model-builders who are also Hornby Train enthusiasts will find the model doubly interesting. Not only will they be able to apply their constructional abilities, but also when the model is completed they will be able to spend many happy hours in operating it in conjunction with their Hornby Train system. If a suitable layout is arranged many exciting and interesting manœuvres can be carried out in conveying "excavated" material to the dumping grounds.



A general view of the model, showing the method of attaching the in-haul and out-haul ropes to the tail carriage.

A NEW COMPETITION

When submitting details of his fine model Medd enclosed also a photograph and a leaflet describing the actual machine. The advantage of being able to compare a model with the machine or mechanism that it reproduces will be obvious to all readers; and it occurred to us that it would be a good idea to organise a model-building competition in which each entry must be accompanied by an illustration of the actual machine it represents.

We have therefore decided to award prizes of £2/2/-, £1/1/- and 10/6 respectively for the three best models sent in by competitors living in the British Isles, and a separate and similar set of prizes for the three best models sent in by competitors living overseas. To enter the contest it is only necessary to send a photograph of the model, together with an illustration of the actual machine it reproduces. A written description of the model must accompany each entry, and the sender's age, name and address must be written clearly on the back of each photograph.

Envelopes containing entries must be addressed "Actual Machines" Contest, Meccano Ltd., Binns Road, Old Swan, Liverpool. The closing date for the competition is 31st March, 1932.

Competitors should have no difficulty in obtaining illustrations of suitable subjects. A magazine cutting or a picture taken from a newspaper will usually answer the purpose, but of course it will be better still if, as in the case of the drag-scraper model, a competitor can obtain an illustration from the makers of the original machine.

In entering this contest competitors should note that whatever subject may be chosen for a model it must be a definite make of machine. For example, suitable subjects would be Collis or Lister trucks, Stothert & Pitt cranes, or a "Sentinel" steam wagon. A model of a truck, crane, wagon or any other machine that does not reproduce a definite original will not be eligible.

Readers will remember the remarkable model of the Garner six-wheeled motor chassis which was illustrated and described, together with the actual vehicle, in the issue of the "*M.M.*" for March, 1931. This is another example of the kind of models required in this competition.

A selection of the successful entries will be illustrated in future issues of the "*M.M.*"

It will greatly assist the competition judges if competitors will try to obtain photographs that show the details of their models as clearly as possible. This is not a difficult matter provided that certain simple precautions are taken. One of the most important points is the choice of a suitable background. For models constructed from coloured parts a plain sheet of white paper makes an admirable background and throws the main constructional details into sharp relief. After the background is arranged, the model should be studied carefully from various angles in order to find the viewpoint that shows the most important details clearly. In the case of complicated models two or even three photographs taken from different angles may be necessary to show all the essential features.

Another good plan is to suspend the model over a mirror, at such an angle that the underside of the model is reflected in the mirror. Then by careful choice of the angle at which the camera is placed, a really interesting and informative photograph will be obtained.

We hope competitors will pay particular attention to these points as in many recent competitions it has been impossible to illustrate the prize-winning models owing to the unsuitability of the photographs.

Two big events!

MECCANO WEEK!

27th November to 4th December

Meccano Week is here! Dealers everywhere are making special displays of Meccano in their windows and in their shops. Go and see them to-day! Enquire about this wonderful hobby for yourself, and think of all the thrilling models you could build if you had a Meccano Outfit—a different one every day if you wished.

The models you build with Meccano are real engineering models in miniature, because they are built with real engineering parts—Nuts and Bolts, Girders, Plates, Gear Wheels, Pinions, Cranks and scores of others. These parts can be used over and over again to make hundreds of different models.

Just imagine the endless fun you could have with Meccano, and make sure you get an Outfit this Christmas!

If you are already a model-builder, make up your mind to buy more parts so that you may build bigger and more thrilling models.

PRICES OF MECCANO OUTFITS

No. 000 Outfit	builds 162 models	Price	2/6
No. 00	,, ,, 189 ,,	,,	3/6
No. 0	,, ,, 343 ,,	,,	5/-
No. 1	,, ,, 573 ,,	,,	10/-
No. 2	,, ,, 629 ,,	,,	16/-
No. 3	,, ,, 687 ,,	,,	27/6
No. 4	,, ,, 753 ,,	,,	52/6
*No. 5	,, ,, 798 ,,	,,	70/-
†No. 5	,, ,, 798 ,,	,,	100/-
*No. 6	,, ,, 844 ,,	,,	125/-
†No. 6	,, ,, 844 ,,	,,	155/-
†No. 7	,, ,, 889 ,,	,,	450/-

*Carton †Enamelled Cabinet

See the Special Displays in all the Shops

HORNBY TRAIN WEEK!

4th December to 11th December

This is the best time of the year for every boy who is keen on model railways to see the Hornby Railway System. During this week the new Hornby Locomotives, Rolling Stock and Accessories will be shown in the shops. Make sure you see them! Take Dad with you and let him see them, too—he will be easily persuaded!

Hornby Locomotives are the longest-running locomotives in the world. In a recent test a Hornby No. 1 Locomotive, running light, covered the amazing distance of 182 ft. on one winding. This wonderful performance could only be accomplished by a Hornby.

If you do not yet possess a Hornby Railway now is the time to start when the world-famous Hornby Trains are better, stronger, and more powerful than ever. For every boy who is keen on model trains this must be a Hornby Christmas.

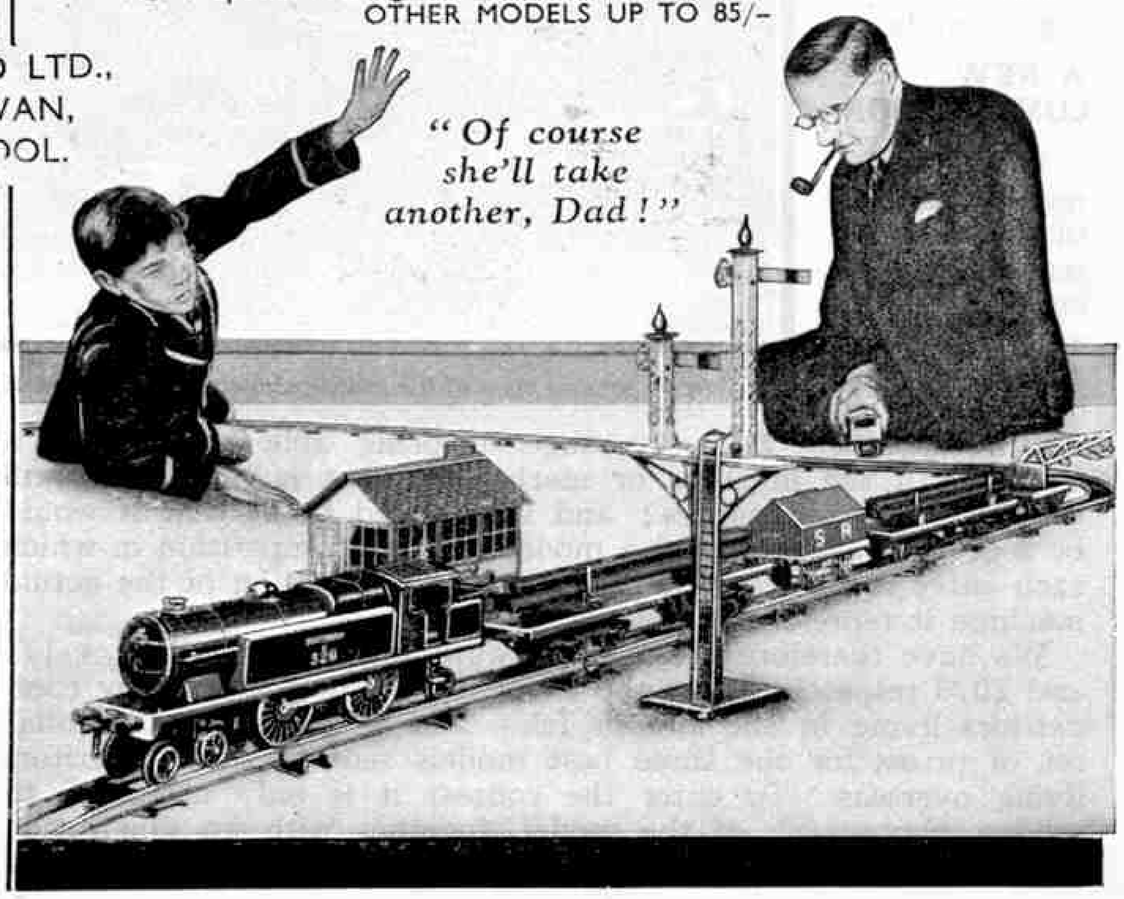
PRICES OF HORNBY TRAIN SETS

M0 Goods Set	Price 5/-
M0 Passenger Set	,, 5/9
M1 Passenger Set	,, 9/3
M1 Goods Set	,, 10/-
M2 Passenger Set	,, 10/9
M3 Tank Goods Set	,, 15/-
No. 0 Goods Set	,, 18/6
No. 0 Passenger Set	,, 17/6
No. 1 Goods Set	,, 25/-
No. 1 Tank Goods Set	,, 25/-
No. 1 Passenger Set	,, 28/6
No. 1 Special Goods Set	,, 32/6
No. 1 Special Passenger Set	,, 35/-

OTHER MODELS UP TO 85/-

MECCANO LTD., OLD SWAN, LIVERPOOL.

Amateurs to-day—Experts to-morrow!



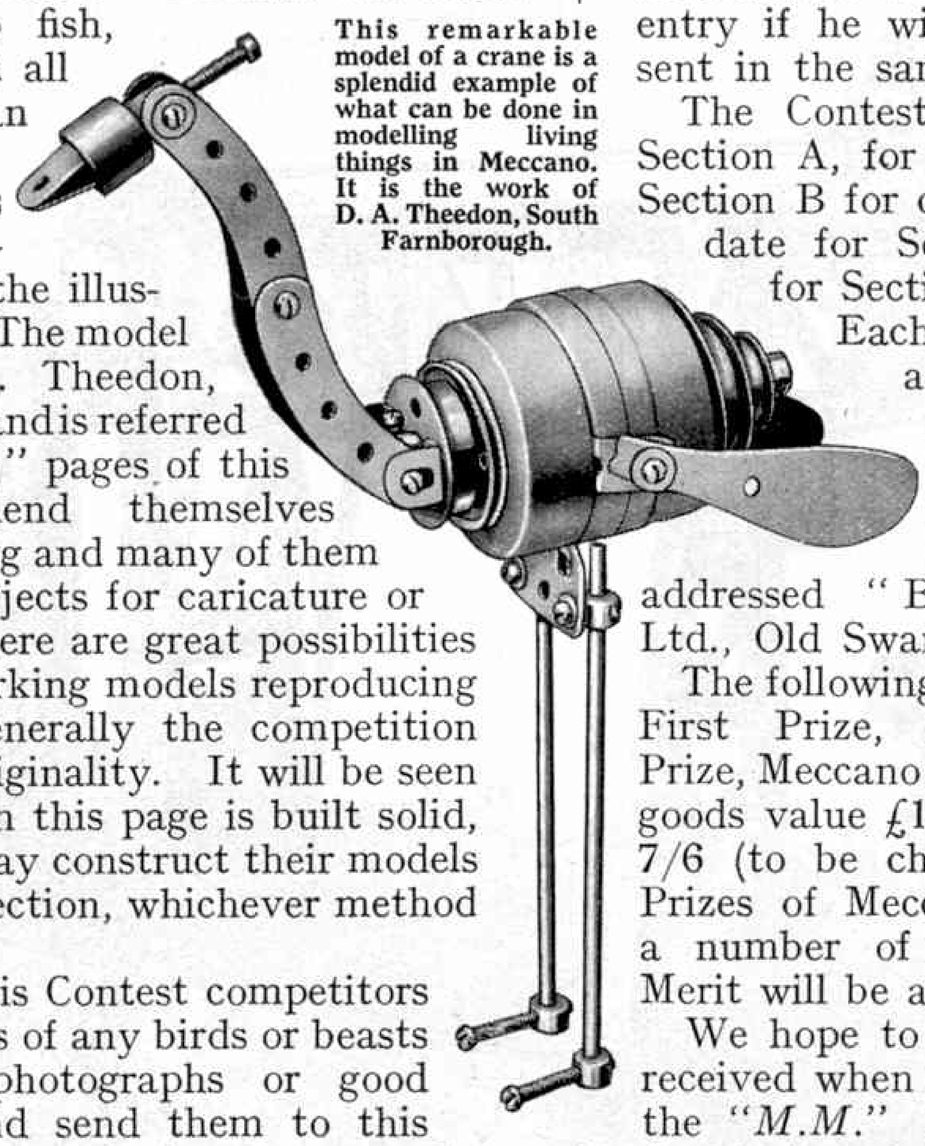
"Of course she'll take another, Dad!"

Special Christmas Competitions

Many Splendid Prizes to be Won

"Birds and Beasts" Model-Building Contest

This month we announce one of the most novel model-building competitions that we have ever organised. We have named it "Birds and Beasts" Contest, and under this term we include also fish, reptiles, insects, and in fact all living things—except human beings!



This remarkable model of a crane is a splendid example of what can be done in modelling living things in Meccano. It is the work of D. A. Theedon, South Farnborough.

Curiously life-like models of this kind may be constructed from Meccano parts, as the illustration on this page shows. The model was constructed by D. A. Theedon, South Farnborough, Hants., and is referred to in the "Contests Results" pages of this issue. Other creatures lend themselves equally well to model-building and many of them are particularly suitable subjects for caricature or humorous construction. There are great possibilities for ingenuity in devising working models reproducing animal movements, and generally the competition offers very wide scope for originality. It will be seen that the model illustrated on this page is built solid, but if desired competitors may construct their models either in the flat or in half section, whichever method they like best.

In order to compete in this Contest competitors should make Meccano models of any birds or beasts and then obtain either photographs or good drawings of the models and send them to this office. Neither photographs nor drawings need be the competitor's own work, but the model itself must be the result of his own unaided efforts.

Any number of Meccano parts may be used in building models and a competitor may submit more than one entry if he wishes, provided that all the entries are sent in the same envelope.

The Contest will be divided into two sections—Section A, for competitors living in the British Isles; Section B for competitors living overseas. The closing date for Section A is 30th January, 1932; and for Section B, 30th April, 1932.

Each competitor must write his age, name and address on the back of each photograph or drawing sent in, together with the letter A or B indicating the Section for which his entry is intended. Envelopes should be addressed "Birds and Beasts" Contest, Meccano Ltd., Old Swan, Liverpool.

The following range of prizes is offered in each Section. First Prize, Meccano goods value £3-3s. Second Prize, Meccano goods value £2-2s. Third Prize, Meccano goods value £1-1s. Six Prizes of Meccano goods value 7/6 (to be chosen by the winners themselves). Six Prizes of Meccano Instruction Manuals. In addition a number of consolation prizes and Certificates of Merit will be awarded in each Section.

We hope to illustrate a selection of the best entries received when announcing the results of the Contest in the "*M.M.*" It should be borne in mind, however, that it is only possible to reproduce photographs that are correctly and sharply focussed.

"The Year's Best Prize Model" Voting Contest

During 1931 illustrations of many splendid prize-winning Meccano models have appeared in the "*Contest Results*" pages of the "*M.M.*," and we think it would be interesting to ascertain our readers' opinions in regard to their relative merits. We have therefore decided to arrange this Contest, in which each competitor is asked to name on a postcard:—A. The prize-winning model he considers the best illustrated during 1931; B. The six models that he believes will prove the most popular, as decided by the massed votes of the competitors in this Contest.

Only those models that have been illustrated on the "*Model-building Contests Results*" pages in any of the issues of the "*M.M.*" for 1931 are to be taken into consideration in this Competition, including, of course, those dealt with on the "Results" pages of this issue. Each model referred to must be identified by giving the page and date of the issue in which the illustration appeared, the name of the model, and that of its builder, and we remind entrants that if the builder's name is not stated in the caption to the illustration it will be found somewhere in the accompanying article.

Entries must be by postcard only. The competitor's name and address must be written on the card, which should be addressed to "Year's Best Model" Voting Contest, Meccano Ltd., Old Swan, Liverpool. *No competitor may submit more than one entry.*

Entries will be divided into two sections—Section A for competitors living in the British Isles; Section B for competitors living Overseas. The closing date for Section A is 30th January, 1932; and for Section B 30th April, 1932. The following prizes will be awarded in order of merit to the competitors whose lists most accurately forecast the final results:—First Prize, Meccano goods value £2-2s.; Second Prize, Meccano goods value £1-1s.; Third Prize, Meccano goods value 10/6. Six Prizes, each consisting of Meccano goods value 5/- also will be awarded, and in addition the builders of the six models shown by the final massed votes of all competitors to be the most popular, will each receive a prize of Meccano goods, value 5/-. Prize-winners may choose any goods they like from current Meccano catalogues.

Results of Meccano Model-Building Contests

By Frank Hornby

"Crane" Contest (Home Sections)

CRANES have always been regarded by model-builders as among the most suitable subjects for reproduction in Meccano, and this led me to expect great things in the "Crane" Competition. That my expectations were fully justified is borne out by the fine models shown in the accompanying illustrations.

The results of the Home Sections of the Contest are given below, and I am now hoping that Overseas model-builders will complete the success of the competition by an equally praiseworthy response.

In Section A three competitors tied for the First Prize, and to get over the difficulty in the fairest possible way it was decided to combine the First and Second Prizes, and then divide the total amount equally between the three competitors.

The list of prize-winners is as follows:—

Section A (for competitors over 14 years of age).

FIRST and SECOND PRIZES have been combined and divided equally between the following three competitors, who will each receive a cheque for £1-15s.: A. M. Campbell, Exmouth; K. W. Cameron, Claughton, Birkenhead; G. Kenneth Holland, Liverpool. THIRD PRIZE, Cheque for £1-1s.: P. D. Williams, Sanderstead, Surrey.

EDITOR'S SPECIAL PRIZE, Cheque for 10/6: D. A. Theedon, S. Farnborough, Hants.

SIX PRIZES of Meccano goods value 10/6: H. Stoyle, Lichfield, Staffs.; C. L. Vickers, Gainsborough; J. H. Sheldon, Smethwick, Staffs.; J. Matthews, Fillongley, Coventry; D. McDowell, London, S.W.2; F. Coltman, Loughborough.

TWELVE PRIZES of "*Famous Trains*" by C. J. Allen: C. E. Wrayford, Moretonhampstead, Devon; W. H. Waters, London, W.C.1; W. Kilburn, Dewsbury; A. Glossop, Chorley, Lancs.; Kenneth Twells, Derby; B. L. Simpson, London, S.W.5; B. H. Beardall, Sutton-in-Ashfield, Nottingham; J. Westhead, Stockport; A Rowsell, Rugby; C. H. Johns, Southampton; J. F. Taylor, London, W.1; Frank Corby, Reading, Berks.

TWELVE PRIZES of Certificates of Merit: A. Thornton, Scarborough; S. Wotherspoon, Waterloo, Lancs.; G. Harding, Bedford; J. Brownlie, Glasgow; C. N. Marston, Halifax; H. W. Webb, Wood Green, London, N.22; R. Message, Dartford; D. F. O'Neill, Balmoral, Belfast; F. H. Stanbury and R. Hobson (joint award), Manchester; W. F. Clement, Willington; T. Rawlings, Bolton; Anthony Johnson, Newcastle-on-Tyne.

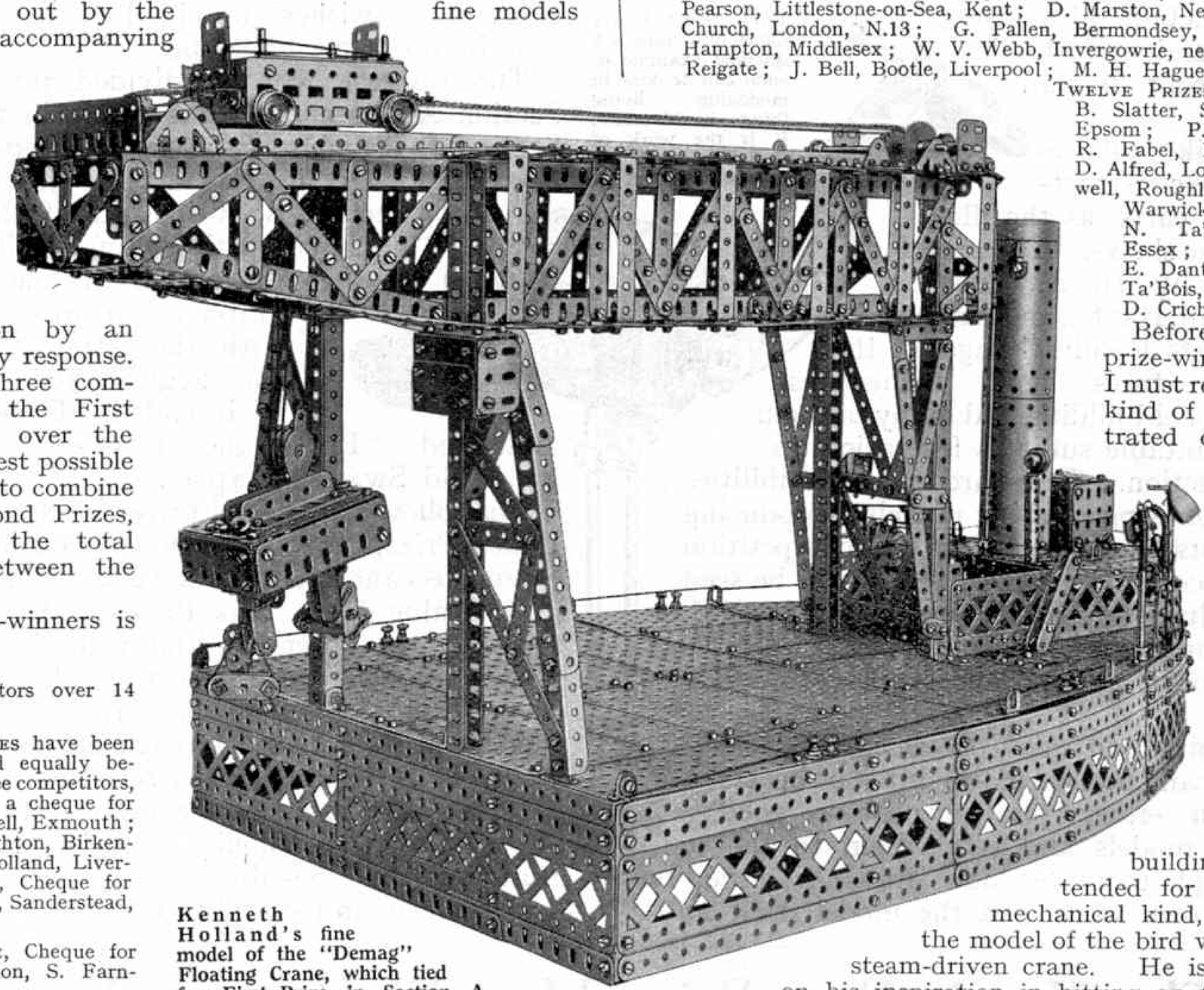
Section B (for competitors under 14 years of age).

FIRST PRIZE, Meccano goods value £2-2s.: A. H. Greenhalgh, Leicester. SECOND PRIZE, Meccano goods value £1-1s.: John Hall, Lough, Lincs. THIRD PRIZE, Meccano goods value 10/6: J. Roberts, Broadstairs, Kent.

SIX PRIZES of Meccano goods value 5/-: L. J. Hughes, Walsall; V. D. Lidbetter, Bromley, Kent; R. Burrill, Wilmslow, Cheshire; R. F. Boddey, Ipswich; J. McBrown, Sutton, Surrey; H. Causer, Sedgley, Staffs.

TWELVE PRIZES of Meccano Engineer's Pocket Books: J. Sumner, St. Annes-on-Sea; A. Ridout, Worthing; R. B. Wood, Battersea, London, S.W.; T. Pearson, Littlestone-on-Sea, Kent; D. Marston, New Ferry, Birkenhead; A. Church, London, N.13; G. Pallen, Bermondsey, S.E.16; H. B. Johnson, Hampton, Middlesex; W. V. Webb, Invergowrie, near Dundee; H. B. Groves, Reigate; J. Bell, Bootle, Liverpool; M. H. Hague, Mapperley, Notts.

TWELVE PRIZES of Certificates of Merit: B. Slatter, Southport; J. R. Hunt, Epsom; P. G. Smith, Birmingham; R. Fabel, High Wycombe, Bucks.; D. Alfred, London, N.W.2; F. N. Maxwell, Roughley, near Sutton Coldfield, Warwick; T. Steer, Hayes, Kent; N. Ta'Bois, Woodford Green, Essex; F. Winter, Ryde, I.O.W.; E. Danter, West Bromwich; A. Ta'Bois, Woodford Green, Essex; D. Crichton, Glasgow, E.1.

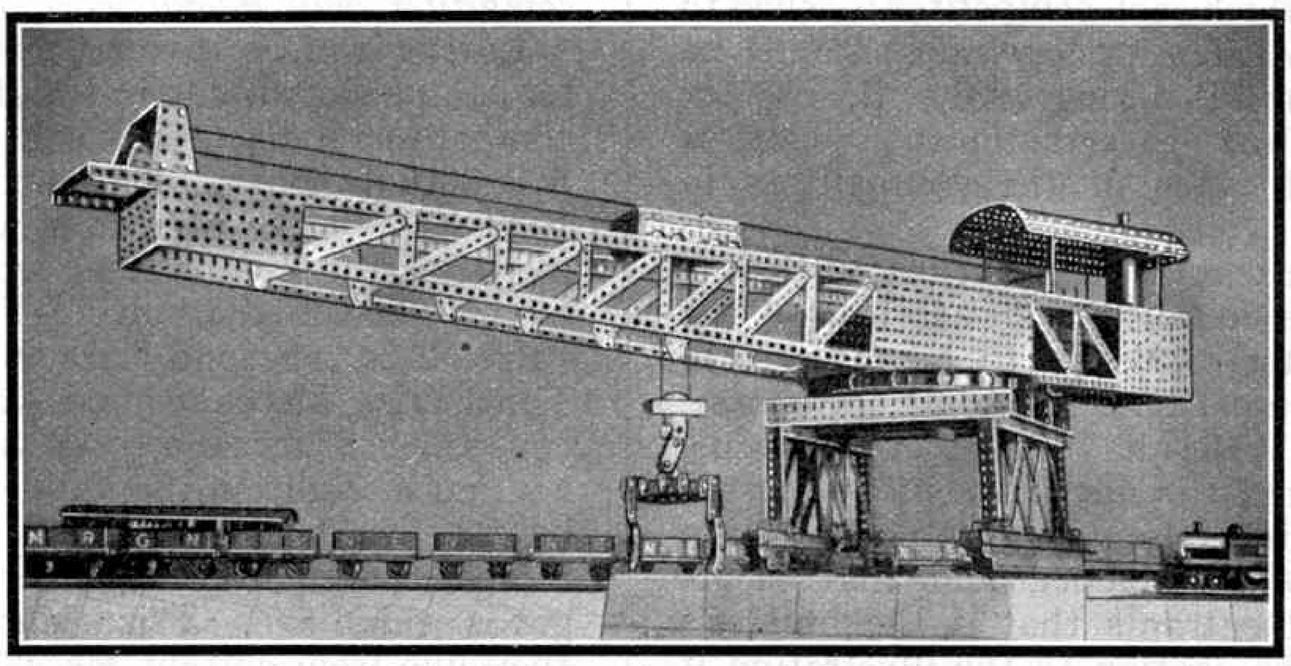


Kenneth Holland's fine model of the "Demag" Floating Crane, which tied for First Prize in Section A.

Before dealing with the prize-winning model cranes I must refer readers to another kind of crane, which is illustrated on the Contest Announcements page in this issue. This remarkable model, which it will be seen reproduces a crane bird, is a competitor's effort to find a suitable model for entry in the "Crane" Contest! Of course he does not really think that the "Crane" Model-building Contest was intended for models of the non-mechanical kind, for he accompanied the model of the bird with one of a portable steam-driven crane. He is to be congratulated on his inspiration in hitting on the idea of the bird, however, and the Editor was so pleased with the originality of this entry that he decided to reward its builder with a special prize of 10/6. The bird is the work of D. A. Theedon, South Farnborough, Hants. Incidentally readers will find elsewhere in this issue details of a new competition, in which models of any kind of animal, bird, fish or reptile may be entered.

K. W. Cameron sent two models. The first is a block-setting crane. It is of "free lance" design, but is based on two illustrations of unusual "Titans" that appeared on pages 55 and 113 of the February and March, 1925, issues of the "*M.M.*" It is interesting to note that the model was built specially so that it could be used to build a miniature breakwater in connection with a model railway system, a task that it carried out admirably.

All the usual features, rotation of the jib, travelling, hoisting and slewing, are incorporated in the model, and the entire mechanism is driven by an



A model "Titan" Block-setting Crane, by K. W. Cameron.

Electric Motor. Fidler's block-setting gear also is a prominent feature of the model. The working of the crane is controlled from four separate levers, one for starting and stopping the Motor, two for the four movements of the crane, and another for operating the brake gear. The gear box is very compact and occupies a space measuring only $5\frac{1}{2}'' \times 2\frac{1}{2}'' \times 2\frac{1}{2}''$. The driving Motor is housed in the rear of the boom so that its weight may be utilised as a counterbalance.

The other model submitted by Cameron is a portable Electric Crane, the design of which is based on the fine crane at Southampton Docks, a photograph of which appeared in the January 1931 issue of the Magazine.

Some idea of the size of this fine model, which requires two Electric Motors to drive it, will be gained from the following details. The base weighs 18 lb. and the body and jib 21 lb. These figures extended on the scale to which the model is built represent weights of 229 and 437 tons respectively, a total scale weight of 666 tons. When properly counterbalanced by placing a sufficient weight in the rear of the model, it will lift a load of 20 lb., representing a scale load of 416 tons. Altogether 1,100 nuts and bolts are used in the structure.

The cover of the September 1928 issue of the "*M.M.*" illustrated the wonderful 400-ton "Demag" Floating Block-setting Crane that forms the prototype of the fine model built by Kenneth Holland, Liverpool, which tied for First Prize with the entries of K. W. Cameron and A. M. Campbell. This model is illustrated here, and is a splendid example of an "*M.M.*" article providing a subject for model-builders.

I am describing this model somewhat fully for I think other readers will want to build similar models for themselves. Each curved side of the hull is built up of three $12\frac{1}{2}''$ Braced Girders with the addition of nine $12\frac{1}{2}''$ Strips, two above and one below each Braced Girder. The pointed stern of the ship is formed by joining the two sides by Hinges. The main deck is constructed from Flat Plates, the centre portion containing eight $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plates and three $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates, flanked at each side by two $5\frac{1}{2}'' \times 2\frac{1}{2}''$, one $2\frac{1}{2}'' \times 2\frac{1}{2}''$ and one $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plates.

The aft portion of the main deck consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates and two $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates, and the irregular space in the stern is filled in with three $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates and one $2\frac{1}{2}''$ Triangular Plate. The sides of the top deck are composed of two $9\frac{1}{2}''$ Braced Girders, and the deck itself is constructed from two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates butted together by their flanges.

The funnel is constructed from two Boilers extended by a Boiler End that is held in place by a long Rod passed through the funnel. The steam pipe is an 8″ Rod extended by a 2″ Rod, and is fastened to the funnel by two Handrail Supports.

Realistic sirens are made from Threaded Pins. Each ventilator is formed from three Couplings and a Collar secured to a $3\frac{1}{2}''$ Threaded Rod, which carries at its upper end a $\frac{3}{4}''$ Contrate Wheel. The anchor winch in the stern is formed from two $\frac{1}{2}''$ loose Pulleys held on Rods in two $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets, and the anchors are represented by Hooks (part No. 57). The cabin on top deck is made from four Girder Brackets and six 2″ Flat Girders.

The life boats, each of which is made from two $2\frac{1}{2}''$ Angle Girders, hang in davits made from $3\frac{1}{2}''$ Rods with tension Springs pushed over them and bent over with Meccano Cord.

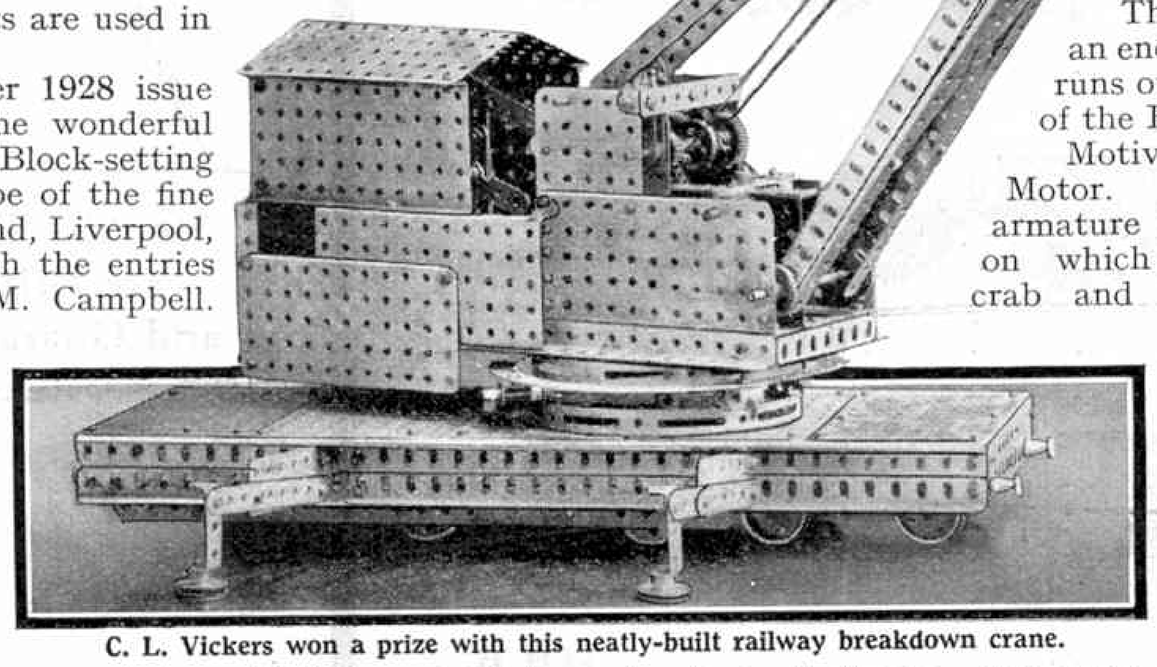
The crane crab consists of a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate with Windmill Sails for the sides and $2\frac{1}{2}''$ Flat Girders for the ends, and is mounted on four $\frac{3}{4}''$ Flanged Wheels that travel on rails formed from Angle Girders bolted to the upper surface of the bridge structure.

A three sheave pulley block formed from three 1″ loose Pulleys mounted on a short Rod journalled in a Channel Bearing is bolted to the underside of the crab.

The device for gripping the concrete block comprises four $1\frac{1}{2}''$ Strips secured in pairs by their centre holes to two Cranked Bent Strips bolted to Double Bent Strips, which in turn are bolted to the underside of the balancing beam. Spring Cord is used to hold open each pair of $1\frac{1}{2}''$ Strips so that they grip the sides of the holes in the concrete block.

The crab is traversed by an endless length of Sprocket Chain, which runs over a 1″ Sprocket Wheel at each end of the Bridge.

Motive power is supplied by an Electric Motor. A $\frac{1}{2}''$ Bevel on one end of the Motor armature engages a $1\frac{1}{2}''$ Bevel on a short Rod on which is wound the hoisting cord. The crab and hoisting mechanism can be thrown out of engagement with the Motor simply by operating two Rods, which control the movements of two slidable Rods that carry Pinions and project outside the ship at the stern. Port, starboard, mast-head, and tail lights are fitted, and these are wired-up in series, the current for the lamps being supplied by three flash-lamp batteries. Ingenious use of Dredger Buckets is made to form port and starboard reflectors.

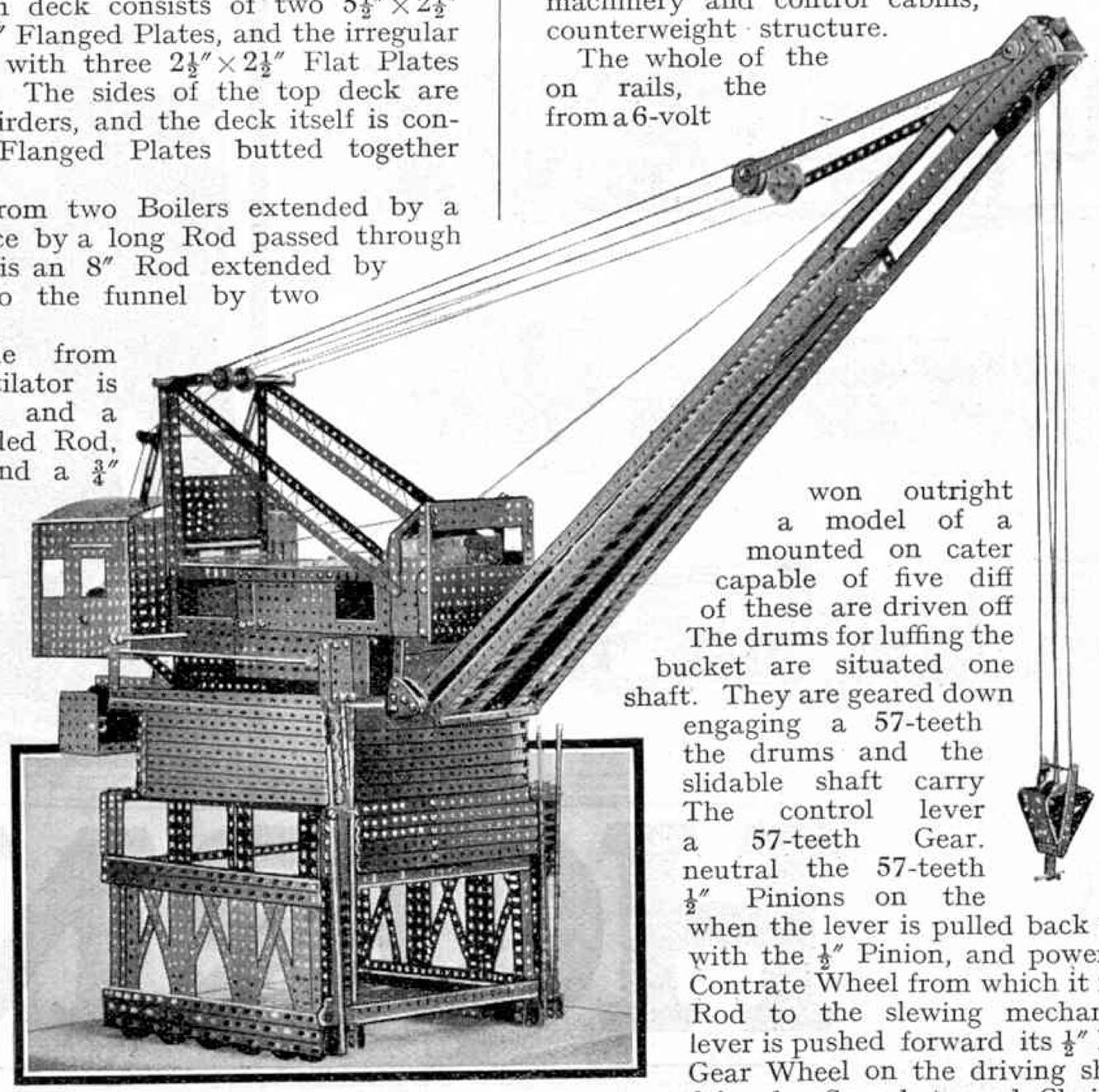


C. L. Vickers won a prize with this neatly-built railway breakdown crane.

The model built by Angus M. Campbell is based on the 50-ton crane at the Southampton Docks. The model closely resembles the real crane in appearance, and also reproduces faithfully each of the movements of the prototype. Essentially it consists of three parts, the base, the top structure, which contains the machinery and control cabins, and the derrick and counterweight structure.

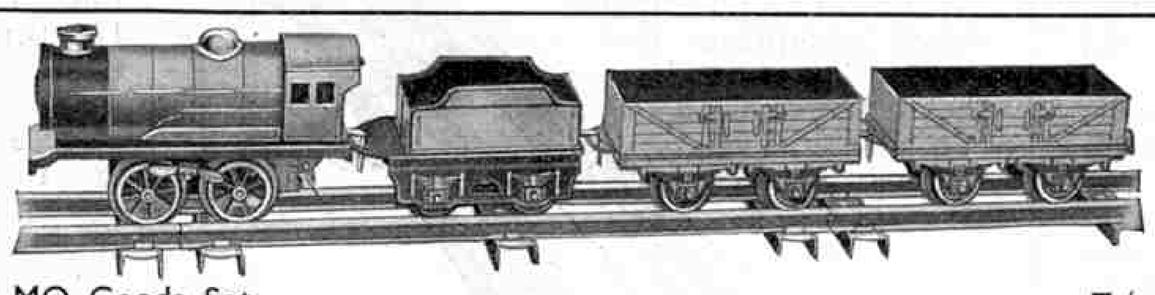
The whole of the top structure rotates on rails, the power being obtained from a 6-volt Motor supplied with current from an Accumulator, which is fitted into the body of the crane. The Motor is placed in the rear of the cabin, and by means of two built-up clutches drives the hoisting and lowering gear, and also luffs the jib.

The Third Prize was won outright by P. D. Williams, with a model of a steam shovel that is mounted on pillar tracks and is capable of five different movements. Four of these are driven off the main driving shaft. The drums for luffing the jib and working the bucket are situated one each side of a main shaft. They are geared down twice by a $\frac{1}{2}''$ Pinion engaging a 57-teeth Gear Wheel. Between the drums and the driving shaft there is a slidable shaft carrying reduction gears. The control lever carries a $\frac{1}{2}''$ Pinion and a 57-teeth Gear. When the lever is in neutral the 57-teeth Gear rests between the $\frac{1}{2}''$ Pinions on the driving shaft, but when the lever is pulled back the 57-teeth Gear engages with the $\frac{1}{2}''$ Pinion, and power is then transmitted to a Contrate Wheel from which it is transferred by a vertical Rod to the slewing mechanism. When the control lever is pushed forward its $\frac{1}{2}''$ Pinion engages a 57-teeth Gear Wheel on the driving shaft and so transmits the drive by Sprockets and Chain to Rack Strips on the bucket arm. The travelling motion (*Continued on page 1019*)

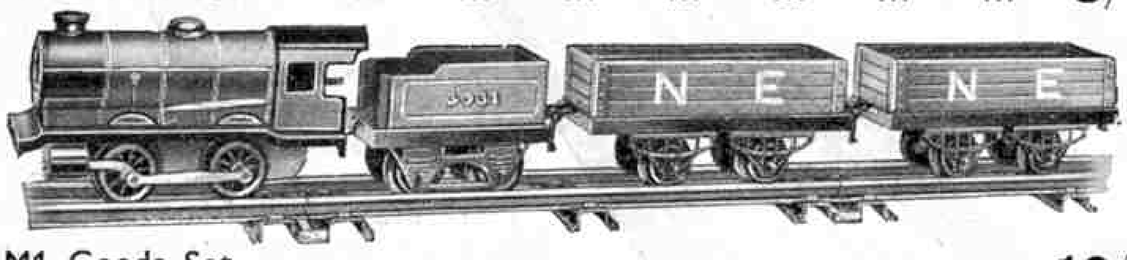


A powerful model of a 50-ton Crane at Southampton Docks, by Angus M. Campbell.

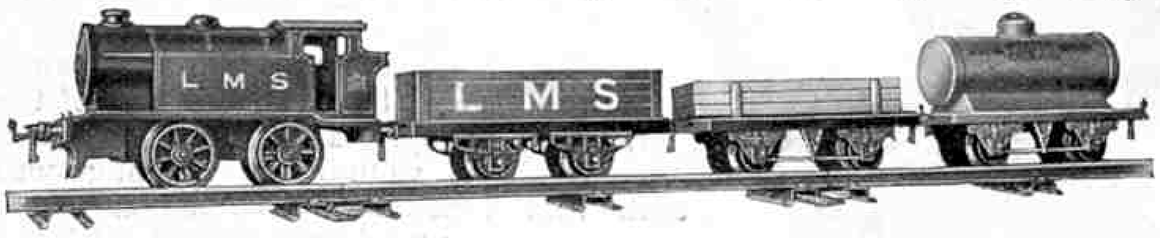
Longer runs - heavier loads - v



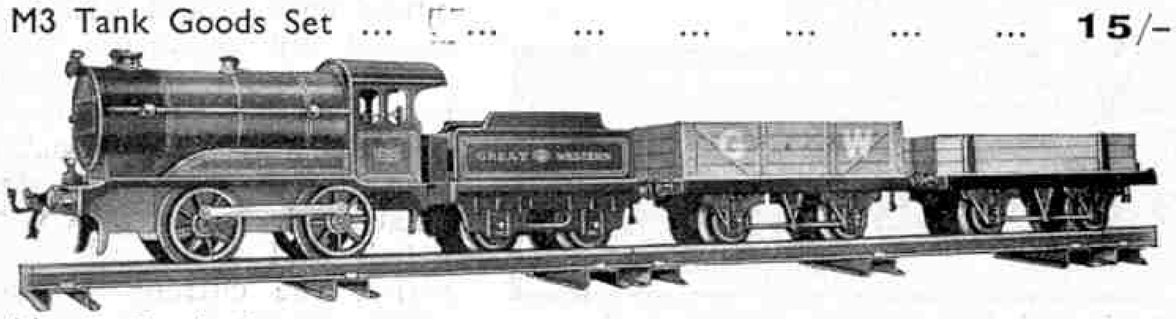
MO Goods Set 5/-



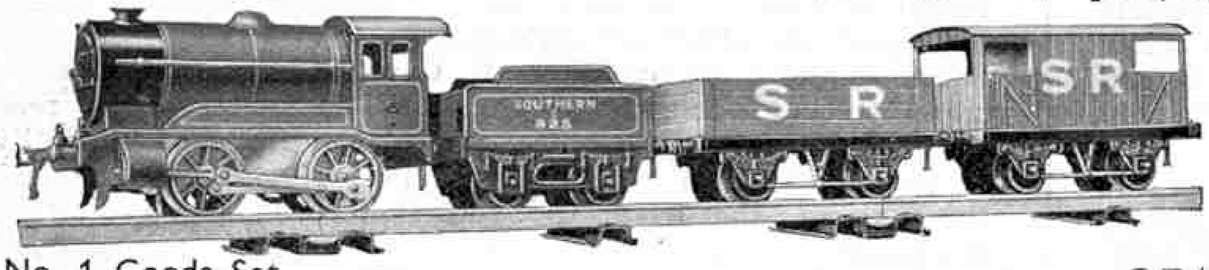
M1 Goods Set 10/-



M3 Tank Goods Set 15/-



No. 0 Goods Set 18/6



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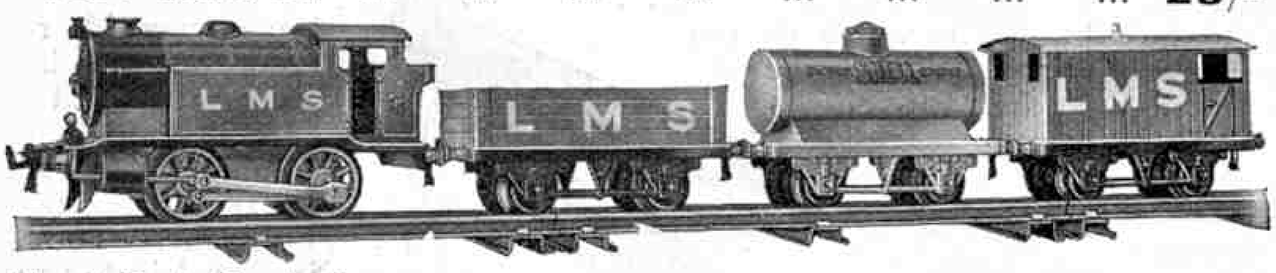

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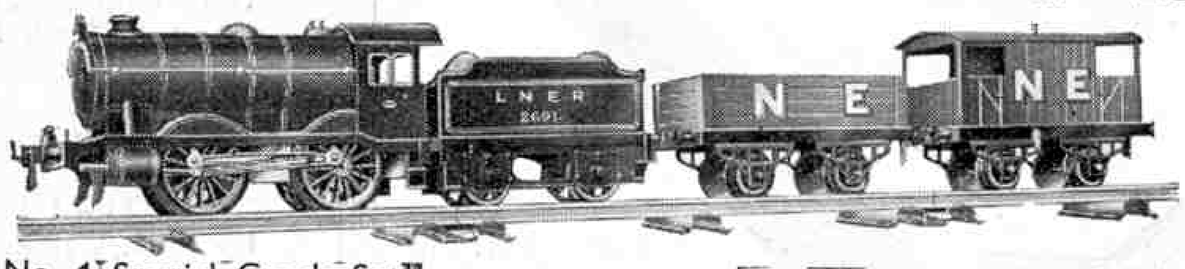
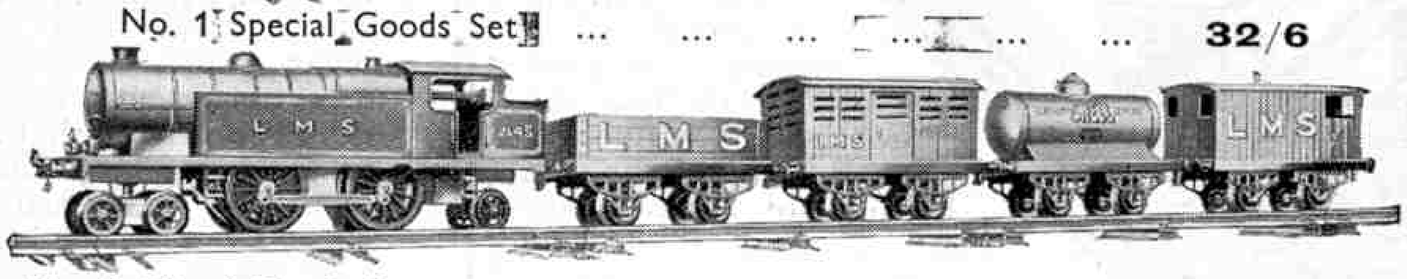


No. 1 Special Goods Set 32/6



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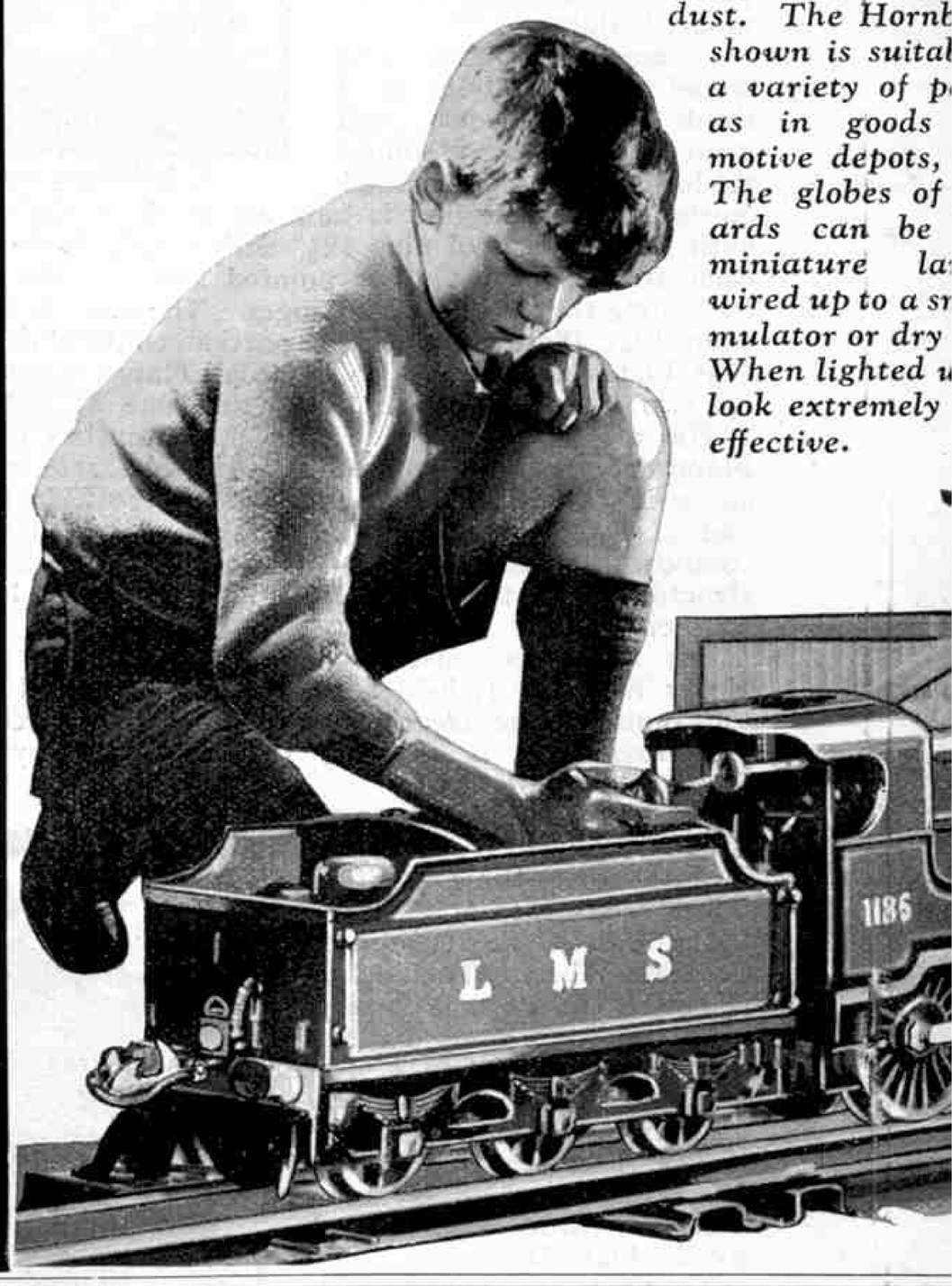

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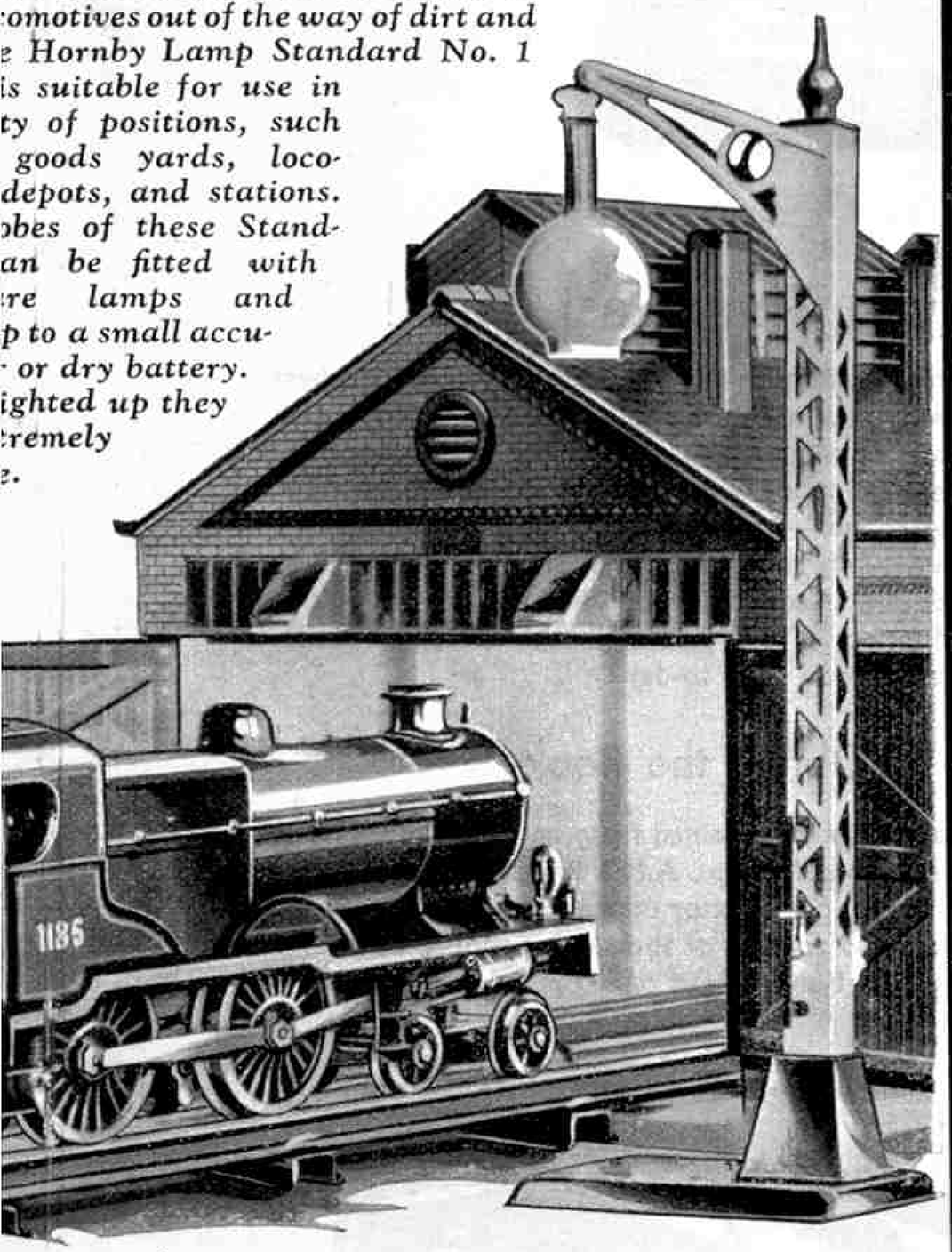
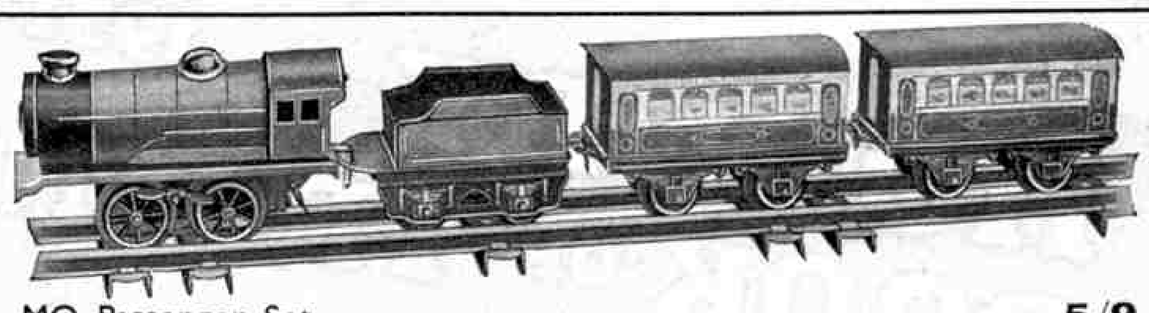
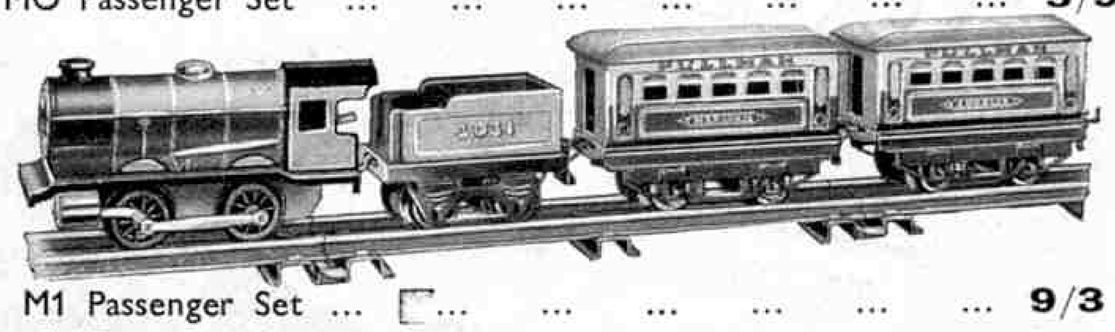
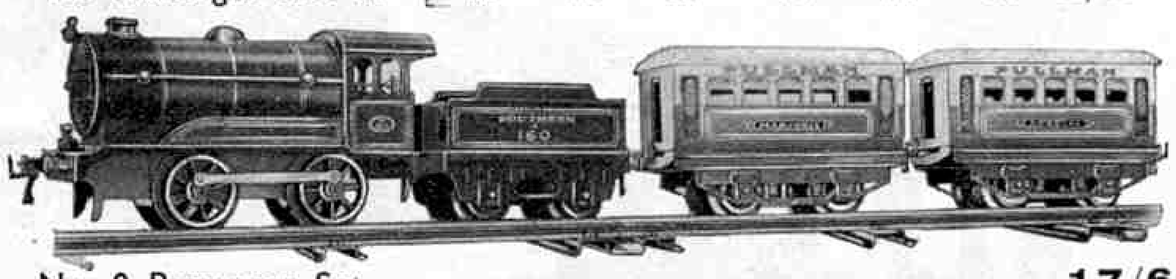




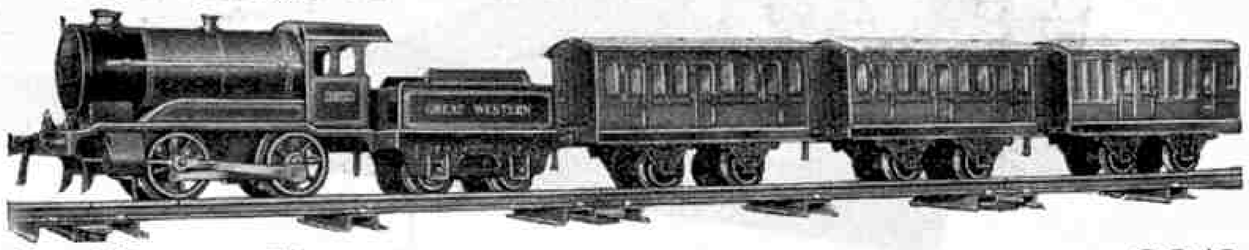
MO Passenger Set **5/9**



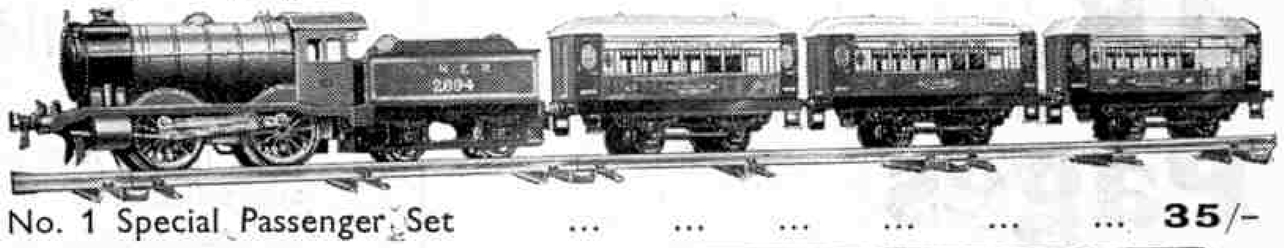
M1 Passenger Set **9/3**



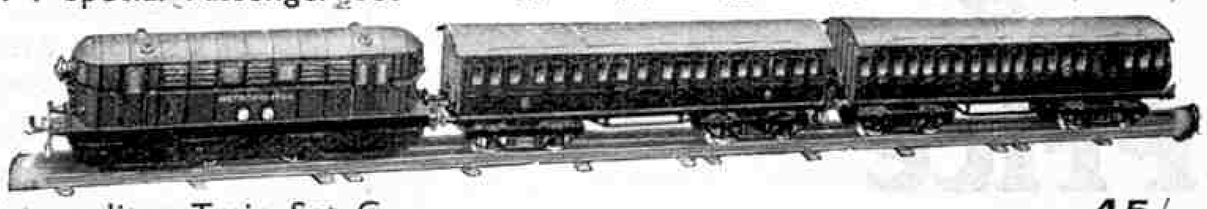
No. 0 Passenger Set **17/6**



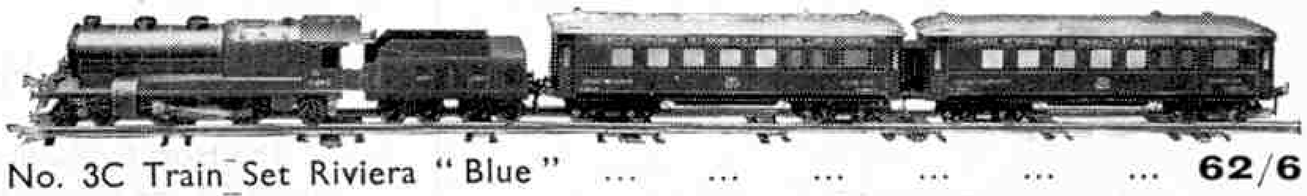
No. 1 Passenger Set **28/6**



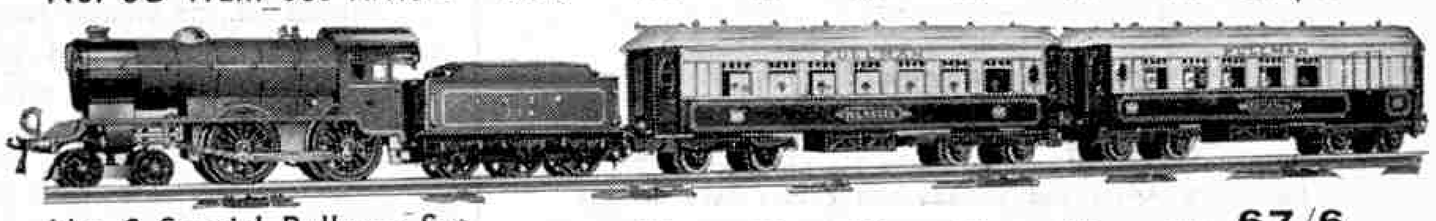
No. 1 Special Passenger Set **35/-**



Metropolitan Train Set C **45/-**



No. 3C Train Set Riviera "Blue" **62/6**



No. 2 Special Pullman Set **67/6**

No. 3C Pullman Train Set **67/6**

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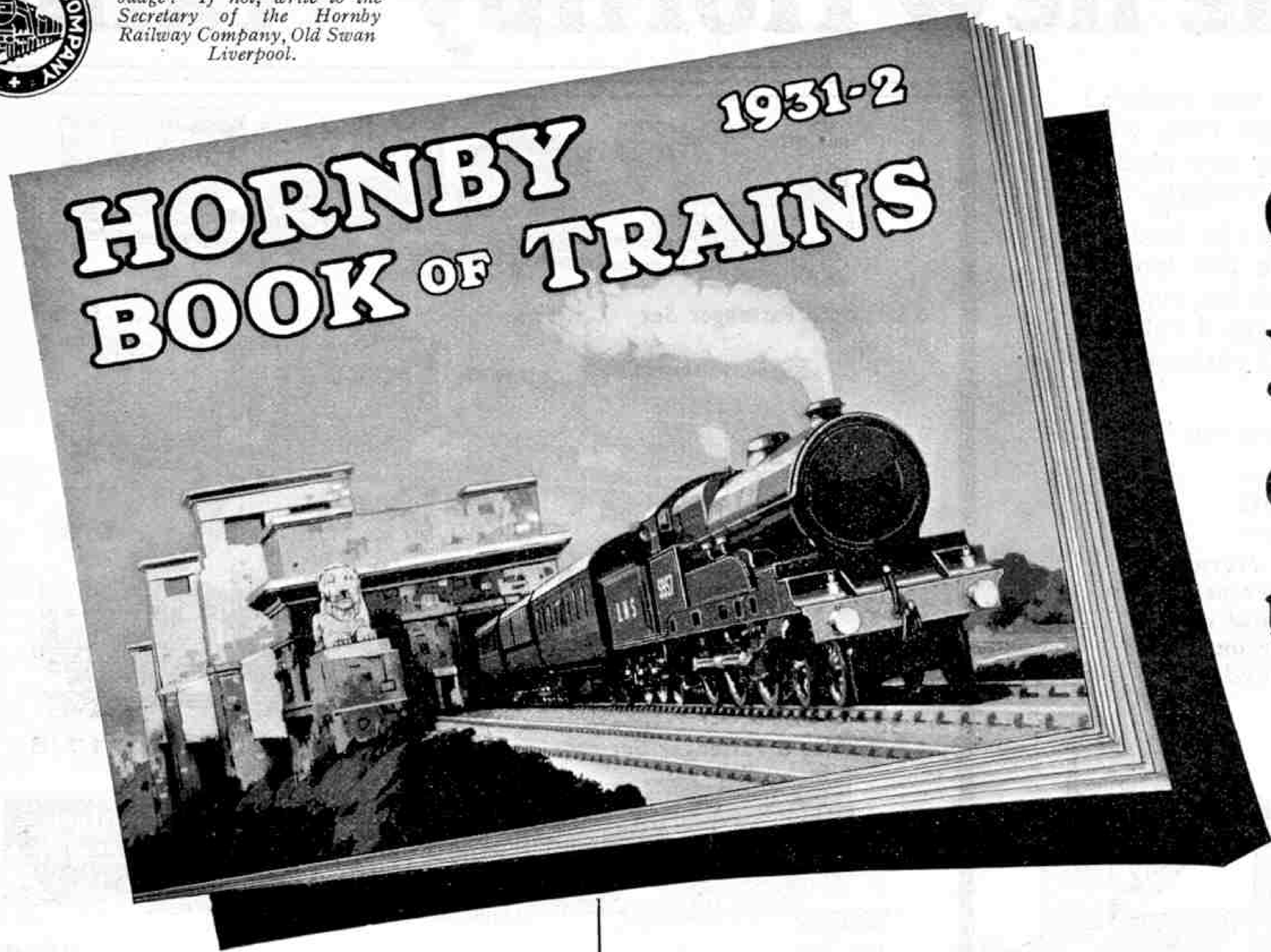

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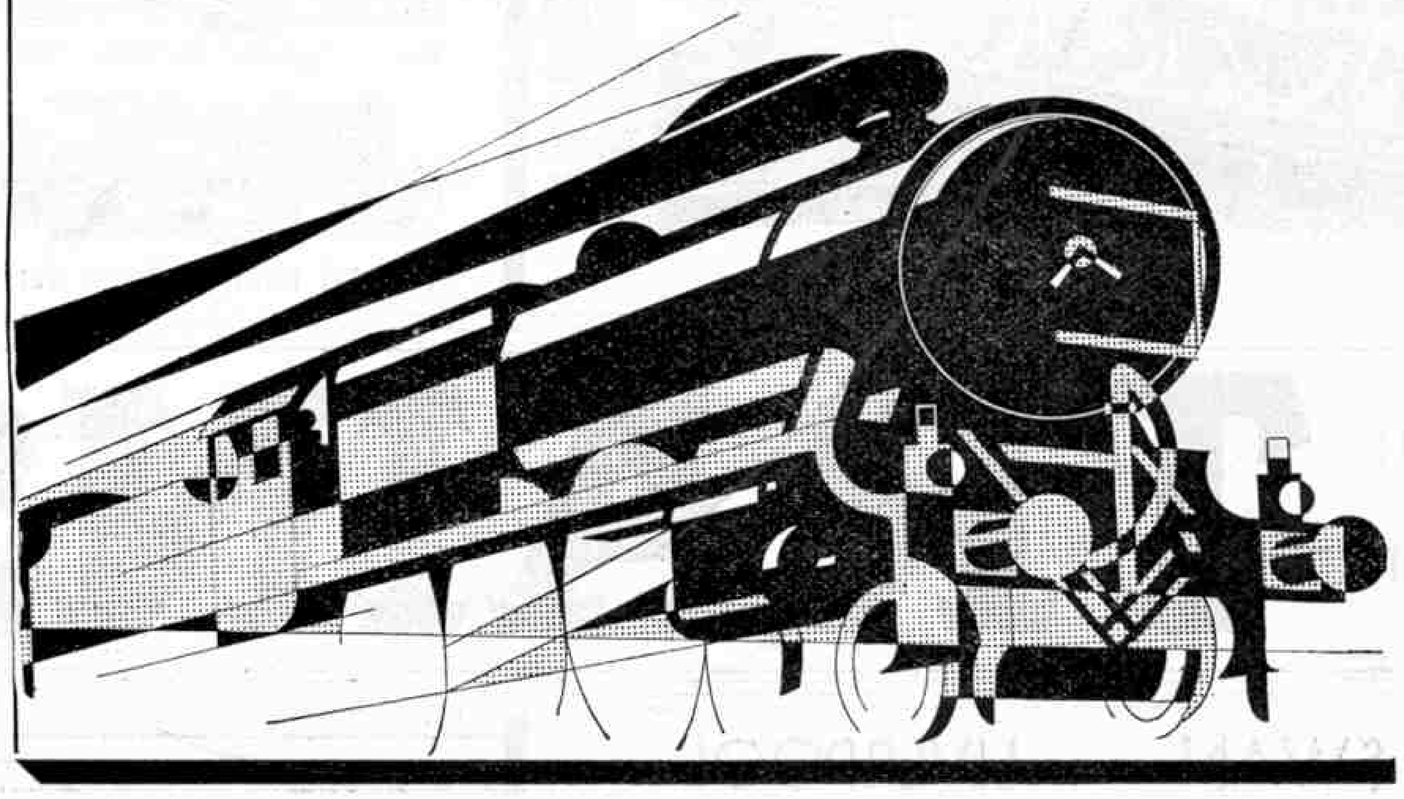


Branch Notes

RAYLEIGH.—An interesting visit was paid to Southend L.N.E.R. locomotive depot. Engine No. 8900 "*Claud Hamilton*," was boarded by the members. This locomotive was in steam and the various controls were demonstrated by the fireman. The party returned home in the guard's van and the working of the vacuum brake was explained by the Chairman en route. Block telegraph working will be introduced as soon as the members have learned the code. Secretary: H. Arbin, 30, Eastwood Road, Rayleigh.

WESTON-SUPER-MARE.—The Branch stock has been overhauled, engines and rolling stock having been cleaned and oiled and all rails and points carefully inspected and straightened where necessary. A permanent track has been laid down on baseboards and a satisfactory method of signalling by means of lights has been devised. It is proposed to fit the main line with a third rail and instal electric working on the layout. Secretary: Cedric E. Hyssett, 8, Elmhyrst Road, Weston-super-Mare.

GLOUCESTER.—Shelves have been erected in a large shed which is to serve as a clubroom, and on these a permanent layout has been screwed down. Electric light has been fitted up in the shed and the Chairman is making concrete bridges for the layout. Secretary: K. Barrow, 22, Painswick Road, Gloucester.

EAGLEHURST (PALMERS GREEN).—Banking work on gradients has been introduced and there was keen competition to show the best results when each member was made responsible for a section of track and any accidents on that section. Cricket has now been replaced by cycle runs. Fourteen cricket matches were won and seven lost during the season. A silver cup has been presented to the Branch and this will be held for three months by the most efficient and deserving member. A visit was paid to the Faraday Centenary Exhibition at the Royal Albert Hall, where a great deal was learned about the applications of electricity to transport. Secretary: Mr. P. D. Garton, 24, Elmdale Road, Palmers Green, London, N.13.

MAIDSTONE.—A new clubroom has been found which is much larger and more convenient than the last. The Branch is combining forces with the Maidstone Meccano Club with the object of holding an Exhibition, and a special committee has been appointed to carry out the necessary plans. The resignations of the Secretary and Treasurer were accepted and two others appointed in their places. The new Secretary is W. R. G. Hills, "The Orchards," Ashford Road, Maidstone.

WEST NORWOOD.—A visit has been paid to the L.N.E.R. depot at Hornsey. Great interest was taken in the large electric coal hopper and the members were fortunate enough to be able to witness its operations from the top. From this lofty situation an excellent view of the L.N.E.R. lines in the neighbourhood was obtained, several expresses passing at the time. Secretary: W. H. Bugg, 80, Wolfington Road, West Norwood, London, S.E.27.

An interesting photograph taken in the Branch room of the All Saints Boys' Club (Stoneycroft), Branch No. 161: Chairman, Mr. Wm. Walker; Secretary, Mr. Harry Farnham. It will be seen that the members are intent on track running. The large increase in membership, which is now 70, has made necessary the installation of a second track.

OVERSEAS

SOUTH KOGARAH.—Two very interesting track meetings were held at which timetables were operated. A new viaduct has been installed and the approaches to this have been modified to suit the special conditions of the situation. An enquiry is to be held in which two drivers are to be called to account for late running. Secretary: H. M. Walsh, "Bringa," 220, Prince's Highway, Kogarah, N.S. Wales, Australia.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

BIRMINGHAM.—J. W. Roome, c/o M. E. S. Fruiters, Station Road, Marston Green, Nr. Birmingham.

BOWDON—P. Brotherton, Aberfoye, Chesham Place, Bowdon.

CHERTSEY—V. Longman, Weir Lodge, Bridge Road, Chertsey, Surrey.

KILKENNY—Thomas Crotty, Newtown Manor, Kilkenny, Ireland.

LONDON, N.W.4.—G. Turner, 33, Crespigny Road, Hendon, London, N.W.4.

MARSKE-BY-SEA—A. Porritt, 103, High Street, Marske-by-Sea, Yorks.

NORWICH—Hugh Bailey, 25, Civic Gardens, Mile Cross, Norwich.

SOUTHAMPTON—V. Tami, 15, Trinity Road, Southampton.

OVERSEAS

AUSTRALIA—R. W. Steane, 2, Earle Street, Mont Albert, E.10, Melbourne.

AUSTRALIA—T. Watson, 595, Parramatta Road, Leichhardt, N.S.W.

HOLLAND—J. B. G. Ringnalda, Huizumerlaan 125, Leeuwarden, Holland.

S. INDIA—M. A. G. Lochan Rao, 2/99, Pedariar Pegoda Street, George Town, Madras, S. India.

Branches Recently Incorporated

198. DISS (NORFOLK)—L. Young, 5, Sunny Side, Diss, Norfolk.
199. NOTTINGHAM HIGH SCHOOL MECCANO AND MODEL RAILWAY CLUB—F. Nabarro, 4, Grosvenor Avenue, Mapperley Park, Nottingham.

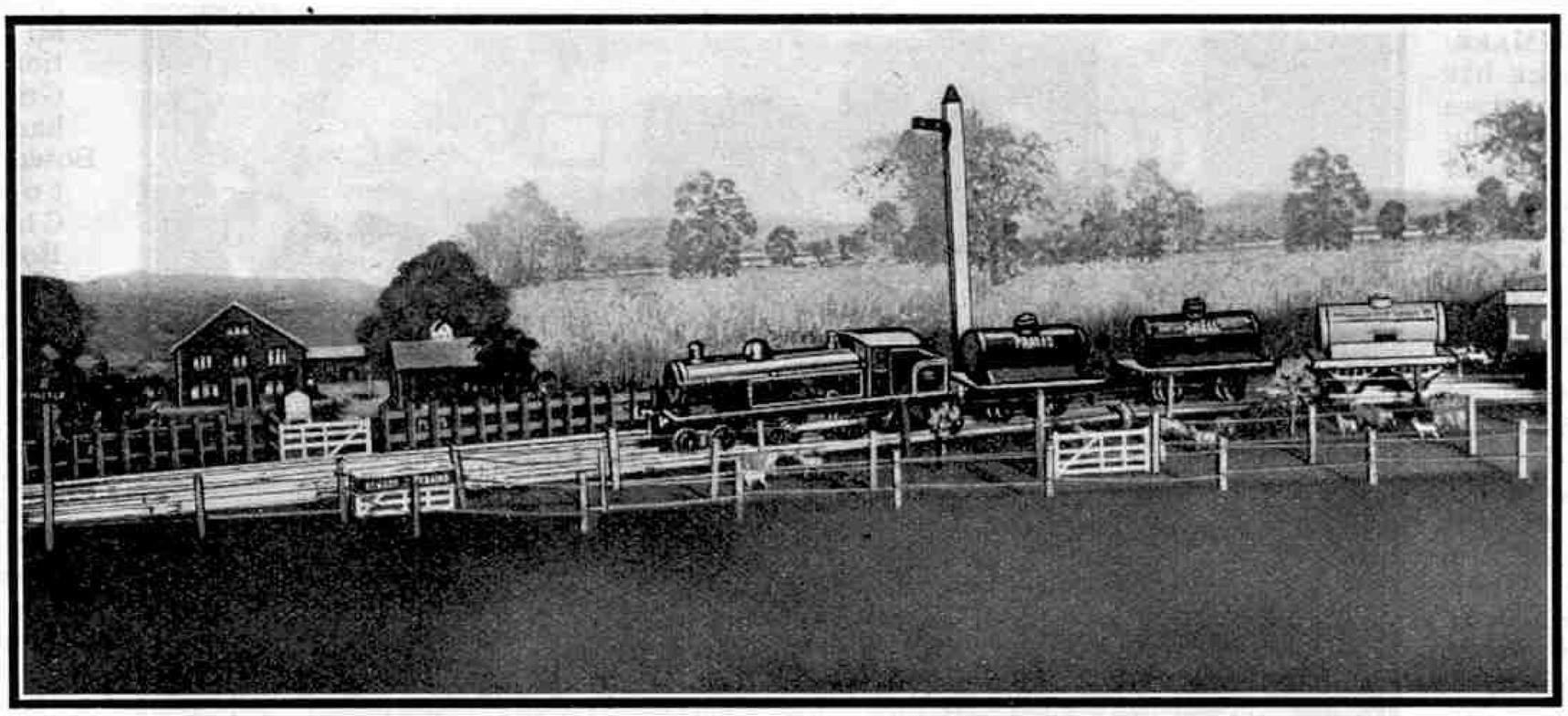
XXXVIII.—REALISM IN LINESIDE EFFECTS

ALMOST all model railways have a gradual growth. They usually commence with a locomotive and a few coaches or wagons and the simplest possible track, and from this stage they develop and grow as their owners' enthusiasm and railway knowledge increase. At first, and in fact for a considerable period, it is natural for attention to be concentrated on the track itself and the running of the various trains. The object is to secure an interesting and railway-like layout, and to operate this by a frequent service of trains, both passenger and goods, signalled correctly as far as possible and perhaps running to a timetable.

During this stage of development little or no attention is paid to accessories and to what we may call "lineside effects," and after a while the railway owner realises that although his line is working efficiently it has little resemblance to a real railway. The next stage is to consider carefully the possibilities of adding to the already efficient system the little touches of realism that make all the difference between an attractive-looking railway and a mere collection of rails, points and crossings.

The nature of the scheme of lineside effects to be adopted depends to a considerable extent upon whether the railway is laid down permanently or has to be taken up each time after use. In the former case more elaborate effects can be obtained, but even a simple portable layout can be made to appear very effective if the right methods are employed. Frequently a compromise between a permanent and a portable system is possible by agreement with the household authorities. Thus, while the railway may be allowed to remain in position for considerable periods it must not be regarded as a fixture, and must be capable of removal at any time on demand. This is quite a good arrangement, and has the advantage that the layout may be modified without difficulty, whereas extensive alterations to a permanent system generally involve a great deal of trouble.

Most layouts are arranged round a room, and one of the problems the railway owner has to face is that of eliminating the "corner effects" that are so obvious and unsatisfactory. Probably on one side of the layout this may be done by having an engine shed in one corner and perhaps a goods yard and depot in the other. Most likely this will be on the same side of the layout as the main station.



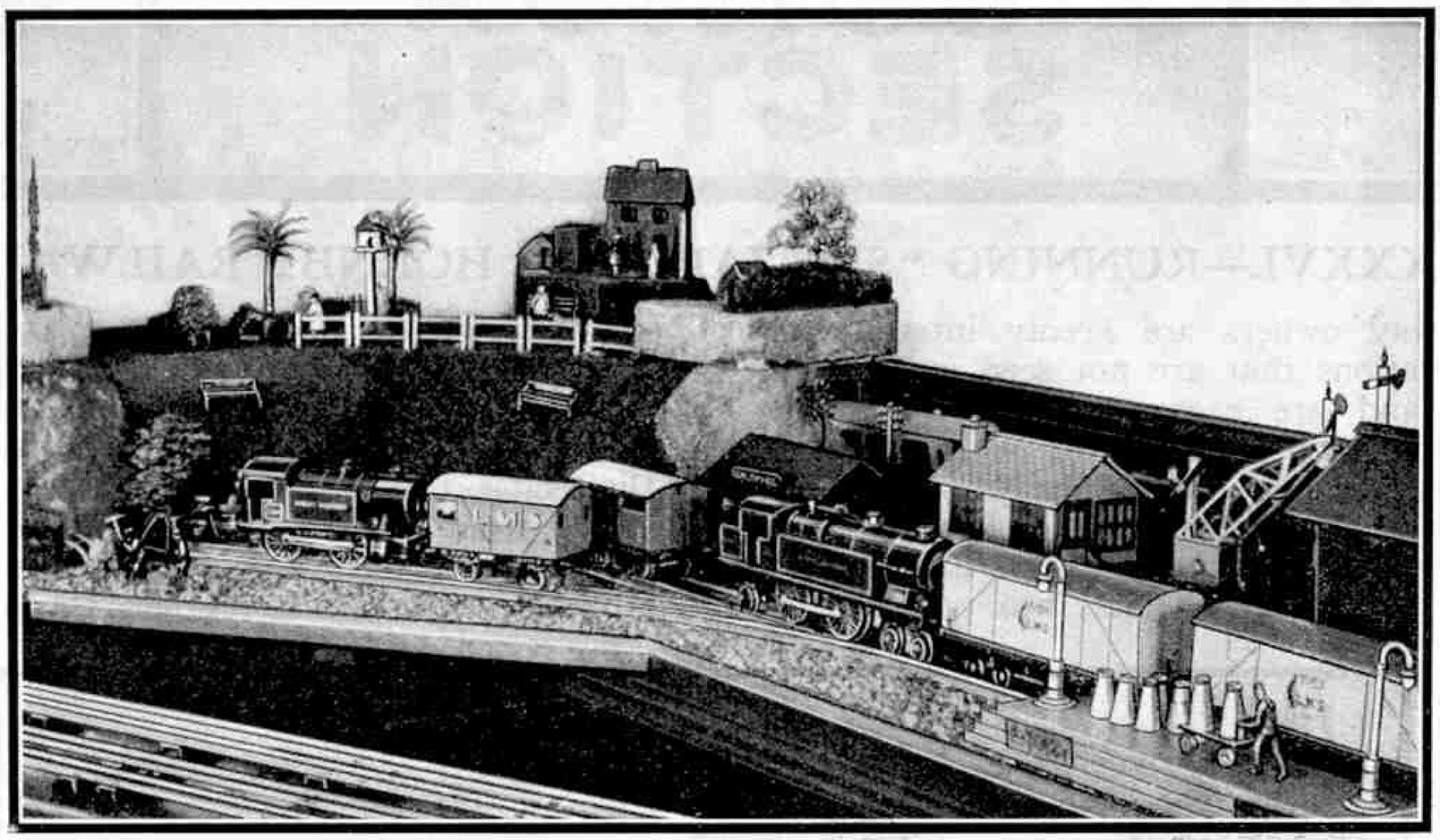
A portion of the layout of Mr. J. Grime, Belfast. A petrol special is passing through a picturesque stretch of country. The background, particularly the "village" scene and the road leading to the gates, gives a very natural look to the line.

There now remain the other two corners of the room to be dealt with. An effective scheme is to arrange a tunnel on the curve, boring through a spur of a range of hills rising into the corner of the room, and filling it effectively. If a complete tunnel, such as that in the Hornby Series, is used, the material forming the hill may be laid over it and heaped up into the corner. Crumpled balls of newspaper may be used for the foundation of the hill, and for covering this there is quite a wide choice of materials. If green cloth of a suitable shade is available it may simply be laid over hill and tunnel and kept in the required position by drawing pins. A disused green curtain sometimes may be pressed into service, and if its surface is rough so much the better will be the appearance. An alternative is brown paper, damped and crumpled and laid in position, and painted according to the characteristics of the ground that is to be represented. On a permanent layout glue or paste may be used to keep this paper in position, but for temporary purposes drawing pins will be found useful and quite satisfactory.

Artificial moss, pieces of loofah coloured green, and twigs with bits of sponge glued to them and painted

may be "planted" to represent bushes and trees. These should not be made too thick, for by keeping them small an illusion of distance is produced, which is far more satisfactory than the grotesque but frequently-seen effect of giant trees completely dwarfing the line.

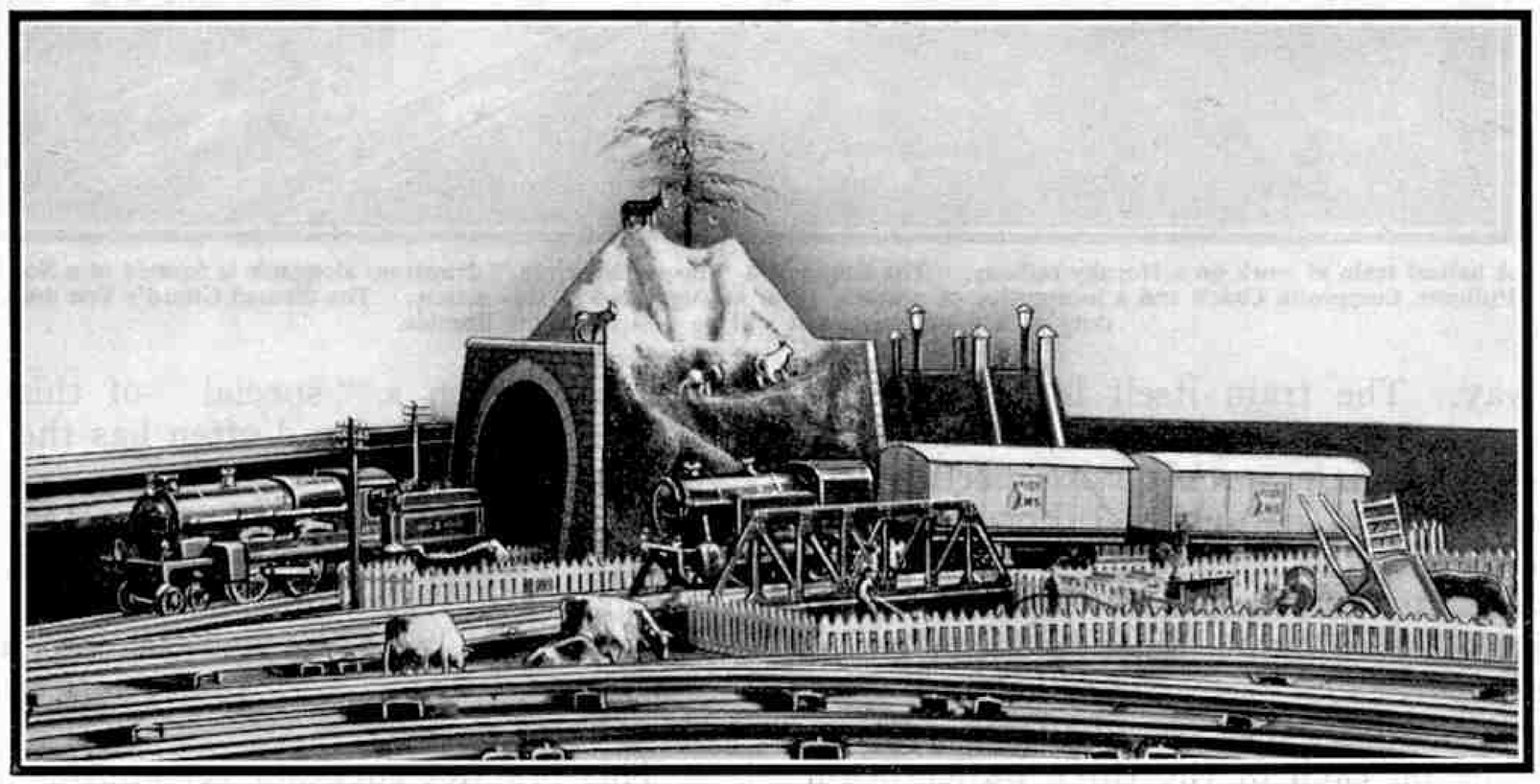
A Viaduct is another useful accessory, and it is not difficult to employ it effectively. Some useful hints on this subject were given by "Tommy Dodd" in the June "*M.M.*," and the employment of a strip of glass having a rippled surface was suggested for the water course over which the Viaduct is supposed to be carrying the line. If such glass is not available a strip of tinplate may be used, and looks very effective. The banks may be represented by brown paper painted, or by crepe paper of a suitable shade, which has the advantage that it may be moulded and stretched into the required position with little trouble. In order to finish up the stream on the wall side of the line a "waterfall" may be staged. A more or less rough ledge of rock may be imitated by dark brown paper fixed to the wall, the falling water being represented by streaks of silver paint. A certain number of "bushes" and "trees" may be dotted about and will complete the scene satisfactorily; or alternatively some suitable piece of scenic background may be employed. The boundaries of the railway property should be duly fenced in, as is the case in real practice. The Paled Fencing that is used on Hornby stations and platforms is available separately for use along the lineside. It may be employed in a great variety of situations, along the line at approaches to stations, or enclosing goods yards and railway premises generally. In one of the accompanying photographs, showing a tunnel and viaduct effectively employed at the corner of the layout, the Paled Fencing is in evidence.



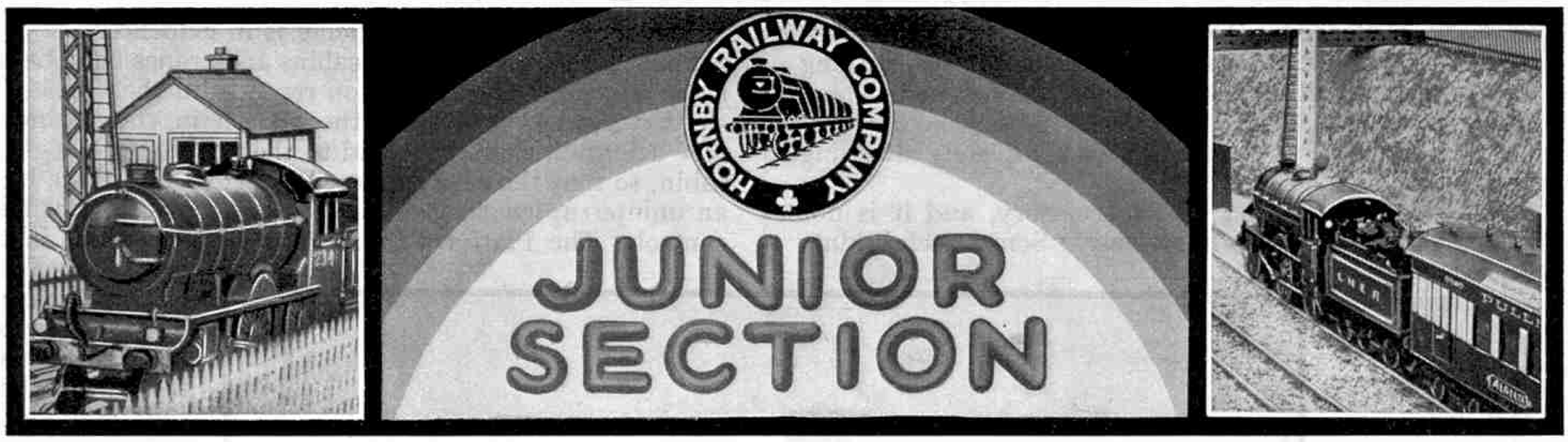
Scenic and other accessories add a great deal to the realism and interest of this photograph. The hill in the background actually covers the tunnel where the railway runs round a corner of the room. The two photographs on this page show parts of the layout of Mr. W. G. Bosley of Nursling, Nr. Southampton.

Such accessories as signal cabins and cranes have been given a good deal of attention recently in the "*M.M.*," so that readers will have these fresh in their minds. Due attention should be paid to the position of a signal cabin, so that the man supposed to be on duty there has an uninterrupted view of all that takes place under his control. The Platform Crane may be used alone in a small goods yard where the Hornby Goods Platform is not provided, or it may be used in addition to this where a large amount of traffic is handled.

These various features will make a miniature railway system far more effective in appearance, but in order to complete the work in this direction some effort should be made to provide a suitable background for the line. Model railway enthusiasts, who have no confidence in their own artistic ability, persist in regarding the production of scenery as a task full of difficulty, and in fact out of the question for them. We wish to emphasise once more that this is not the case. Almost any model railway owner is capable of producing a scenic background sufficiently good to be effective, which is all that matters; and even if there are a few cases where this is not possible there is never much difficulty in enlisting the services of a friend, who has some aptitude with pencil and brush. It is quite possible, of course, to use a border of wallpaper frieze if a suitable one can be found. Nowadays such friezes are hard to find, however, and of the few that do exist the majority have the defect of repeating the same scene over and over again. This repetition is not a serious objection if the frieze represents only a general view of country with no details more conspicuous than trees; but the effect is decidedly objectionable if a windmill, a farmhouse, or an ancient castle (*Continued on page 1019*)



Hornby Paled Fencing is used here to enclose the railway property. A No. 1 Special Tank is crossing the Viaduct shown, and a G.W R. "Caerphilly Castle" is emerging from the tunnel beyond it.



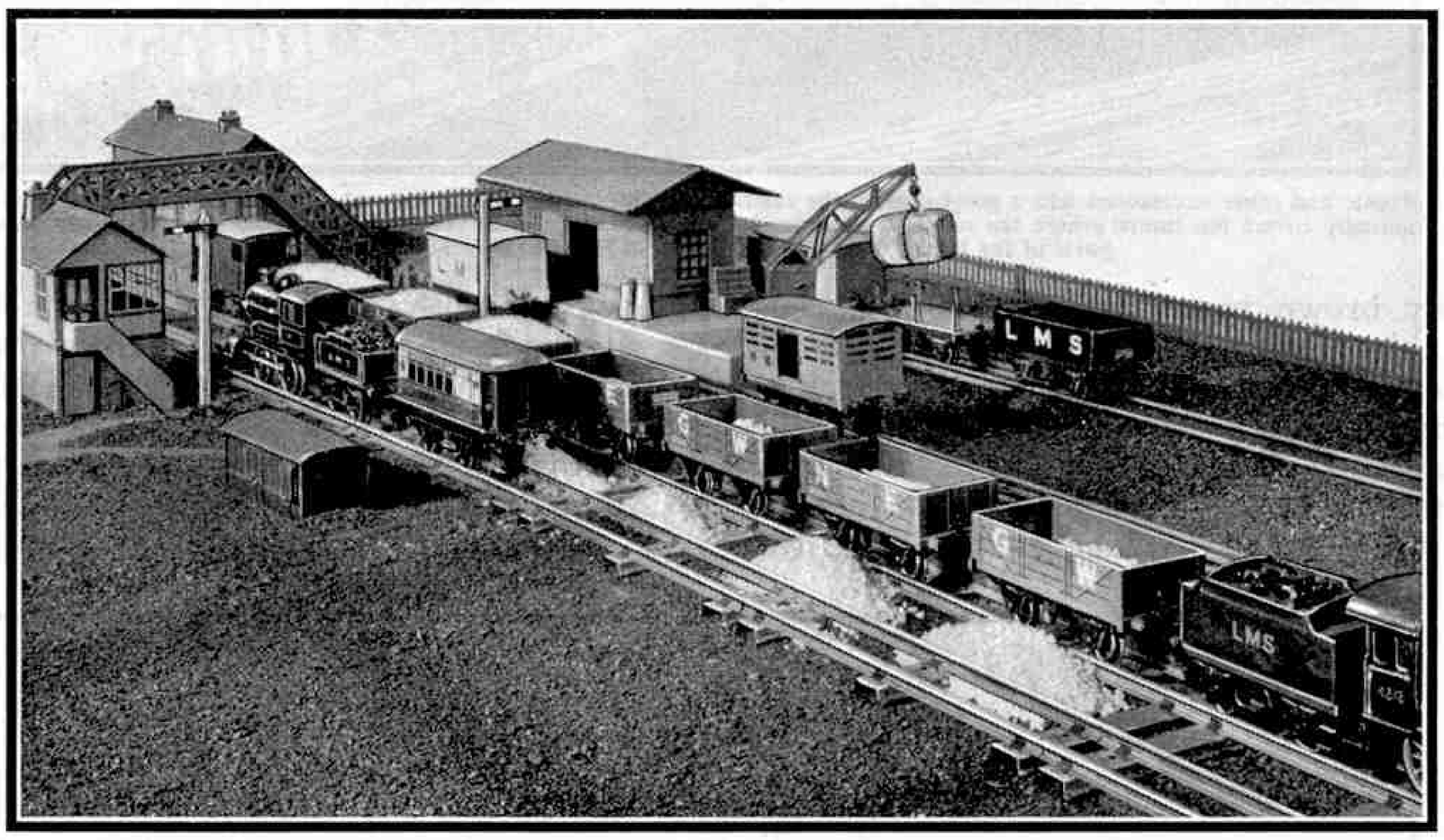
XXXVI.—RUNNING "SPECIALS" ON HORNBY RAILWAYS

MODEL railway owners are keenly interested in train operations that are not seen in everyday practice, and are eager to introduce similar working on their own layouts. As a general rule this is possible, although occasionally some extra equipment may be necessary. Examples of special working already dealt with in these pages have enabled readers to put interesting schemes into practice, but many other types of extraordinary traffic also lend themselves to reproduction on miniature railways. In carrying out schemes of this kind regular running must not be neglected, for a good deal of the fun of working extra trains is obtained from efforts to fit them into the normal routine.

The Royal Train makes an excellent "special" for a miniature railway. The train itself is of luxurious character and very smart appearance, and the elaborate arrangements to ensure safe working are particularly interesting to a railway enthusiast. For instance, facing points over which the train will pass are locked in order to prevent any possibility of derailment and shunting operations on adjoining lines are suspended during its passage.

The locomotive hauling the Royal Train carries four headlamps—one on each of the three buffer beam brackets, and one below the chimney. This gives us the opportunity to make up and operate in miniature a very distinguished-looking train. The Hornby No. 2 Special Pullman coaches, with their smart brown and cream livery and with their wheel tyres painted white, are excellent representatives of the vehicles of the real Royal Train. The miniature express locomotive employed should be polished for the occasion and, as one of our illustrations shows, it will present an imposing appearance when displaying headlamps on the four brackets provided for the purpose.

It was formerly the custom to decorate the engine of a Royal Train and even to whitewash the coal on the tender, but this has fallen into disuse. The display at the front of the miniature engine of a small crown or royal coat-of-arms of suitable size cut from a coloured advertisement will strengthen the appearance of importance that the four headlamps give.



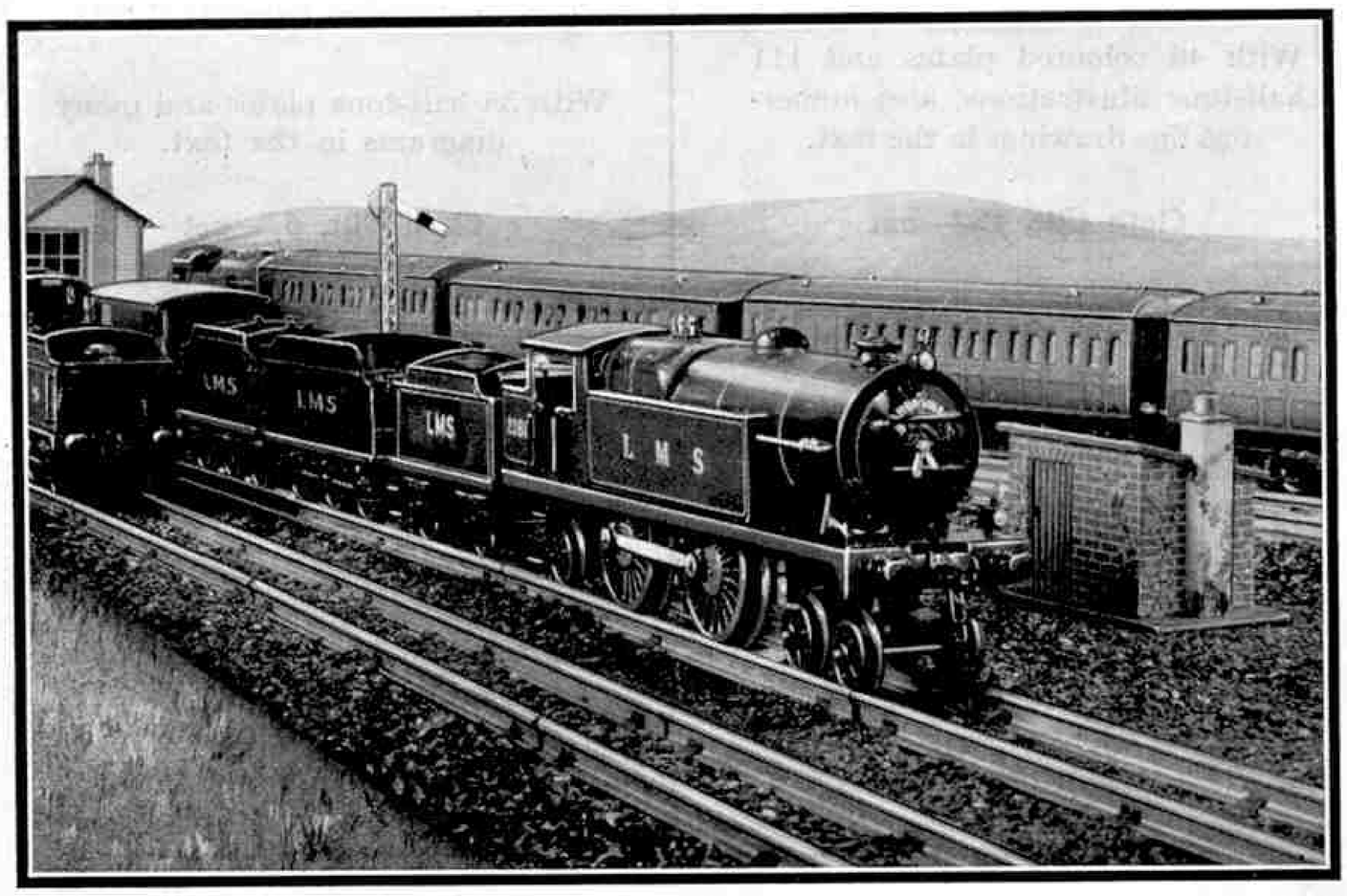
A ballast train at work on a Hornby railway. The Engineer's "inspection train" drawn up alongside is formed of a No. 1 Pullman Composite Coach and a locomotive of obsolete type, as suggested in this article. The disused Guard's Van doing duty as a platelayer's hut will be noticed at the lineside.

Other interesting examples of special trains are seen when railway directors and chief officers are making a tour of inspection, or perhaps visiting a certain spot for a particular purpose, while District Engineers also have special vehicles for use when travelling to places where work is in progress. The coach used on a "special" of this kind is generally of the saloon type, and often has the rear part specially arranged for observation purposes. The locomotive employed is sometimes a respected veteran that has retired from active passenger service, and is used only on inspection work and similar light duties of a special kind. It is usually well-cleaned and polished and consequently has a very smart and well-kept appearance in spite of its age.

This practice suggests yet another interesting feature for reproduction on a miniature layout. The inspection saloon may be quite well imitated by a No. 1 Pullman coach, now replaced perhaps on first-class main line work by No. 2 Special vehicles. Provision of the locomotive should not be difficult, for most railway owners possess an old engine that is still in good condition, but is scarcely capable of taking its place in regular heavy-duty working. If this is of a type not now available it will represent even more realistically

the obsolete veterans usually employed as inspection engines, and a load of one coach, and that only a four-wheeler, should not cause any difficulty in the matter of haulage. One of the accompanying photographs shows an "inspection" engine and coach drawn up at a spot where engineering operations are in progress on the line. Fresh ballast is being put down from the work train, and the scene is given additional interest by the presence of the inspection unit.

Another suggestion that introduces a realistic touch is contained in the same photograph. Readers will often have seen old coaches or brake van bodies mounted on the ballast at the lineside. These are used for several purposes. They may serve as ordinary platelayers' huts, for the storage of tools and stores, or as meal-time accommodation for the staff at some depot. Imitation of this practice enables miniature owners to make good use of obsolete or worn-out rolling stock. In the illustration referred to, the body of a guard's van placed near the signal box is doing duty as a hut for the use of the gang engaged in the reballasting that is in progress.



An interesting train of tenders going for repairs hauled by a No. 2 Special Tank. A train of empty coaches is waiting in the sidings in the background.

The running of coaching stock empty is sometimes necessary in order to work vehicles to a spot where they are required to form a train. This course may be followed in miniature, when the chief interest will be in the lamp code used on the locomotive. One lamp is placed over the right-hand buffer, and the other below the chimney, but variations from this are found in certain districts. Sometimes the empty coaches are attached at the rear of a goods train that may be going in the required direction. The opportunity is thus taken of getting them to their destination without requiring another locomotive, and without additional occupation of the line. This method may quite well be employed on a miniature system, for it will lend additional interest to operations, and the avoidance of the use of an extra locomotive is an important consideration.

A representation of the Royal Train on a Hornby railway. It is distinguished by the fact that the locomotive hauling it—in this case a No. 2 Special Midland Compound—displays four headlamps, one on each bracket at the front end.

Long trains of empty stock are usually made up when the vehicles in question are being returned to the carriage works for overhaul. The appearance of these trains is often interesting, owing to the variety of the rolling stock of which they are composed. Small and low-roofed local coaches are found mixed up with luxurious modern bogie coaches, with lofty roofs, that are possibly of all-steel construction and are without any of the projecting mouldings as common on the older wooden coaches.

This brings us to an even more interesting "special"—one consisting of a number of locomotives coupled together and being towed to the works for repair. They look very curious like this, as the mixture of types is often remarkable. When these engines are ready for service once more they are often given trial runs down the main line, two or three being coupled together for the purpose. This scheme may be varied on a Hornby layout if several engines require attention. They may be worked to a convenient point on the layout and the necessary cleaning, adjustment and lubrication carried out. The locomotives concerned should all travel under their own power, for it is not advisable to force one clockwork locomotive along by means of another, damage to the spring being an invariable result.

Tenders also make an interesting train load, and are of course quite easy for a locomotive to manage. One of our photographs shows what a fascinating appearance a train of this kind has on a miniature layout. The joining of the tenders together presents no special difficulty, as the couplings at their leading ends may have wire loops temporarily attached to them in order to enable them to be joined to other similar couplings, or to those already fitted at the rear ends of the vehicles in front of them.

Interesting trains are sometimes seen conveying traffic of the "horse and carriage" variety, though these have become more rare than formerly owing to the popularity of the motor car. It is still necessary to convey such traffic occasionally by rail, however, and readers will find its reproduction most fascinating.

Aviation of To-day

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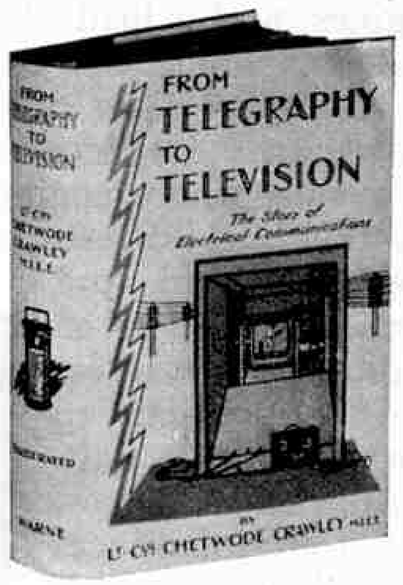

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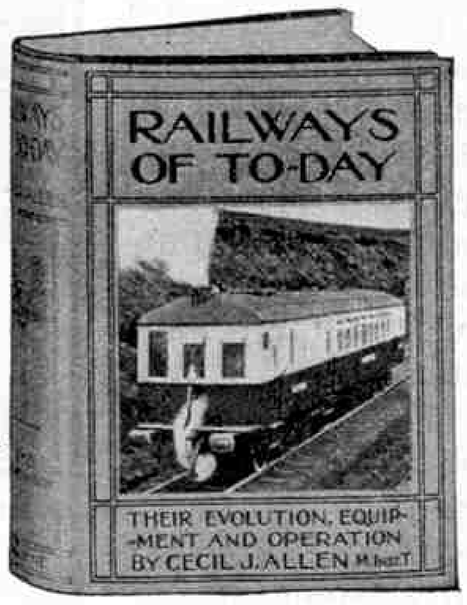

FREDERICK WARNE & CO. LTD.
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NEW HORNBY ACCESSORIES

Every owner of a Hornby Railway will be pleased to learn that he can now add life and interest to his station and goods yard by means of Posters, Poster Boards and a realistic Hoarding. Details of new Hornby goods are as follows :—

M TUNNEL - Price 2/6.

POSTERS IN MINIATURE. These are reproductions of familiar national advertisements. They are intended to be pasted on the Station Hoardings or the Poster Boards described below, and are beautifully printed in full colours.
Packet of 51, Price **6d.**

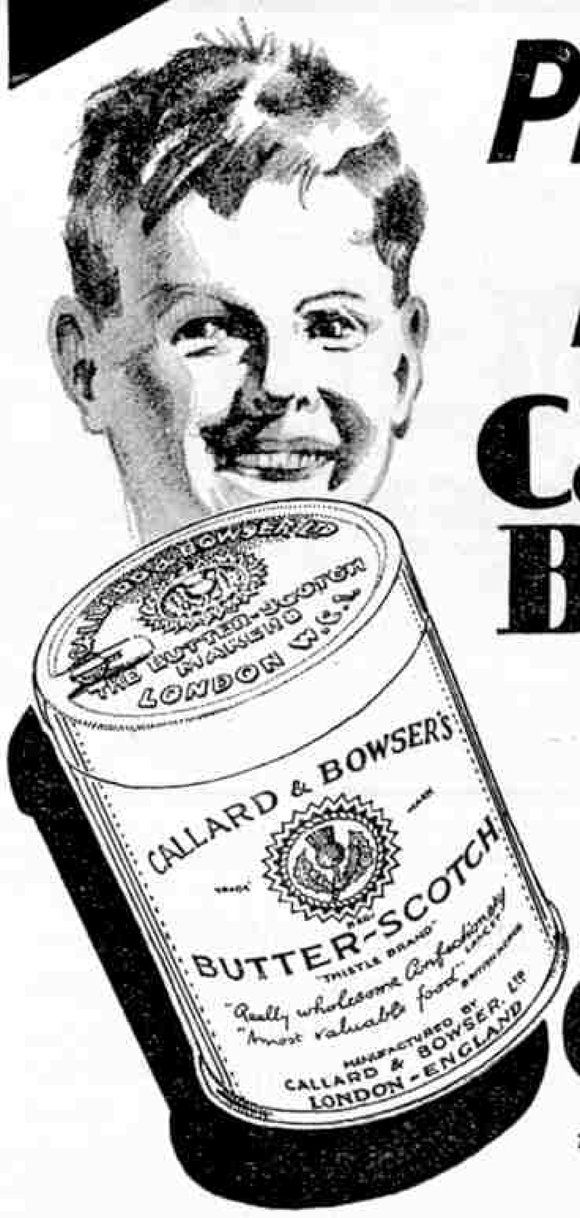
POSTER BOARDS to carry Hornby Miniature Posters. They are provided with lugs for attachment to paled fencing, etc.
Packet of 6 (3 large, 3 small), Price **6d.**

STATION HOARDING. A strongly built accessory on which the miniature Posters may be mounted, as desired.
Price **8d.**

MECCANO LTD., OLD SWAN, LIVERPOOL

Sectional illustration showing Poster Boards hanging on the fencing of a Hornby Station, together with a Station Hoarding.

BUTTER-SCOTCH *Please!!*



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Callard & Bowser's

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Sold in the original paper packets at
1d. 2d. 6d. & 1/-
and in
6d & 1/-
round airtight tins

CALLARD & BOWSER LTD., DUKE'S ROAD, LONDON, W.C.1.

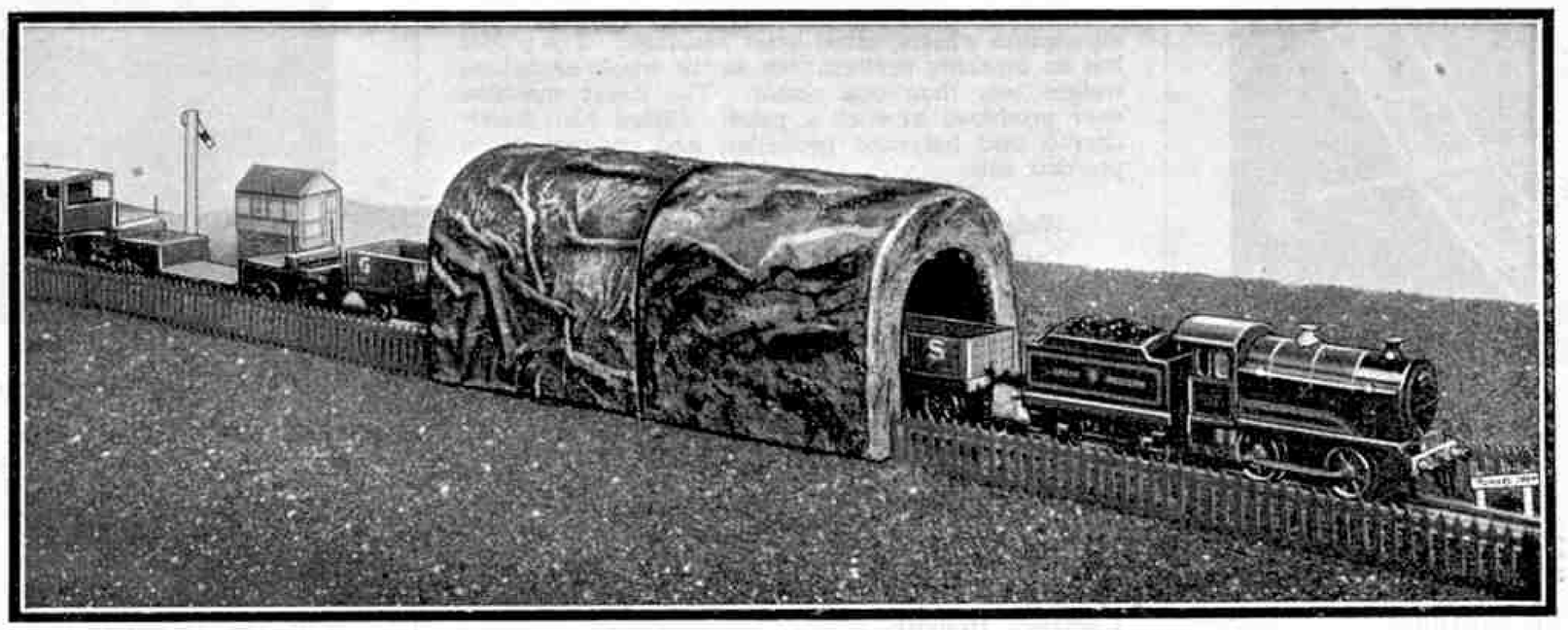
S.C.P. 114

Hornby Miniature Railway Staff

More Realism for Station Platforms

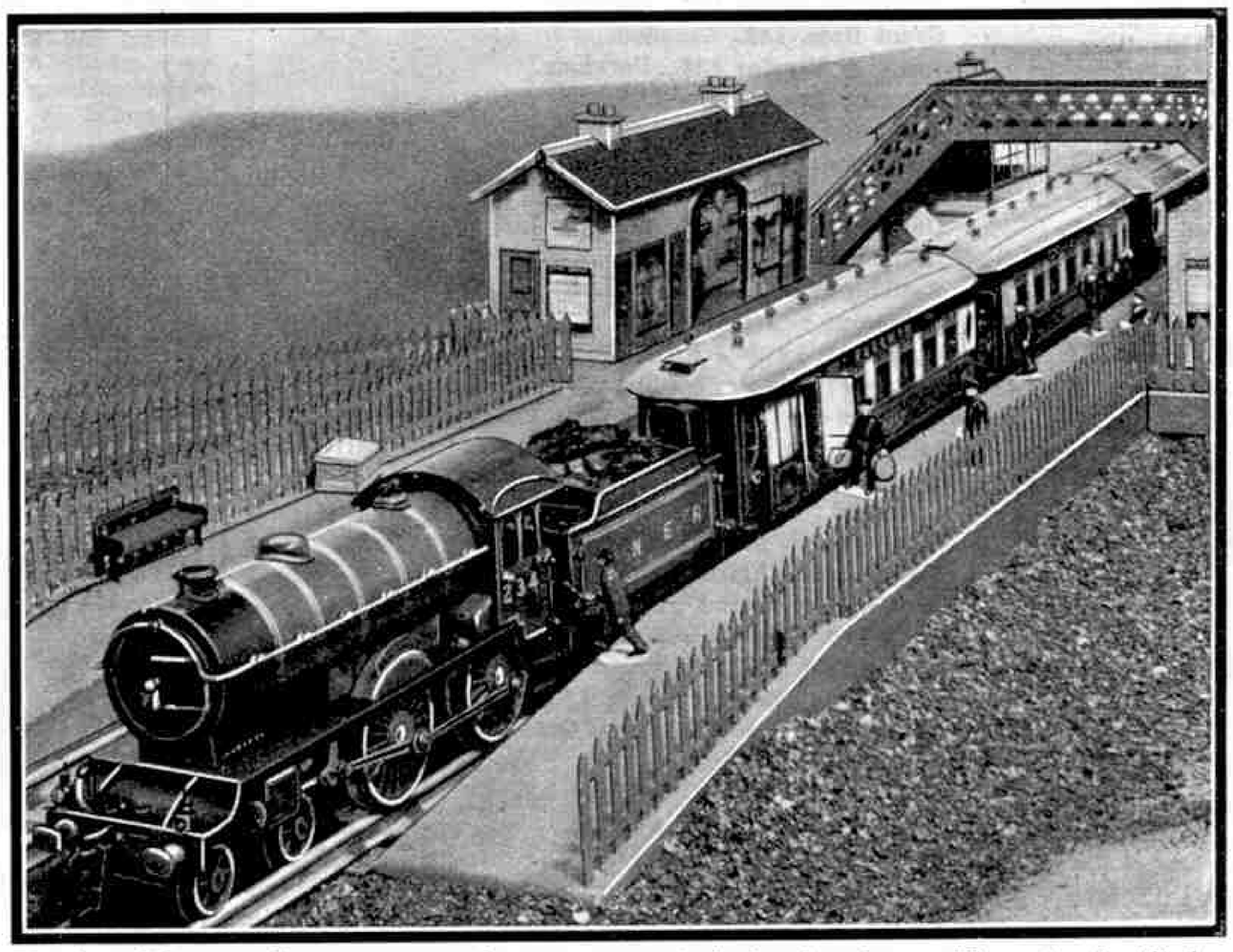
By "Tommy Dodd"

ALL model railway enthusiasts who have developed their hobby to any extent have felt from time to time the difficulty of making their stations look "alive." It is impossible to arrange for movement in a model station, and no matter how active and realistic the railway as a whole may be, a bare stretch of platform spoils the general effect by its stolid and unattractive appearance. In order to break up the monotony of the Hornby Station platforms and to provide a suggestion of activity, certain miniature Platform Accessories were introduced to the system some time ago. The items include Luggage and Truck, Milk Cans and Truck, Platform Machines, and Seats. When these are distributed at suitable points on a Hornby Station platform they effect a surprisingly great improvement in appearance. Although there is of course no actual movement, the tiny accessories give a strong suggestion of the daily activities of the average station.



The effective appearance of the new M Tunnel is well indicated in this picture in which two of these tunnels are placed end to end, to obtain greater length. A mixed goods train is passing through.

These Railway Accessories proved enormously popular, but Hornby Railway enthusiasts were not satisfied—they wanted miniature railwaymen and passengers to add the final touch of realism. This month we are glad to be able to announce that the first step has been taken to satisfy this demand, in the form of six splendid little railwaymen issued in a set known as Modelled Miniatures No. 1. The figures represent a Stationmaster, a Ticket Collector, a Guard, a Locomotive Driver and two Porters. The miniature railway figures that have been available hitherto have almost all suffered from a stiff and stodgy appearance that made them very unattractive. These Hornby figures are free from this defect, and are remarkably life-like in appearance. Another point of great importance is that the figures are of the correct height for Hornby and all other No. 0 gauge railways. Thus they fit in perfectly with the general scheme, and do not dwarf everything in their neighbourhood when they are placed on a station platform or near an engine or train.



Hornby miniature railwaymen preparing an express train for departure. The natural attitudes of these platform figures, as described in this article, give a most realistic air to the scene.

The Stationmaster has the dignity that is peculiar to his rank. He is an imposing personage in a long coat, and his gilt buttons and gold braided cap are visible signs of authority. He is standing in an attitude of attention, with a sheaf of papers in his hand. Surveying the scene with calmness, he is an impressive figure, and looks extremely well either on the passenger station or goods platform, superintending the business of the moment.

No one without a ticket can hope to reach or leave a platform of a Hornby station where the Ticket Collector is on duty! He has a businesslike appearance, with his nippers in one hand and the other hand outstretched to take tickets. He has a short coat with silver buttons, and looks very efficient. In addition to his obvious use at the ticket barrier, he may also be "posed" at a carriage door, about to enter the train during a stop at a station where tickets are examined or collected.

The Guard is thoroughly businesslike. His whistle is held to his mouth, and he is almost in the act of waving his flag as the signal for departure. He is equally suitable standing facing the train or with his back to it, so that he may be used on any station with ordinary or island platforms, and for trains in either direction.

The Locomotive Driver is attired in the blue overall suit of his calling, and his cap is of the correct shape. He is holding a long-spouted oil can in his hand, and his general appearance of activity shows that he is keen on his job.

The two Porters are energetic-looking men. One is carrying a suitcase and a hatbox, and the other is hurrying forward to attend to any job that may be necessary. The attitudes of both are well arranged, and they are attired in the sleeved waistcoat in which we are accustomed to see them at work. The Porter who is not carrying luggage is a particularly useful figure, for he may be used almost anywhere on the layout—on the station platform, passenger or goods, crossing the line, proceeding to the signal cabin, or in the goods yard when shunting operations are in progress.

This is a good opportunity for mentioning another new accessory, the M Tunnel, which undoubtedly will be warmly welcomed by Hornby Railway owners. This Tunnel has been produced in response to the insistent demands of those who require something simpler than the standard Tunnel, but who do not wish to employ the separate Tunnel Ends, making up the remainder of the bore and the covering themselves. The new M Tunnel should appeal to all who aim at realistic effects, for it is covered in a special manner to represent rock, soil and vegetation.

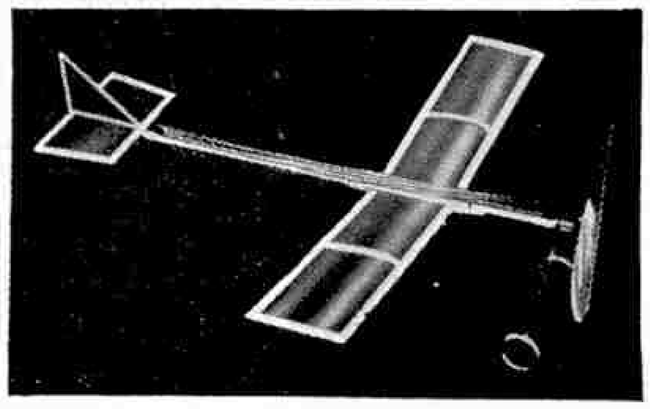
OUTSTANDING FLIGHTS

LONGER—FASTER—HIGHER

WARNEFORD AIRPLANES

Performance counts—NOT size!

LONG, FAST FLIGHTS AND BEAUTIFULLY FINISHED



The "MOTH" Tractor *Price 4/6*

Length 19 in., span 18½ in., fitted patent double-bearing and shock-proof chassis, 8 in. hand-carved and balanced propeller, covered red proofed silk. A splendid flier, and beautifully finished. At the price this model is undoubtedly the finest value ever offered.

(Patent No. 296946).

Weight, 1 15/16 ounces. Distance, 550 feet.
Speed, 15 m.p.h. Ceiling, 50 feet.
Rises from the ground.

100% more Power with Geared Drive

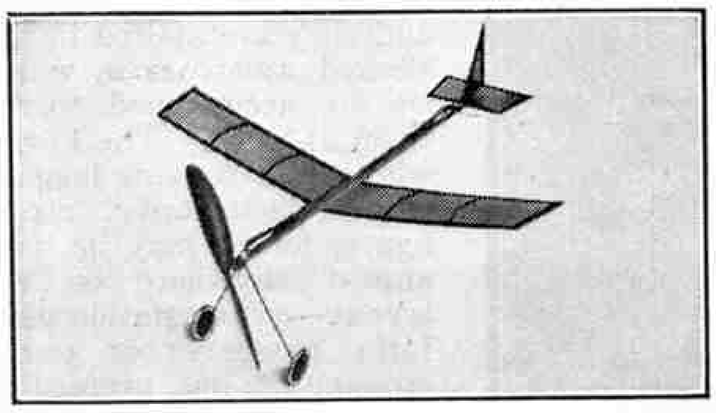
The "RACER" Tractor *Price 21/-*

Length 32 in., span 31 in., fitted 12 in. hand-carved and balanced propeller, patent twin gear rocking bracket and shock-proof chassis. Reinforced frame, wing covered yellow proofed silk with identification discs. A fast and powerful machine, designed for the aeroplane enthusiast. The twin gear drive fitted to this machine gives 100 per cent. more power than a single unit.

(Patent No. 296946).

Weight, 7 ounces. Distance, 1,200 feet.
Speed, 19 m.p.h. Ceiling, 90 feet.
Rises from the ground.

SUPER PERFORMANCE DUE TO WEIGHT REDUCTION



The Warneford "IMP" Tractor *Price 6/-*

Length 23 in., span 20⅝ in., fitted 9 in. hand-carved and balanced propeller. This new model is of all-round increased performance, due to a general reduction in weight. It is fitted with the usual Warneford shock-proof chassis and a 9 in. hand-carved balanced propeller, and also a four-ribbed main-plane. This model, having a steel wire tail-plane, is capable of being set for stunting.

Weight, 2⅛ ounces. Distance, 750 feet.
Speed, 12½ m.p.h. Ceiling, 60 feet.
Rises from the ground.

The "NIPPER" *Price 2/6*

SPECIAL FEATURES: A long bearing allowing no movement or wobble on the propeller—therefore a steady flyer. High-tension steel wire tail and rudder—therefore model can be adjusted for stunting. All aluminium wheels, fitted brass bearings. The model has an amazing performance as the whole aeroplane weighs less than one ounce. The finest machine ever produced at such a price. Fitted 7 in. hand-carved and balanced propeller, and covered green proofed silk.

(Patent No. 296946).

Weight, 1 oz. Distance, 400 feet.
Speed, 12½ m.p.h. Ceiling, 40 feet.
Rises from the ground.

During the Xmas Season WARNEFORD Experts will be in attendance at the following Stores :

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Gamages, Holborn.
Gamages, Cheapside.
Barkers, London.
Army & Navy Stores.
Whiteleys, London.
Daniel Neal & Co. Ltd., London.
Thomas Wallis & Co. Ltd.
G. Cozens & Co. Ltd., Edgware Road.
Bon Marche Ltd., Brixton.
John Barnes Ltd., Finchley Road.
Arding & Hobbs Ltd., Clapham.
Grant Bros. Ltd., Croydon.
Jones & Higgins Ltd., Peckham.
Belfast : Robb & Co. Ltd.
Birmingham : Lewis's Ltd.
Bournemouth : J. E. Beale Ltd.
Bournemouth : Brights.
Darlington : Binns, Son & Co. Ltd.
Derby : Midland Drapery Co. Ltd.
Eastbourne : J. E. Beale Ltd.
Edinburgh : Jenners Ltd.
Glasgow : Lewis's Royal Polytechnic Ltd.
Glasgow : Lumley's Ltd.
Kingston-on-Thames : Bentalls Ltd.
Littlehampton : Townsend's Ltd.
Liverpool : Lewis's Ltd.
Liverpool : Blackler's Ltd.
Manchester : Kendal Milne & Co.
Manchester : Lewis's Ltd.
Newcastle-on-Tyne : Hy. A. Murton Ltd.
Norwich : Jarrold & Sons Ltd.
Nottingham : Toby's Stores.
Plymouth : Spooner & Co. Ltd.
Scarborou h : Rowntrees & Sons Ltd.
Sheffield : Cole Bros. Ltd.
Southampton : Wm. McIllroy Ltd.
Southport : Bobby & Co. Ltd.
Torquay : Bobby & Co. Ltd.
Paris : A la Samaritaine.
Paris : Aux Trois Quartiers.

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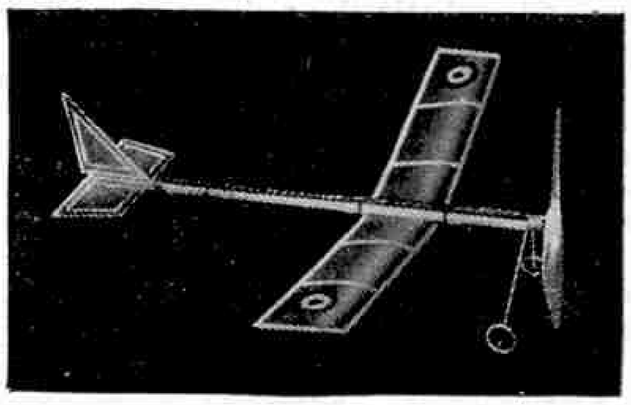
For Stunting—The "Sports Model"



The "DEMON" Tractor *Price 7/6*

Length 25½ in., span 23 in. Fitted 10 in. hand-carved and balanced propeller, patent double-bearing and shock-proof chassis, covered yellow proofed silk with identification discs. Weight and wind resistance are reduced to a minimum in this model, giving the utmost duration of flight.

(Patent No. 296946).

Weight, 3¼ ounces. Distance, 850 feet.
Speed, 16 m.p.h. Ceiling, 80 feet.
Rises from the ground.

FOR LONG and STEADY FLIGHTS

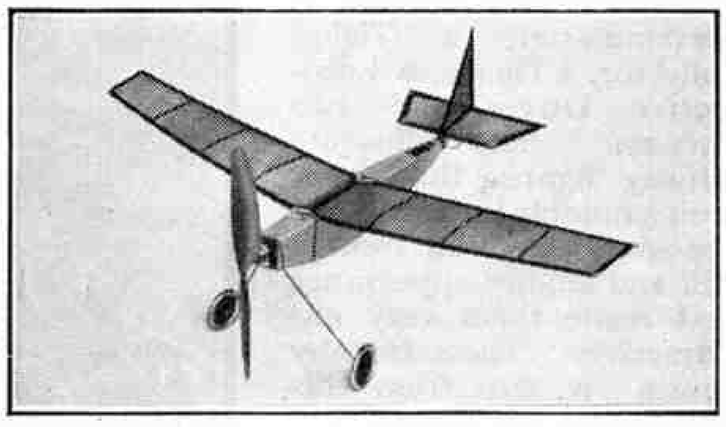
The "SWIFT" Tractor *Price 10/6*

Length 30 in., span 26½ in., fitted 11 in. hand-carved and balanced propeller. Patent double-bearing and shock-proof chassis. Covered yellow proofed silk with identification discs. A long and very steady flight is obtainable with this model, which although of large dimensions is very easy to handle.

(Patent No. 296946).

Weight, 4⅛ ounces. Distance, 1,250 feet.
Speed, 15½ m.p.h. Ceiling, 100 feet.
Rises from the ground.

REALISTIC APPEARANCE and a GOOD FLIGHT



The Warneford "Whippet" Fuselage Model *Price 17/6*

Length 20⅝ in., span 30 in., fitted 11 in. hand-carved and balanced propeller, and covered orange proofed silk. This beautiful Fuselage Model Aeroplane has an excellent performance, is very strong, and has full adjustment of main-plane, tail, and fin. It dissembles and folds so that it fits into a very small box for storage and transport. The finish is in keeping with the usual Warneford high standard.

Weight, 4⅜ ounces. Distance, 550 feet.
Speed, 17 m.p.h. Ceiling, 50 feet.
Rises from the ground.

Suggested Hornby Train Improvements

CONVERTING ORDINARY POINTS FOR CONTROL WORKING

As soon as the Hornby Control System is installed on a layout the desire is felt to apply it to as many of the existing hand-operated points as possible. The conversion to control working involves the substitution for the existing hand lever and sleeper of a special sleeper fitted with a bell crank and coupling to enable the points to be connected to the Lever Frame. This special control sleeper costs 8d. (postage 2d. extra), and may be obtained separately by ordering it specially through a dealer or direct from Meccano Limited.

As the lever sleeper is soldered to the rails the application of heat is necessary to remove it. A soldering iron or a small self-blowing lamp burning methylated spirit may be used for this purpose. The old sleeper should first be heated at one end, and when the solder melts the bottom part of the sleeper should be forced away from the top. The other end is then heated and the bottom pulled right off. The point rod is removed by bending down the clip that supports it. Each rail is now heated where the lugs of the sleeper grip, and when the solder melts, these lugs should be prised up and the top part of the sleeper may then be removed. The new sleeper is placed in the position occupied by the old one, and the pin, which is fixed in the link attached to the bell crank, should be passed through the hole provided in the end of the switch rail assembly. If the bottom of the pin is supported upon some hard flat surface, a small hammer and punch will enable the necessary riveting of this pin to be carried out satisfactorily. The lugs of the sleeper should now be pressed home firmly, so that they grip the rails. A little soldering flux should be applied to each rail round the edges of these lugs, and a small piece of solder placed in position. Heat is then applied, and the solder will run round the edges of the lugs. This process is carried out for each rail, and the complete points are then put aside for a moment or two to let them cool and allow the solder to set. Any excess of flux may be removed by wiping the rails with a rag dipped in methylated spirits, and the points are ready to connect up to the Lever Frame.

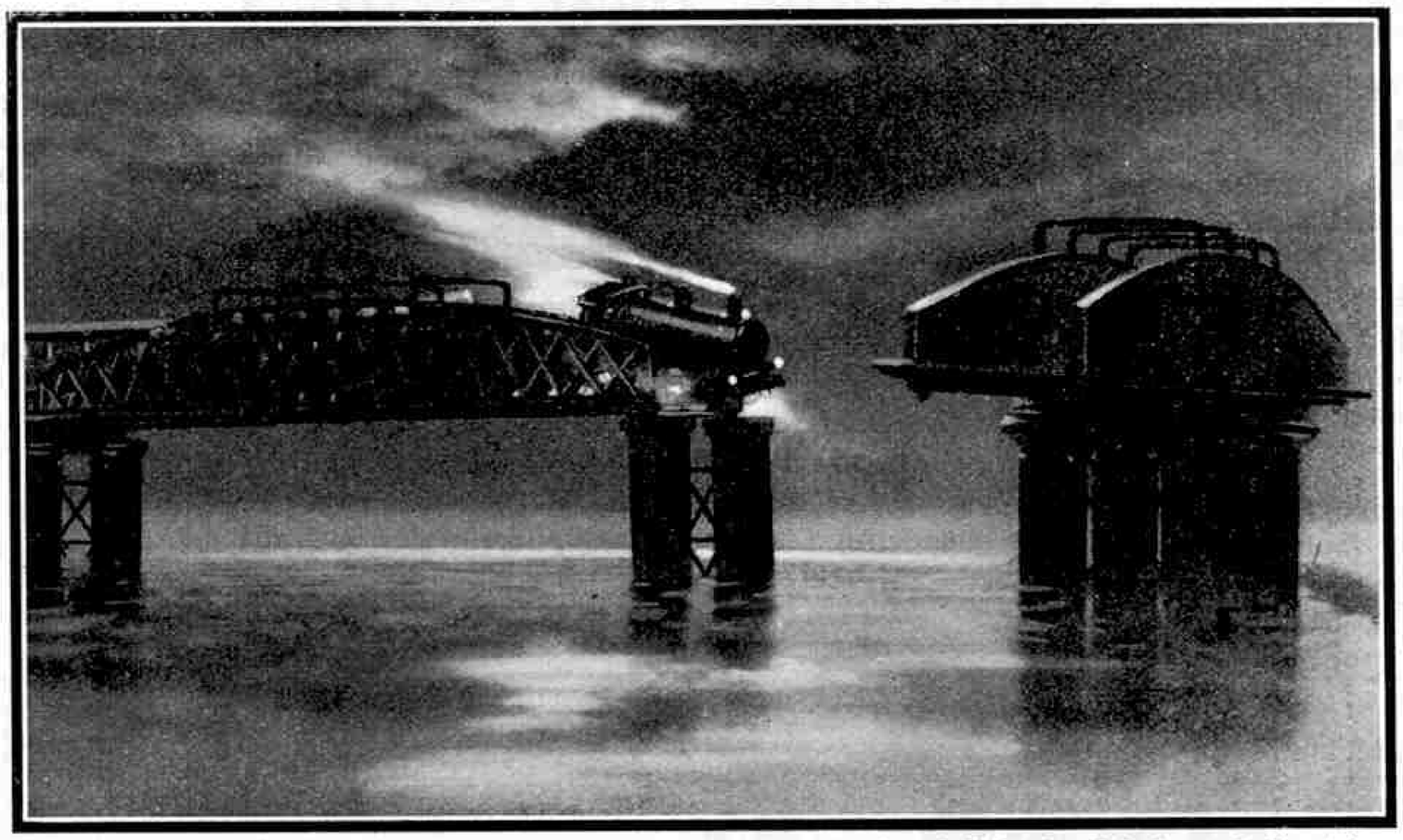
CLEANING CLOCKWORK MECHANISMS

When a clockwork locomotive has been in use some time, a falling off in power may be noticed, and inexperienced owners frequently are unable to explain this. Over-oiling may be the cause, for a surprising amount of dust sticks to oily bearings on locomotives that are often in use, and eventually this finds its way into the mechanism and reduces its efficiency. Thorough washing with petrol or paraffin will remove it.

In order to clean the mechanism it is best to remove it from the body of the engine. The connecting rods of engines with outside cylinders may have to be removed, but this depends upon the type of engine and the means by which they are secured. It is better, where possible, also to remove the coupling rods, and care should be taken to put the crank pin nuts in a box or some other safe place to prevent them from being lost

After undoing the nuts on the holding bolts beneath the engine, the mechanism may be carefully withdrawn from the housing. Petrol or paraffin should then be passed through the mechanism in order to wash out the clogging oily dust. Petrol is the better of the two and it is a good plan to keep a separate oil can filled with the liquid chosen in order that it may be ready for use when required for this purpose. The mechanism should be allowed to stand in a disused tin box lid, so that all oil and dirt falls into this. As the liquid passes through the mechanism, this may be wound up while it is held in the hand and the wheels allowed to revolve gently in order to assist the petrol or paraffin to work out the dirt.

The wheels and side plates of the mechanism should be wiped clean after washing and it should be left on one side until the petrol has evaporated. The moving parts of the mechanism should then be lightly oiled, and it is a good plan to introduce a few drops between the plates of the spring. Before replacing the mechanism, the engine itself should be cleaned up and the interior rubbed with a rag dipped in petrol as a certain amount of oil is flung about by the mechanism.



The "Ghost Train" plunges headlong to destruction! The culminating thrill in the Gainsborough film taken with the assistance of the Great Western Railway, as described on page 952.

COAL IN WAGONS AND TENDERS—A great increase in realism is effected by providing locomotive tenders and wagons with coal. Merely placing coal in these vehicles makes them dirty, however, and any mishap or derailment results in the material being strewn untidily about. It is much more satisfactory to build a framework of cardboard that fits inside the wagon or tender in a position just below the top of its sides. This framework should be painted black. Pieces of coal of suitable size are then washed, preferably by leaving them overnight in water, and when dry are strewn on top of the cardboard framework after this has been thinly coated with Seccotine or glue. As far as possible the coal should be heaped up in a realistic manner in order to give it the appearance of having been tipped into the vehicle. When the glue has set the load is ready for use. This method has the advantage of cleanliness and lightness, and when necessary the load may be removed from the wagon or tender without difficulty.

LARGER ENGINE SHEDS.—If you find that the present Hornby Engine Shed is not large enough for your requirements, we suggest that you join two No. 2 Sheds together to make a longer shed, or place them side by side. The effect obtained in either case will be found most realistic, as you will have noticed from photographs previously published in the "*M.M.*" The introduction of a larger shed is out of the question on account of its immense size. (*Reply to F. F. Taylor, Chester*).

GERMAN STATE RAILWAYS LOCOMOTIVE.—We are interested in your proposal that we should introduce into the Hornby Series a representation in miniature of a German State Railways locomotive. Such an engine would be useful in conjunction with the recently-introduced "Mitropa" coaches, and your suggestion will be carefully considered. (*Reply to P. West, Oxford*).

CATTLE WAGON WITH DROP DOORS.—We are unable at the moment to introduce a new model of the Hornby Cattle Truck. Your suggested arrangement of the doors to conform to actual practice—the lower portion acting as a loading flap—would be a great improvement, and possibly this feature will be incorporated in any revised design of these vehicles that may be brought out. (*Reply to T. Winstanley, Lincoln*).

TINPRINTED EMBANKMENTS.—The production of a model embankment to be sold in lengths as you suggest would no doubt be a simple matter. We think, however, that such an accessory would not be altogether welcomed by miniature railway owners, as they much prefer to construct their own embankments according to the conditions obtaining on their own layouts. If you wish to build an embankment on your line we suggest that you follow the hints given from time to time in these pages and study the photographs illustrating them. (*Reply to D. Butler, Gravesend*).

TUNNEL ENDS FOR DOUBLE TRACK.—This is an interesting idea and probably Hornby Train enthusiasts would like to see the introduction of such an accessory. We are filing the suggestion for consideration, and if a favourable decision is reached an announcement will be made. (*Reply to T. P. M. Leigh, Malpas, Cheshire*).

DETACHABLE NAMEPLATES FOR HORNBY LOCOMOTIVES.—This is a novel scheme, but possibly you have not considered the fact that if the name of a locomotive were to be changed it would be necessary to alter its number also. As the numbers are transferred on to the locomotives, no facilities are afforded for alterations, so that we regret your idea cannot be given further attention. (*Reply to K. Ford, London, S.W.17*).

NEW SERIES OF 4-4-0 LOCOMOTIVES.—At the moment we do not propose to go into the question of introducing a new series of 4-4-0 locomotives as the present ones are proving exceedingly popular. Next season however your idea may be considered, as there are of course many worthy prototypes at work in addition to those represented by our No. 2 Specials which would be well received if introduced. (*Reply to T. E. Frodsham, Bradford*).

THE "PHOTOWEIGH" MACHINE

This wonderful machine is entirely automatic and gives you your Photograph and correct weight on payment of 2d. Don't miss it.

GAMAGES

THE PERFORMING INSECTS

These insects are formed into a circus. You can see them tight-rope walking, weight lifting, dancing, chariot racing, etc. Admission, including Tax, Adults 7d., Children 4d. First Floor.

THE ENCHANTED CASTLE AND LUCKY DIP

Imprisoned in a castle is a Fairy Princess, guarded by a great brute of a Giant.

You must seize the big gun, fire at the Giant and kill him, otherwise she may be there for years.

When he is killed she will come down from the castle and present a lucky parcel to you. Second Floor.

ZADA—THE THOUGHT READER

Zada can read your thoughts, describe with amazing accuracy any article you produce, answer any intelligent question. This lady is blindfolded, and there is definitely no means of communication of any sort other than thought transmission. Ground Floor.

Admission, including Tax, 6d.

HOLBORN 1931 XMAS BAZAAR

THE BOYS' OWN STORE STAGES ITS GREATEST CHRISTMAS SENSATION

BOYS! This year Gamages Christmas Bazaar is staged on a larger scale than ever before. It is the Bazaar of a thousand thrills. Here we describe briefly, some of the special attractions which you will find of absorbing interest. But words cannot do justice to the marvellous array of Toys, Models, Games, Hobbies, etc. and the wonderful Christmas atmosphere which prevails throughout the store.

THE ROBOT MAN

Thousands upon thousands will want to see this amazing piece of mechanism, this almost human figure that moves . . . . . and talks.

It will leave you thrilled and amazed, that human ingenuity can produce such a figure . . . a figure that may well be the forerunner of a ROBOT race of the future.

Admission, including Tax, Adults 7d., Children 4d. First Floor.

GAMAGES ZOO

Here is a fascinating attraction. See the guinea pigs, monkeys, birds of every shade, size and nationality, dogs, cats, rabbits, etc.

Any animal can be purchased! So if any one of them captivates your fancy, you can take it home with you. Lower Ground Floor.

Demonstrations

On every floor there is a demonstration of intense interest to Boys, principal among them being:

MECCANO,
HORNBY,
ELECTRIC MODELS,
RACING CARS,
AEROPLANES,
LODOMO BRICKS,

CHAPMAN'S FAMOUS CIRCUS

One long thrill. See the Two White School Horses from the Coliseum; Isabella, England's foremost Lady Rider; 'Appy-'Arry on the Wire; Chapman's Clowns; The Five Wonderful Comic Black Bears; Two Girls and a Boy on a Trapeze; The Famous Six Royal Cream Ponies.

Admission by Ticket only—price 7d., including tax. Performances 12, 2, 3, 4 and 5 o'clock. Saturdays 11 and 12 o'clock. Advance bookings. State time and date required to:—CHILDREN'S CIRCUS BUREAU, GROUND FLOOR.

Demonstrations

Continued:—

TOOTSIE TOYS,
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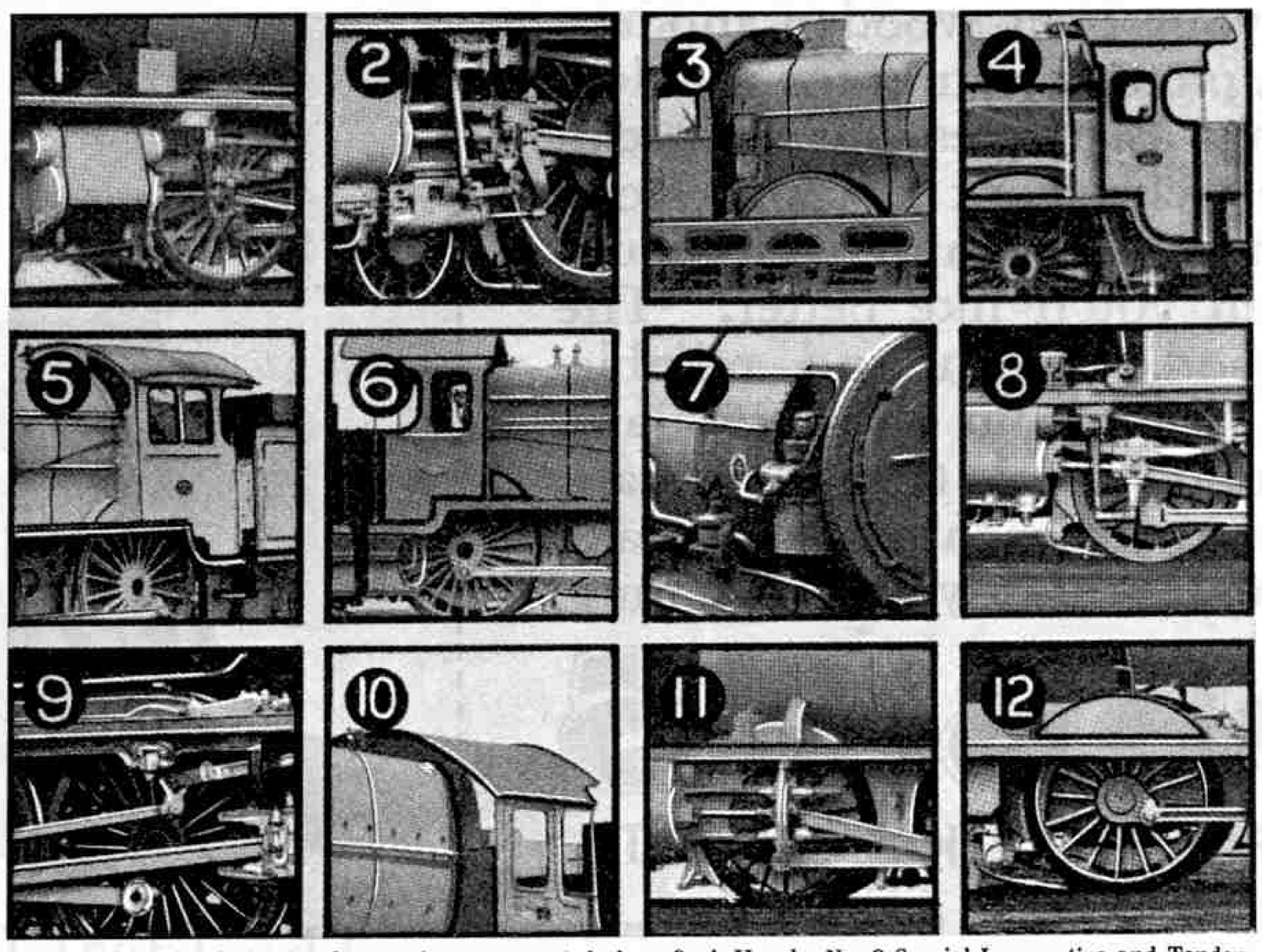
H.R.C. Christmas Competition

True-to-Type Locomotives as Prizes

A FASCINATING LOCOMOTIVE PROBLEM

One of the finest Christmas presents a member of the H.R.C. could have is a Hornby No. 2 Special Locomotive and Tender, beautifully finished in the colours of any one of the four great railway groups. The ability this locomotive has shown for hauling heavy trains over long distances has made it a great favourite with all miniature railway owners. To receive one unexpectedly on the morning of Christmas Day would be a splendid surprise, and our competition this month is destined to give four H.R.C. members this pleasure.

In this simple, yet fascinating special contest, all that competitors are required to do is to identify the twelve locomotives of which portions are shown in the accompanying illustration. When he has traced the originals of the sections, each competitor is required to make a list in numerical order, giving the class and wheel arrangement of the locomotives concerned, together with the names of the companies owning them. The sender's name and full address must appear at the end of the list, and each entrant also is required to state which No. 2 Special Locomotive and Tender he would like to have in the event of his being awarded one of the prizes.



Can you identify the twelve locomotives represented above? A Hornby No. 2 Special Locomotive and Tender, finished in the colours of his favourite railway, will be awarded to the sender of each of the four best entries in the competition announced on this page.

The No. 2 Special Locomotives and Tenders will be awarded to the senders of the four most accurate lists, and in addition to the principal prizes there will be others consisting of Hornby Train goods (or Meccano products, if preferred) to the value of 10/-. Neatness and novelty in presentation will be deciding factors if there is a tie for any one prize.

Envelopes containing entries should be clearly marked H.R.C. "*Christmas Locomotive Contest*" in the left-hand corner and should be addressed to Meccano Limited, Binns Road, Old Swan, Liverpool. Competitors are asked to note particularly that entries in the Home Section must arrive not later than 19th December, this date having been fixed in order to allow ample time for the despatch of prizes to reach the winners on Christmas Day. The Overseas Section closes on 31st March, 1932.

Entries received after the published closing dates will not be entertained and any not bearing the competitor's H.R.C. membership number will not be accepted.

Railway Joke Contest

Most H.R.C. members will be familiar with the usual jokes that are made by habitual travellers upon their local railways. Any peculiarity or failing in the services, or the engines or stock employed, is immediately seized on and made the subject of a jest. Apart from this, however, we are sure that members know several stories connected with the actual working of a railway. Thus the guard who applies the brakes when going uphill so that the train cannot run away backward, and the porter who employs a different accent according to the class of the passengers he is addressing, are well-known characters.

For our contest this month we want members to send up "*The Best Railway Joke*" that they have heard. The Contest will be divided into two sections, Home and Overseas. Prizes of Hornby Train material (or Meccano products if preferred) to the value of 15/-, 10/6, 5/- and 2/6 respectively will be awarded to the senders of the four best jokes in each section.

Entries should be enclosed in an envelope marked H.R.C. "*Railway Joke Contest*" and posted to reach Meccano Ltd., Binns Road, Old Swan, Liverpool, by 31st December. The Overseas closing date is 31st March, 1932.

COMPETITION RESULTS

HOME

September "Past and Present Locomotive" Drawing Contest.—First: L. Haslam (20332), Carnforth. Second: A. J. Richards, King's Heath, Birmingham. Third: S. Beeton (6649), Bolton, Lancs. Fourth: T. Bowen (7907), London, N.1.

September "Feature Essay" Contest.—First: E. Routley (3327), Brighton. Second: R. Wood (179), Gorton, Manchester. Third: J. Cables (21250), London, S.E.13. Fourth: R. Allanson (8379), Torquay.

OVERSEAS

June "Errors Contest No. 2."—First: A. N. Starling (22602), Natal, S. Africa. Second: W. Moore (20918), Toronto, Canada. Third: A. Wallace (24241), Vancouver, B.C. Fourth: J. Wilks (14252), Kroonstad, O.F.S., S. Africa. Consolation Prizes: W. T. Munro (22754), Auckland, New Zealand; A. Douglas (15376), Palmerston North, New Zealand; D. Menzies (9399), New Plymouth, New Zealand; V. Blom (13354), Johannesburg, S. Africa; J. Rawbone (17780), Claremont, S. Africa; D. Parsons (9964), Johannesburg, S. Africa; A. Gillham (14776), Sydney, Australia; D. Gordon (24698), Parkdale, Victoria, Australia; R. W. Steane (17448), Melbourne, Australia; E. A. Gay (9963), Christchurch, New Zealand; B. Neal (8942), Auckland, New Zealand; D. Culpan (22853), Fimiston, W. Australia.

June "Railway Photo" Contest.—First: F. D. Aria (12362), Bombay, India. Second: P. Galdes (14183), Valletta, Malta. Third: J. A. Coates (23863), Verdun, Quebec, Canada.

Have a Hobbies FRETWORK SET this Christmas

You can build anything you like in wood if you have a set of Hobbies Fretwork Tools. Think of it. Make your own toys, build your own wooden models, make boxes, picture frames for the den, or such things as wireless speakers, calendars, pipe racks, work tables for your people. There is nothing you could choose which you'll like better. The tools are good, British and reliable. There are Outfits from 1/- to 45/-, and each with enough tools to make a start. You can commence right away to make up something useful in your spare time.

HOBBIES

BRITISH FRETWORK OUTFITS

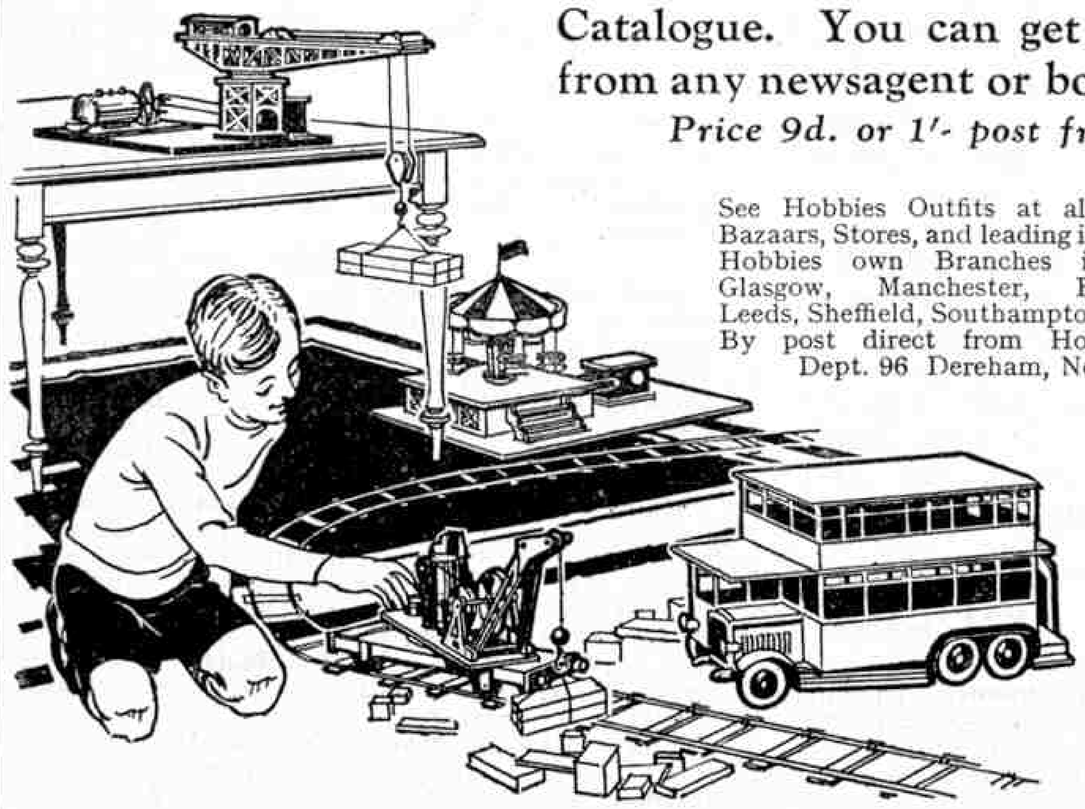
A FREE BOOK

A new interesting booklet, "Father and Son Find Hobbies Fun," free on application to Dept. 96, Hobbies Ltd., Dereham, Norfolk.

There are Outfits to suit every purse, each one containing a complete set of tools, with instructions how to use them. Modern fretwork designs are published weekly and over 1000 things to make are illustrated in the Hobbies 1932 Catalogue. You can get a copy from any newsagent or bookstall.

Price 9d. or 1/- post free

See Hobbies Outfits at all Christmas Bazaars, Stores, and leading ironmongers. Hobbies own Branches in London, Glasgow, Manchester, Birmingham, Leeds, Sheffield, Southampton, Brighton. By post direct from Hobbies Ltd. Dept. 96 Dereham, Norfolk.



The Ideal Outfit

The most popular set of tools in the world. Complete in a strong box, and including a 48-page handbook of instructions for the beginner, as well as wood and patterns for six simple articles to make. The tools include a 14 in. Cutting frame, and two dozen spare blades, a Drill and two spare bits, a polished metal Table, a special Plane, Hammer and Sandpaper block.

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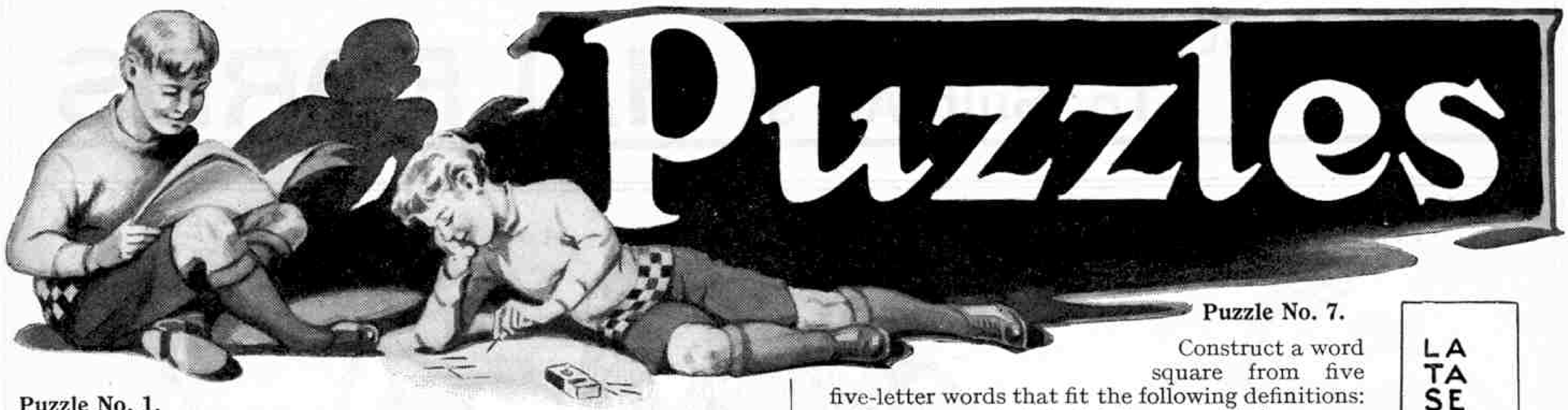
Hobbies

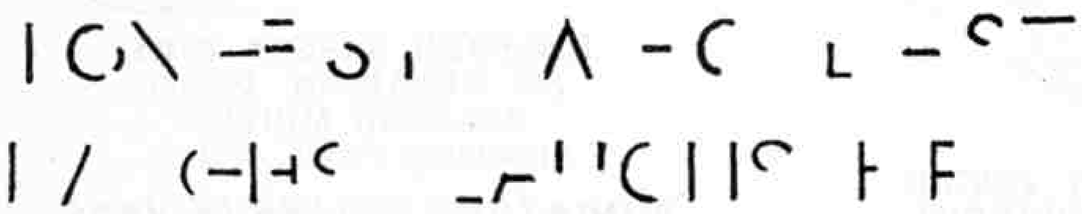
FREE GIFT

During December a special gift of an extra two dozen saws is being made with every A1 Outfit sold. These saws are equal to 1/- gift and will be supplied during December only. Such a present makes the Outfit better value than ever.



Puzzle No. 1.

The accompanying square contains the names of fifteen well-known types of aeroplanes, all of which have been mentioned in the "*M.M.*" The names of these machines will be found by



Puzzle No. 12.

beginning at a certain letter and following the king's move in chess, which is one square at a time in any direction. Every letter in the square is used once, and only the actual name of each machine is used. For instance, D.H. "Moth" is given as "Moth."

Puzzle No. 2.

A mouse one day discovered a box in which there were several ears of corn, which he proceeded to carry off to his hole. He brought out with him three ears on each journey, and altogether he found it necessary to make nine journeys before the box was empty. How many ears of corn were there originally in the box ?

Puzzle No. 3. *Contributed by G. Robinson, Tarporley, Cheshire.*

My first is in horse, but not in foal,
My second in hothouse and also in vole.
My third is in rattle but not in baby,
My fourth is in mantle but not in lady.
My fifth is in black, but not in white,
My sixth is in wealthy, but not in fight.
My whole brings joy to many a boy.

Puzzle No. 4.

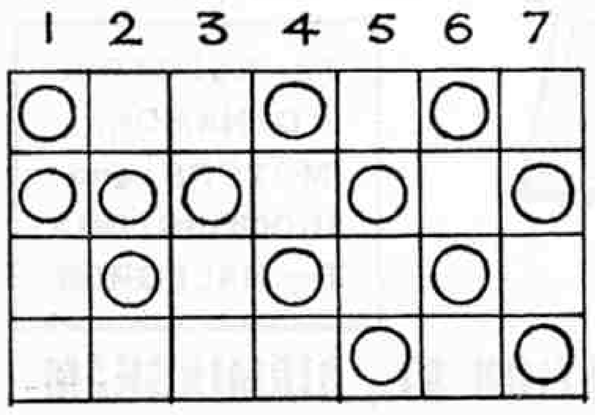
In the following collection of letters and dots, replace each dot by a vowel so as to form a sentence that reads the same backward and forward :—

R . D R . . T P . T . P T . . R D . R

Puzzle No. 5.

A spider and a fly were in a room measuring 30 ft. in length, 12 ft. in width and 12 ft. in height. The spider was in the middle of one of the end walls and exactly a foot away from the ceiling, while the fly was on the opposite wall also exactly in the middle but only a foot above the floor. The accompanying illustration shows this clearly.

The fly was sleeping and remained stationary all the time, but the spider saw his victim, crawled towards him and effected a capture. Naturally the spider wanted to get to the fly as quickly as possible. Which was his shortest route ?



Puzzle No. 11.

Puzzle No. 6.

At a certain hour yesterday morning my two clocks showed the same time. The alarm clock gained one minute an hour on correct time, while the grandfather clock lost two minutes every hour, with the result that this evening the alarm clock struck eight when the other clock struck seven. At what time yesterday did they agree?

Puzzle No. 7.

Construct a word square from five five-letter words that fit the following definitions:

Recess ; an indolent fellow ; a girl's name ; flocks ; obliterate.

Puzzle No. 8. *Contributed by Victor Davis, Penketh, Warrington.*

I am composed, please to observe,
Of many things together.
Beheaded, I am what you are
In very sultry weather.

Behead once more. This time you'll find
I'm different once again,
Yet all the time I'm close at hand,
A portion of your frame.

Puzzle No. 9.

Puzzle No. 9.

All the letters of the alphabet are contained in the bag the little man is holding in the illustration to this puzzle. What letter must he take out, so that, when added to the pairs of letters on the board, it will make a word out of each ?

Puzzle No. 10.

Tommy had not been very polite to his mistress at school and she was annoyed.

"As a punishment for your facetious remarks," she told him, "you can stay in after the others have gone home until you have discovered at least two words in which all the five vowels are given in their correct order."

One word was quickly discovered, but it took Tommy much longer to find the other one than it would have taken him to write 100 lines ! What were the two words he eventually succeeded in writing down ?

Puzzle No. 11.

In the figure illustrating this puzzle the seven vertical columns are to be filled by means of the clues given, putting vowels in the circles and consonents in the squares. When this has been done correctly, the first and third lines across will give the names of two famous speed kings.

Clues :—1. Trees ; 2. Noise ; 3. Add en to make name of famous Dutch city ; 4. Always ; 5. The first half of a famous Devonshire town ; 6. River ; 7. A girl's name.

W	P	E	T	E	U	T	E	U	C
A	L	I	D	S	O	T	H	R	L
T	R	A	T	I	E	R	T	E	S
K	I	M	G	N	I	R	H	O	M
I	S	N	R	W	I	D	G	L	F
S	E	N	E	D	H	B	A	D	Y
T	O	C	R	O	L	U	E	O	L
C	M	A	K	B	A	Y	S	I	G
E	L	L	G	N	I	A	N	R	K
D	O	G	U	B	V	C	O	C	A

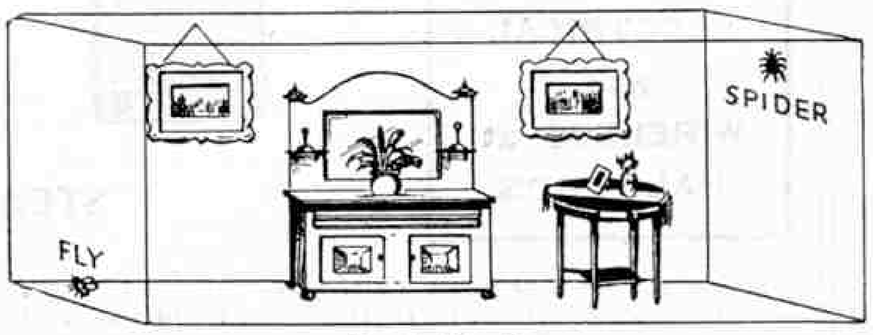
Puzzle No. 1.

Puzzle No. 12.

The hieroglyphic symbols shown in the illustration to this puzzle do not constitute a message to Meccano boys from an early Egyptian. They are only the remains of a proverb that was set up in defective type, a part of each letter being missing. The fragments of the letters in each word are in their correct order but the words themselves are jumbled. Can you identify the original proverb ?

Puzzle No. 13.

Fifteen boys called at a friend's house last Good Friday. He invited them in and then discovered to his great surprise that he had only one hot cross bun to share with them. What time was it ?



Puzzle No. 5.

The Latest Gifts To Suit All at HALFORDS

TRICYCLES

THE HALFORD ARCADIAN
British Made, 39/6
HALFORD ROYAL SCOT
Chromium Plated, 59/6

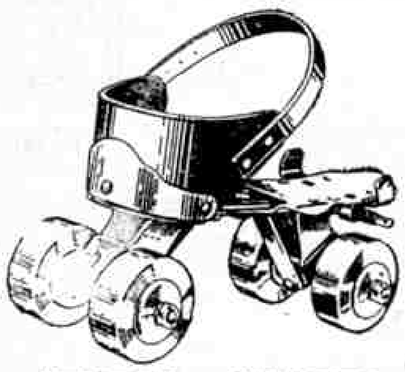
CYCLES

THE HALFORD JUNIOR
BRITISH THROUGHOUT
Boys' or Girls' £3/14/6
Chromium Plated 7/6 extra

CYCLETTES

HALFORD SAFETY BIKE
The ARCADIAN, 22/6
HALFORD MIDGET
Chromium Plated, 49/6

ROLLER SKATES



STREET SKATES
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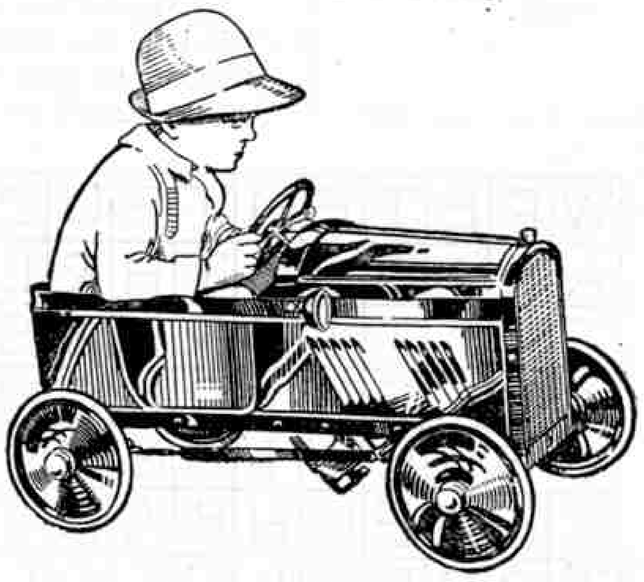
from 7/6 pair
ICE SKATES Stocked

TOY MOTORS



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British Made, 16/6
Large selection of Models at all
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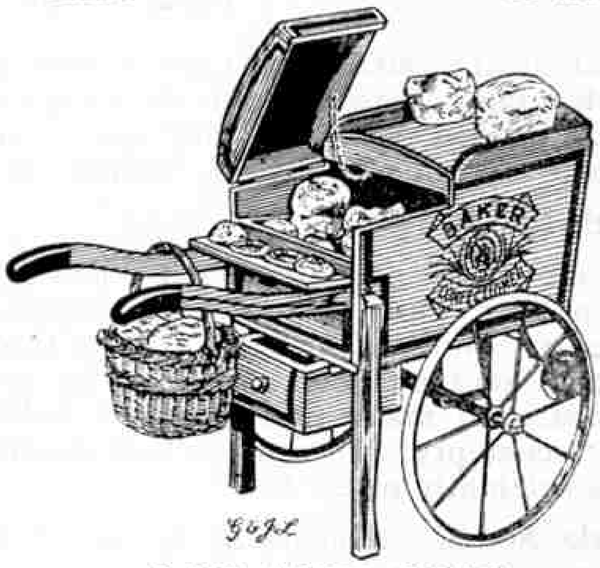

G.P.O. CART, 22/6
CONFECTIONERY VAN, as shown
31/6
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HALFORDS stock
AIR GUNS, SKATES, TARGETS,
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ALL SIZES OF OUTFITS
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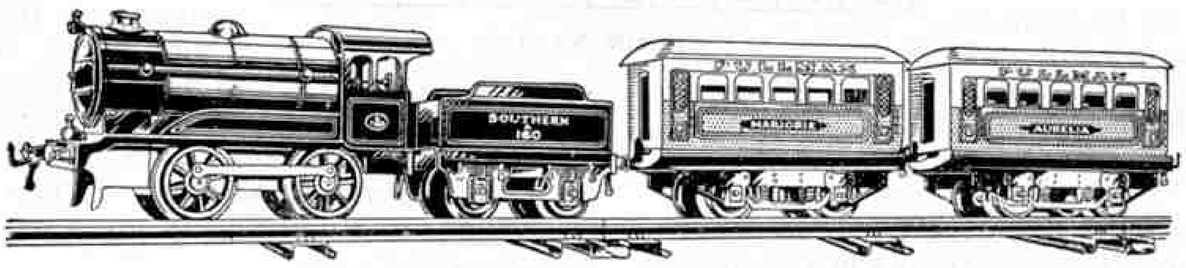

LARGE SELECTION OF CLOCKWORK AND ELECTRIC TRAIN SETS
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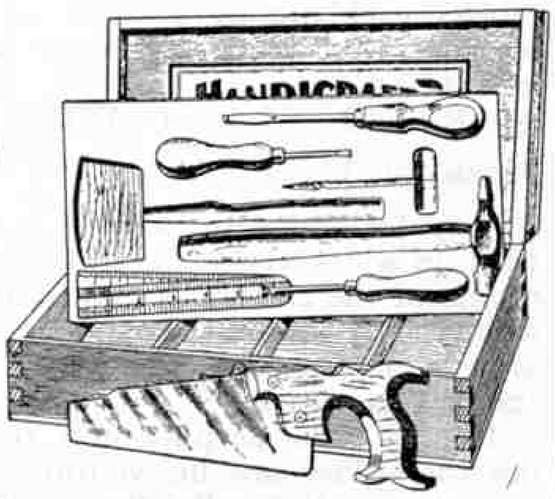
All British made

HANDICRAFT SETS



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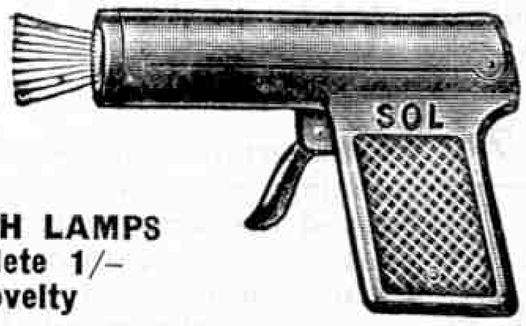
LAMPS
from 1/4 as shown.

PISTOL LAMPS



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Latest Novelty

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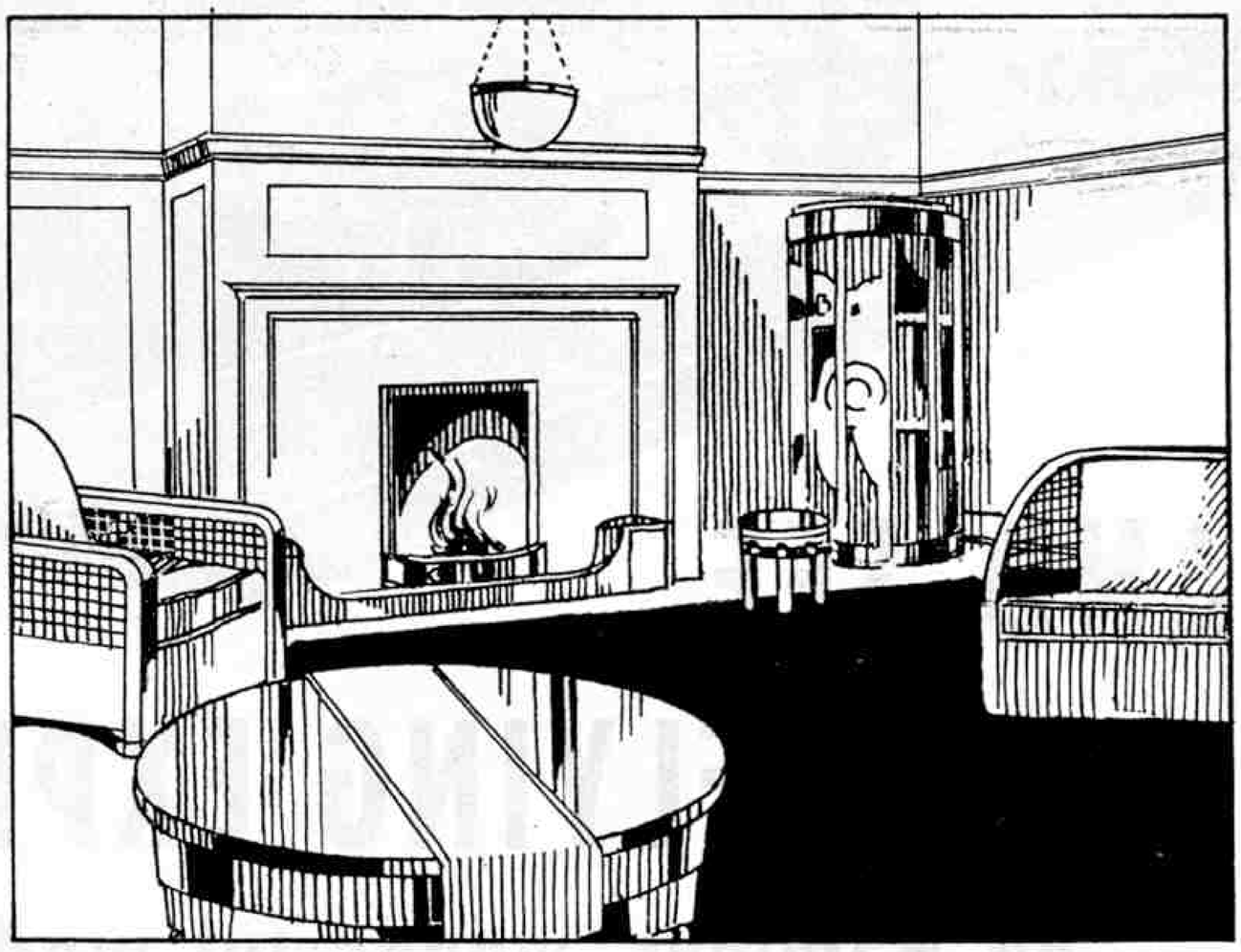
Competition Page

A Novel Drawing Contest: Christmas Decorations

In another competition on this page readers are asked to write to the Editor to tell him what part of the Christmas celebrations they enjoy best of all. We wonder how many will declare for the important preliminary of decorating the home!

Most of our readers doubtless have lent a hand at the job, and possibly even tried to supervise the efforts to produce a colourful decorative scheme with bunting and paper streamers, holly and mistletoe, Christmas trees and crackers. Unfortunately, the task is one in which "grown-ups" also revel, and suggestions from the young folk are apt to be treated rather scornfully. That seems a bit unfair, so our competition this month is designed to allow our readers to demonstrate—on paper, at least—that they are equally capable of doing the work in artistic style.



The sketch reproduced here shows a typical small room from which all decorations in the nature of pictures, ornaments, flowers, etc., have been removed, and competitors are asked to complete the picture to show how the room would look if they were allowed a free hand in decorating it for Christmas. There are no restrictions of any kind. Any suitable decorative material may be introduced to secure the best effect, and the finished sketch may be in black-and-white or in colours. Competitors need not cut the original picture from the magazine unless they prefer to do so; a tracing of the sketch will serve equally well.

Entries will be divided into two sections, A for those from competitors aged 16 and over, B for those from boys under 16, and prizes of Meccano or Hornby Train products (to be chosen from our current catalogues by the winners) to the value of 21/- and 10/6 respectively will be awarded to the best and second-best entries in each section.

In judging the entries, ingenuity of arrangement will be considered in addition to the quality of the finished drawing. Therefore a moderately executed drawing showing merit in its general scheme of arrangement will have just as good a chance of winning a prize as a good drawing that has only small merit from a decorative point of view. In order that young entrants may compete on level terms with the older boys of their section, allowance will also be made for each competitor's age.

Entries must be addressed "Christmas Decorations, Meccano Magazine, Old Swan, Liverpool," and should reach this office not later than 31st December. Overseas closing date, 31st March, 1932.

The Best Part of Christmas

Christmas is essentially a festival for young folk. A boy's problem then is not how to amuse himself, but what next to enjoy. With so many opportunities for enjoyment it is not surprising that opinions vary as to the most delightful feature. To encourage readers to give the Editor their views, prizes are offered this month for the best letters on the subject *"What I enjoyed best at Christmas."*

The letters received will be divided into two groups—A for those from readers aged 16 and over, and B for those from readers under 16. Meccano or Hornby Train goods (to be chosen by the winners) to the value of 21/- and 10/6 respectively will be awarded to the writers of the best and second-best letters in each group.

Letters should be addressed to the Editor, "Meccano Magazine, Old Swan, Liverpool," and should be marked "Christmas" in the top left corner. Closing date, 30th January. Overseas, 31st March.

Competition Closing Dates

HOME

Christmas Decorations ...	31st December.
Christmas Letter	30th January.

OVERSEAS.

Third Stomachion Contest ...	31st December.
September Photographic Contest	31st December.
Book Votes	30th January.
Pet Drawings	30th January.
Missing Words No. 2	29th February.
Crane Drawing Competition ...	29th February.
Christmas Decorations ...	31st March.
Christmas Letter	31st March.

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry.

Entries, other than prize-winning efforts, for photographic, drawing and similar competitions, will be returned to the competitors concerned if a stamped addressed wrapper is sent with the entry, and its return requested.

COMPETITION RESULTS

HOME

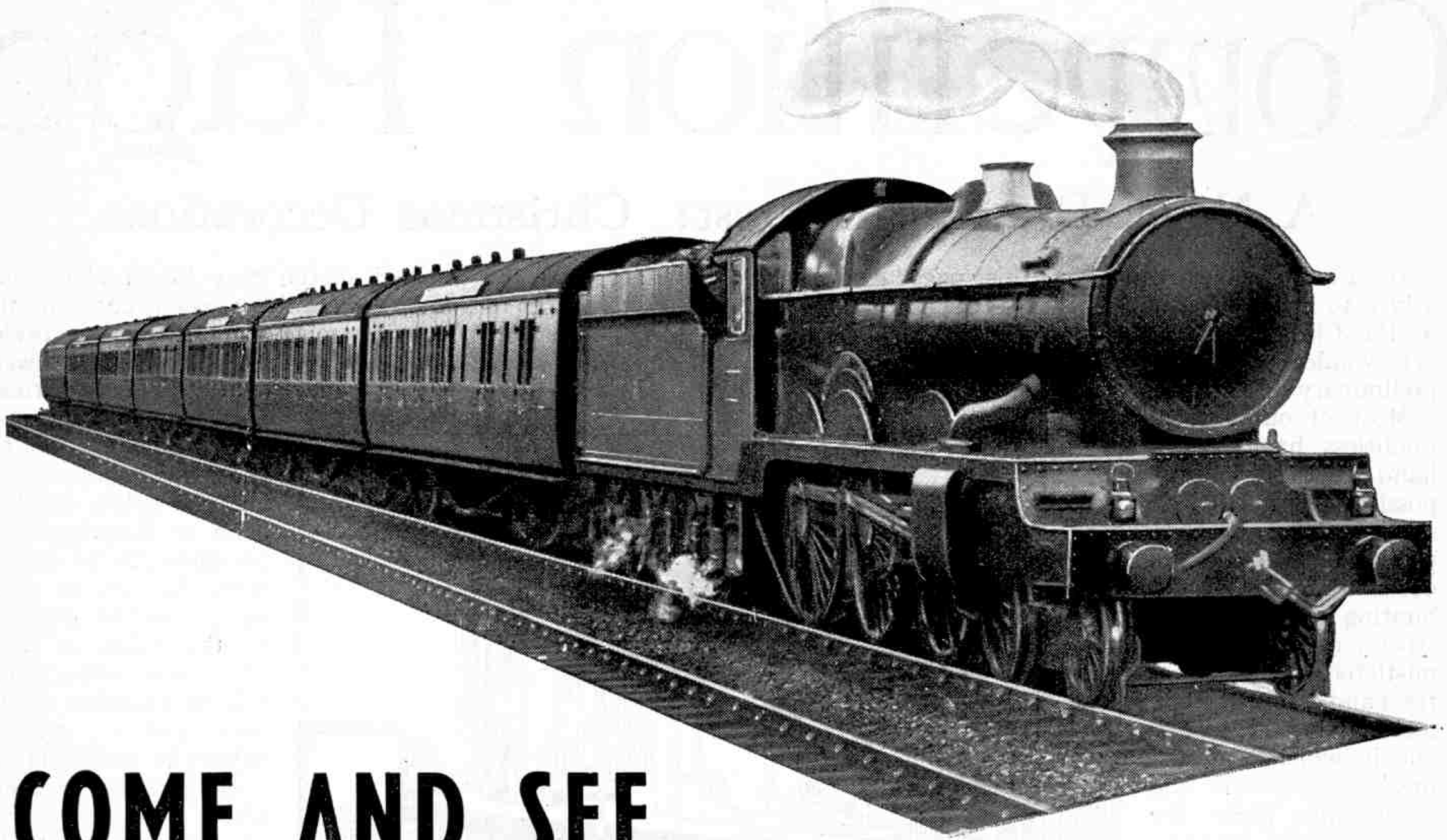
Pet Drawing Contest.—First Prizes: Section A, E. A. Boughey, Herne Hill, S.E.24; Section B, R. R. Rolfe, Palgrave. Second Prizes: Section A, H. Lane, Stokesley; Section B, A. E. Lukey, Camden Town, N.W.1. Consolation Prizes: J. Baines, Handsworth; F. Dines, Aldwick; R. Dugdale, Shrewsbury; L. P. James, Cinderford; R. Lumley, Plymouth; A. Robertson, Dundee; D. F. Symes, Dawlish; W. Stewart, Lenzie.

Favourite Book Voting.—1. L. F. Britten, Enfield; 2. J. C. Button, Cambridge; 3. M. Hirst, Anerley, S.E.20; 4. K. Rippingale, Surbiton. Consolation Prizes: B. Browning, Bedford; D. W. Campden, Lingfield; A. S. Cox, Upper Tooting, S.W.17; J. L. Holt, Richmond; G. C. Jones, Frankby; T. Lock Lowestoft; L. Norman, Bristol; C. Simonds, Plympton; W. J. West, Kettering.

OVERSEAS

June Photo Contest.—First Prizes: Section A, C. J. McCain, Sydney, N.S.W.; Section B, R. A. Brown, Cape Town. Second Prizes: Section A, L. W. Humm, Geraldine, N.Z.; Section B, F. Cook, Sydney, N.S.W.

July Photo Contest.—First Prizes: Section A, J. A. N. Beyers, Maritzburg; Section B, J. Cohen, Johannesburg. Second Prizes: Section A, K. Reid, Regina; Section B, C. Galdies, Valletta. Consolation Prizes: F. Van Bulck, Brussels; A. H. Coverdale Calgary; —. Quilliam, Beaulieu.



COME AND SEE

THIS FLYING EXPRESS

on Hamleys' wonderful model railway

There was never a model railway like it before ! Think of it—over 300 feet of rail taking up the whole of the gallery on the first floor of Hamleys' big shop, in Regent Street. Hornby Expresses, goods trains, life-like down to the very smallest detail. A dock-side, with 14 points, actually loading freight—the latest signalling devices—bridges—rivers—lighted villages and stations. Here is the most complete railway system in miniature that has ever been shown in London. This is something you simply mustn't miss.

HAMLEYS MORE MARVELLOUS THAN EVER!

Hamleys has been entirely reconstructed this year. It is full of the most exciting things imaginable. Working models of all descriptions—toys—books—torches—guns—tents—a pond with boats—and a host of other things you must see.

Come as soon as you can to

Hamley's
Estd. 1760
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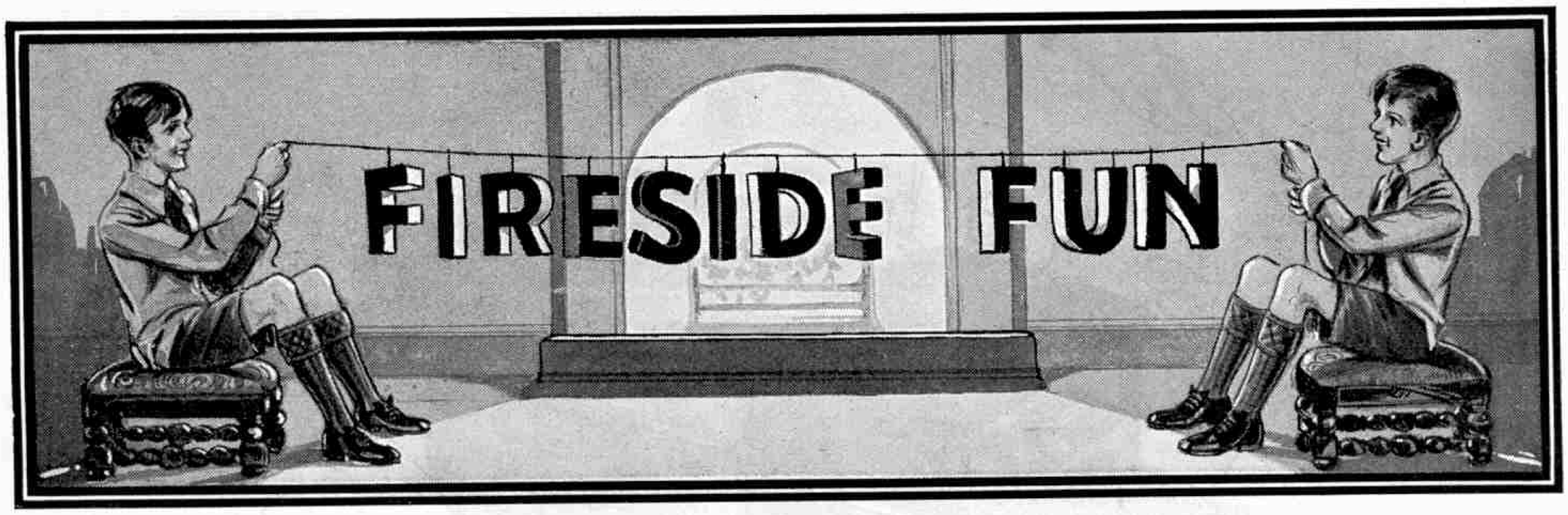
THE FINEST TOYSHOP IN THE WORLD

HAMLEY BROTHERS LTD., 200-202 REGENT STREET, LONDON, W.1.



NO FOOLING HIM!

A silver-voiced tenor "found" in a factory was on trial before a well-known London manager. He sang a variety of ballads about 'earts and 'opes and 'appy 'omes. The manager was impressed, but, with a view to an engagement ventured to suggest one improvement.

"I should like to hear an 'h' or two," he said.

"Can't teach me anything about music, guv'nor," was the quick reply. "There ain't no 'haitch'—the 'ighest note's G."

* * * *

"When I woke up at last," said Mary, describing her nightmare, "I was still terribly frightened and my heart was beating a regular tattoo."

"What on?" her brother asked facetiously.

"Why, on the drums of my ears, silly," retorted Mary.

* * * *

Brown had not been able to do much with the labour-saving device he had patented owing to the fact that he had no money.

"I hear that a prominent banker has become interested in your device," said a friend.

"Yes," replied Brown, "and with his backing I can now go forward."

* * * *

The clubman who was slightly deaf was talking to a new member and asked his name.

"Constantinewhistle, sir," said the younger man.

"I beg your pardon?" queried the deaf one.

"Constantinewhistle."

"I beg your pardon, sir, but I didn't get it that time, either. It sounded just like Constantinewhistle to me."

* * * *

"Smith! What do you mean by coming to school with your hair in that disgraceful condition?"

"No comb, ma'am!"

"Well, why couldn't you use your father's comb?"

"No hair, ma'am!"

* * * *

Vicar: "Good morning, Giles; did you enjoy your bus ride at the week-end?"

Giles: "Didn't get a chance to ride, sir. Every bus as came along was full of them there hikers."

* * * *

Abrahams: "Our Isaac has had a shop only a week and it has already been on fire once."

Levy: "I'm so glad. I always said he had a flair for business."

* * * *

Customer: "Hey! You're giving me a piece of bone!"

Butcher "Oh no, I'm not, you're paying for it."

* * * *

The estate agent had shown numerous houses to the prospective tenant, but not one had been satisfactory.

"Now, there is a house without a flaw," he said at last, hopefully.

"My goodness" exclaimed the client, "that most certainly will not do. What do you expect me to walk on?"

* * * *

Young Jack, just home from his first visit to the country, was telling the folks of its wonders.

"And what do you think, mother," he said, "out on the farm they get milk from cows, and it's just as good as what we get from the milkman."

* * * *

"Do fishes go about in schools, mother?"

"Yes, dear."

"Then do they have a holiday when the teacher gets caught on a hook?"

* * * *

Actor: "Is this the way to the manager, sonny?"

Office Boy: "Yes, sir. Keep right on till you come to a notice 'No Admittance,' go straight through till you see a sign 'Keep Out,' carry on till you come to a door marked 'Private,' and go straight in!"

FINDING A CALLING

The foreman was interviewing an applicant for employment.

"I'm very sorry but I really have nothing for you at the moment," the foreman said. "Why, I've so many men working for me at present that I can't even remember all their names."

"Well, then," replied the applicant, "take me on to keep a record of their names for you."

* * * *

It was the first time he had lunched at the new restaurant.

"I should say that you have a spotlessly clean kitchen here," he said to the manager.

The manager was naturally delighted at this remark.

"Very good of you to say so, sir," he replied. "May I ask what makes you think that?"

"Well," replied the diner, "everything I have had so far has tasted of soap."

An Order Promptly Executed

Proprietor: "Anyone given any orders while I've been away?"
Assistant: "Yes, sir. One man came in and ordered me to put up my hands while he emptied the till."

Little Billie was spending his holidays in the country. One day he came home to lunch and announced proudly that the blacksmith had given him some work to do.

"But a little chap like you can't shoe horses," said his father laughingly.

"Perhaps not," replied Billie, "but I can shoo flies."

* * * *

Henry was working away in the tool-shed when suddenly he let out a terrific yell.

"What's wrong, Henry?" called Mother.

"I hit the wrong nail."

* * * *

The colonel wanted a horse, but as he could not afford to buy a thoroughbred he had to be satisfied with an old hack.

"This one, sir," said the dealer "'as been bred in the best military traditions."

The colonel purchased the horse and a few days later angrily returned to the dealer.

"I thought you said that this horse was bred in the best military traditions," he shouted.

"So he is," returned the dealer, "he'd sooner die than run."

* * * *

"My boy, you will only get on by energy, enterprise and perseverance. Why, one of the world's richest men came here without a shirt to his back, and now he has millions."

"Millions! Good heavens How many does he put on at a time?"

WITH MALICE AFORETHOUGHT

"No," said the boaster, "not once have I been involved in an accident of any kind."

"But you told us only yesterday that you were once tossed by a bull!" remarked his friend.

"That wasn't an accident," he replied. "The bull did that deliberately."

* * * *

Jim: "I hear you're working in a cinema, now."

Jack: "Yes, that's right."

Jim: "Good. You'll be able to get me some free tickets."

Jack: "Certainly. And as you work in a bank, you'll be able to get me some free bank notes, won't you?"

* * * *

The auctioneer could not raise a bid, no matter how frantically he raved. He made one last effort.

"Won't anyone give me a bid?" he demanded plaintively.

"I will," said a man standing near the door.

"Splendid!" shouted the delighted auctioneer. "What will you bid?"

"I'll bid you good-night?" said the man, moving off.

* * * *

Teacher had been giving a natural history lesson and stressed the example set by the ants.

"They are really wonderful," she said, "they seem to do nothing but work."

"Please miss," broke in Smith, "I do not agree with you. Every time we've had a picnic the ants have been there, too."

* * * *

Sergeant (to recruit): "You got a bull that time."

Recruit: "Splendid, Sir, I was beginning to despair of doing anything."

Sergeant: "But it is a prize bull in that field a couple of hundred yards to the left of the target."

* * * *

An American was motoring in England with an English friend. Driving past a large estate he saw two huge dogs, carved out of granite, on each side of the entrance.

"How often do you have to feed those dogs?" he asked jocularly.

The Englishman was equal to the occasion. "Whenever they bark, of course," he replied.

* * * *

Little Mary, who had fallen over and hurt herself, was crying badly.

"I wouldn't cry like that if I were you," said the kind lady who had picked her up.

"Well," said Mary between her sobs, "you can cry any way you like, but this is my way."

* * * *

Uncle: "When you leave school you must do something to become famous, my boy. Just think of Stainforth's great feat."

Johnny: "And Charlie Chaplin's."

* * * *

A group of workmen were discussing the origin of man. One of the party remained silent, and a companion turned to him and demanded his opinion.

"I ain't goin' to say," he replied doggedly, "I remember as 'ow Henry Green and me threshed that out once before, and it's settled as far as I am concerned."

"But what conclusion did you arrive at?"

"Well," he said slowly, "Henry, he arrived at the 'orspital, an' me at the police station."

* * * *

Smith: "Travel certainly broadens the mind."

Jones (just returned from Continental trip): "And contracts the pocket book."

* * * *

Brown: "I see you are wearing an orphan hat."

Smith: "Don't be funny, it's a Panama hat."

Brown: "Quite so, but it is an orphan hat, just the same."

Smith: "How do you make that out?"

Brown: "Because it has no Pa-na-ma, of course!"

Even father will be fascinated!

THE 9 POINTS OF THE TRI-ANG TRUCK

1. All parts built to scale, of heavy gauge steel.
2. Bright red and black stove-enamelled, with nickel-plated radiator and fittings.
3. Body tips by one turn of steel handle.
4. Driven mechanically by momentum flywheel —a push, and it goes by itself.
5. Real steering by wheel in cab.
6. 6 wheels with big balloon rubber tyres.
7. Loaded with 6 dove-tailed hard-wood boxes.
8. Weight 6-lbs. Length 20 ins. A boy can sit on it.
9. British made throughout from British materials.

This is something more than an ordinary toy. It is a real engineering job, made from the finest British steel by British craftsmen. A life-like mechanical motor truck driven by a powerful momentum flywheel. A motor truck that will last and last. Every boy will love this model. Every parent will be fascinated by it. Study the 9 points of the Tri-ang truck. Think what a present it would make! And it costs only 10s. 6d. at any toyshop!

TRI-ANG

6 WHEELED TRANSPORT

TRUCK 10/6

The toy sensation of the Season

ILLUMINATING INFORMATION

The lecturer had travelled extensively in the Frozen North.

"The Eskimos are so fond of fat as an article of diet," he said, "that often they would eat our candles."

"A little light luncheon," murmured one of his students.

* * * *

"Are you going to the lecture to-night?"

"Yes."

"I'd advise you to stay away. It's sure to be awfully boring."

"I'm afraid I can't get out of it—I'm the lecturer."

* * * *

"I thought you said young Williams was a good man. I don't see him around your office any more."

"What I said was that he was fired with zeal and energy."

* * * *

The memory training expert was giving his first lecture at the great school.

"Now," he said, "let us suppose you wish to remember the name of a poet—Bobby Burns, for instance. To do this fix in your mind's eye a picture of a policeman in flames. See—Bobby Burns?"

"Yes, I see," said a bright pupil. "But what if we still don't remember and think that it represents Robert Browning?"

* * * *

The police constable was "on the carpet."

"Why did you let him get away?" demanded his chief.

"Well, Sir, he took a mean advantage of me," said the constable hopefully. "He ran across the grass in the park where there was a notice 'Keep off the grass.'"

* * * *

Astronomer (to distinguished visitor): "The light of the star I'm going to show you now, takes many millions of light years to reach the earth."

Visitor: "Very interesting, I'm sure. But I don't think I could wait so long."

* * * *

The bald man had asked for a bottle of hair restorer. "Yes, sir," the assistant said. "This preparation is sure to make the hair grow."

"Is that so?" inquired the bald man. "In that case please wrap up a brush and comb with it."

* * * *

Throughout the whole of the evening Mr. Borem had waited to be asked to recite. At last his opportunity came.

"Won't you do something for us, Mr. Borem?" asked the hostess.

"I'm afraid it's getting late," he protested, simpering. "Besides the guests are beginning to go."

"Yes, but not fast enough," said the hostess absent-mindedly.

* * * *

New resident: "And do the people here borrow much?"

Old Resident: "Borrow! Why I feel more at home at any house in the street than I do in my own."

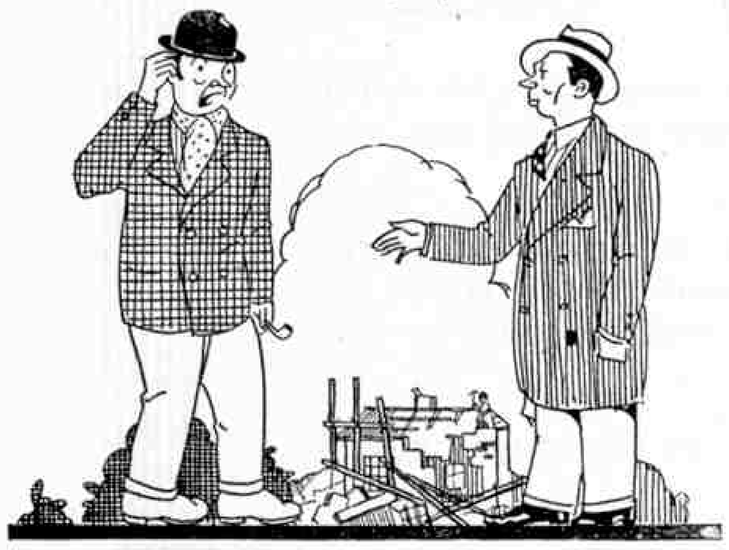
* * * *

The Scotsman had worn the same hat for fifteen years, but at last he decided that he really must have a new one. Sorrowfully he walked into the only hat shop in his village.

"Hello, mon," he sighed, "here I am again."

* * * *

BE PREPA(PE)RED!



The manager of the building firm stared in amazement at the scene of desolation.

"Whatever's happened?" he asked his foreman.

The foreman scratched his head in perplexity.

"As soon as we started to take the scaffolding away the whole building collapsed," he explained.

"You fool!" snapped the manager. "Didn't I tell you not to touch the scaffolding until the wall-paper was up?"

* * * *

Judge: "What happened after the prisoner gave you the first blow?"

Witness: "He gave me a third one."

"You mean a second one?"

"No, I gave him the second one."

* * * *

"Where did you get that rotten cigar you gave me yesterday?"

"What do you mean by rotten? That was a two-for-a-shilling cigar."

"Well then, who got the tenpenny one?"

A MARKED MAN

Junior Partner: "Why on earth did you engage that man as cashier? He squints, has a crooked nose, cauliflower ears and a bad limp."

Senior Partner: "Just think how easy he'll be to identify if ever he absconds."

* * * *

The steamer was almost on the move when Paddy rushed up and jumped from the quay to the ship. He fell and his head came into such violent contact with the deck that he was stunned and did not recover until about ten minutes after the vessel had started.

"Begorrah!" he cried, as he saw that the land was nearly a quarter of a mile away, "what a jump!"

* * * *

"Do you know what the earwig said as it fell off the table?"

"No."

"Earwig'o!"

* * * *

SURE TO MAKE A SPLASH!

The master plumber was discussing his apprentice. "I've never seen a fellow take so long over a job," he said. "You mark my words, that lad'll go far."

* * * *

Brown: "I say, James, will you lend me sixpence for my bus fare home?"

Jones: "I'm very sorry, but I've only got half-a-crown."

Brown: "Good! I'll take a taxi."

* * * *

The manager of the circus was interrupted by a deputation. "What's the matter now?" he demanded.

It was the India-rubber Man who was in trouble.

"Every time the Strong Man writes a letter he uses me to try and rub out the mistakes," he complained.

* * * *

Clergyman (to father who has just had his baby christened "Homer"): "I suppose Homer is your favourite poet?"

Father: "Poet! Lor', no sir! I keep pigeons."

* * * *

Very Amateur Photographer: "Have my films developed all right?"

Would-be Funny Chemist: "The answer is in the negative."

* * * *

The dear old soul entered the chemist's shop and approached the counter nervously. "Are you fully qualified, my man?" she asked.

"Yes, madam."

"You understand all about your business?"

"Certainly, madam."

"You're registered?"

"Of course, madam."

"Is that your certificate I see hanging over there?"

"It is, madam."

"Well, then, you can get me a box of cough tablets."

* * * *

Salesman: "And now that you have decided on the furniture, how would you like the payments?"

Customer: "Permanently deferred."

* * * *

"Why have you got three pairs of glasses, Grandpa?" asked Bill.

"Well," said Grandpa, "I must have one pair for reading and another for ordinary wear."

"But what is the third pair for?" queried Bill.

"Oh!" replied Grandpa. "I use those to hunt for the other two."

* * * *

An editor was interviewing a prospective new member of his staff.

"Why did you tell me that you had had three years of newspaper experience when you only left school last year?" he asked.

"Well, sir," replied the youth, "you advertised for a writer with imagination, didn't you?"

* * * *

Employer: "Now I want a very careful chauffer—one who doesn't take the slightest risks."

"I'm just the man for you, sir. Can I have my salary in advance?"

* * * *

The village grocer was endeavouring to insure his shop against fire.

"What facilities for extinguishing fire are there in your village?" inquired the insurance official.

The man scratched his head, pondered for a moment, and answered: "Well, there's the rain!"

* * * *

"You know, Brown has uncanny luck as a fisherman. He can almost talk the trout out of the water."

"Really? He must use baited breath."

EASY ADVICE TO FOLLOW

Prison Doctor (absent-mindedly, to convict): "And whatever you do, don't attempt to go out in this bad weather."

* * * *

The landlord demanded his long-overdue rent. "Please let me know what you intend to do, pay up or get out!" he concluded his threatening letter.

The reply came by return of post.

"Dear Sir, I remain, Yours faithfully, John Brown."

* * * *

"Don't you think black hens are cleverer than white ones, Mother?"

"Why, dear?"

"Because the black ones can lay white eggs but the white ones can't lay black eggs."

* * * *

The two waiters were standing by the table over which the tired diner had fallen asleep.

"I've already wakened him twice," said the first waiter, "and I'm going to wake him again now."

"Why don't you have him taken out?" suggested the second waiter, who was fed up with the performance.

"Nothing doing," replied the first waiter, shaking his head. "Every time I wake him up he pays his bill."

* * * *

Ticket Collector: "That child looks more than three years old."

Mother: "I know he does, but he's had a lot of trouble."

* * * *

"I pride myself on my sense of humour. I certainly know how to appreciate a good joke."

"You do. I've heard you tell the same joke twenty times and laugh at it every time."

* * * *

Bill: "I have decided to buy that watch dog that you offered me the other day."

Dick: "I'm sorry but you are too late: it's been stolen."

* * * *

Explorer (going for a swim): "Are there any sharks about here?"

Native: "No, they're afraid of the crocodiles."

* * * *

Lady: "Oh, so you've been in touch with royalty have you?"

Tramp: "Yes, ma'am, I was once stung by a queen bee."

* * * *

The man who was cleaning the hall saw the victorious boxer carefully examining the empty ring.

"Looking over the scene of your triumph?" he demanded.

"No," replied the boxer, "Merely looking for a piece of my ear."

* * * *

Gentleman: "Why on earth are you fastening a muzzle on your little brother?"

Big Brother: "Because I am just sending him to buy some toffee for me."

* * * *

"Please ma'am," said the tramp, "will you kindly lend me a cake of soap?"

The good lady was surprised. "Do you really mean to say you want some soap?" she asked incredulously.

"Yes, ma'am," replied the tramp. "My mate's got the hiccups and I want to scare him."

* * * *

NOT OUT FOR BIG GAME

R.A.F. Sergeant: "Know anything of an aeroplane that's come down near here, Sonny?"

Johnny (holding out his catapult): "N-n-no, sir, I've only been shooting at windows."

* * * *

The jobbing gardener was working in Mr. and Mrs. Newlywed's garden. In the afternoon the young housewife carried him a cup of tea and a plate of cakes.

"These are all home-made," she explained. "Take your pick, gardener."

The toiler shook his head.

"Haven't got one with me, ma," he replied. "If it's all the same to you, I'd sooner have a slice of bread and jam."

* * * *

"That pig is almost white, isn't he?"

"Yes, but we call him 'Ink.'"

"Why?"

"Because he keeps running out of the pen."

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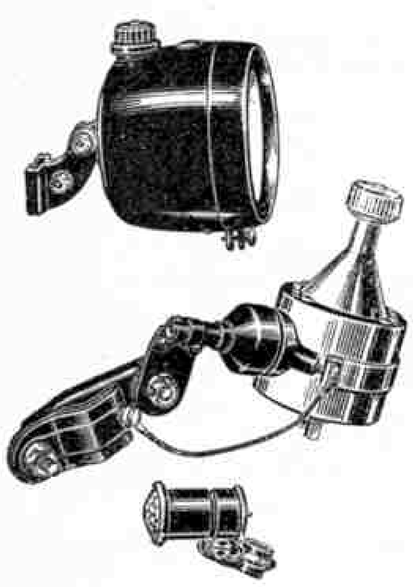

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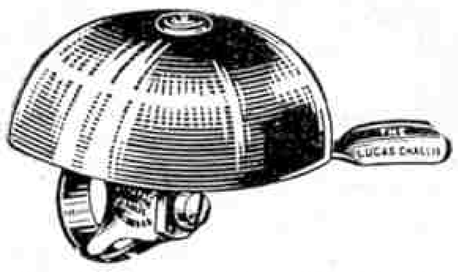

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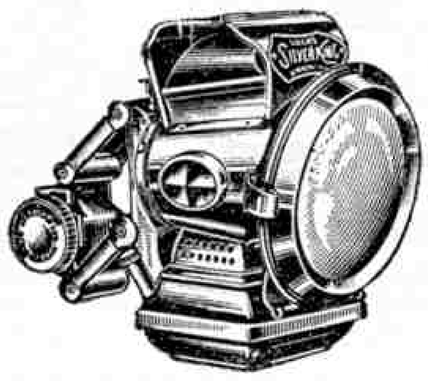

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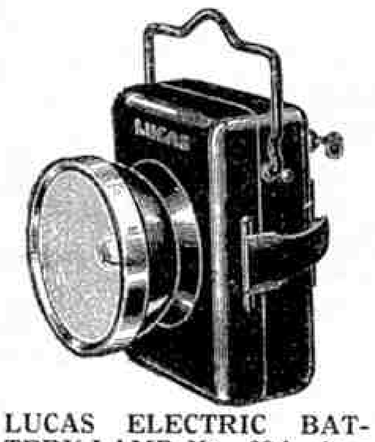

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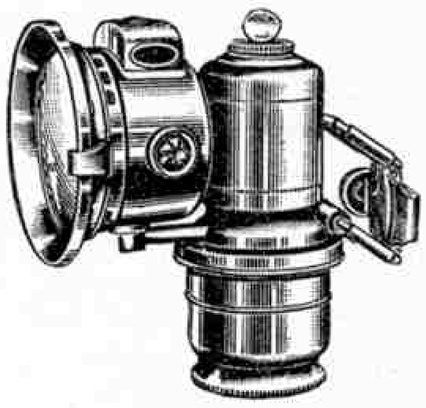

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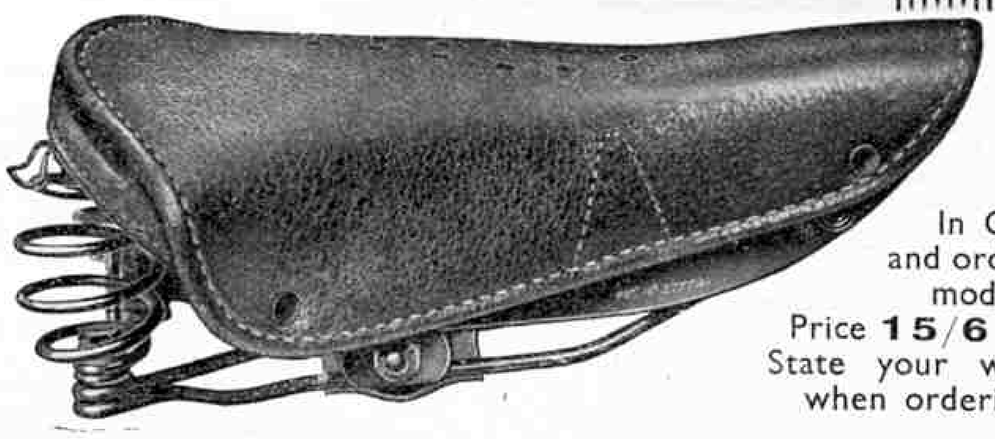

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How to Get More Fun—(*Cont. from page 1001*)

appears at intervals of every two feet or so! A length of blue wallpaper of a suitable shade forms a useful basis for a scenic background. On this the various details of the country the railway is supposed to traverse should be roughly drawn in ordinary pencil, and when the outline scheme is considered fairly satisfactory colouring may be proceeded with, either paints or coloured chalks being used as preferred. The great mistake that is so often made at this stage is that of trying to include too much detail. This not only adds enormously to the difficulty of the work, but even when it is carried out successfully it is not effective when looked at from the required distance. Broad effects only should be aimed at, similar to those that are to be seen on the splendid posters issued year by year by the various railway companies. In the case of a portable layout the wallpaper may be simply pinned to the wall; but where the railway is a fixture it is more satisfactory to paste it round the walls of the room, so that it is held securely and permanently in position.

The advantage of this method of preparing scenery is that trees, fields, farms and all the usual features of the countryside may be introduced as required. A particularly interesting point is that where footbridges and level crossings are installed, the footpaths and roadways leading up to them may be realistically depicted.

A good example of the blending of different scenes is shown in the photograph on page 1000, taken on the layout of Mr. J. Grime of Belfast.

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Model-Building Results—(*Cont. from page 995*)

is obtained by gearing a ½" Pinion with a 57-teeth Gear Wheel, on the Rod of which is a Worm that drives a vertical shaft carrying a Gear connected to the caterpillars.

Another good model in this Section is the railway breakdown crane illustrated here. It was built by Charles Vickers of Gainsborough, and is one of the neatest models of this kind that I have had the pleasure of seeing in recent "*M.M.*" Competitions.

In Section B, Allan Greenhalgh took First Prize, with a model railway breakdown crane. An imitation steam engine gives the model an appearance of realism. The hoisting block makes use of 2½" Triangular Plates for the sides of the pulley housing, and unfortunately these appear too large for the proportions of the remainder of the model, which otherwise is very neatly and soundly constructed.

Monkey curiosity! The larger animal is seriously investigating the mysteries of a reflex camera; the small one appears to be wondering what will happen when the owner comes back!

John Hall, a young competitor from Louth, Lincolnshire, submitted a model of a steam-driven derrick crane, which incorporates a Meccano Steam Engine driving an excellently arranged gear box. The model will lift a considerable load and is well worthy of the Second Prize that it secured.

The Third Prize winner in Section B, John Roberts, earned his success with a steam-driven jib crane that is capable of three movements, swivelling, hoisting and luffing. This model also is driven by a Meccano Steam Engine, and the various gears are brought into engagement by the operation of three push-pull levers conveniently situated at the rear of the model.

The smaller prize-winning models include a travelling crane by James McBrown; a swivelling hammerhead crane by N. D. Lidbetter, and a fine bulk coal loading transporter by Harry Causer.

I was particularly pleased to see that many of the hundreds of fine photographs sent in for this Contest show marked improvement in sharpness and clearness on those submitted in recent Contests. A sharp photograph is a great aid to the judges in deciding the merits of a model, and on this account I hope that the improvements displayed will be maintained in future competitions.

I hope to illustrate one or two more of the prize-winning models in future issues.

Electrical and Chemical Outfits

The interests of the modern boy are largely practical, and he is happiest when he is finding how things work, or learning for himself how they are constructed. For this reason he will be attracted by the excellent range of Electrical Sets manufactured by British Games Ltd., of London. These sets contain materials with which a large number of interesting experiments in magnetism and electricity may be performed, and also the parts required for making voltaic cells, a voltmeter, an ammeter, a rheostat, and many other electrical instruments and devices. An illustrated book of instructions accompanies each of the outfits, which range in price from 7/6 to £5/5/-.

Another interesting electrical outfit produced by British Games Ltd., is the B.G.L. Morse Telegraph Set, price 7/6. This contains the necessary parts for making a simple electric telegraph, by means of which two boys may exchange messages in code. The construction of the necessary switches and buzzers in itself forms an attractive task for any boy, and the fun that may be obtained with the aid of the completed instruments is unlimited.

The B.G.L. Chemical Cabinets manufactured by the same firm have deservedly proved popular, for they enable their owners to carry out experiments of an interesting nature, and thus to acquire a considerable knowledge of chemistry. A well-designed series of outfits is available, the prices ranging from 3/6, 5/- and 8/6 for the smaller ones to 105/- for the largest. The experiments described in the booklets contained in the various cabinets are very attractive, and it is satisfactory to find that reasonably large quantities of the chemicals required are provided.

A New Transformer

Since publishing the 1931 Hornby Train catalogue and the Combined Meccano and Hornby Train catalogue we have introduced a new 6-volt Transformer, the price of which is 22/6. This replaces the one listed at 30/- in these catalogues.

The new Transformer is available for all standard voltages from 100 to 250 inclusive, at all standard frequencies, from 50 cycles upwards. Will readers who have already obtained copies of the new price lists make a note of this alteration in the pages on which the Transformer is featured.

Puzzle Your Friends—(*Continued from page 951*)

You will now have a short tube with a loop of tape inside that can be pushed to either end at will, as shown in Fig. 8.

Take your six coloured handkerchiefs and pack them one at a time into one end of the cardboard fake. The tape will prevent them from being pushed right through. Now lay the fake on its side on your table, and place a fairly thick book in front of it as shown in Fig. 9. The book hides the tube from the audience.

Pick up your sheet of paper, show both sides of it, and lay it down on the book with one edge projecting a little over the tube. Now display the six white handkerchiefs and lay them beside the book. Pick up the paper with your right hand, at the same time picking up also the tube behind it. The paper should be held with the fingers in front and thumb behind, the thumb pressing the tube against the paper (Fig. 10). Roll the paper into a tube, with the fake inside.

Pick up the six white handkerchiefs one at a time, and push them into the paper tube, taking care to push them in at the end where the tape end of the fake is situated. Push them right into the fake tube, and they will push the coloured ones out at the other end. When all these white silks are safely inside the fake tube draw the six coloured handkerchiefs out and lay them on the table. As you spread out the last one and lay it on the table, hold the paper tube slantwise behind it, and let the cardboard tube slip out into a little bag behind the table, made by bending up the edge of the cloth. See Fig. 11. You can now unroll the paper tube and show it empty.

An Ingenious Short Wave Adaptor

Most readers who possess wireless broadcast receivers will have wished at some time or other that they could adjust their sets to receive the broadcasts from the large number of European and American stations that employ waves below 100 m. in length. Hitherto it has been impossible to do this without going to considerable expense and a great deal of trouble. The difficulty has now been overcome, however, by means of an interesting device called the Eelex Short Wave Adaptor, introduced by J. J. Eastick & Sons, 118, Bunhill Row, London, E.C.1. This adaptor consists of a single-valve oscillating detector unit built into a small leatherette cabinet, and the necessary connections to an existing receiving set can be made in a few minutes. The tuning range of the set thus converted is from 16 m. to 60 m., while if required a special coil for use on the 140-190 m. wave band is supplied. The whole thing is simplicity itself, and the results obtained are surprisingly good. The price of the adaptor without valve is £3, and we can strongly recommend it.

Another attractive product of the same firm is the Eelex Frame Aerial. This has been specially designed for use with all types of receivers, and is particularly valuable in cases of interference due to a local transmitter, for by means of it the interfering station may be eliminated either completely or sufficiently for all practical purposes, by simply rotating the frame. The aerial may be used for either long or short waves, the change from one to the other being effected by a switch. The price of the frame aerial is £1, and actual tests have shown it to be remarkably efficient.

Another interesting item is the T.2.L.C. type of terminal, an improvement on one already marketed by J. J. Eastick & Sons to which plugs, spade ends and bare wire can be connected, and which also has a slotted screwed shank to enable sound joints to be made without soldering. In addition to these features the new terminal has a non-detachable head and a removable nameplate. Although its usefulness has thus been increased, however, the price has been reduced from 4½d. to 3d.

For Cheltenham Readers

An interesting Model-building Competition was held at Cheltenham recently by Pantoys Limited. The entries were of a high standard and the Meccano representative who was sent specially to judge them was greatly pleased with the quality of the models.

The first prize was won by A. Hudson, age 13, with a splendid model of a Hammerhead Crane, driven by an electric motor and fitted with clutch and brake. The second prize went to John Houghton, age 11, for a Furniture Van complete with furniture; and the third prize to M. C. Myers, age 10, for an interesting model of a Steam Lorry. A special prize was awarded to H. B. Tweedy for an extremely good model of an 0-4-0 Tank Locomotive. The prize-winning models were shown in the windows of Pantoys Limited, and attracted considerable attention.

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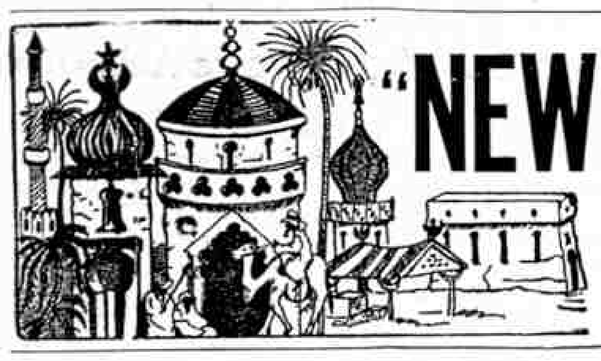

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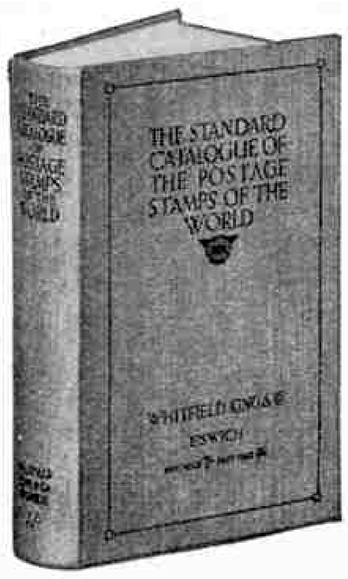

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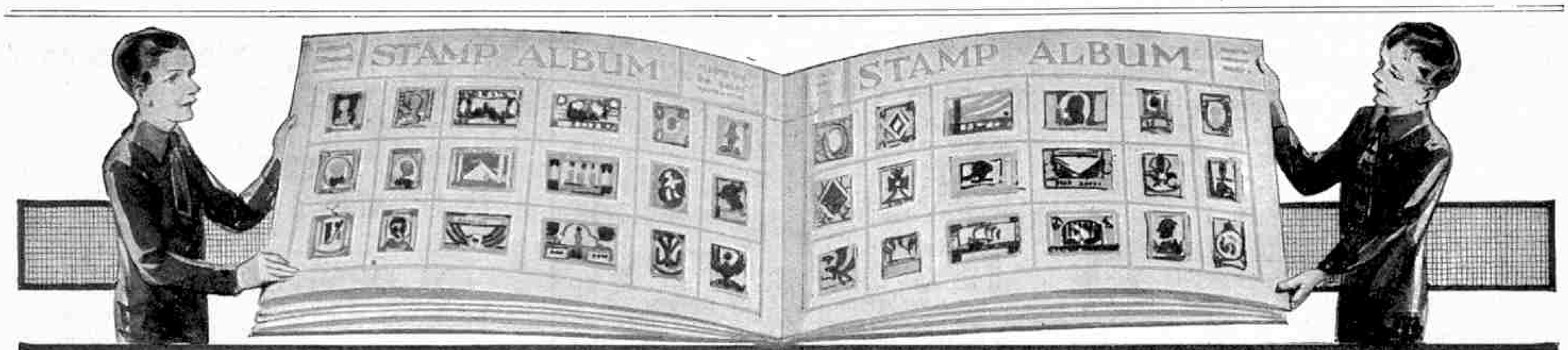


STAMP COLLECTING

STAMP STATUARY

FEW boys have any real love for their history lessons, and we confess that in our schooldays we, too, often wondered why it was so important that we should commit to memory, among other things, the date upon which a pre-occupied English King failed to observe the excessive cooking of a batch of scones! Years after we left school we discovered a new and more interesting way of learning history—by studying stamp designs featuring the statues and monuments erected to the memory of famous men and incidents of history. Facts in history that we did not trouble to learn at school have since been imbibed readily in this way. History lessons have become a pleasant evening pastime!

In recent days our interest in such stamps has been revived by the appearance of two new issues depicting famous statues. The first of these is Sudan's new air stamp set issued for use on mail carried over the London-South Africa air route, showing in silhouette a statue of General Gordon, the hero of Khartoum, against an expansive desert background, broken only by the winding course of the River Nile. The statue illustrated stands outside the Governor-General's residence at Khartoum, barely a stone's throw from the site of the Old Palace in which General Gordon and his garrison were massacred on 26th January, 1885, two days before a relief column arrived to rescue the beleaguered forces.

Beyond question this issue is the most beautiful of all our Colonial air issues. It consists of eight values, ranging from 5 milliemes to 5 piastres in denomination, with the design illustrated common to them all.

From France comes a new two Franc pictorial stamp showing what is probably the best known monument in the world, the Arc de Triomphe. Standing in the centre of the Place de l'Etoile at the head of the Champs Elysées, it rises 162½ ft. above the ground. It is 147 ft. in width, and from front to rear measures 72½ ft.

The construction of the arch was decreed by Napoleon on 12th February, 1806, to replace an existing arch, and was planned by the architect Chalgrin. It was inaugurated on 29th July, 1836, and bears the names of the chief victories of the Revolutionary period and of the First Republic, and those of 386 Generals who took part in the wars, in addition to many beautiful bas-reliefs by the most famous artists of the epoch.

On 11th November, 1920, the remains of an unknown soldier who fell in the Great War were interred beneath the Arch. A small fire is constantly kept burning on this Unknown Warrior's Tomb, which is always covered with wreaths from various organisations and personalities, paying homage to the heroism of the men who sacrificed their lives for their country.

The structure has recently been fitted with two electric lifts that enable sightseers to go to the top in comfort, instead of climbing up the tortuous stairways. A magnificent view of the surrounding area is obtained from the terrace, and the vista down the Champs Elysées to the original and much smaller monument in the Jardins des Tuilleries at its foot is a sight never to be forgotten.

Our friends across the Atlantic probably would dispute the reference to the Arc de Triomphe as the best known monument in the world, and would desire to give this honour to their own great Statue of Liberty, standing on Bedloe's Island at the entrance to New York Harbour. This statue was a gift from France to America to celebrate the first centenary of American Independence. Its cost was defrayed by public subscription in France, and it was executed in bronze by the great French sculptor Bartholdi. Its base is on an eminence 150 ft. above sea level, and from the base to the tip of its flaming torch is a further 151 ft. The statue is illustrated on the 15c. value of the current U.S. issue, but a much more striking picture of the statue appeared on a Uruguayan issue in 1919 celebrating the conclusion of the Peace Treaty at the end of the Great War. Both stamps are illustrated here.

On a scale only slightly less magnificent than the Arc de Triomphe is the arch illustrated on the ½ anna stamp of India's New Delhi commemorative issue. This arch also is a war memorial, erected to the memory of the Indian troops who died in the Great War. It stands 75 ft. clear above its surroundings and completely dominates the foot of the great 1,200-ft. roadway, King's Way, the main artery of the city. Surmounting the arch is a dome that rises a further 70 ft. When the arch was planned it was intended that a pillar of smoke should ascend perpetually from the dome as a living tribute to the Dead. For reasons of economy, however, that project had to be abandoned, and the smoke cloud now appears only on special occasions.

No reference in a British stamp article to war memorial monuments would be complete without including the great British war memorial that stands at the Menin Gate at Ypres. The Ypres Salient was one of the key positions in the Great War, and continuously for more than three years it was the centre of a fierce struggle. More than 90 per cent. of the British troops occupying the Salient passed through the Menin Gate on their way to the trenches, and no more fitting place could have been chosen for a British War Memorial on the actual battlefields. The walls of the memorial are covered by panels on which are inscribed the names of "missing" British soldiers whose bodies could not be found after the battles of Ypres. Our illustration is from the 35c. value of the Belgian 1929 Anti-Tuberculosis issue.

Our next specimen takes

(*Continued on page 1023*)

THIS YEAR—HAVE STAMPS FOR XMAS

A fine new List of Sets, Packets and Bargain Offers is now ready, and will be sent on request. Albums also. Our illustrated List is sent post free.

NEW ISSUES AND NOVELTIES

New Guinea : The new Bird of Paradise set, just issued. 1d. to 3d., 4 values **1/-**
Optd. **" Air Mail,"** ½d. to 2d., 4 values ... **9d.**
Optd. **" O.S."** scarce, 1d. to 2d., 3 values **8d.**
Hut type, optd. **" Air Mail,"** now obsolete, 1d., 1½d. & 2d., 3 values at **8d.** : ½d. (rare) **2d.**

COLLECT AIR MAILS The finest packets obtainable.
25 all different... **6d.**
50 all different... **2/6**
100 all different... **10/-**

Sudan : first issue Air Provls., set of 3 ... **1/3**
Pictorial types, set of 3 ... ... **1/-**
British Guiana : Centenary, set of 4 ... **9d.**
France : 2 Frs. Arc de Triomphe, pictorial **6d.**
Ruanda : Pictorials, just issued, 3 values ... **3d.**
Persia : pictorial Air stamps, 4 values ... **6d.**

FINE PACKETS AND SETS

35 Barbados : all different **4/-**
25 Belgian Congo : all different **1/6**
25 Canada : all different ... ... **6d.**
25 China : all different ... ... **9d.**
50 Egypt : all different **2/-**
26 Great Lebanon : opts., pictorials, etc. ... **4/-**

XMAS OFFER

NYASSA, the famous Triangular Set (usual price 1/-), post free ... **6d.** to all serious applicants for our **WESTMINSTER BLUE BOOKS.** The finest cheap approvals on offer.

25 Iceland : all different **1/9**
70 India : a fine packet, all different ... **4/-**
100 Persia : Air Stamps, Pictorials, etc. ... **4/6**
50 Soviet Russia : all different **1/-**

1,000 all different **Stamps of the World, 3/6 ;** 2,000 all different **Stamps of the World, 10/-**
Postage extra on above prices.
WESTMINSTER STAMP CO., 43, BUCKINGHAM GATE, LONDON, S.W.1.

100,000 STAMPS FREE!

SEND only the postage for a selection of our World-Famous Approvals. Hundreds of hinge-mounted space fillers sent, all **less than** 1d. each. Thousands of Meccano Readers amazed and delighted with the value and vast variety. Also we shall give you entirely **FREE—100** all different Stamps including **SYRIA,** Lebanon and Alaouites (unused), or 25 Fine old **BAVARIA** (Ludwigs, etc.), or 5 scarce **ICELAND** (view of Reykjavik National Museum, etc.), or 25 diff. **FINLAND** (inc. overprints). **STATE WHICH.** Further along with interesting Lists, etc., will be included full details of the above gigantic gift-scheme. **1½d.** For part-postage only, and you get the biggest and best Stamp Packet advertised. Overseas 3d. Mystery Parcel of 5,000 **UNKNOWN** Stamps, Mostly Foreign, 3/6. Overseas, 4/9. **1½d.**

ASTLEY & CO. (M.16), LOW HILL, WOLVERHAMPTON

"DIAMONDS"

MANY RARE STAMPS have been found by purchasers of **The " DIAMOND " Packet,** which is guaranteed to contain 1,000 Unsorted Stamps from Convents abroad, **1/3** ; 2 packets, **2/5** ; 3 packets, **3/6** ; 4 packets, **4/6** ; 5 packets, **5/6.** All post free. (Abroad 3d. per packet extra).
O. NERUSH, Importer
(Dept. E), 68, Turnpike Lane, Hornsey, N.8.

MY CHRISTMAS PRESENT

During December I shall mount and write up each air mail cover I sell free of charge. Early application for approval selection is advisable. Covers from 1d. to £3. As usual each new client will receive set of French Colonials gratis. " Murrayfield " packets of 25 for 6d. are the best obtainable value. 25 diff. Iceland 1/-. 50 diff. Iceland 2/6. Postage extra please.
JAMES A. R. DRYDEN,
3, Coltbridge Gardens, Edinburgh, W.

SENT BY AIR MAIL

The celebrated Richemont 6d. and 1/- packets of stamps, as also new sets and singles sent on approval by Air Mail on receipt of 4d. for postage. The new and attractive Swiss Pro Juventute Set, 1931, appears December, 1/- complete set.
Orders booked now.
PHILLIPS,
Richemont, St. Legier, Sur Vevey, Switzerland.

AIR MAIL STAMPS AND WALLET, FREE!

A fine Pocket Wallet, filled with Air Mail Stamps, given FREE to every applicant requesting Approvals. Send 1½d. stamp for postage.
S. L. SHELLEY,
HILLSIDE ROAD, BILLERICAY, ESSEX.

100 DIFFERENT STAMPS, INCLUDING COLONIALS
12 U.S. America, 10 Roumania, including Boy King. Free to applicants for my famous ½d. Stamps, and cheap Sets. Without Approvals, 6d. Postage 1½d.
S. H. FLEMING,
ST. WINIFREDS, CHRISTLETON ROAD. CHESTER.

DON'T OVERLOOK THE BORNEO JUBILEE STAMPS

Obsolete Dec. 31st. 3, 6, 10, 12c. at **1/-**, 25c. at **8d.**
Free to approval applicants, **50 French Colonials,** and details of further gifts catalogued at **36/-**
S. Africa, set of 14 Pictorials, ½d. to 1/-, Price **1/2**
Roumania, Boy King, set of 9 used, complete **5d.**
Palestine, 10 used pictorials, 2m. to 20m. ... **7d.**
Add 1½d. for postage. **Buy Packets for Xmas.** List of 80 different Country Packets sent gratis.
Harold Stroud, 57, New Bank Road, Blackburn, Lancs.

STAMP FREE! WALLET

Fine pocket case fitted linen shelves for stamps. Perforation gauge, etc., containing fine MINT CENTRAL AMERICAN STAMP, CATALOGUED **7/6,** gratis to genuine applicants for my " BETTA" APPROVALS (large discounts), sending 3d. postage and packing only. Finest selection of hard-to-get stamps at lowest prices. Send at once to :—
ALIX HARLAND (Dept. A.3),
3, Featherstone Buildings, High Holborn, W.C.1.

5/- BOXES POST FREE. Abroad Extra.
1,500/2,000 Well Assorted Unpicked Stamps. These Stamps are obtained from **Foreign Missions** abroad and are sold just as imported. Countries represented :— West and South Africa, Bahamas and Fiji Islands, Jamaica, Kenya, New Zealand, Morocco, Falkland Isles, Australia, Straits Settlements and surrounding States (Kedah, etc.), Danzig, Russia, Finland, and many other countries too numerous to mention. Many good Stamps have been found in these mixtures. " My boys are delighted with their boxes," writes one client.
JOS. H. GAZE, DIDSBURY, MANCHESTER.

1000 DIFFERENT STAMPS 1000
ON APPROVAL

from which you may select any 100 for **3/-.** This selection is **not** made up of the thousand commonest stamps, but contains specimens priced by Stanley Gibbons up to 1/- each. For 3/- you have the opportunity of choosing 100 stamps of the catalogue value of 20/- or more.
H. HARDY, 86, Ridge Rd., Hornsey, London, N.8

5 Paraguay, 1931, Air Mail ... ... **5d.**
5 Soruth Pictorials ... ... **4d.**
25 Air Mails ... ... **6d.**
Australia 1/4, used, **4d.** **2/-** used ... ... **2d.**
Postage 1½d. extra. Selections sent if desired.
J. N. MORRIS, 9, Audley Road, Folkestone, Kent.

Have You Any 'Latakia' Stamps?

We are **giving away** a set of **Four Unused Pictorial Provisionals** from this Country together with **50 different other stamps** if you ask for our " Bumper " Approval Books. Send 1½d. postage.
Special Offer : Rhodesia 1896-7 2, 3, 3, 4, 6, 6, 8, 8d. and 4/- (cat. £1 5s. 3d.) only 2/6. 6 Albania 1925 (cat. 3/-) 8d. 19 Liberia 1921-3 1c.–$1 various (cat. 11/4) 3/6.
HARRY BURGESS & CO., Dept. C54, New Malden, Surrey.

125 Different Stamps Free

To introduce my Approval Service to serious collectors, I am offering 125 Different Stamps Free to genuine applicants who request to see my Approval Books of British Colonials and Pictorials priced from ½d. each, less 3d. in the 1/- discount. This excellent packet includes British and French Colonials, Pictorials, etc.
ERIC J. WATTS, 48, LONDON ROAD, NORTHAMPTON

THE BRITISH COLONIAL SPECIALIST

FREE

50 USED EUROPEAN INCLUDING SETS AND HIGH VALUES
The above Packet sent Post Free to all applicants for Approvals sending 2d. postage.
H. S. HUGHES
OVERLEY, SUTTON ROAD, WALSALL

HAVE YOU SEEN THEM ? My Record Approvals. Endorsed by my many customers as indeed a **RECORD OF QUALITY AND CHEAPNESS.**
HUGE DISCOUNT OF 9d. IN 1/-
allowed for all purchases of 2/6, or 8d. in 1/- for less. Approvals post free.
FREE GIFT to all who send 2d. for cost of postage.
SPECIAL OFFER THIS MONTH—Set of old and new Russian, price **6d. Cat. 3/6 (1/7th Cat).**
RECORD STAMP COMPANY,
23, CANNING ROAD, EAST CROYDON.

CHRISTMAS BARGAINS

1 GREAT BRITAIN, 1d. black **2/6**
The first stamp ever issued.
10 GREAT BRITAIN, 1840-85, old issues ... **1/-**
Catalogue value more than 4/-.
1 SOUTH AFRICA, 1926, 4d. Triangular ... **7d.**
Something to show your friends.
24 FRENCH COLONIALS, pictorials ... ... **10d.**
Not cheap stuff—four sets of six.
48 FRENCH COLONIALS, pictorials **1/9**
A fine lot—six sets of eight.
25 AIR MAIL, mixed ... ... **8d.**
These are very popular at present.
24 BRITISH COLONIALS—Africans ... ... **6d.**
Catalogue value 2/-, some unused.
24 BRITISH COLONIALS—West Indians ... **6d.**
Some unused—excellent value.
24 BRITISH COLONIALS—Asia, etc. ... ... **6d.**
Not the ones that everybody has.
24 BRITISH COLONIALS—Australia, etc. ... **6d.**
Includes many Queen Victoria stamps.
24 EUROPE—Pre-War ... ... **3d.**
Pictorials and other good stamps.
24 SOUTH AMERICA ... ... **4d.**
The majority are unused.
16 PORTUGUESE PICTORIALS ... ... **8d.**
16 ITALIAN PICTORIALS ... ... **8d.**
10 SPANISH PICTORIALS, etc. ... ... **6d.**
Handsome additions to your collection.

All the above are excellent value, and certainly not the kind you can buy in packets. The British Colonials are especially fine and include many unused. In each case the catalogue value is four times the price, or even more. The others are all fine stamps that would cost 1d., 1½d. or 2d. on approval sheets. Tell me the countries in which you are interested, and I will supply your wants.
REMEMBER !
CATALOGUE VALUE IS IN EACH CASE MUCH GREATER THAN PRICE. NO RUBBISH !
FREE GIFT WITH EVERY ORDER !
MONEY RETURNED IF NOT SATISFIED !
WHAT MORE CAN YOU WANT ?
MAURICE WILLIAMSON,
53, SOUTH STREET, DURHAM.

THE "109" PACKET!——— XMAS GIFT FREE!

To all readers of the " M.M." this festive season, we are presenting **FREE** to all those requesting our famous Approvals, this wonderful Packet of 109 Different Stamps, including **AERO TRIANGULAR,** Set of Pictorial **U.S.A., RARE ABYSSINIAN PROVISIONAL, USED, RARE BR. SOMALILAND, Etc., Etc.** To those not requiring Approvals the price of packet is **1/3.** A limited number of packets are being reserved for overseas readers.

EXPRESS STAMP SERVICE, Dept. "B," 11, REGENT ST., CHELTENHAM, ENG.

For further Stamp advertisements see pages 1018 and 1047

Stamp Collecting—(*Continued from page 1021*)

us back rather more than a century to the greatest sailor that the British Navy has ever known, Lord Nelson, to whose memory many splendid memorials have been erected. The monument illustrated here is from the Barbados issue of 1906 to commemorate the centenary of Nelson's great sailing feat—a 24 days' crossing of the Atlantic—that saved the comparatively defenceless colony from an attack by a French fleet commanded by Admiral Villeneuve. The Barbados monument is of special interest also because it was the first statue erected in Nelson's honour.

The 18 pi value of the Cyprus British Rule Jubilee issue of February, 1928, dips even further into British history, for it shows a statue of Richard I, Cœur de Lion, who ruled England from 1189 to 1199. Richard Cœur de Lion's special claim to fame are his Crusades in the Holy Land, and it was in the course of the Third Crusade that British contact with Cyprus was first established. Richard paused at the island, on his way to Palestine, to conquer it as a punishment against its Hellenic governor for discourtesy to Richard's betrothed wife, Berengaria of Navarre, who, a little time previously, had been forced by gales to anchor off Limassol.

After mastering the island, Richard and Berengaria were married there on 12th May, 1191, and a mediæval chapel at Limassol in which the ceremony is said to have taken place, is still displayed to visitors. Richard sold the island to the Templars, but a year later it passed into the hands of the Frenchman Guy de Lucignan, and for almost 300 years remained the seat of a French Kingdom. Subsequently it was conquered by the Turks, and remained a province of the Ottoman Empire up to 1878 when the Turkish authorities consented that the island should be governed by the British, although remaining nominally Turkish territory. The entry of Turkey into the Great War automatically annulled that convention, and in May, 1925, Cyprus attained the full status of a British colony. The statue illustrated on the stamp, by the way, does not stand in Cyprus itself. It is the statue that stands outside the Houses of Parliament at Westminster. London readers may recall that the sword in King Richard's hand was broken in the great gales of November, 1928.

To the best of our recollection this is only the third occasion on which a pre-Victorian British monarch has been illustrated on a stamp. King Charles I was illustrated on the Barbados tercentenary issue of 1927, and James I on Newfoundland's tricentenary issue of August, 1910. These stamps do not come within the scope of the present article, however, and must be left for reference on another occasion.

We thank Stanley Gibbons Ltd. (see advertisement page 1018) for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

Stamp Gossip

and Notes on New Issues

Italian Special Air Issue

Scenes reminiscent of the Port Fouad melee took place in Rome on 27th June last, when there was placed on sale a quantity of the special 7L.70 stamps used to frank mail carried by an Italian air squadron on a formation flight from Rome to Rio de Janeiro in December last.

The quantity available for sale was only 1,500, and only one copy was sold to each applicant. Naturally the supply was hopelessly inadequate and, with the prospect of disappointment before them, many would-be purchasers scrimmaged for places in the queue. Fortunately no serious accidents occurred. The stamps are commanding a very high price already, as it is understood that no further supplies will be issued at face value.

New Belgian Colonial Set

The standard of interest in Belgian Colonial issues is always high, and the recently issued long set of new stamps for Ruanda-Urundi makes a striking addition to the list. The designs are full of interest, for they are substantially a pictorial story of native life in this Belgian Mandated Territory. There are 14 stamps in the series, ranging from 10c. to 20 fr. in value. Briefly listed the designs are as follows :—10c., Mountain country in Ruanda ; 15c., a native warrior ; 25c., The kraal of a chief ; 40c., Two cowherds ; 50c., Head of a buffalo ; 60c., A young native porter ; 75c., Native women ; 1 f., Wives of Urundi chieftains ; 1f.25, A native mother and child ; 2f., The manufacture of wooden pots ; 3f.25, A native craftsman at work ; 4f., A potter of the Watubu tribe ; 5f., A native dancer ; 10f., Native warriors ; 20f., A prince of the ruling dynasty.

Gibraltar Makes a Change

It must be unique for a country to change the design of its stamps because tourist visitors have ignored them. That, however, is an underlying reason for the appearance of a pictorial design for Gibraltar's 1d. and 1½d. values, after 45 years' strict adherence to monarch's head designs. The new stamp was illustrated in our last issue.

It seems that British tourists, misled by the likeness of Gibraltar's King's head stamps to those of Great Britain on casual inspection, have been using G.B. stamps to frank their homeward mail. The new stamps are sufficiently distinctive to remove any possibility of future confusion. They show a splendid view of the Gibraltar peninsula, and in the foreground a British Naval vessel.

The Austrian Poets Commemorated

The Austrian charity issue to which we referred in a note in the October "*M.M.*" appeared on 12th September, and although the poets of Austria have not the same wide appeal as their country's musicians, the issue is certain to attain great popularity. It contains six stamps and was sold only in complete sets at double face value.

Each of the portraits displayed is of a poet who was at the zenith of his fame in the 19th century, and considerable interest surrounds them all. Franz Grillparzer, whose portrait appears on the 20 gr. value illustrated here, is certainly the outstanding man of the group. He was one of the greatest dramatic poets of the age, but like many another genius his life was not happy and his great plays vividly illustrate the ups and downs of his career. Strangely enough, it was in the midst of his greatest troubles that Grillparzer did his greatest work.

Ferdinand Raimund (1790-1836), who is shown on the 10 gr. value, was originally a stage comedian, but subsequently he devoted himself to the writing of serious drama of high merit. In common with many comedians Raimund was a melancholy man, and the transfer of public popularity to a rival playwright, Johann Nestroy, led him to take his life. Johann Nestroy (1801-1862), whose portrait appears on the 30 gr. stamp, was chiefly famed for his farces and comedies.

Adalbert Stifter (1805-1868) appears on the 40 gr. stamp. He is principally famous for his descriptive poems on the woodlands of his native Bohemia. The 50 gr. stamp bears a portrait of Ludwig Anzengruber (1838-1889), who is of a later period than the poets already referred to. His greatest successes were simple plays and poems and one of his plays, "*Die Pfarrer von Kirchfeld,*" still enjoys a substantial vogue in Austria. Peter Rosegger (1843-1918) is shown on the 1 sch. value.

* * * *

An event of outstanding interest to our stamp collecting readers, The Schoolboys' Stamp Exhibition, is to be held in London from 1st to 9th January. The organisers have arranged a most attractive programme, and the Editor of the "*M.M.*" is arranging for "*M.M.*" readers to be admitted free on 7th January. Further details will be announced in our January issue.

You must have all the wheat

Every part of the wheat grain contributes something vital to the health and growth of the human body, especially during youth.

The inner layers and germ are rich in proteins and minerals which build up flesh and bone. The kernel supplies energising carbohydrates, which are the 'fuel' foods. The bran in the outermost skins is necessary to keep the digestive tract active and so promote health in the way nature intended.

Shredded Wheat contains the whole of the wheat, steam cooked, shredded and baked. This process makes it crisp and appetising and, by breaking down the starch cells, converts the wheat into a form which our bodies can assimilate and digest. It is to this exclusive process that Shredded Wheat owes its unique qualities.

Give Shredded Wheat a good trial for breakfast, lunch or supper. You will like it more the more you have, either with milk, fruit or with butter and cheese.

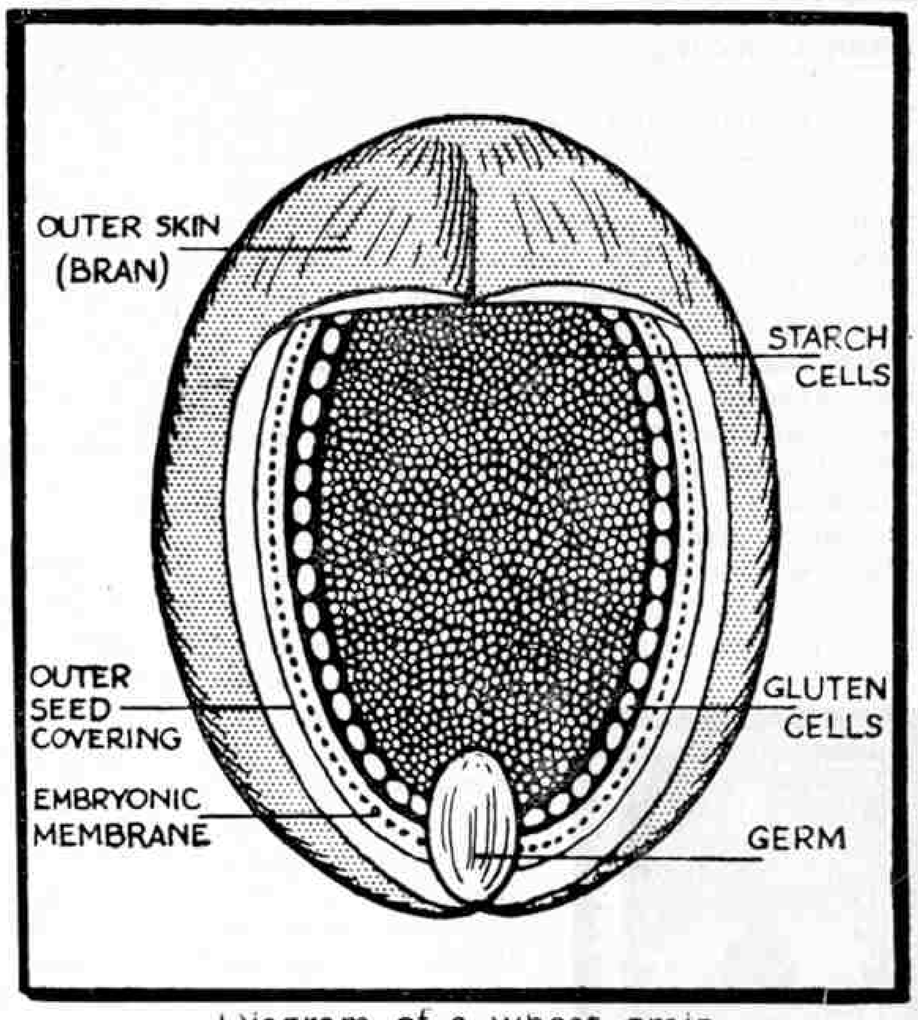


Diagram of a wheat grain

SHREDDED WHEAT

Shredded Wheat is made by British labour, from Empire-grown wheat only, by The Shredded Wheat Co. Ltd., Welwyn Garden City, Herts.

This happy Fellow chose a famous

B.S.A. Air Rifle

.177 in. bore £4
or 7/6 monthly
B.S.A. Pellets
.177 in. 2/6 per 1,000
1/4 box of 500.

And who wouldn't be happy with the finest of all Christmas gifts—a famous B.S.A. Air Rifle.

You, too, should choose a B.S.A. Air Rifle, it will be your proudest possession for many, many years and the envy of all your chums.

Remember, B.S.A. Air Rifles are ALL-BRITISH and fully guaranteed. They have a fixed rifled barrel, patented cocking mechanism, are deadly accurate and remarkably hard-hitting.

Tell dad that you must have a B.S.A. Air Rifle this year, and remind him that no licence is necessary to purchase or to use in the house or garden and that B.S.A. Pellets cost only 2/6 per 1,000—33 accurate shots for a penny.

The B.S.A. Target Holder makes indoor shooting perfectly safe.

Choose wisely, choose British, choose a B.S.A. Air Rifle.

Post the coupon NOW

B.S.A. Guns Ltd., 92, Small Heath, Birmingham.
Please send B.S.A. Air Rifle Leaflet.

Name .....

Address .....

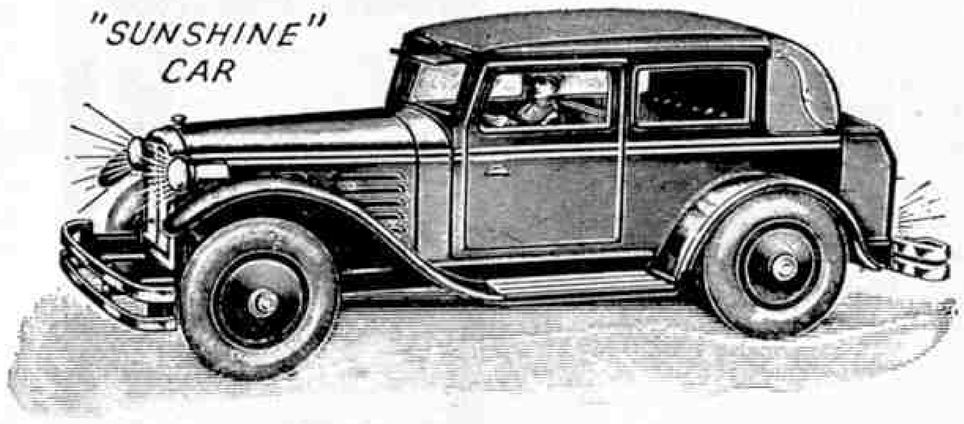
"NIPIT"

(BRITISH MADE)

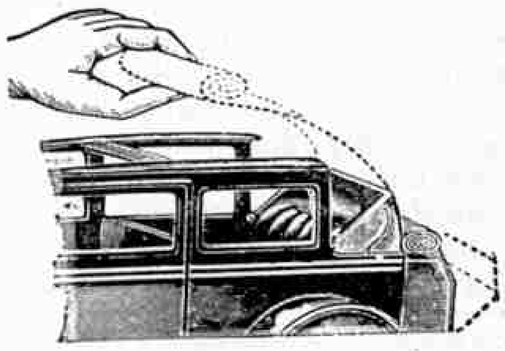
The best GAME of the year.
With plenty of "PEP" in it.
A good game is always a good investment.

Price 7/6

The New "Sunshine" Motor Car



Well made, handsome appearance, each car fitted with a "Sunshine" hood (which can be neatly rolled up), also a luggage box; bumpers, back and front, strong clockwork, with automatic check action. Without lamps, 7/- each. With two head lights, 8/6 each.



If unable to obtain from your Store or Dealer, write

A. J. HOLLADAY & CO. LTD.
3, Aldermanbury Avenue,
London, E.C.2.

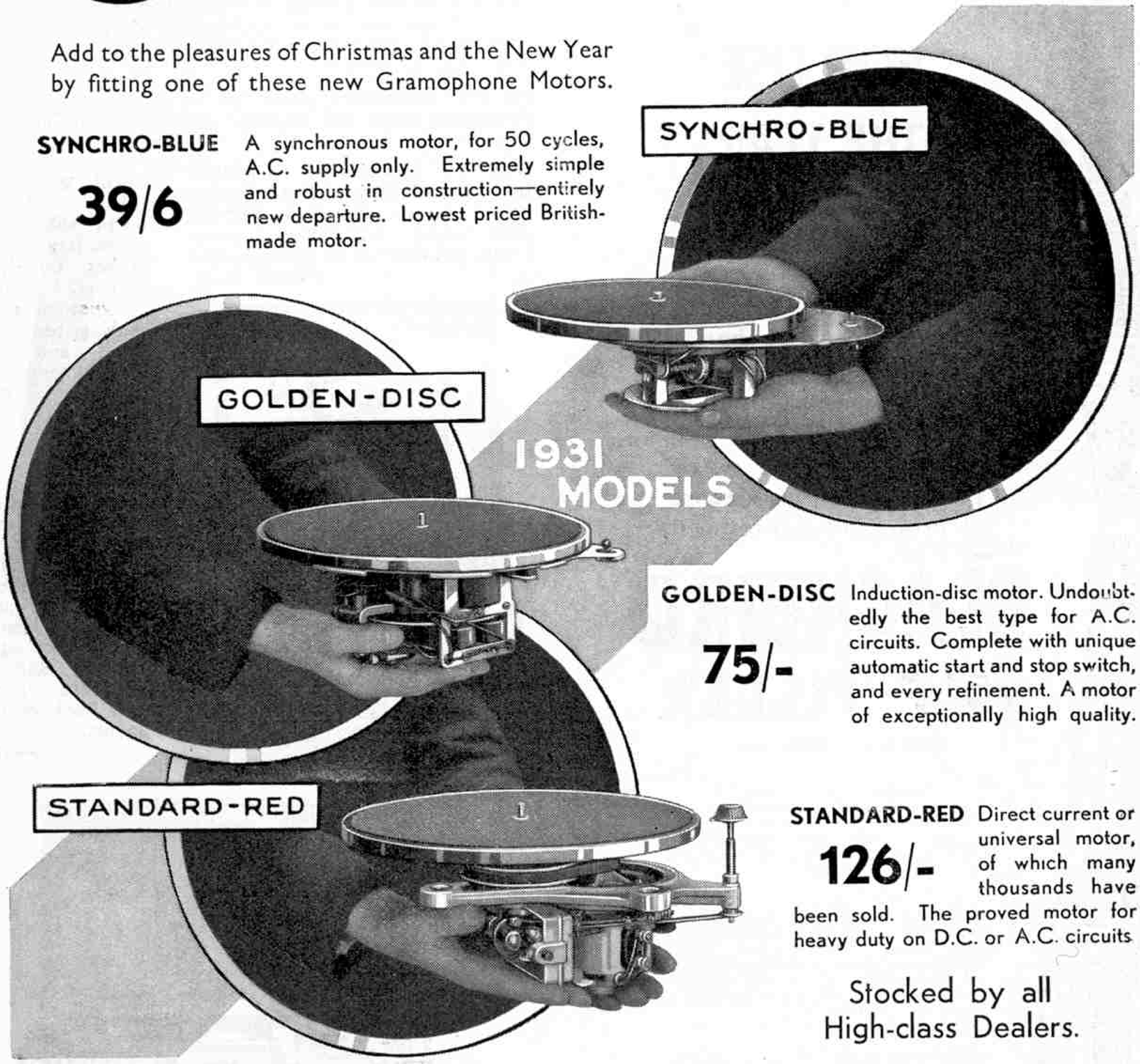
Here's something useful for Christmas!

B T-H

THE ELECTRIC GRAMOPHONE MOTOR

Add to the pleasures of Christmas and the New Year by fitting one of these new Gramophone Motors.

SYNCHRO-BLUE **39/6** A synchronous motor, for 50 cycles, A.C. supply only. Extremely simple and robust in construction—entirely new departure. Lowest priced British-made motor.



GOLDEN-DISC **75/-** Induction-disc motor. Undoubtedly the best type for A.C. circuits. Complete with unique automatic start and stop switch, and every refinement. A motor of exceptionally high quality.

STANDARD-RED **126/-** Direct current or universal motor, of which many thousands have been sold. The proved motor for heavy duty on D.C. or A.C. circuits

Stocked by all High-class Dealers.

The British Thomson-Houston Co., Ltd.

ELECTRICAL ENGINEERS AND MANUFACTURERS

Head Office: Rugby, England. London Office: "Crown House," Aldwych.

Works: Rugby, Birmingham, Willesden, Coventry and Chesterfield.

A1093N

Christmas Gifts

FOR USE THE YEAR ROUND

There is no better gift for a boy or girl than a 'Blackbird.' It is a full-sized pen, substantial in appearance and so well made that its very possession brings a sense of pride and self-respect.

'BLACKBIRD' SELF-FILLER

MADE IN ENGLAND

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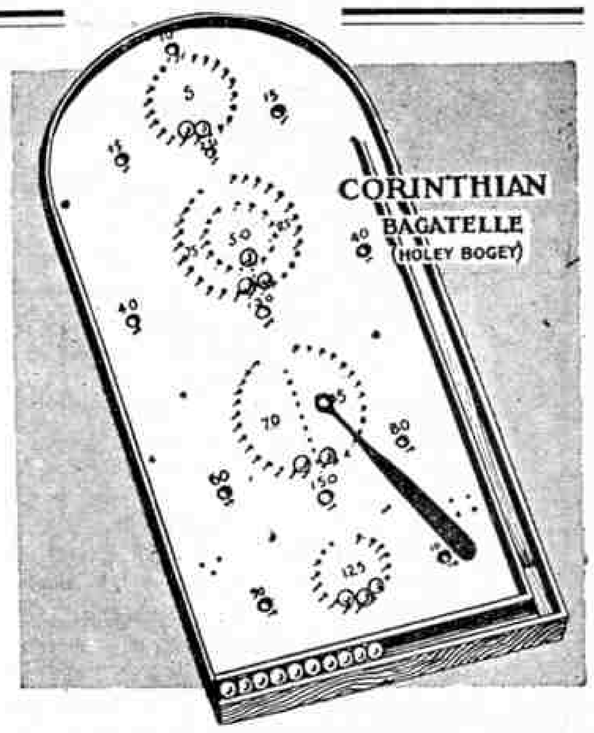

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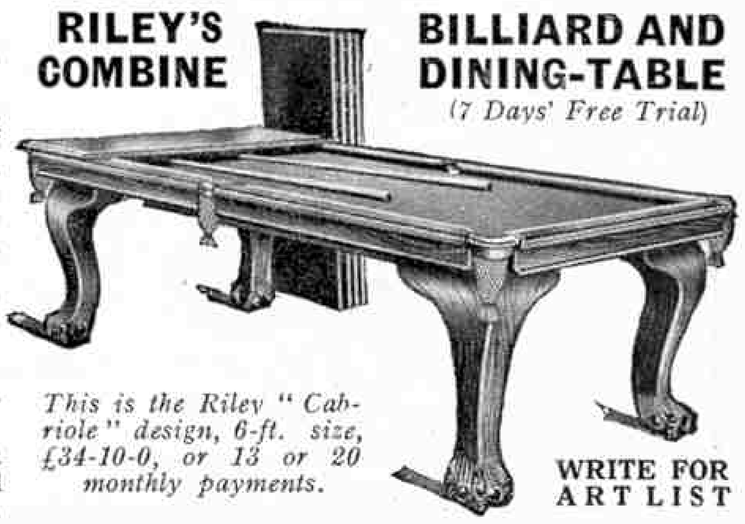

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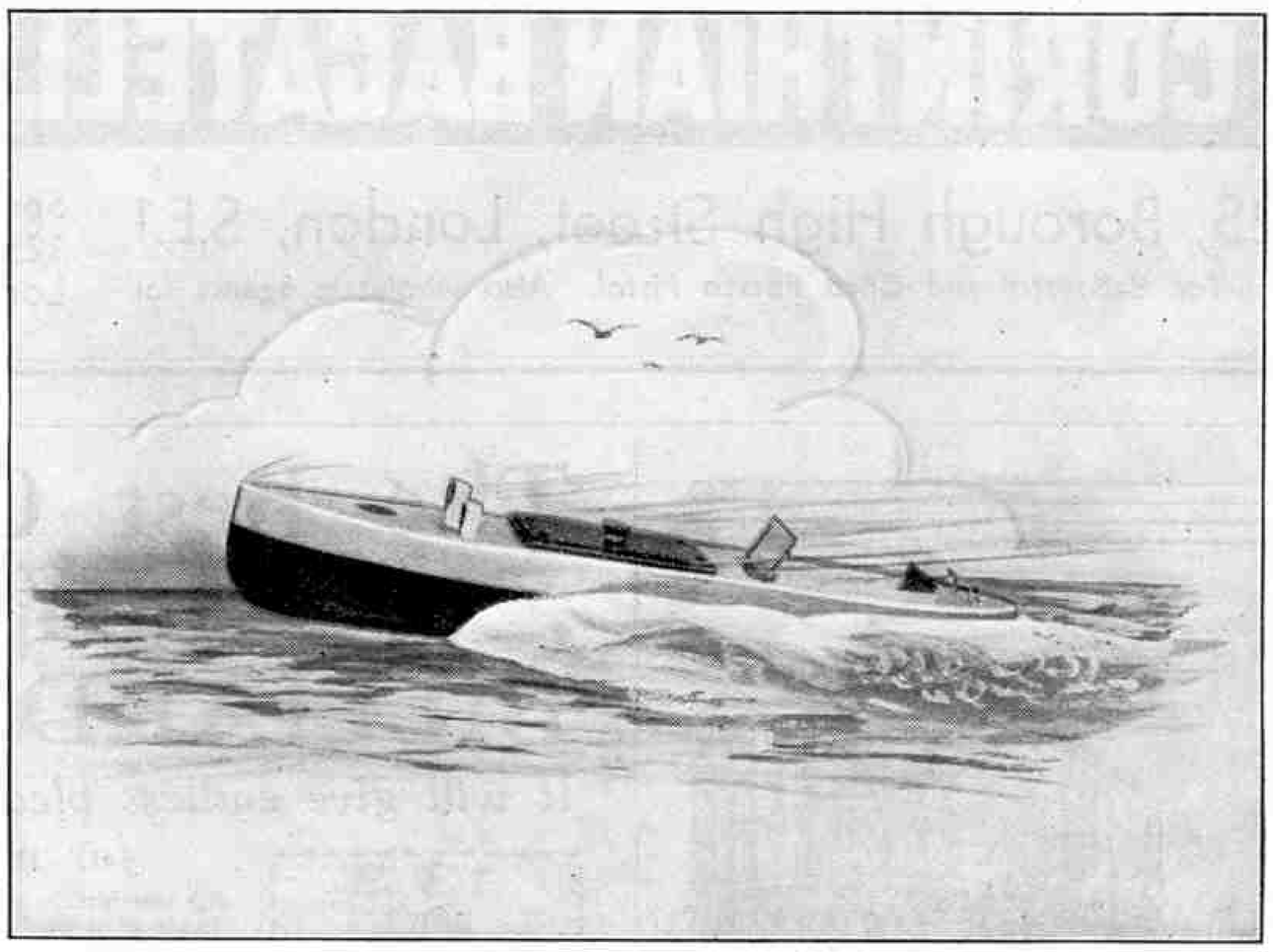

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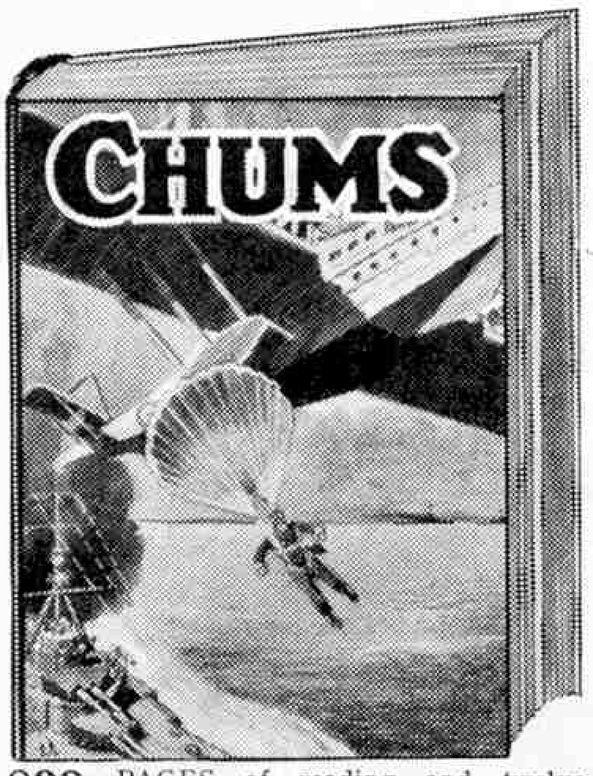

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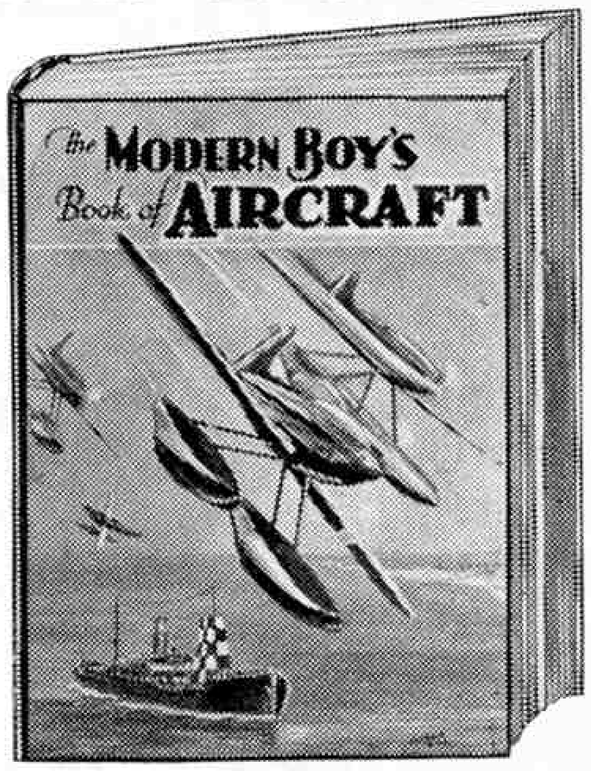

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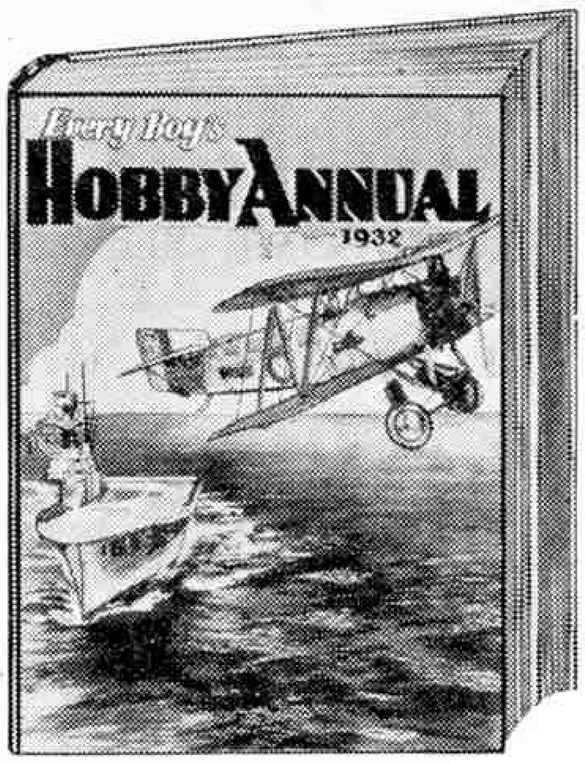

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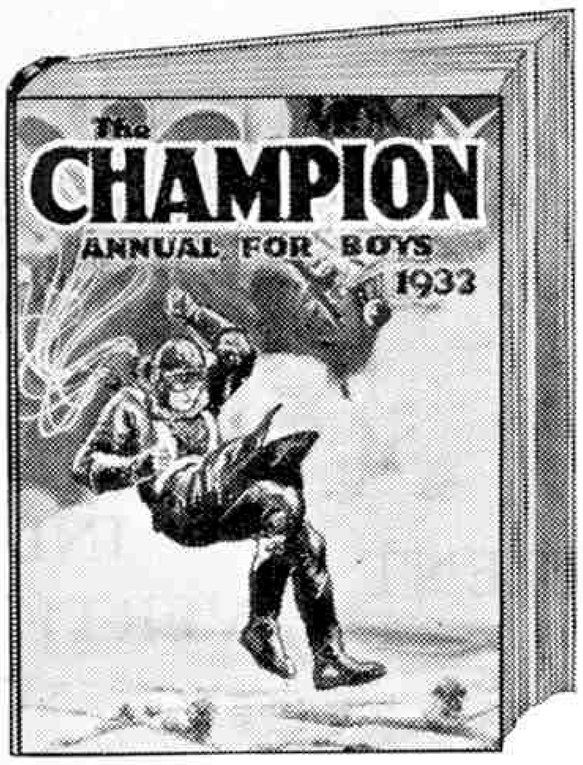

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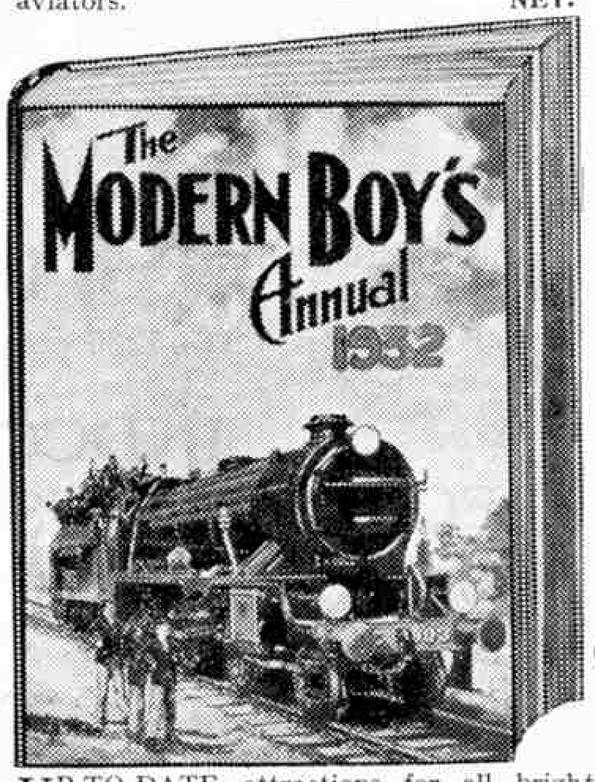

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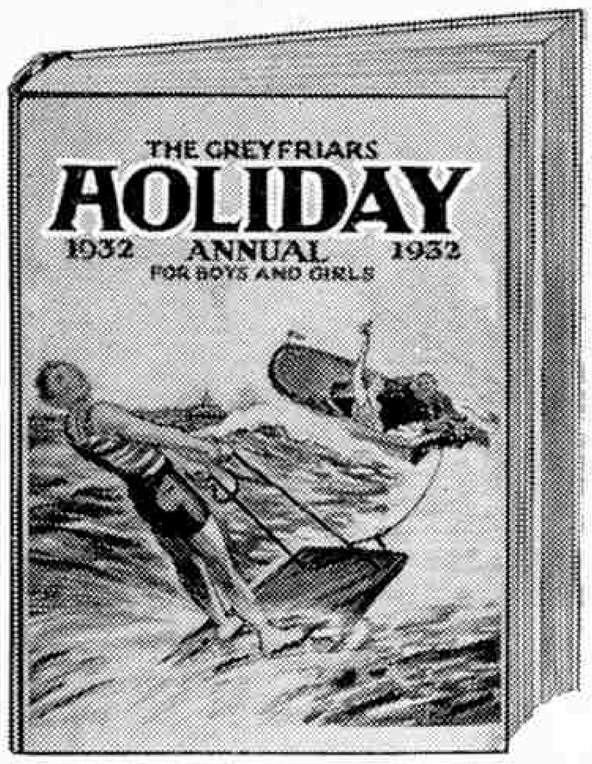

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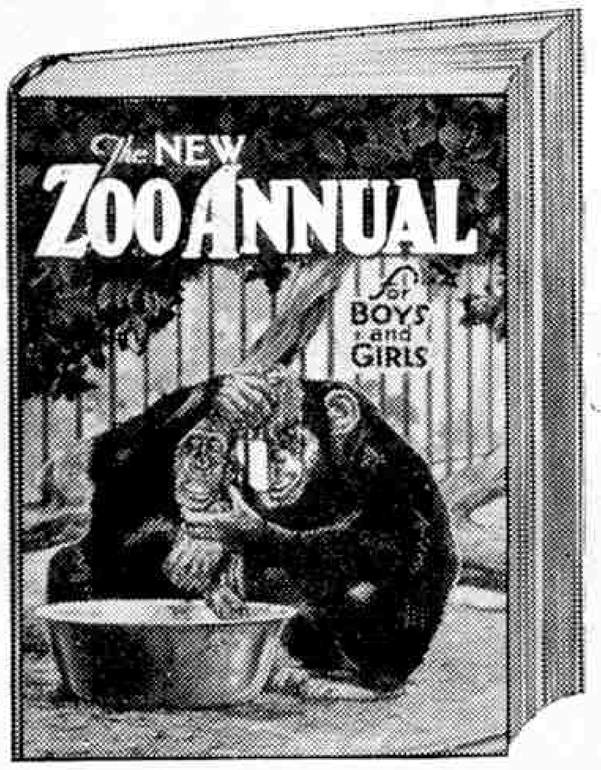

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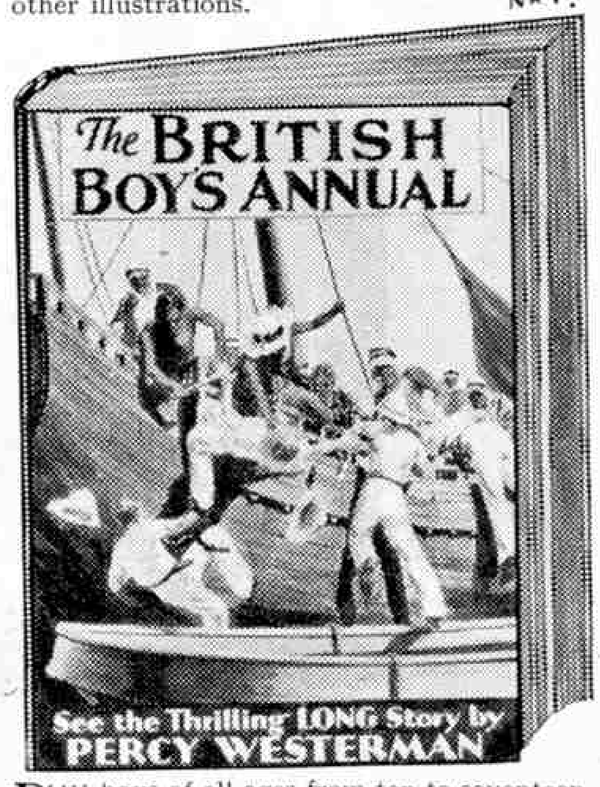

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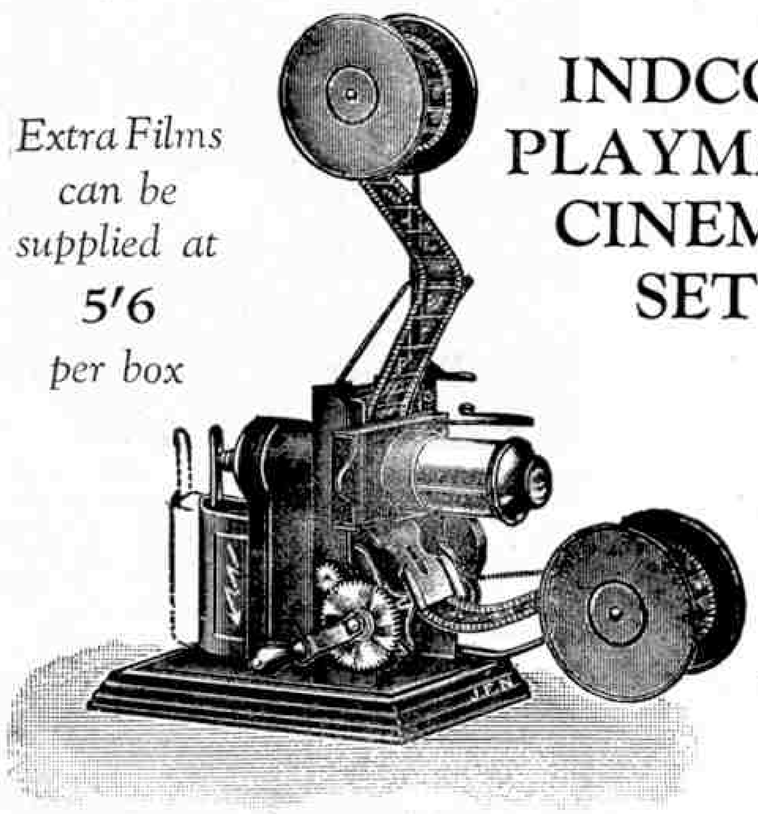

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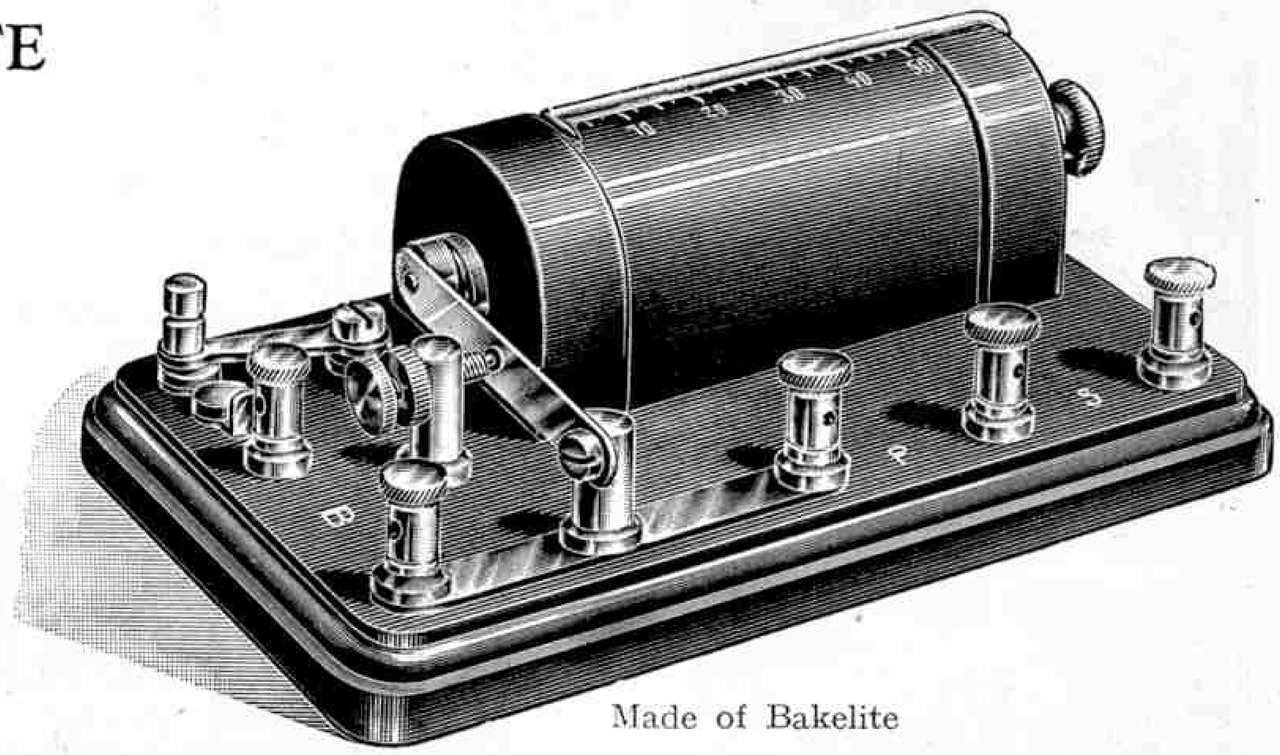

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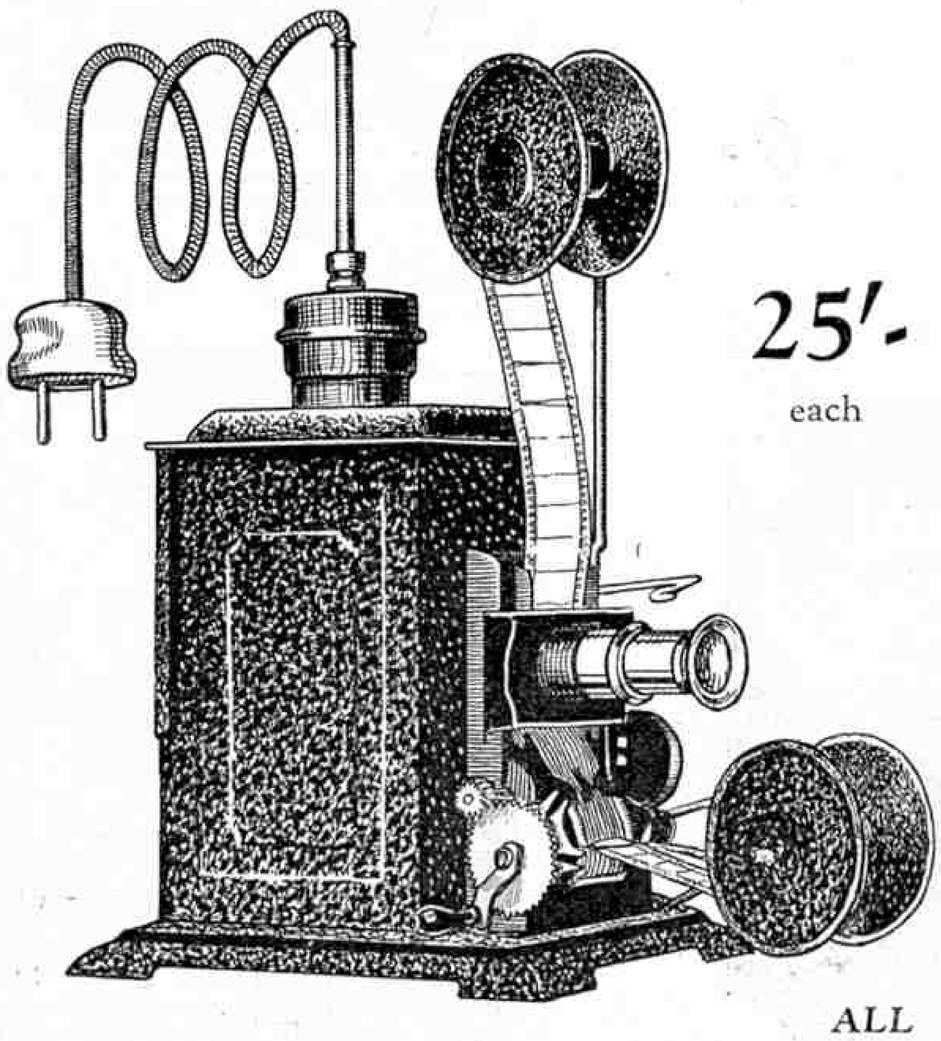

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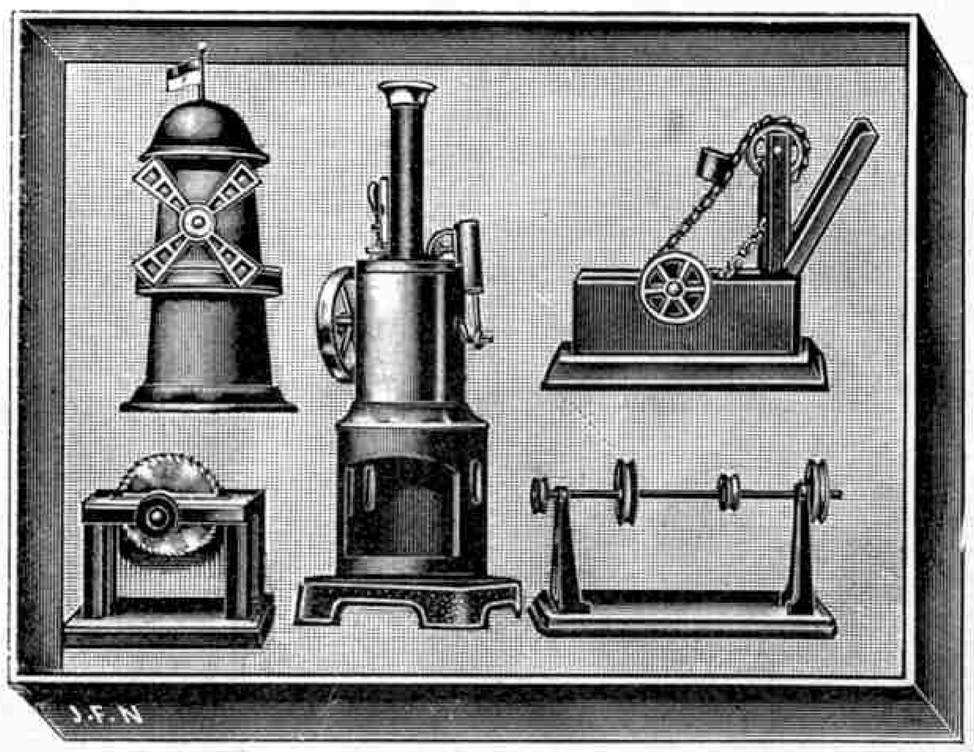

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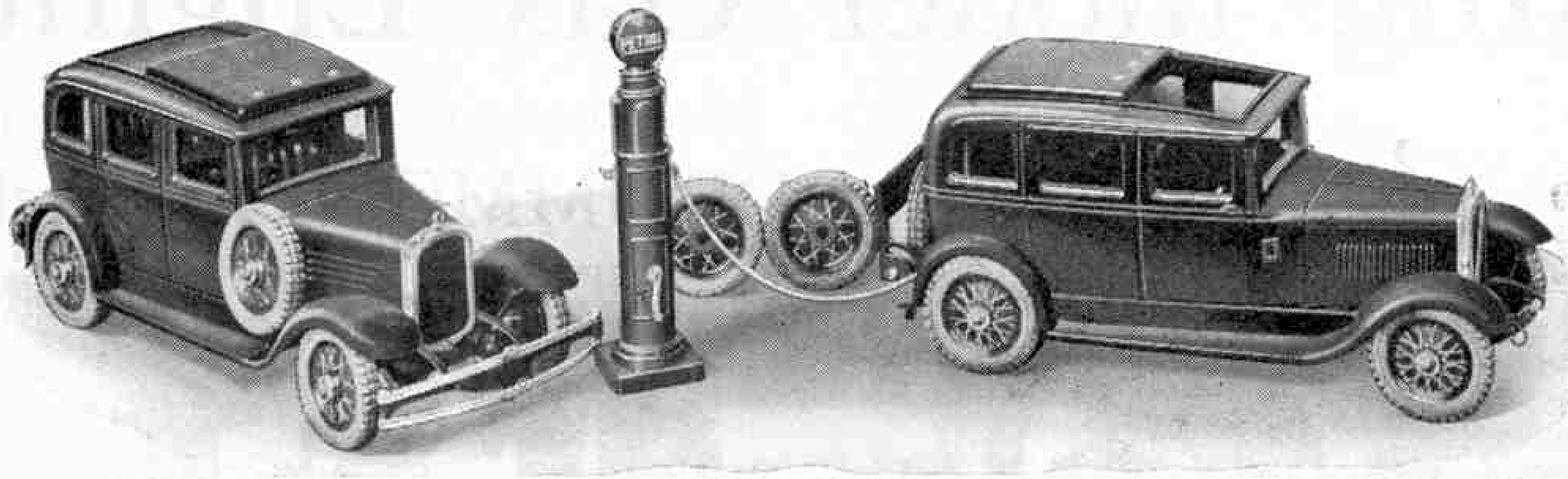

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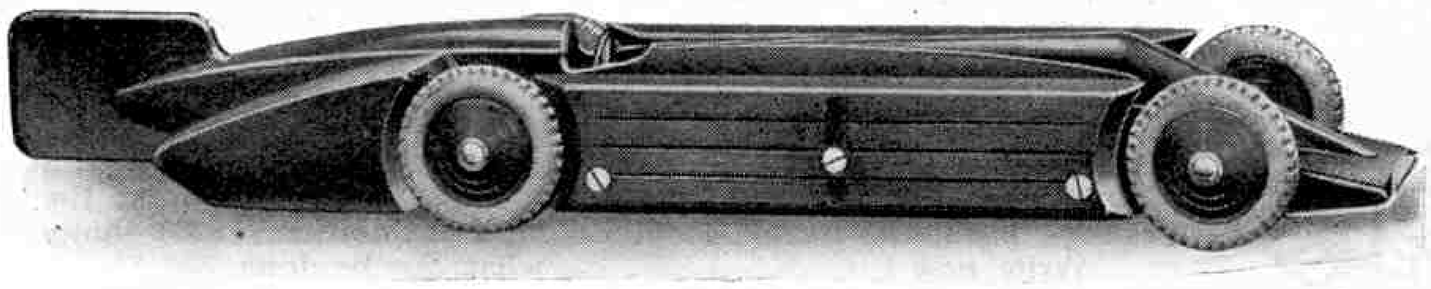

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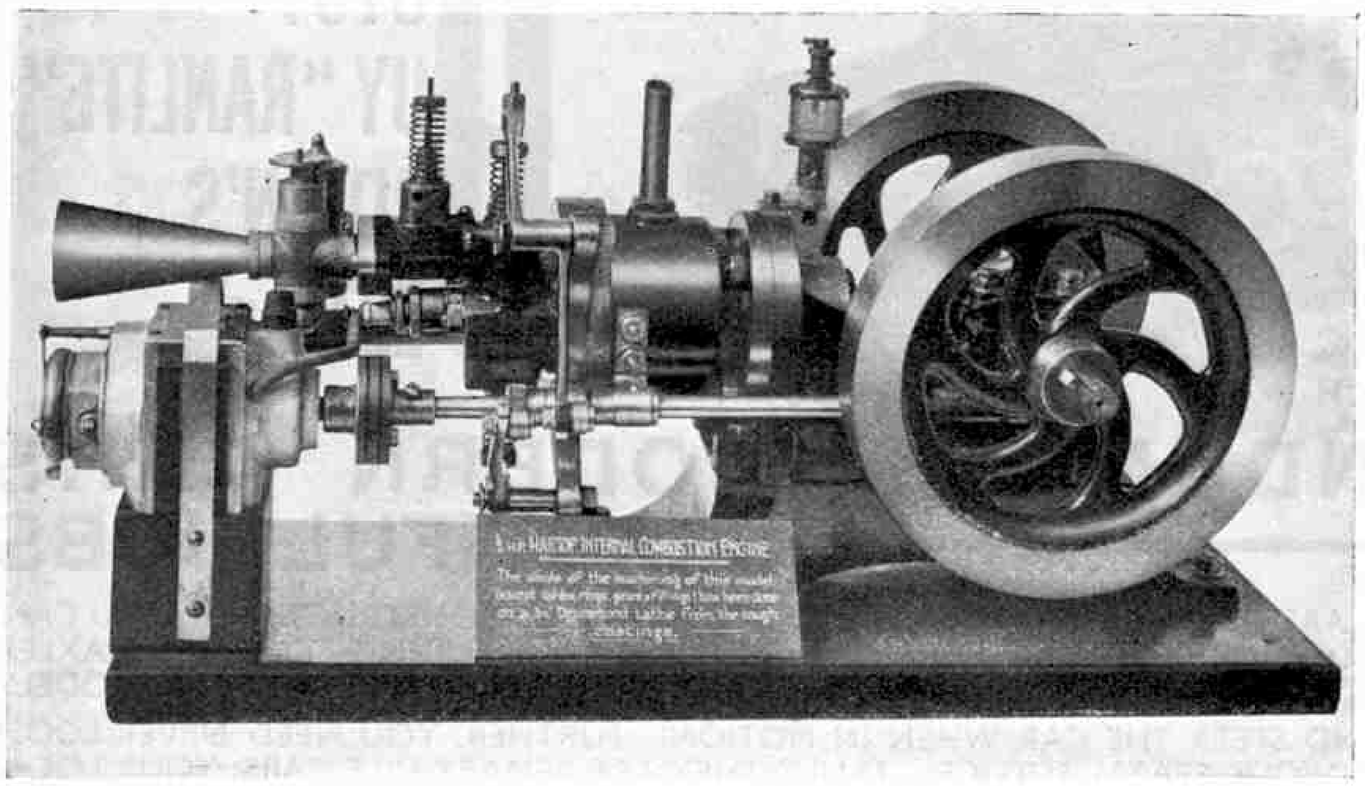
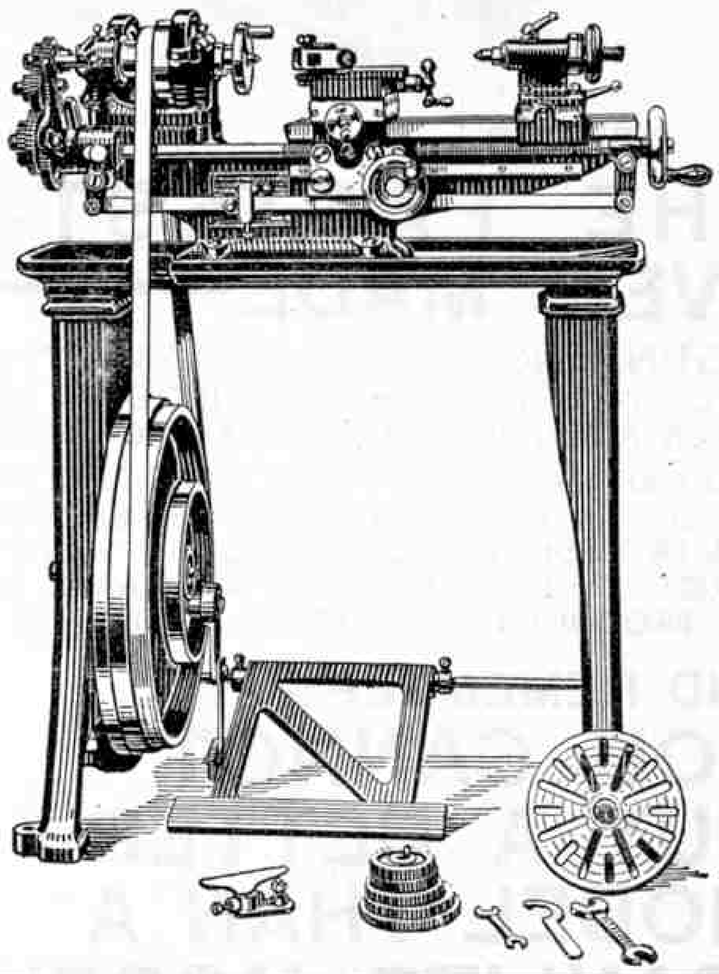


Was machined almost entirely on a

DRUMMOND $3\frac{1}{2}$ inch BORING AND SCREWCUTTING LATHE



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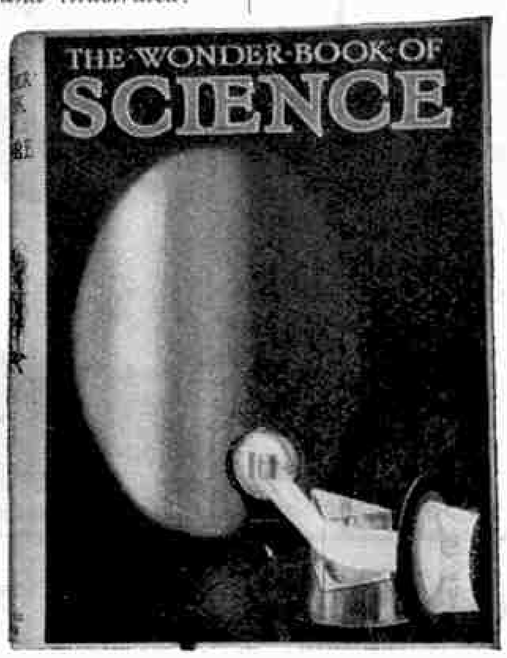

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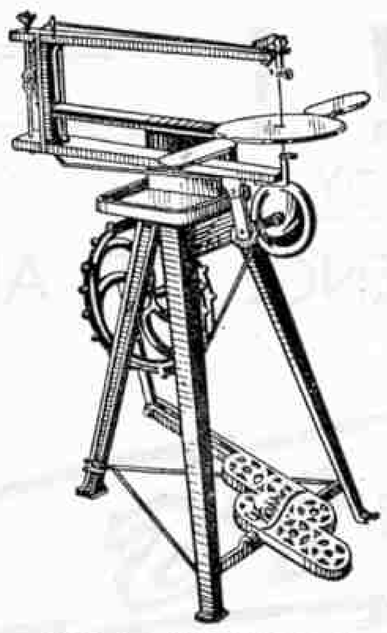

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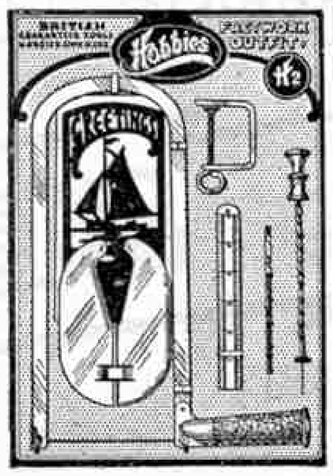

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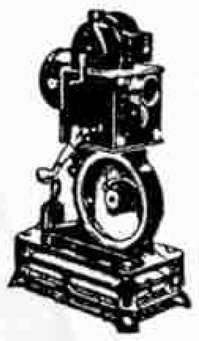

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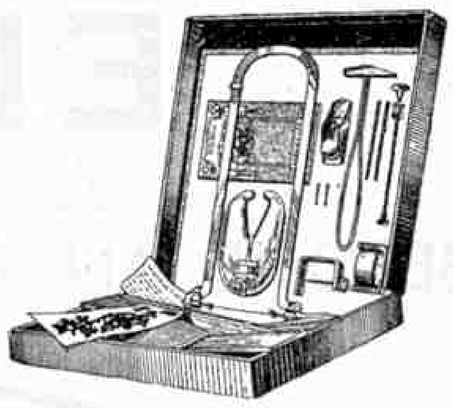

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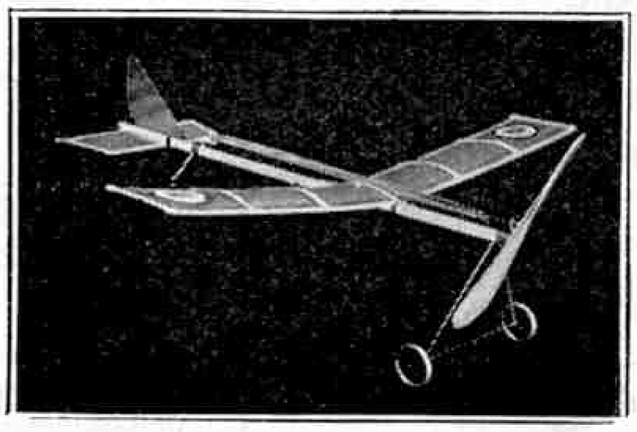

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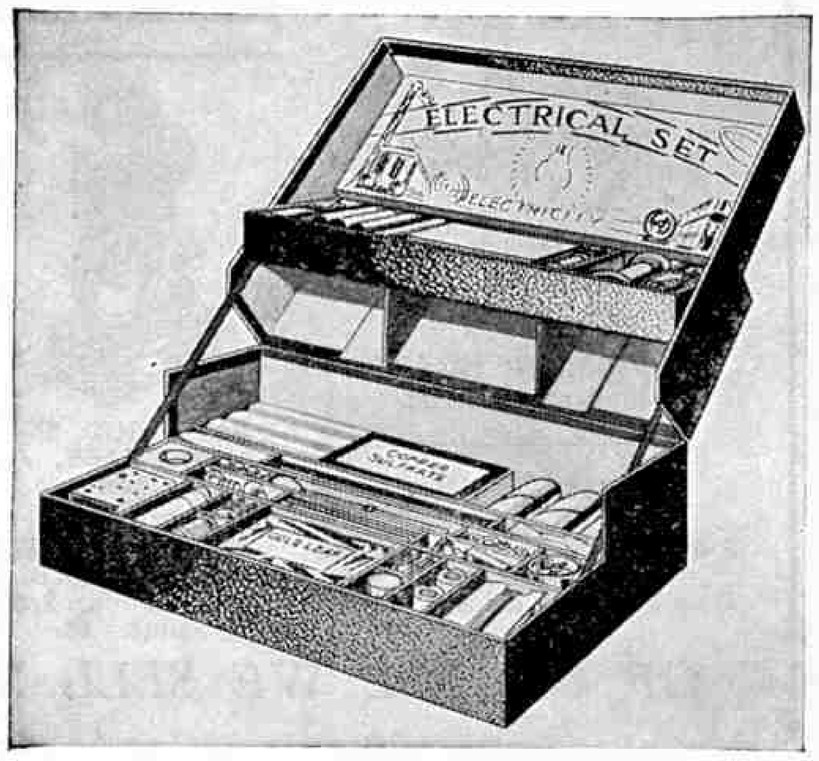

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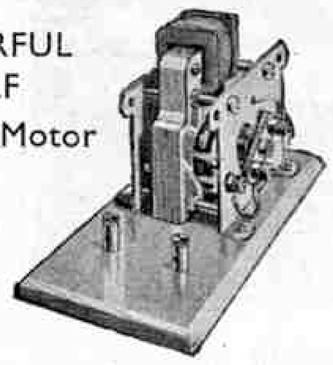

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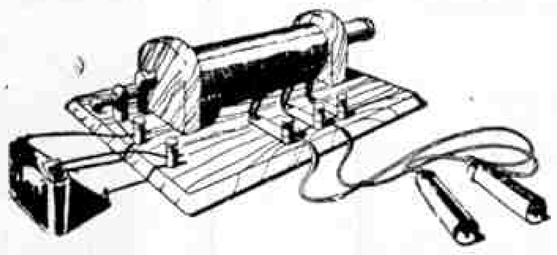

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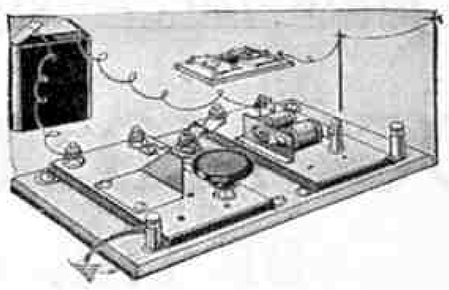

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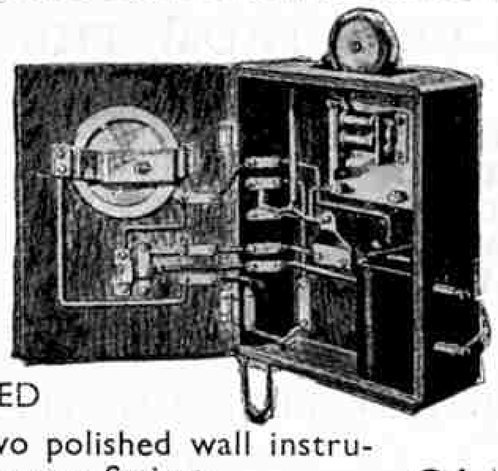

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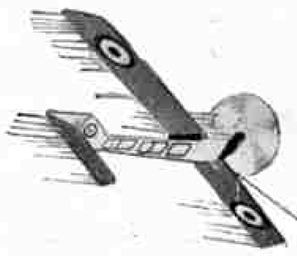

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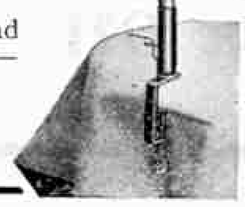

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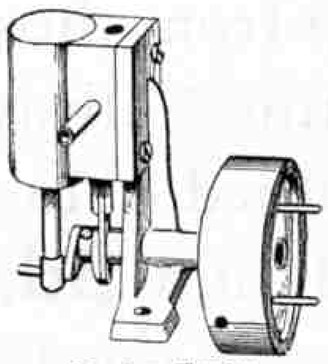

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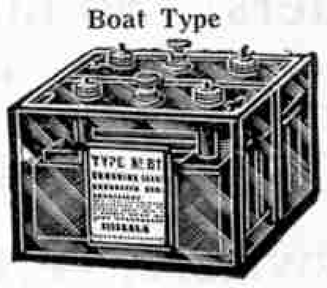

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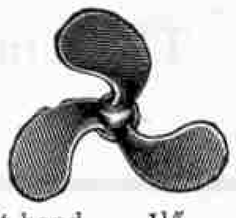

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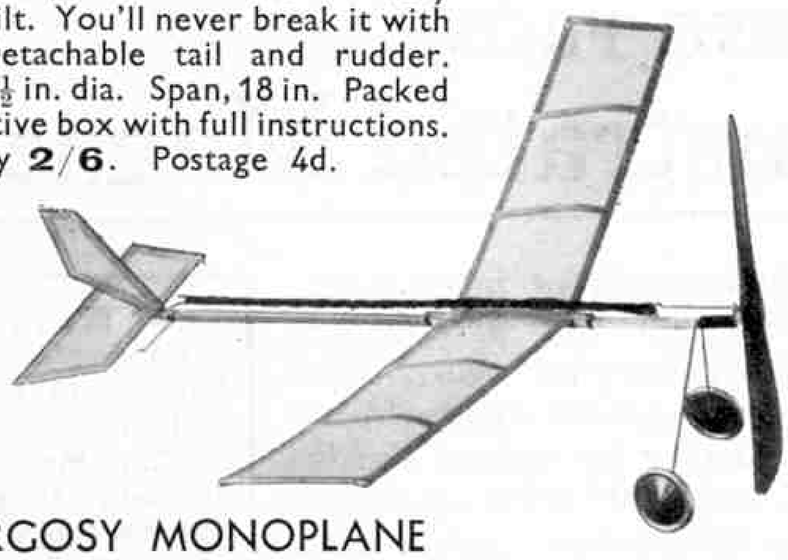

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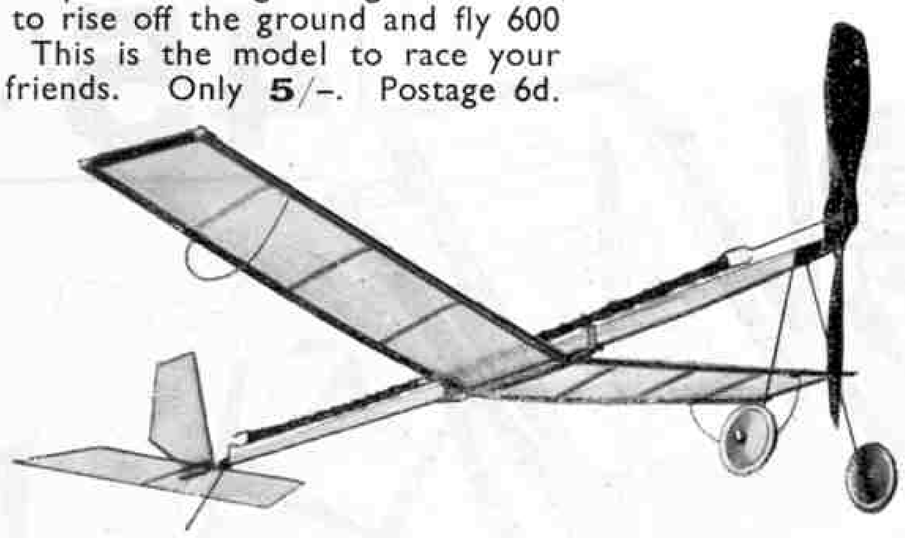

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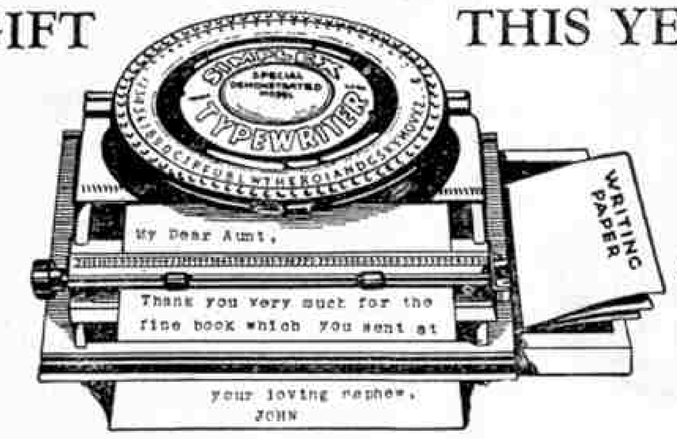

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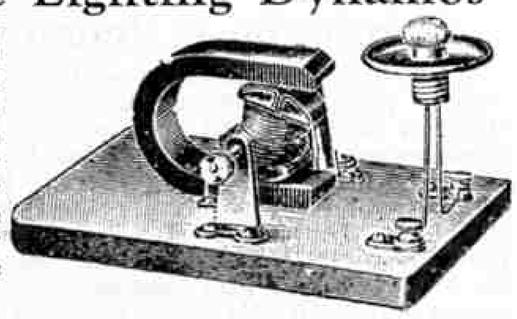

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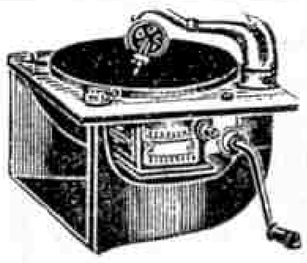

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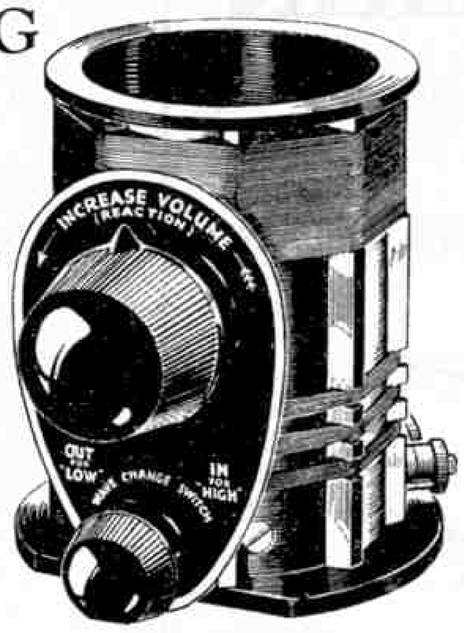

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Exhibition in Johannesburg

Mr. A. E. Harris, the agent of Meccano Ltd. for South Africa, recently held an interesting exhibition of Meccano models at his showrooms, 142, Market St., Johannesburg. Almost half of the 45 models on view were equipped with Meccano Electric Motors and were kept in operation practically throughout the entire exhibition. The models shown included such well-known examples of the resources of the Meccano system as the Motor Chassis, with representations of the famous racing cars, Sir Malcolm Campbell's "Bluebird" and Sir Henry Segrave's "Golden Arrow," the Big Wheel, Eiffel Tower, Blocksetting Crane, Travelling Gantry Crane, Watt's Beam Engine and other types of Steam Engines and a number of Bridges.

The large numbers of visitors who attended the exhibition were greatly interested in all the models, and particularly in a wonderful representation of No. 3 Shaft of Geldenhuis Deep, one of the famous gold mines of the Rand. This model was constructed by a ten-year old member of the Malvern M.C., the members of which combined with those of the Turffontein M.C. in the construction of special models for display at Mr. Harris's exhibition.

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An Interesting Runabout

The "Bat" runabout manufactured by Automatic Pressings Ltd., Bat Works, Blackheath, near Birmingham, is an interesting sporting toy for any youngster. It is a three-wheeled vehicle with front wheel drive, propelled by pedals attached to a two-throw crank on the front axle. It is steered by a tiller connected to the rear wheel, and as it can be turned in a radius of 3½ ft. it is suitable for both indoor and outdoor use.

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ARE you content with the position you occupy now—with the money you are earning—or do you wish for something better and something more?

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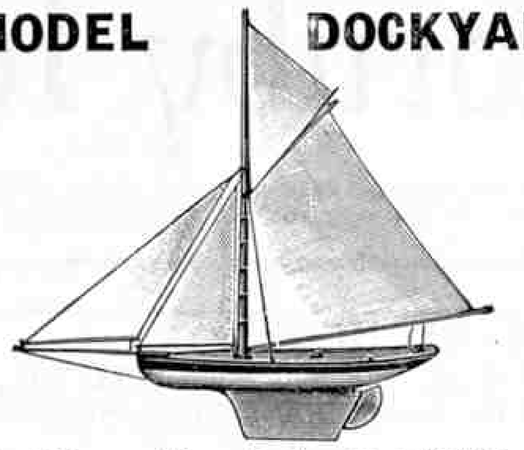

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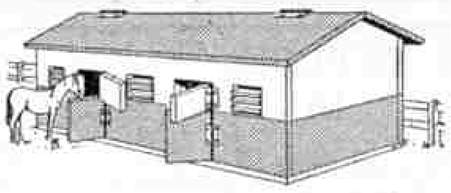

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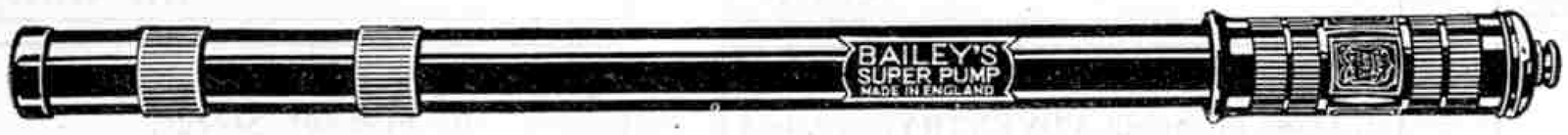

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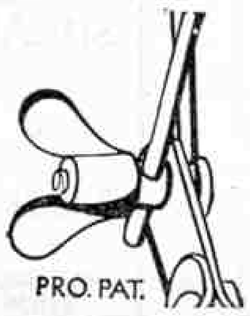

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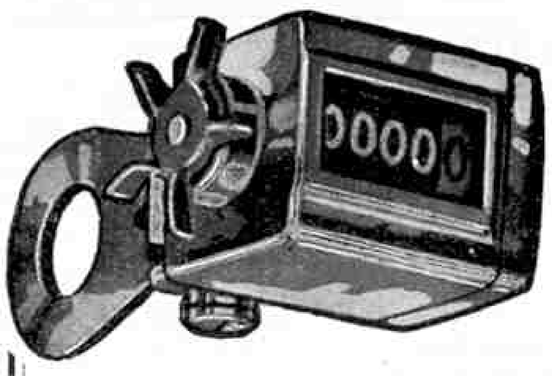

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This Month's Special Articles

	Page
Air News	970
Amusing Meccano Models for Christmas	984
Battle of the Falkland Islands	976
Books to Read	980
Competition Page	1013
Conjuring Tricks for Christmas	950
Engine Head Codes, Past and Present	968
Engineering News	958
Filming "*The Ghost Train*"	952
Fireside Fun	1015, 1017
From Our Readers	978
Gramophone Pages	974–5
Guild Pages	982–3
Hornby Railway Company Pages	999–1009
In Reply—Meccano Section	987
Ladder Making at 100 Years of Age	960
Largest Motor Vessel Afloat	962
Last Voyage of Henry Hudson	955
£500 Model-Building Competition	989
Meccano Cable Drag-Scraper	990
Model-Building Contests	993
Model-Building Contests Results	994
Mysteries of the Dynamometer Car	966
Puzzles Page	1011
Railway News	964
Remarkable Multiple Drilling Machine	946
Stamp Collecting	1021
Stamp Gossip	1023
Story of the Microscope	956
"What Shall I Be?"	948
World's Largest Landplane	972

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To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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INDEX

Vol. XVI

Jan.—Dec., 1931

Across the Andes by Rail, 196
Admirals, Famous British :—Lord Howe, 449, 533
Aero Engine Testing, 464
Aero Engines :—Armstrong Siddeley, 33 ; Bristol "Mercury" Series, 311 ; "Cirrus Hermes" Mark II, 34, 130 ; Pobjoy "R," 461 ; Rolls-Royce "Kestrel" and "Buzzard," 367, 638
Aeroplanes :—Avro Training, 885 ; Armstrong Whitworth Monoplane, 367 ; "A.W.XVI," 715 ; Blackburn-Segrave "Meteor," 795 ; Cierva "Autogiro," 362 ; D.H. "Swallow Moth," 795 ; Desoutter Sports Coupé, 128 ; Fokker "Safety 'Plane" and F.XII, 364 ; Gloster "A.S.31," 32 ; Gloster "S.S.19," 557, 715 ; Handley Page "Hannibal," 308 ; Junkers G.38, 972 ; Modern Bombing, 796 ; Modern Types of Helicopter, 886 ; Saro "Meteor" Mark I, 221 ; Sikorsky S-38, 885 ; "Southern Cross," 311 ; Troop Carrying, 716
Air Conditioning in Railway Cars, 114
Air News, 32, 130, 222, 310, 366, 460, 556, 636, 714, 794, 884, 970
Airships :—German "L.Z.128" and "L.Z.129," 131, 795 ; "Graf Zeppelin," 556, 884 ; Italian "Bebe," 33 ; U.S. "Z.R.S.-4," 223, 637
Alarm Signals on Passenger Trains, 286
Antarctic, Exploring the :—Search for a Mythical Continent, 200 ; Antarctic Continent discovered at last, 276 ; Scott's great March to the Pole, 374 ; Shackleton's great Effort, 456 ; Loss of the "Endurance," 530 ; Byrd's Flight to the Pole, 612
Automatic Train Control on the G.W.R., 198

Baltimore and Ohio Railroad :—Air-Conditioning of Dining Coach, 114 ; "Steel Specials," 543
Battle of the Falkland Islands, 976
Behind the Scenes with the Railway Chef, 880
Birds take their own Photographs, 400
Blasting the foot of a Mountain, 102
Books to Read, 36, 132, 216, 306, 390, 470, 562, 642, 722, 804, 894, 980
Bottle-Making Machine, Wonderful, 295
Brains and Bravery, 303, 807
Breakdown Trains and their Work, 858
Bridges :—Golden Gate, U.S.A., 385 ; James River, U.S.A., 472 ; Kill van Kull, U.S.A., 697 ; Martinez-Benicia, U.S.A., 380 ; Middlesbrough Vertical Lift, 127 ; Montreal Harbour, 2 ; Newcastle-Gateshead, 186
Broadcasting, The Growth of, 484

Camping grounds in the Heart of the Rockies, 628
Car Testing Machine, 803
Cartwright and the Power Loom, 16
Centenary of the Dynamo, 626, 700
Charcoal Burning, 479
Cold Storage of Fruit, The, 781
Competition Pages :—69, 163, 253, 341, 429, 511, 593, 673, 751, 837, 925, 1013
Competitions, Hornby Railway Company :—65, 157, 247, 333, 421, 507, 585, 665, 746, 835, 923, 1009
Conjuring Tricks for Christmas, 950
Cornish China Clay Industry, The, 872

Day in a Canadian Roundhouse, A, 24
Derby Seen by Television, The, 635
Development of Vacuum Tubes, The, 710
Drilling Machine, Remarkable, 946
Dynamometer Car, Mysteries of the, 966

Earthquake in New Zealand, The Great, 862
Editor, With the, 1, 97, 185, 273, 361, 449, 529, 609, 689, 769, 857, 945
Electro-Hydraulic Transmission, 208
Elephants of India and Asia, 690
Elevator Cars in One Shaftway, Two, 802
Engine Head Codes Past and Present, 968
Engineering in Ancient Egypt, 866
Engineering News, 12, 126, 212, 300, 384, 468, 550, 616, 776, 864, 958
Epic Ride of Sir Harry Smith, The, 630
Excavators, Modern Mechanical, 98
Exploring the Solar System, 202
Exploring Underground, 450

Faraday, Michael, 626, 700
Fastest Train in the World, The, 791, 882
Film of the "Ghost Train," Making the, 952
Fireside Fun, 71, 165, 255, 343, 431, 513, 595, 675, 753, 839, 927, 1015, 1017
Floodlight for Aerodromes, New, 799
Floodlighting in Changing Colours, 634
Flying Boats :—German "Rumpler," 223 ; Modern British, 371 ; Short "Kent," 310, 367
Ford Works at Dagenham, 382
Freckle Hogan's Grit, 38
Friese-Greene, Kinematograph Pioneer, 188
From Our Readers, 30, 124, 218, 304, 392, 482, 560, 640, 720, 800, 890, 978

Game Fish in Canadian Waters, 692
Garner Six-Wheeled Lorry Chassis, 224, 738
Gear Ratio, 2½ Million to One, 44
Gliding and Soaring, Thrills of, 462
"Gold Coast Limited," The, 191
Gramophone News, 806, 893, 974
Great Buffalo Rodeo, The, 868
G.W. Railway :—Acton Marshalling Yard, 291 ; Automatic Train Control, 198 ; "Cheltenham Flyer," 791, 882 ; "City of Truro" Retires, 398 ; "County" Locomotives, 480 ; South Wales Ports, 6

Heat Expansion in Railway Engineering, 112
Hornby Railway Company, Junior Section :—Aids to Realism, 326 ; A Reader's Layout, 414 ; Branch Line Working, 578 ; Developing a Layout, 740 ; Goods Yards and Depots in Miniature, 916 ; Miniature Railways out of Doors, 656 ; Minor Operations, 148 Notes on Hornby Track, 238 ; Placing of Accessories, 58 ; Running "Specials," 1002 ; Sidings, Loop Lines and their Uses, 826 ; Uses of Cardboard, 500
Hornby Railway Company Notes, 56–7, 146–7, 236–7, 324–5, 412–3, 498–9, 577, 663, 739, 829, 913, 999
Hornby Railway Layouts and Workings :—Boat Trains, 824 ; Classification of Hornby Locomotives, 502 ; Layout for Everybody, 150 ; Locomotive Depots, 580 ; Novel Operations, 60 ; Realism in Lineside Effects, 1000 ; Scenery on Layouts, 240 ; Station Platforms, 329 ; Suggestions for Metropolitan Enthusiasts, 742 ; Summer Services, 658 ; Tank Locomotives, 914 ; Useful Hints on Train Formation, 416
How Industrial Locomotives are Built, 106
How the World's Timber Supply is Produced, 610, 718
Hudson, The Last Voyage of Henry, 955

In Reply :—Hornby Train Section, 67, 154, 243, 335, 419, 506, 587, 667, 747, 833, 921, 1007. Meccano Section, 49, 142–3, 233, 318, 409, 497, 575, 651, 735, 821, 907, 987
Interior of a Signal-Box, The, 453
Inventions, Famous :—Diving Suit, 698, 772 ; Microscope, 956 ; Talking Pictures, 280, 377 ; Telescope, 454, 536, 618
Inventors, Famous—Cartwright and the Power Loom, 16 ; Le Prince and the Kinematograph, 100 ; William Friese-Greene, 188 ; "Isothermos" Axle-Box, The, 547

Ladder Making at 100 Years of Age, 960
Le Prince and the Kinematograph, 100
Locomotive Work on the N.Y. Central, 284
Locomotives :—Engines in "Black Coats," 786 ; "Hall" Class, G.W.R., 118, 474, 543, 704, 875 ; How supplied with Steam, 792 ; Industrial Electric, 476 ; Industrial Steam, 106 ; Irish 4–4–2 Tank, 397 ; Painting of, 302 ; Re-built "Claughtons," 22 ; "Sandringham" Class, L.N.E.R., 27, 118, 290, 398, 475, 542, 620, 704 ; Some Members of the Family, 876 ; S.P. "Mountain" Type, 9 ; "Super-Pacifics" on the Nord Railway, 790
Log Sawing Machine, High-Speed, 486
Lorry, World's Largest, 104
L.M.S. Railway :—"Ro-Railer," The, 26, 195, 288 ; "Royal Scots," 118, 291, 398, 543, 621, 791, 874
L.N.E. Railway :—Portable Turntables for Rail Motor Trollies, 548 ; Twin Steam Rail Coach, 27 ; Wireless on King's Cross-Leeds Express, 27

Mail Bag, 161, 674
Meccano Automatic Control for Camera Shutter, 400
Meccano, Breakdown Cranes in, 899
Meccano Club Notes, 43, 159, 249, 339, 425, 509, 589, 669, 749, 823, 911, 983
Meccano Competition Models :—Aeroplanes, 230, 408, 733, 819 ; Airship, 408 ; Articulated Motor Lorry, 47 ; Balloon, 405 ; Breakdown Cranes, 735, 899, 995 ; Bridges, 908 ; Cesspool Emptier, 135 ; Collis Trucks, 816-7, 909 ; Derrick Crane, 491 ; Destroyer, 652 ; Diesel Engine, 313 ; Electric Clock, 313 ; Electric Fan, 318 ; Excavators, 406, 571 ; Ferry Boat, 907 ; Flying Boat, 230 ; Fret Cutting Machine, 653 ; Gantry Crane, 312 ; "Garner" Chassis, 738 ; Jib Crane, 50-Ton, 995 ; Lathe, 135 ; Lift ng Bridge, 135 ; Locomotives, 48, 231, 312, 572-3 ; Mortar Mixers, 407, 733 ; Motor Cars, 48, 571, 652, 733 ; Motor Cycles, 406, 571 ; Motor Wagon, 655 ; Old-Time Fire Engine, 47 ; Omnibuses, 55 ; Racing Car, "Silver Bullet," 232 ; Railplane, 46, 407 ; Reaping and Self-Binding Machine, 134 ; Sailing Yacht, 492 ; "Scammell" Road Lorry, 47 ; Sewing Machine, 229 ; Ships, 134, 493, 732, 819 ; Stephenson's "Rocket," 407 ; Tank Lorry, 407 ; Tractor, 733 ; Tramcar, 231 ; Trench Excavator, 573 ; Trolley Hoist, 653 ; Tug Boats, 492, 732 ; Vacuum Cleaner, 406 ; Vertical Steam Engine, 733 ; Warship, 46 ; Zeppelin Rail Car, 819
Meccano Guild, Secretary's Notes, 42, 158, 248, 338, 424, 508, 588, 668, 748, 822, 910, 982
Meccano, "Henderson" Cable Drag-Scraper in, 990
Meccano House Building, 736
Meccano in Pantomime, 19
Meccano Model-Building Contests Results, 46–8, 134–5, 230–2, 312–3, 406–8, 492–3, 572–3, 652–3, 732–3, 738, 816–7, 819, 908–9, 994–5
Meccano Model-Building in Norway, 427
Meccano Models, New :—Anti-Aircraft Gun, 564 ; Archer, 809 ; Automatic Coal Tipper, 410 ; Block-setting Crane, 897 ; Breakdown Crane, 643 ; Bridge, 897 ; Cable Ploughing Engine, 725 ; Centrifugal Governor, 234 ; Doxford Internal Combustion Engine, 565 ; Drummer Boy, 564 ; Eiffel Tower, 235 ; Electric Locomotive, 234 ; Flying Boat "Do.X," 564 ; Generating Set, 897 ; Hand Loom, 897 ; Land Yacht, 724 ; Lathe, 323 ; Momentum Tractor, 494 ; Monoplane, 808 ; Mortar Mixer, 410 ; Motor Chassis, 411, Mouse Traps, 411, 645 ; Naval Gun, 645 ; Newton's Disc, 323 ; Norse Longboat, 725 ; Oil Well Drilling Machine, 724 ; Omnibus, 494 ; Pit Head Gear, 53 ; Radial Drilling Machine, 644 ; Road Wagon with Trailer, 144 ; Robot, 52 ; Saw Bench, 495 ; Sheerlegs, 564 ; Ship Coaler, 896 ; Ski-ing Meccanitian, 565 ; Steam Driven Sifter, 235 ; Steam-Driven Workshop, 323 ; Stephenson's "Locomotion" and "Rocket," 143 ; Stiff-leg Derrick, 809 ; Tipping Steam Wagon, 808 ; Toplis Level Luffing Cranes, 53, 322 ; Traction Engine, 896 ; Tractor, 233 ; Travelling Crane, 235 ; Truck Hoist, 235 ; Variable Condenser, 410 ; Windmill, 495
Meccano Models, Super :—Electric Derrick Crane, 319 ; Level-Luffing Automatic Grabbing Crane, 728, 812 ; Railway Breakdown Crane, 568, 648 ; Six-Inch Howitzer with Limber and Tractor, 900
Meccano Parts, New :—Rail Adaptor, 251
Meccano Toys, New, 984
Mineral Wealth of South Africa, 782
Miniature Railway at Scarborough, 624

National Parks of New Zealand, The, 394
Ninth Planet was Discovered, How the, 202

Of General Interest, 214, 466
Our Busy Inventors, 14, 388, 712

Photographs from Aeroplanes, Taking, 368
Photography, 591, 671
Piercing the Cascade Range, 778
Portable Electric Crane at Southampton Docks, 5
Preserving the World's Steelwork, 770
Puzzle Page, 1011

Quarrying by Compressed Air, 274

Rails, Development of Steel, 879
Railway Engineering, Heat Expansion in, 112
Railway News, 26, 118, 194, 290, 398, 474, 542, 620, 704, 790, 874, 964
Railway Notes on a Rhineland Journey, 116
Railways :—American "Steel Specials," 543 ; "Bay" type Coaches, C.N.R., 396 ; Crookedest in the World, 703 ; Facts about British, 706 ; Fastest C.P.R. Train, 621 ; Railway with R derless Cars, 789 ; Steel Sleepers on British, 399, 475
Railways fight Snow, How, 334
Roadless Traction, Future of, 292
Road-Rail Problem, Solving the, 26, 195, 288
Rolling Stock Bearings, Improvements in, 547

Seaplane, The Parnall "Peto," 220
Searchlight, World's Most Powerful, 211
Seasonal Variations in Goods Traffic, 622
Ships :—Cunard, Giant, 212, 385, 550 ; "Empress of Britain," 538 ; P. & O. Turbo-Electr c, 469, 777 ; "Augustus," 962
Southern Railway :—"Bournemouth Belle," 708 ; First "Jubilee" Engine scrapped, 543 ; Pullman Cars for Ocean Specials, 119 ; Re-Numbering Scheme, 705 ; Southampton Dock Extension, 194
South Wales Ports of the G.W.R., 6
"Spirit of St. Louis," The, 190
Stamp Articles :—Air Mails of Newfoundland, 515 ; Collecting as an Investment, 167 ; Gossip, 75, 169, 259, 347, 435, 517, 597, 677, 757, 843, 931, 1023 ; History of Aviation, 841 ; India's First Commemorative Issue, 433 ; Mountaineering Expedition, 929 ; New Field for Stamp Collectors, 345 ; Pictorial Stamps of South West Africa, 755 ; Starting Stamp Collecting, 73 ; Statuary on Stamps, 1021 ; Second Millenary of Virgil, 257
Suggestions Section :—Automatic Brakes, 227, 403 ; Automatic Clutch, 489 ; Automatic Steering Gear for Model Yachts, 227 ; Boy's Rainbow Cup, 316 ; Car Radiator, 139 ; Caterpillar Track, 567 ; Curious Lever Movement, 905 ; Differential for Sprocket Drive, 51 ; Electric Switch, 139 ; Film Developing Machine, 226 ; Flashing Sign, 647 ; Four-Movement Gear Box, 566 ; Front Axle for Tractors, 317 ; Front Wheel Drive, 402 ; Gramophone Sound Box, 727 ; Hand Drill, 51 ; Intermittent Drive, 905 ; Internal Expanding Brake, 489 ; Limit Switches, 226, 317 ; Meccano Control Levers, 316 ; Miscellaneous, 51, 139, 227, 317, 403, 489, 567, 647, 727, 811 ; Motor Testing Mechanism, 488 ; Naval Range Finder, 646 ; Novel "Slip" Drive, 139 ; Overflow Indicating Device, 51 ; Push-Pull Switch, 727 ; Puzzle Box, 811 ; Quick Return Motion, 905 ; Race Game, 726 ; Range Finder for Short Distances, 647 ; Screw Jacks, 317 ; Self-Adjusting Winch, 51 ; Silent Overhead Camshaft Drive, 403 ; Single Plate Clutches, 50, 139 ; Soldering Iron Stand, 647 ; Steam Hammer, 567 ; Two-Speed Derailleur Gear, 810 ; Two-Speed Reversing Crane Hoist, 811 ; Variable Pitch Propeller, 138 ; Warning Device for Cranes, 226 ; Worm Drive Unit, 727

Tea Packeting by Machinery, 632
Teleprinters for Railway Telegraphy, 20
Tennis Balls are Made, How, 552
Thrills of Sea-Lion Catching, 283
Transport Methods of the Future, 10
Tunnels :—Canadian, 301 ; Cascade, U.S.A., 778 ; Kingsway, 213 ; Moffat, U.S.A., 616 ; Tanna, Japan, 300
Turntables for Rail Motor Trollies, Portable, 548

Vacuum Tubes that Control Electrical Energy, 299
Veteran Steam Engine, A, 298
"V.S.G." Gears and their Application, 208

Washing 10,000 Bottles per hour, 554
What Shall I Be ? 28, 122, 206, 278, 386, 458, 540, 614, 694, 774, 860, 948
Why Trains are Double-Headed, 245
Working of a Goods Yard, The, 544
World, Our Wonderful, 120, 296, 784, 870

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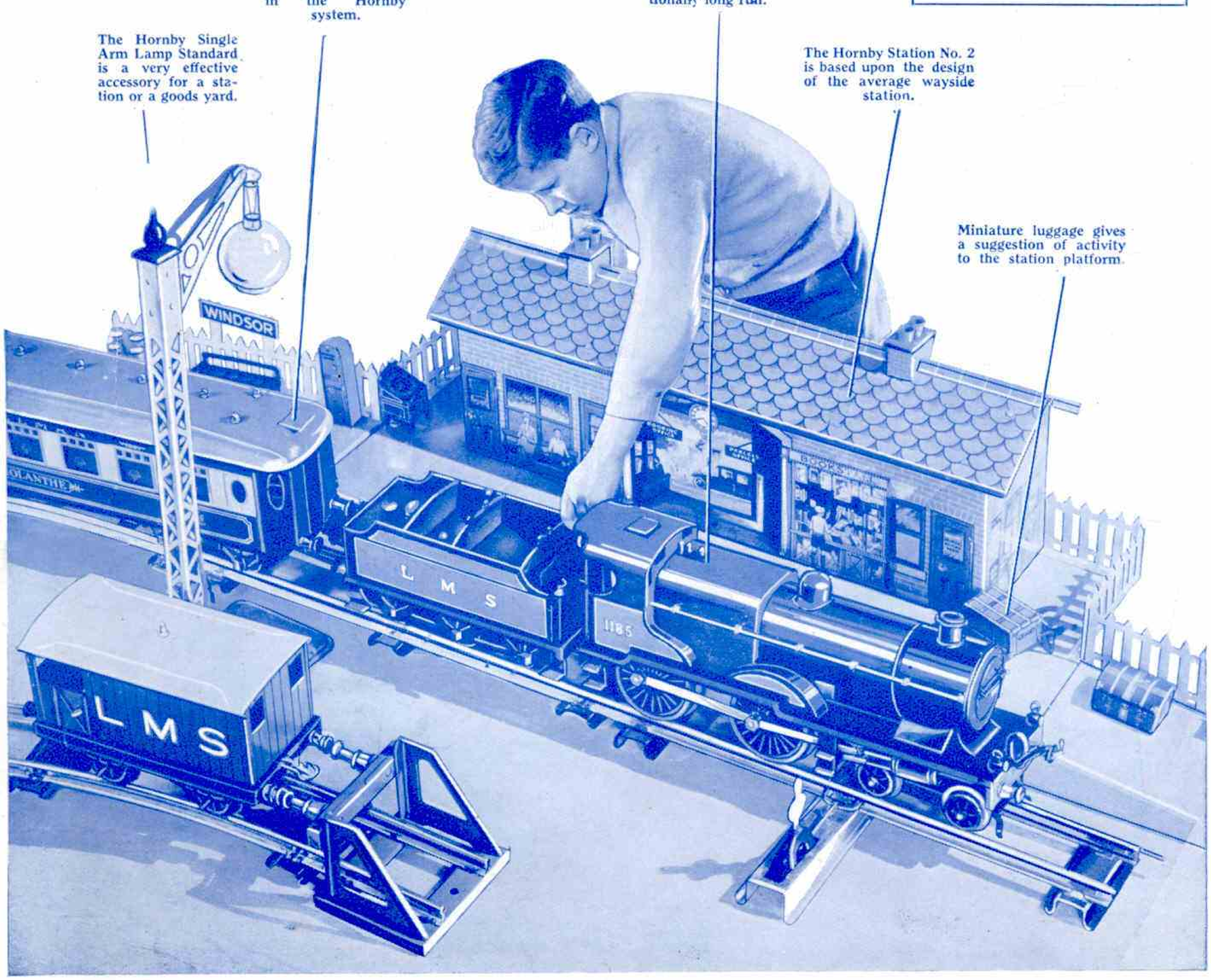

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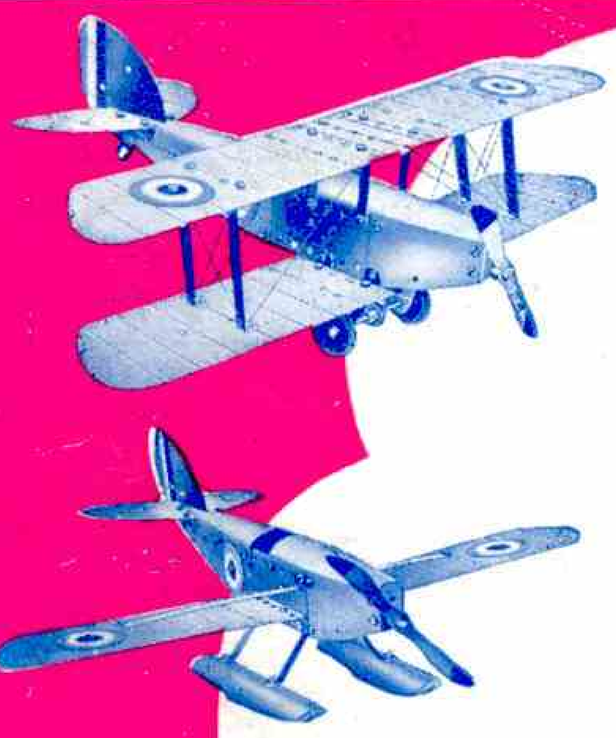

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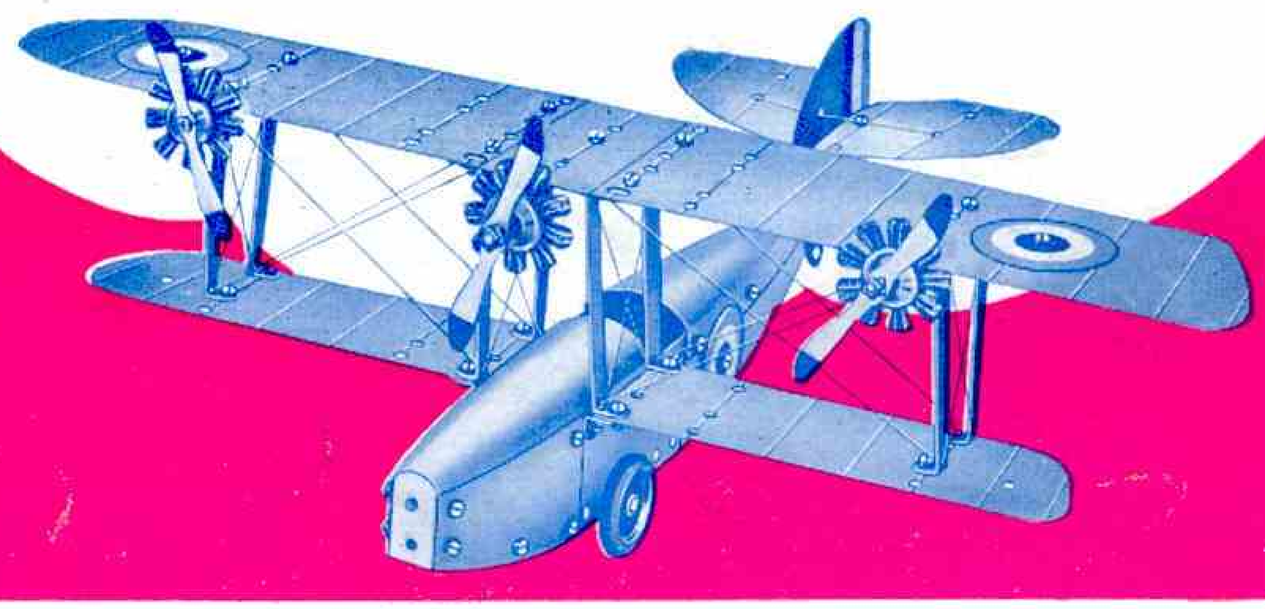

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