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MECCANO MAGAZINE

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VOL. IX
No. 2

Published in the interests of Boys

THE MECCANO LIMOUSINE

Full Instructions for Building this New Model on page 30

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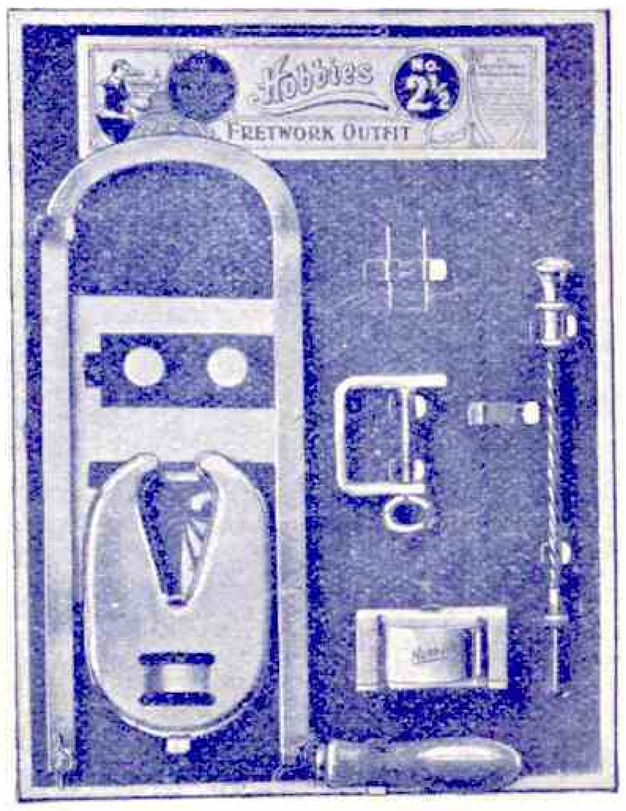

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EDITORIAL OFFICE
Binns Road,
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MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

EDITORIAL

BY the death last month of M. Gustave Eiffel, France has lost one of her illustrious sons, and the world one of its greatest engineers. As the designer of the great Tower at Paris, M. Eiffel requires no introduction to Meccano boys, tens of thousands of whom have built models of his famous engineering structure. When I read the announcement of the passing of this eminent man, I felt that I should like to tell my readers something of his life work on this page.

A Famous Engineer

In the personality of every great man there seems invariably to be something of outstanding importance—some particular quality that other men, less famous, do not possess. M. Eiffel was no exception to the rule, and anyone who has read his life story cannot fail to be impressed by the wonderful qualities of perseverance and cheery optimism that marked his whole career. Famous engineers might ridicule his cherished plans for a Tower 1,000 ft. in height. Friends might attempt to dissuade him from embarking on a project that, they affirmed, would result in disaster. But M. Eiffel, supremely confident in himself, heeded none of them. Brushing aside all objections, he persevered with his task and lived to see the successful fulfilment of his plans, to the amazement of his admiring friends.

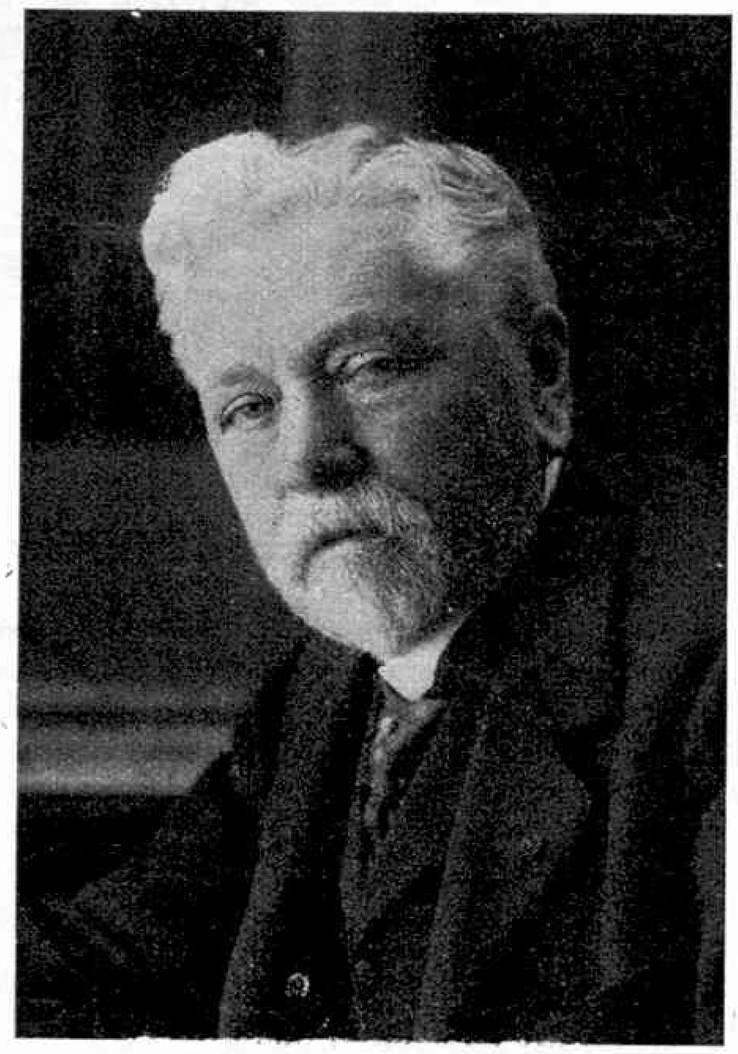
An Outstanding Quality

Intending from his earliest days to become an engineer, Gustave Eiffel spent the whole of his boyhood with this ambition always in his mind. At school he devoted himself to the study of engineering and mechanical subjects, and work that seemed difficult or distasteful to other boys, became a hobby to him. As he grew older, Eiffel's continual pleadings and steady purpose had their reward, and he was entered a student in the Paris Central School of Arts and Crafts, an institution that has given many famous engineers to France. Here he soon qualified as an engineer, and while yet a young man was appointed to superintend the construction of an iron bridge at Bordeaux. A few years later he was able to establish his own engineering works, and his daring engineering feats brought him world-wide fame.

Eiffel's Early Days

The Railway Strike

We regret any delay in this issue not reaching our readers by the 5th Feb., but our publishing arrangements were completely disorganised by the Railway Strike.



The late M. Gustave Eiffel

Later he proposed to construct a Tower that would be higher than anything in the world. Despite adverse criticism, and even open hostility, he set to work. Naturally he met with great difficulties, but bravely overcame them all. Nothing daunted him—nothing swerved him from his purpose. By steady work, combined with the highest engineering skill, he gave to France a unique structure, known the world over. The Eiffel Tower has stood for 34 years, a magnificent monument to perseverance and engineering knowledge. As a "show object" at the great Exhibition, for which it was originally built, it created wonder and awe in the thousands of people who beheld it. It has done more than this, however, in subsequently serving many practical purposes. For years it has nightly flashed wireless time-signals over continent and ocean, enabling ships at sea to ascertain their positions and to keep their courses. During the war it played its part, being used for many scientific purposes, including the detection of approaching Zeppelins.

A World-Famous Tower

The qualities of the man who carried out this great engineering achievement were of the kind that every boy, whether he intends to become an engineer or not, should strive to imitate. Perseverance holds the key to success in every walk of life, and the old advice of "try, try again" is as true as ever. Every boy who wishes to be successful in life—and what Meccano boy does not?—should choose his path in life, and having chosen, should devote his whole mind to getting on, persevering as did Eiffel and others before him. Many boys do not come to a decision until they leave school and then take the first job that comes along. That is not always the best method of achieving success. Some boys are too lazy to think about the future and put off until it is too late, or until someone else has to make a decision for them. Every boy should think first and decide what business or profession he wishes to follow. Waiting for every boy there is some particular job that he can enjoy. Remember that the man who enjoys his work climbs high up the ladder of success. Make up your mind what you want to be, and go "all out" until you attain your objective. Don't get slack when either failure or success seem near, but keep on trying. Someone has said it is not enough to "keep on," but that we should "keep on keeping on"—which is perhaps even more desirable. Remember that there is always room for good men at the top of the ladder in every walk of life—and it is the man who perseveres who gets there.

The Secret of Success

Good Things Coming

In spite of the increase in the number of our pages we find it difficult to print articles on all the fascinating subjects that appeal to our readers. We are pleased at all times to receive suggestions, but we are guided in our choice of subjects by the general demand. There are many good things in store for future numbers of the "*M.M.*"

These include the following articles:—

Stronger Than 1,000 Men:—
Giant Bucket Excavator.
Wonderful New Ccaler.
Story of London's Tube Railways.
Some Interesting Electrical Experiments.
Lives of Famous Engineers.
A Rival to the Forth Bridge.

These articles will appear shortly, and you should place an order *now* for a copy of the "*M.M.*" regularly every month with your Meccano dealer or newsagent.

THE MECCANO LIMOUSINE

Full Instructions for Building a Splendid Body for Model 701 (Chassis)

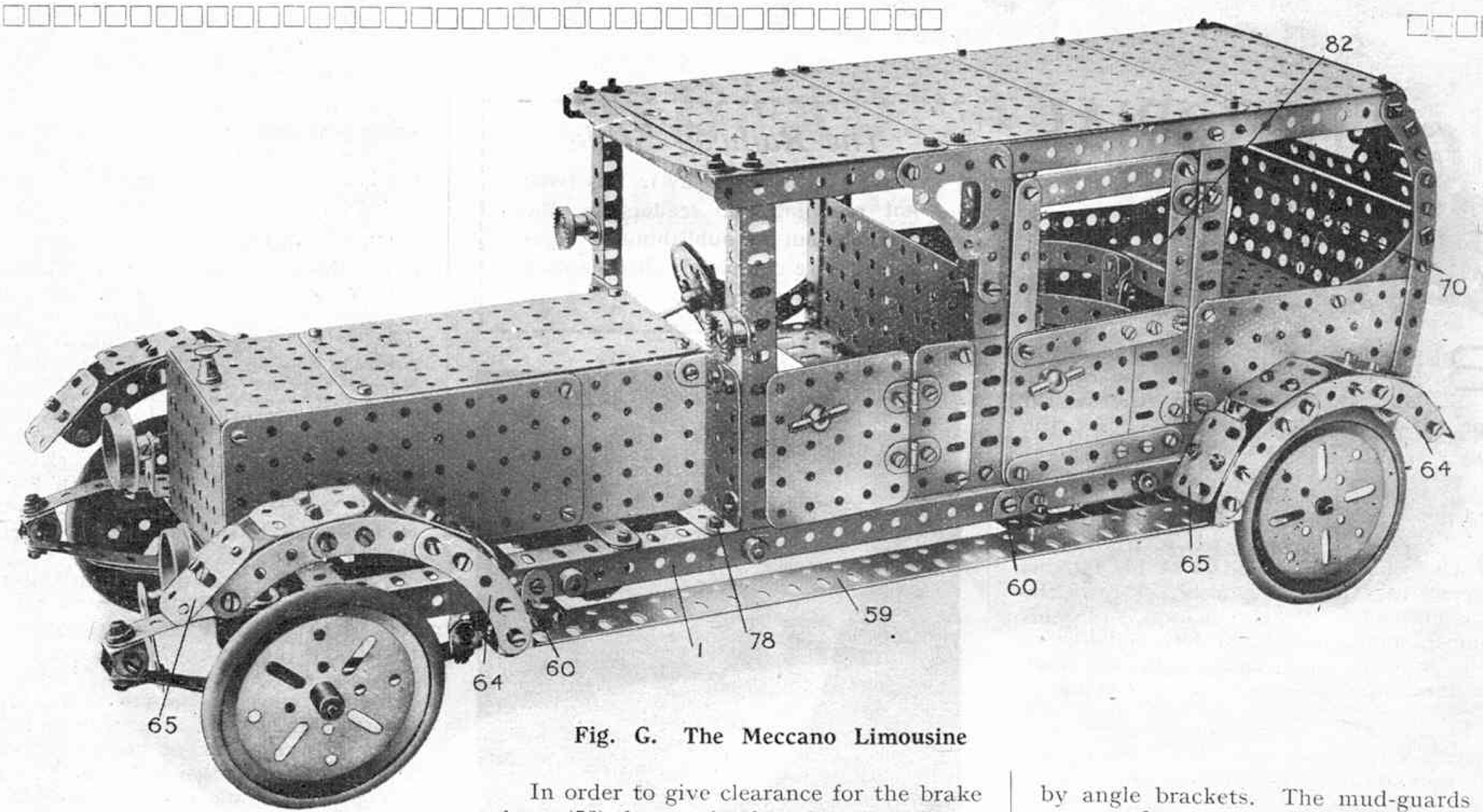


Fig. G. The Meccano Limousine

THOSE of our readers who have built the famous Meccano chassis will be interested to hear of a special limousine body that may be constructed for fitting on to the chassis. This model is shown in the accompanying illustrations, and the following details make clear its construction.

For the addition of this body the chassis is made shorter by replacing the sides of the frame (1 Fig. 701B)* by 18 in. angle girders. As will be seen from Fig. J these girders are braced by three additional 5½ in. strips (2a). The rear cantilever springs (33 Fig. J) are reinforced by the addition of 5½ in. and 3½ in. strips. This necessitates the cardan shaft (Fig. 701C)* carrying the driving pinion (27) being replaced by a 3½ in. rod, to correspond with the shortened frame members.

Running Boards and Mud-guards

The appearance of the model is considerably improved by the addition of running boards (59 Figs. G and J). The running board on the near-side (59 Fig. G) consists of one 12½ in. flat girder, attached by two 1 × ½ in. angle brackets (60 Fig. G) to the 18 in. angle girders (1) forming the frame.

* The figures referred to are those appearing in the Chassis Instruction Leaflet (price 4d. post free). They were also printed in the "*M.M.*" for September and October, 1923.

In order to give clearance for the brake lever (53) the running board on the off-side is made up of three flat girders 4½ in., 5½ in. and 2½ in., the latter overlapping one hole (at 61 Fig. J). The 4½ in. and 5½ in. flat girders are connected by a 1½ in. strip (62), the whole running board being then attached to the main angle girder by four 1 × ½ in. angle brackets (63).

The mud-guards for the front and rear wheels are all similar, and are constructed of three curved strips (64) on each side. These are overlapped two holes and four 1½ in. flat girders are attached to them

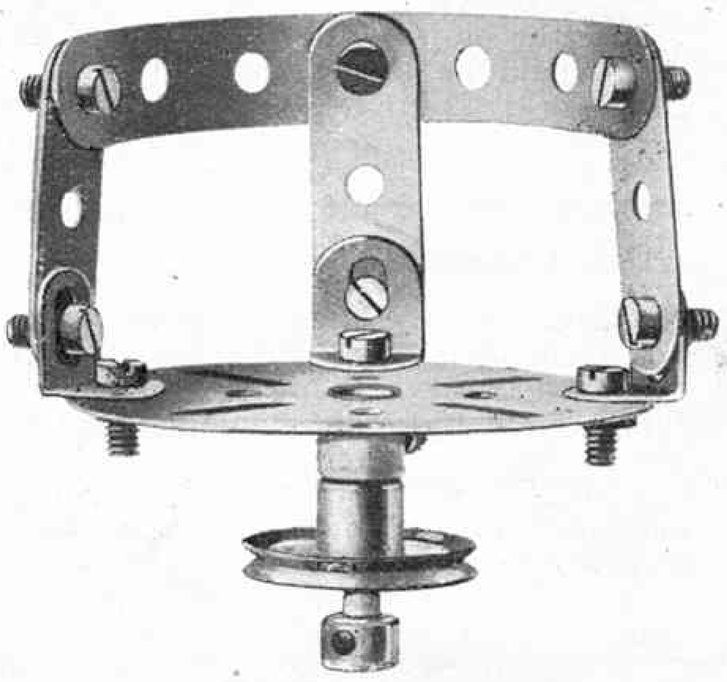


Fig. K. Revolving Seat

by angle brackets. The mud-guards are connected to the ends of the running boards (59) by angle brackets.

In constructing the body, begin by bolting together two 12½ in. angle girders (66 Fig. H) and six 5½ in. vertical angle girders (67) to form two side frames, connected by a 5½ × 2½ in. flat plate (68) and a 5½ × 3½ in. flat plate (69). Then bolt on the rear 5½ × 3½ in. flat plate (70) by means of a 5½ × ½ in. double angle strip (71) and 5½ in. curved strips (72). The back window is fashioned from two 5½ × ½ in. double angle strips, one above and one below, and four 1½ × ½ in. double angle strips, two at each side. These are reinforced by two 2½ in. strips bolted on the inside. The lower side panels (73) consist of two 4½ × 2½ in. flat plates, bolted to the curved strip (72) and to the uprights (67). The driver's seat is a 5½ in. flat girder (74) fastened to a 3½ in. angle girder, which in turn is bolted to the plate 69.

The main doors are formed by two 4½ in. vertical strips and one 3½ in. strip at the top. The lower panels consist of a 2½ × 2½ in. flat plate and a 2½ in. flat girder, braced at the top and bottom of the panel by two 3½ in. strips. The method of attaching the hinges will be plainly seen from the accompanying illustrations.

The base of the body consists of three 5½ × 3½ in. flat plates (75) the front plate overlapping the second by one hole.

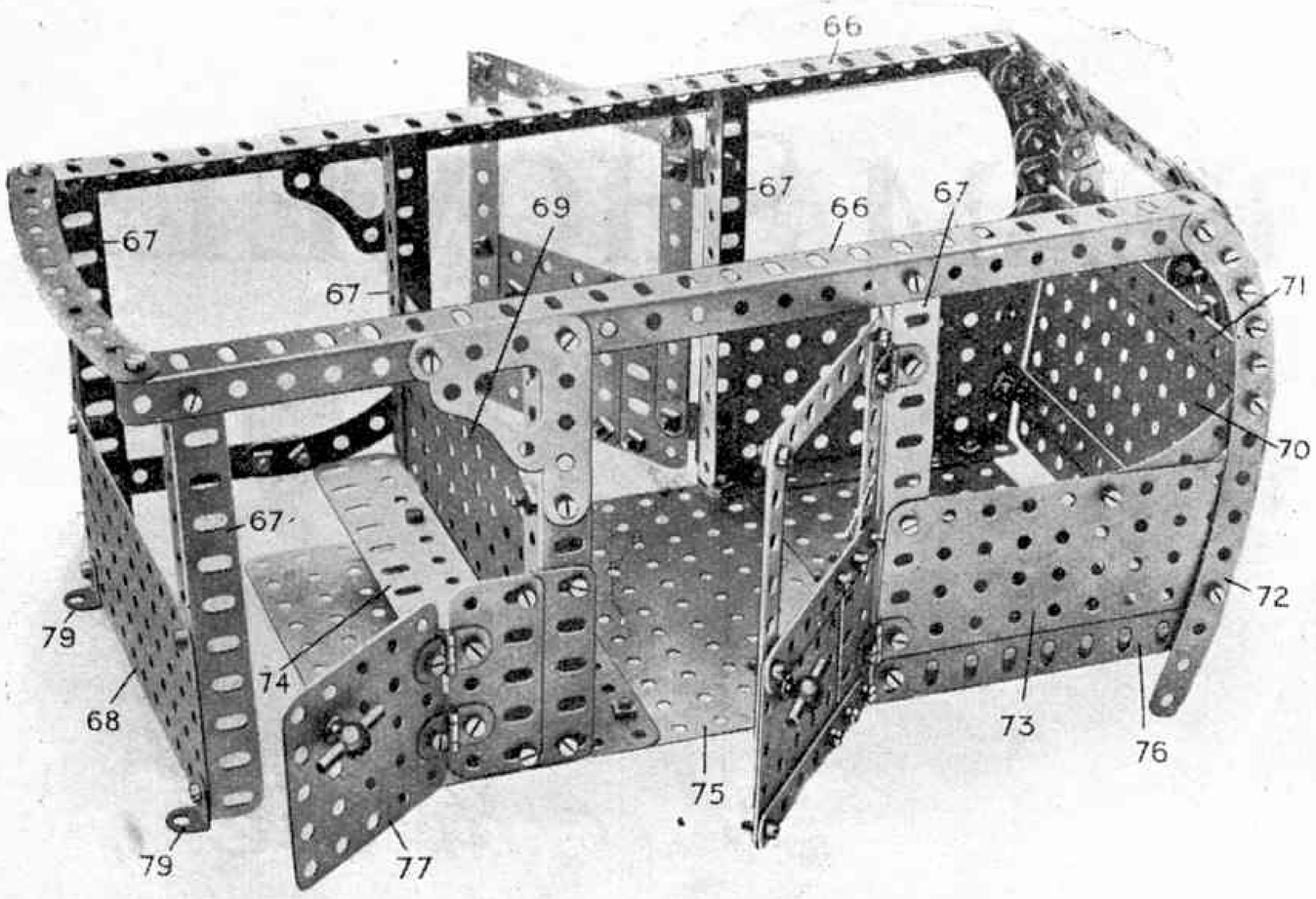


Fig. H. The Limousine Body

The front plate is bolted to a $4\frac{1}{2}$ in. angle girder, which is also bolted to the lower edge of the front plate (69), the rear plates being bolted to the $4\frac{1}{2}$ in. angle girders (76). The front door (77) is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. flat plate, hinged to a $2\frac{1}{2}$ in. flat girder, which overlaps another $2\frac{1}{2}$ in. flat girder, bolted to the vertical angle girder (67).

The body is secured to the chassis by four bolts (78 Fig. G), those at the front passing through angle brackets (79 Fig. H) and being secured to the main side girders at 80 Fig. J. The rear bolts pass through holes in the rear plate (75) and through holes (81 Fig. J) in the rear $5\frac{1}{2}$ in. bracing strip. The top is enclosed by three $5\frac{1}{2} \times 3\frac{1}{2}$ in. flat plates and one $5\frac{1}{2} \times 2\frac{1}{2}$ in. flat plate. The back seat (82) is a $5\frac{1}{2} \times 2\frac{1}{2}$ in. flanged plate bolted to the rear plate (70).

The construction of the two revolving seats will be readily seen from the detail view (Fig. K). They revolve on 1 in. rods running from the face plate boss through a loose 1 in. pulley, a collar and set screw being fitted to the lower end of the rod.

The handles of the doors are made with hand rail supports and one inch rods as shown in the illustration.

Parts Required for the Meccano Limousine Body

No.		
2	$5\frac{1}{2}''$ Perf. Strips	1
2a	$4\frac{1}{2}''$,, ,, ...	4
3	$3\frac{1}{2}''$,, ,, ...	6
4	$3''$,, ,, ...	1
5	$2\frac{1}{2}''$,, ,, ...	2
6a	$1\frac{1}{2}''$,, ,, ...	7
8	$12\frac{1}{2}''$ Angle Girders	2
9	$5\frac{1}{2}''$,, ,, ...	6
9a	$4\frac{1}{2}''$,, ,, ...	3
9b	$3\frac{1}{2}''$,, ,, ...	2
10	Flat Brackets	2
12	Angle ,, ...	52
12a	$1''$ Angle Brackets	2
12b	$1 \times \frac{1}{2}''$ Angle Brackets	7
14	$6''$ Axle Rods	1
18b	$1''$ Axle Rods	5
20	Flanged Wheels	2
20a	$2''$ Pulley Wheels	1
22	$1''$,, ,, Fast	2
29	$\frac{3}{4}''$ Contrate ,, ...	2
32	Worm ,, ...	1
37	Nuts and Bolts	104
37a	Nuts	150
48	$1\frac{1}{2} \times \frac{1}{2}''$ Double Angle Strips ...	4
48d	$5\frac{1}{2} \times \frac{1}{2}''$,, ,, ...	4
52	$5\frac{1}{2} \times 2\frac{1}{2}''$ Flanged Plates	1
52a	$5\frac{1}{2} \times 3\frac{1}{2}''$ Flat Plates	9
53	$3\frac{1}{2} \times 2\frac{1}{2}''$ Flanged Plates	2
53a	$4\frac{1}{2} \times 2\frac{1}{2}''$ Flat Plates	2

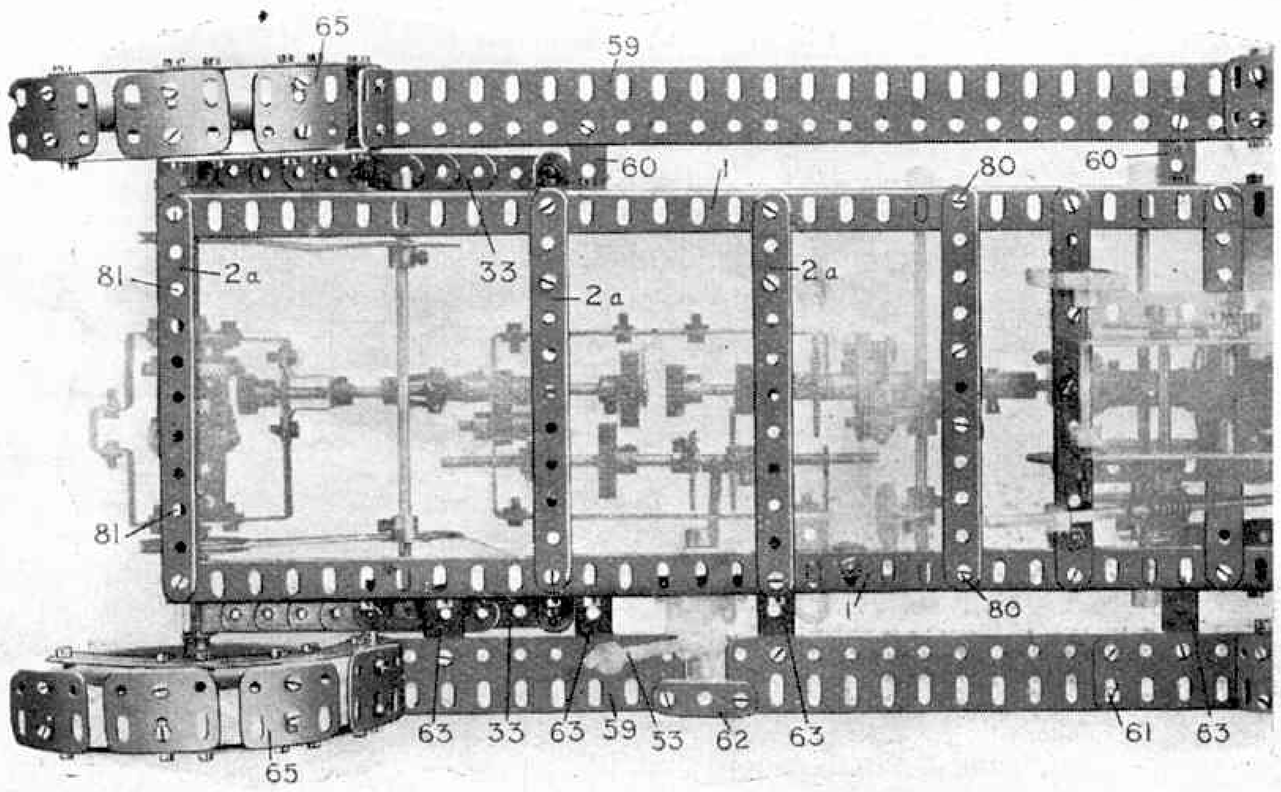


Fig. J. Method of Attachment to Chassis

59	Collars	4
70	$5\frac{1}{2} \times 2\frac{1}{2}''$ Flat Plates	4
72	$2\frac{1}{2} \times 2\frac{1}{2}''$,, ,, ...	5
89	$5\frac{1}{2}''$ Curved Strips	3
90	$2\frac{1}{2}''$,, ,, ...	29
103	$5\frac{1}{2}''$ Flat Girders	2
103b	$12\frac{1}{2}''$,, ,, ...	1
103c	$4\frac{1}{2}''$,, ,, ...	1
103f	$2\frac{1}{2}''$,, ,, ...	5
103h	$1\frac{1}{2}''$,, ,, ...	16
108	Architraves	2
109	Face Plates	2
111b	$7/32''$ Bolts	150
114	Hinges	6
120	Buffer	1
136	Handrail Supports	3

OUR MAIL BAG

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

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

P. Short (Derby).—Your poem commencing "Yes! we have no Meccanos" is very good, but we seem to have heard something of the kind before in connection with the fruit business! We read your cheery letter with much pleasure.

Sidney Miles (Woodford Green).—You are quite right in surmising that this is the happiest and best time of the year for us. Hundreds of bright cheery letters arrive every day from boys living in all corners of the earth. We work early and late, Sydney, but we enjoy every minute of it.

A. Ferruccio (Turin).—We think you write English very well, and it was a pleasure to read your letter. We wish you success in your engineering career, and we thank you for your kind expressions towards Meccano and the Editor of the "*M.M.*"

F. E. R. Nunn (Colchester).—You get extraordinarily good results on your Crystal Set, and we congratulate you on possessing such an efficient piece of apparatus. Telephonic reception at 350 miles is most unusual. We note you prefer Guild Badges in the form of pendants or tie pins.

L. K. Thompson (Bath).—Publishing the "*M.M.*" once a month keeps us very busy, but it looks as though we might have to go to press more frequently. There are many articles of the greatest interest for boys now being prepared for our future numbers. We much appreciate your good wishes.

A. G. Johnson (Northwich).—All Meccano Clubs actively take up sports and games of all kinds, both Winter and Summer, but it is difficult to find room in the "*M.M.*" to deal with their exploits and prowess in this direction.

J. Spiegelhalter (Malton).—We were interested to see the photographs of the three-valve set you have made, and we congratulate you on a very efficient and workmanlike job. We were also interested to know that you get Bournemouth clearly on the loud speaker, and this is our experience here. We hope you will spend many pleasant evenings "listening in."

W. Penman (Partick, N.B.).—We were pleased to hear of the wide interest being shown in your club, and we hope this will result in more Meccano clubs being established in Glasgow.

E. Drafern (Southampton).—At present we fear that there are too many difficulties in the way to enable us to publish the "*M.M.*" weekly. The suggestion will not be lost sight of, however, and you may be sure that if we are able to see our way to do so, we shall certainly publish more frequently.

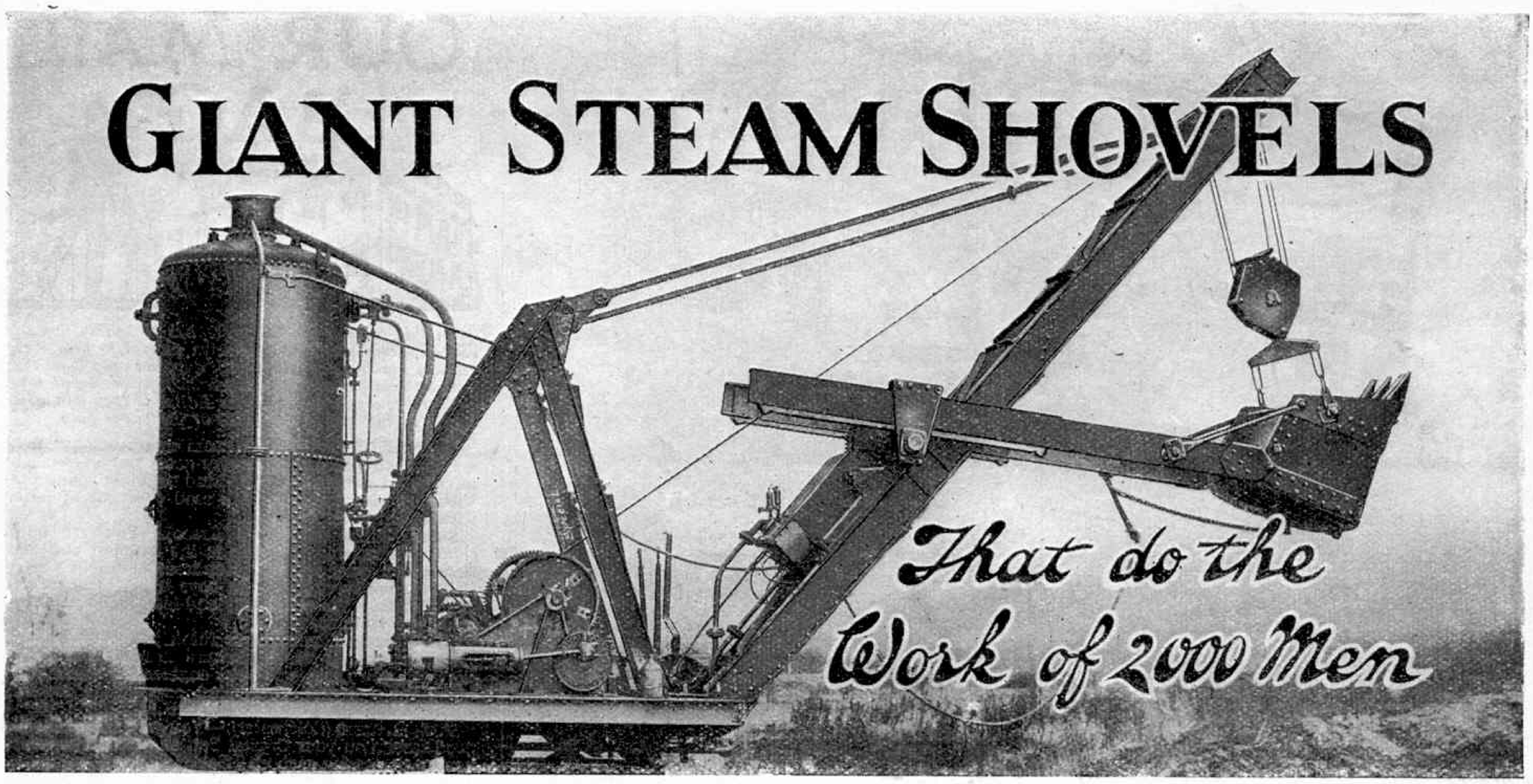
F. Padgett (Newark).—We quite agree with you, Frank, when you say that Meccano is "something more than a toy." We are sorry not to be able to print your verses, but these are scarcely up to our usual standard.

R. L. Uphill (Ryde, I.O.W.).—The subscription rates in Australia are the same as in England. Most Australian dealers stock the "*M.M.*" We wish you all good fortune in your new home.

A. E. Bebb (Redditch).—Now that we know that you will be confined to your room during the whole of the winter through sickness, we are more pleased than ever that you carried off the prize in our Tom Sawyer competition. We trust that you will derive much pleasure from your wireless outfit. Under the circumstances you could not take up a finer hobby.

B. Mitchell (Stockton).—Send us a copy of your Magazine by all means, Bernard. Nothing pleases us so much as to see boys with literary tastes taking a keen interest in amateur journalism.

G. Winward (Burnley).—You will be more than delighted with the heavy Hornby Tank Loco. It is a beauty! We are sorry to hear of your trouble with your eyes, but if the doctor says that wearing the bandage for some days will cure you, you should be thankful it is no worse.



(Continued from last month)

IN our last issue we described the general principles on which steam shovels are constructed and the purposes for which they are used. We saw that the size of the machine employed on any particular contract is governed by the output required and the nature of the material to be worked. In addition we saw that the size of the machine also depends on the size of the bucket it is to carry, a fact which itself depends again on the amount of material to be handled.

Considerations Affecting Construction

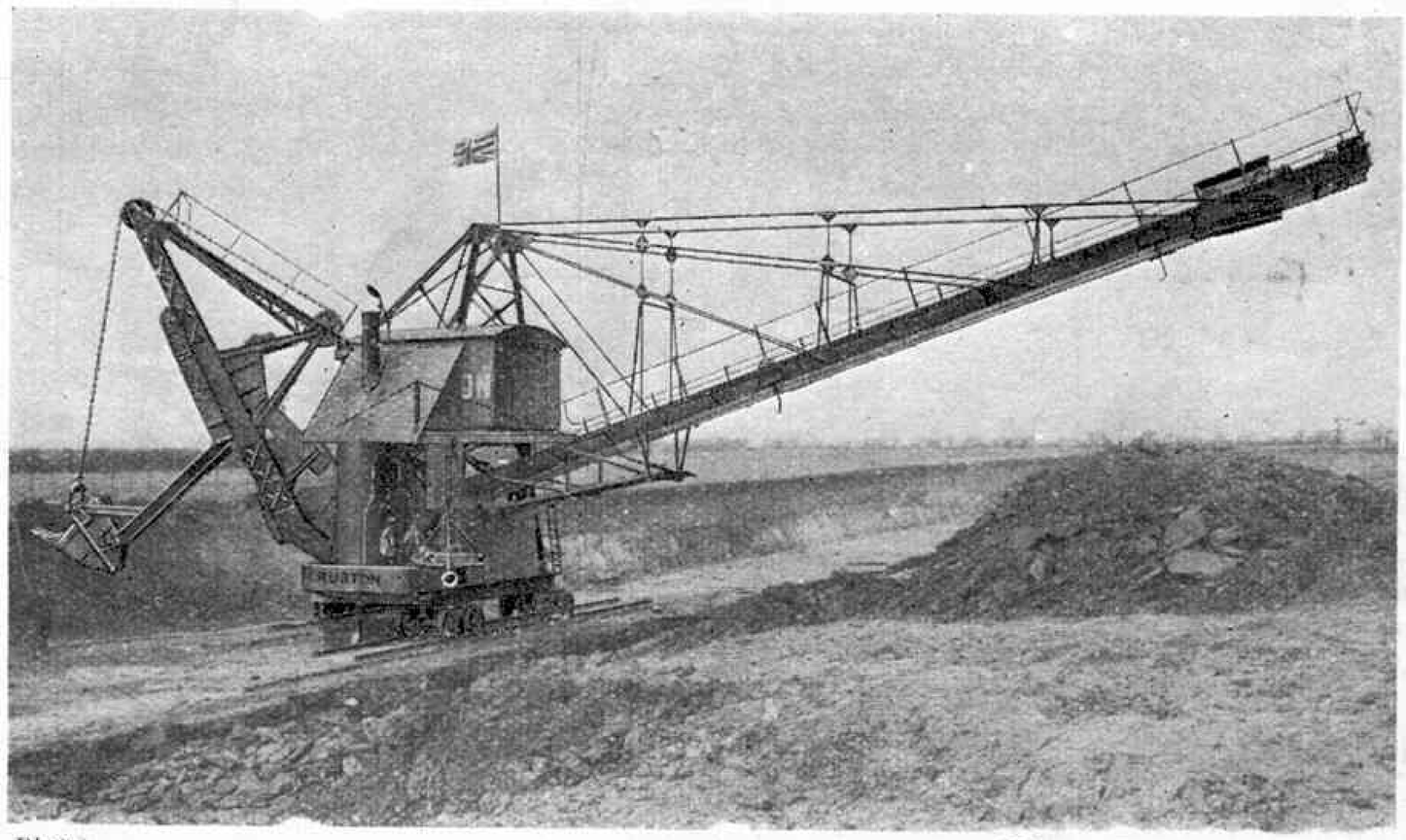
Another consideration that affects both the size and constructive details of these machines is the distance from the machine that it is required to discharge the excavated material. For instance, steam shovels of the standard type (weighing 55 tons) discharge the excavated material at distances of up to 32 ft. from the machine centres. This standard type of shovel may be modified by adding a longer jib, however, and this makes possible the discharge of the material at distances of up to 60 ft. Such machines are used for quarrying mineral buried beneath a top covering of earth, and will excavate ordinary soil or clay at the rate of 25 to 50 cubic yards an hour. The steam shovel stands on the uncovered deposit and works at the face of the material covering the remainder of the mineral to be quarried.

Machines with Long Jibs

The lengthening of the jib in this manner makes it necessary to considerably decrease the cutting effort on the teeth, as compared with that on the standard machine. Were this not done the machine would be unstable. The bucket is therefore made smaller and handles only $1\frac{1}{4}$ cubic yards, or roughly about a quarter the quantity handled by the standard bucket.

On the radius over which the machine effectively operates depends also the depth to which it is able to cut. Modified machines, such as are referred to above, will excavate soil, etc., to a depth of 15 to 20 ft. and deposit it up to 60 ft. distances. If it is desired to excavate to a greater depth than this, machines with even longer reaches must be constructed.

If the material to be excavated is heavier than soil or clay, more powerful machines with larger buckets must be used. Some very large machines of this type are now in use, and we illustrated one of these giants on page 3 of our last month's issue. Some of these machines are equipped with rock-loading buckets having capacities of $3\frac{1}{2}$ cubic yards. Although naturally slower in operation than the lighter types, they are able to complete a cycle of operations in about a minute! They eat their way through 300 cubic yards of material in an hour and discharge their loads at any given point over a radius of 100 ft.



Photo] [Messrs. Ruston & Hornsby Ltd.

A Ruston Combined Steam Shovel and Transporter

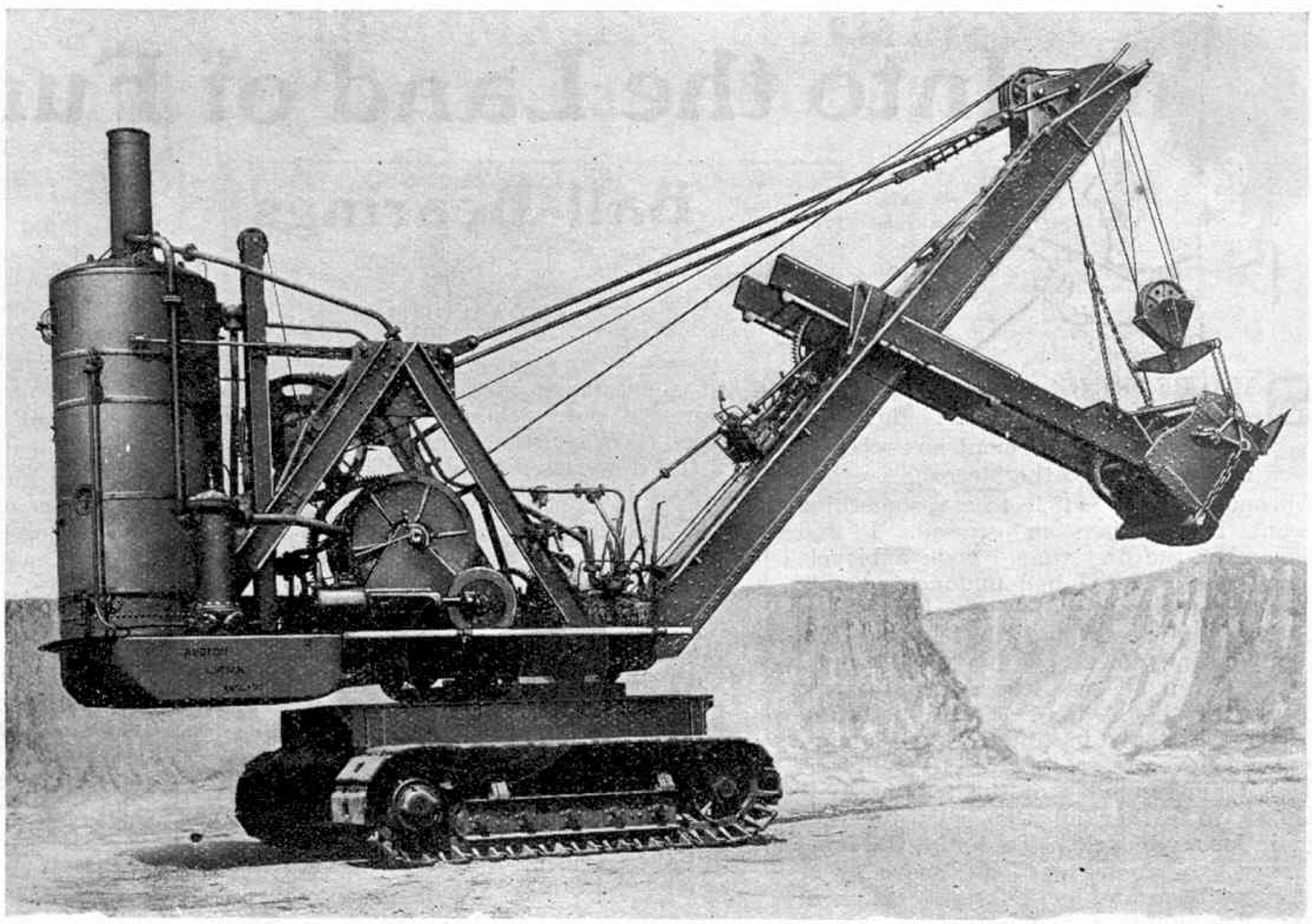
Combined Excavators and Transporters

It is not always economical, nor always possible, to employ an excavator with a long jib, where dumping at a distance is necessary. Sometimes, for instance, it may be required to remove earth from one side of a narrow cutting and deposit it on the top of the opposite bank. The slewing motion of a machine working on the lower level would not be able to accomplish this.

In such circumstances, or in the case where it is desired to build up a high banking with the excavated material, a transporter may be installed to work in conjunction with the excavator. A transporter may also be used, in conjunction with a standard shovel, for taking away the excavated material to a greater distance than would be possible with a jib of ordinary length.

The transporter is sometimes a separate unit, and distinct altogether from the excavator. In this form it generally consists of an under-frame and tower, supporting a double cantilever track for the wagon or skip. The under-frame is fitted with the necessary wheels and travelling gear to enable it to be moved about the quarry under its own power. The boiler and winding engines for actuating the transporting gear and the transmission system are supported on the under-frame.

In another type of machine the transporter consists of a framework attached to the excavator, and worked by the main engines. Such a machine is illustrated on the previous page. With both types the earth to be dumped is run up the inclined track of the transporter in a skip, which is slightly larger than the excavator bucket to allow for spillage. The skip is fitted with a hinged door, similar to that on the bucket of the excavator. It is so arranged, however, that the door may be opened at any desired point on the transporter track by means of a moveable trip placed at the required position by the driver, who is thus able to regulate the building-up of the dump.



Photo] [*Messrs. Ruston & Hornsby Ltd.*

A Splendid Steam Shovel, mounted on Caterpillar Travelling Gear

Controlling the Machinery

Having now seen something of the construction of these giant shovels we may consider for a moment how a machine of the standard type is operated.

When commencing operations, the bucket hangs in a vertical position, with the teeth resting on the ground opposite the face of the material that is to be removed. The driver starts up the engines and throws-in the hoisting clutch. This action drags the bucket forward and upward, to the face. At the same time it is thrust outwards by means of the racks along the bucket arm until it is cutting away the material to the required depth.

With one hand on the control-lever of the main engines, and the other on the control-lever of the racking engines, the driver is able to control the depth of cut so that an equal thickness is taken throughout the whole length of the stroke. He thus ensures that the bucket is completely filled when the top of the stroke is reached. At this stage, the hoisting clutch is thrown out and the racking motion draws in the bucket until clear of the working face, being held in the meantime on the free drum by means of the brake.

Working at High Speed

The slewing motion is then started up, and the bucket is swung over the wagon, or over the point where the material is to be dumped. When the correct position is reached, the driver pulls a cord by his side, and his action withdraws a catch on the bucket door, allowing the contents of the bucket to be discharged.

The slewing motion is then reversed and the bucket is swung back into position to take the next cut from the working face. The bucket is allowed to return to the bottom of the stroke by releasing the drum, which is loose upon its shaft. When free of the clutch it is under the driver's control by means of a foot-brake.

All these operations take place almost as quickly as they are described, and the whole series, or "cycle" as it is called, is performed in from 20 to 60 seconds, the actual time depending on the size of the machine and the length of the jib. As an illustration may be mentioned a special test of a steam shovel capable of dealing with about 150 cubic yards of soil or clay per hour, or from 60 to 100 yards of iron-ore per hour. In the tests referred to it regularly completed the cycle of operations in from 25 to 35 seconds.

Working with a Transporter

The operations when a separate transporter is employed are not difficult to follow. The excavator takes a cut and discharges the material into the skip, which stands ready at the foot of the transporter track. When the skip is thus filled the transporter driver starts his engines and the loaded skip is hauled up its track to the tipping point. Here the catch holding the door of the skip is knocked out automatically by a trip gear, as already described, and the skip is emptied. The driver then throws out the hoisting clutch and the skip is lowered by gravity to the foot of the track, the drum to which its hauling rope is attached being allowed to run free, but controlled by the driver with a brake.

In designing a transporter it is necessary to arrange for the bucket to complete its trip from start to finish at a speed that is slightly faster than is required for a complete cycle of operations by the excavator with which it is working. In the case under review the transporter makes a round trip in about 25 seconds and is several seconds quicker than the excavator, which is not therefore called upon to wait for the return of the skip. Exactly the same foresight must be exercised when an ordinary excavator is used, where the excavated material is loaded into wagons. In this case a good contractor will always arrange that his steam shovels are never left idle, waiting for empty wagons.

An excavator working with a separate transporter is capable of a larger output than a long-jib shovel of equal bucket capacity. This is largely because the machine has a shorter jib and therefore is able to slew round more quickly than a shovel with a long jib. Really, therefore, the work of the long jib is carried out by a separate machine, the transporter, which works at top speed and has a longer reach than a shovel with a long jib. Also in practice it is found that the coal consumption of the two separate machines is rather less than that of a single long-jib machine, because the latter is very much heavier and requires more power to work.

Of course, there are disadvantages as well as economies. These are chiefly that an extra man is required to work the transporter and also that tracks must be laid for two machines instead of one.

A good deal more might be written about these interesting machines, and in next month's "*M.M.*" we shall have something to say about another type of excavator, called the Drag-Line. We shall give illustrations of the heaviest Drag-Line in the world, and announce an interesting competition in connection with this model, for which a special prize of £5 cash will be awarded.

Into the Land of Fun:

Ball-Bearings

by

"SPANNER."

BALL-BEARINGS are one of the greatest inventions in engineering, and as this movement has recently been introduced into the Meccano system, I propose in this article to say something about ball-bearings in general. I well remember the first time I took a bicycle to pieces. When I had undone the nuts that held the front wheel in its fork, taken off the hub caps and pushed out the spindle, some dozens of tiny balls dropped out and ran all over the floor into any corner they could find! It was one of my first experiments in practical mechanics, and whenever I see a ball-bearing now-a-days I am reminded of the tedious hunt I had to gather all the balls together again for my bicycle. No doubt, the same experience has occurred to many other Meccano boys, and no doubt, too, they will have learned that the best way to put the balls back into position when re-assembling a wheel, is to fill the hub with thick grease, which holds the balls in position and serves as a lubricant after the wheel has been re-assembled.

The Cause of Friction

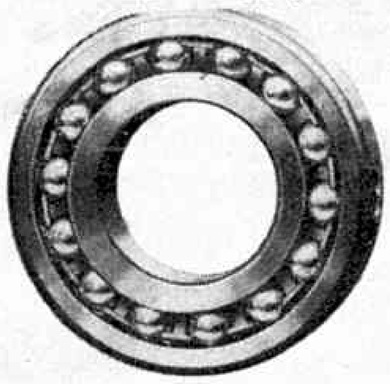
One of the greatest troubles that occurs in connection with every engine or, indeed, with any form of movement where things rub, is due to friction. Friction is caused by the microscopic projections on the surface of one body interlocking with those on another body, upon which it may be moving. This causes a machine to run more slowly than if friction were entirely absent.

The reduction and elimination of friction has been the subject of considerable thought and experiment by engineers. The very first attempts to eliminate friction were those made by pre-historic man, when he placed rollers beneath the load he was dragging, finding it easier in this way to drag heavy stones or trunks of trees from one place to another. Even then, however, there was friction between the rollers and the ground, but later this was reduced to a certain extent by the introduction of large narrow rollers placed at the centre of the load. This ultimately led to the invention of the wheel.

Advantages of Oil

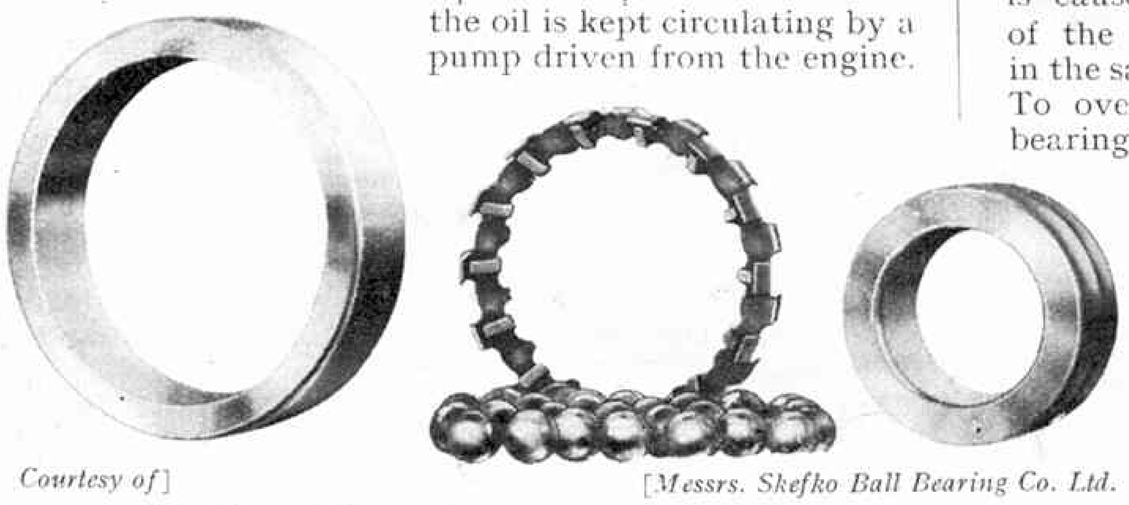
A certain amount of friction is eliminated by lubrication. Generally, oil is regarded as a sort of magic fluid that makes things run more easily. I wonder how many Meccano boys know exactly what happens when a bearing is oiled. What occurs is that a layer of animal or vegetable fat forms a film on the surfaces in contact, and so keeps them apart. The oil forces itself between the two surfaces, even though the pressure be as much as a ton to the square inch. It refuses to be squeezed out, although in the course of time it is consumed unless replaced.

It is now easy to see why it is so necessary to maintain an ample supply of lubrication



A Radial-Journal Ball-Bearing

to all parts of an engine or machine, where friction is likely to occur. In bicycles, special oil-holes are provided in the hubs of the wheels and in the free wheel. In motor cycles the crank-case contains a certain amount of oil in which the fly wheels revolve, splashing the oil to all parts of the engine in the form of a fine spray. In motor cars a similar principle is adopted and in some the oil is kept circulating by a pump driven from the engine.

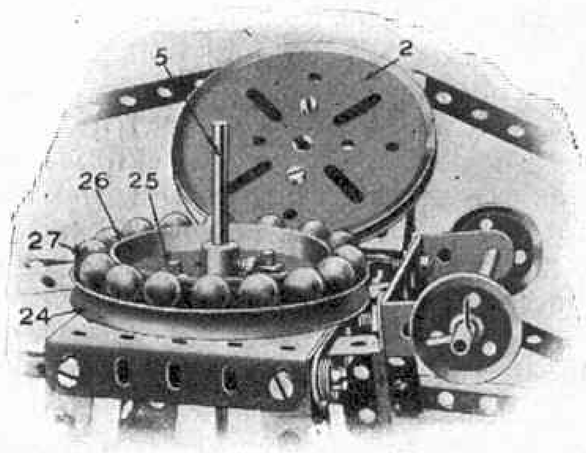


Courtesy of [*Messrs. Skefko Ball Bearing Co. Ltd.*

The Four Parts of the Radial-Journal Ball-Bearing

Friction may be considerably reduced by using ball-bearings, which have the effect of reducing the area of the surfaces in contact. Instead of the whole of the two surfaces rubbing one another, the only surfaces in contact when ball-bearings are used are points.

The advantages of ball-bearings may be well illustrated in the following manner. Take three or four balls—billiard balls, tennis balls, or even marbles will do quite well—and placing them on the table, rest a heavy book on them. It is quite easy to move the book from one side to the other when resting on the balls, but if the balls be removed and the book be pushed about on the flat table the difference will be appreciated. Notice how very much greater is the amount of power required to overcome the friction between the two large surfaces when the book is lying on the table, than is the case when it is resting on the balls, when the only points of contact are the very small surface areas where the balls touch the book and the table.



The New Meccano Ball-Bearing

Types of Ball-Bearings

The earliest form of ball-bearing to be used was known as the "cup and cone" type, such as is used in bicycle wheels. This type is not altogether satisfactory, however, for there is a great deal of what may almost be called "side-slip" as well as the normal rolling action. This slipping is caused through the points of contact of the balls and their tracks not being in the same plane as the plane of revolution. To overcome this defect a new type of bearing called the "radial-journal" was introduced. In this bearing, which is illustrated on this page, the points of contact lie in a plane that is at right-angles to the axis of rotation. This results in a pure rolling motion on the part of the ball.

The radial-journal type of bearing consists of four principal parts, (1) the outer and (2) inner rings or "races," (3) the balls, and (4) the supporting device, usually called the "cage." The rings are grooved for the ball tracks, as shown on the smaller ring at the right-hand side of our illustration. The grooves are of a slightly larger curvature than the balls in order that the principle of contact of points shall be preserved.

Remarkable Accuracy

One of the most important points about the balls is that they should be of exactly uniform size. One of the leading manufacturers guarantees the balls used in their bearings to be true to within one ten-thousandth part of an inch! Some idea of the minuteness of such a measurement may be obtained by comparing it with the thickness of a sheet of fine tissue paper, which is approximately one-thousandth of an inch in thickness. Thus the balls are guaranteed true to about one-tenth the thickness of such a sheet.

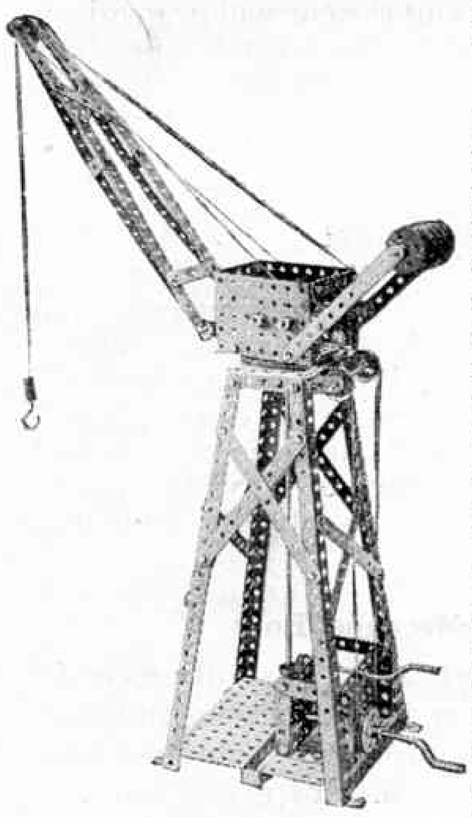
When we understand how necessary it is to manufacture the balls with such accuracy, we are able to see that it is bad policy to renew one or two balls in a bearing.

Ball-Bearings—(*cont*).

The new balls may be a fraction of an inch larger than the old balls, which have become worn, and the new balls will take the whole of the thrust or weight. The bearing will not therefore work correctly, and may probably break down under the strain. Therefore, if one of the bearings of your bicycle requires a few new balls you should change all the balls in that particular bearing.

The supporting cage of a radial-journal bearing is necessary to support the balls and ensure that they take up their load smoothly. It is made of an anti-friction metal, for it is the only part of the bearing where friction may possibly develop. For very light loads and comparatively low speeds, cages are not absolutely necessary and small bearings are generally made without cages.

Ball-bearings are made from a special carbon-chrome steel of such exceptional hardness that it is impossible to mark it with a file! The balls are highly polished and thus present the minimum of microscopic projections to the surfaces with which they come into contact.



Model No. 401.
Crane in which the Meccano Ball-Bearing is used to advantage

Use of Ball-Bearings

The use of ball-bearings is to substitute a rolling action for a sliding action, and by doing this they considerably reduce friction. Ball-bearings are also used for taking-up end-thrusts, for taking the weight of vertical shafts, for "locating" horizontal shafts, for taking-up the thrust of worm and bevel gear drives, and for many other purposes. Bearings to take-up the thrust are of a different pattern to those illustrated. They resemble more closely two washers with a cage of balls between, the washers being grooved to take the balls. Many other patterns of bearings are also made, each designed for its own particular purpose.

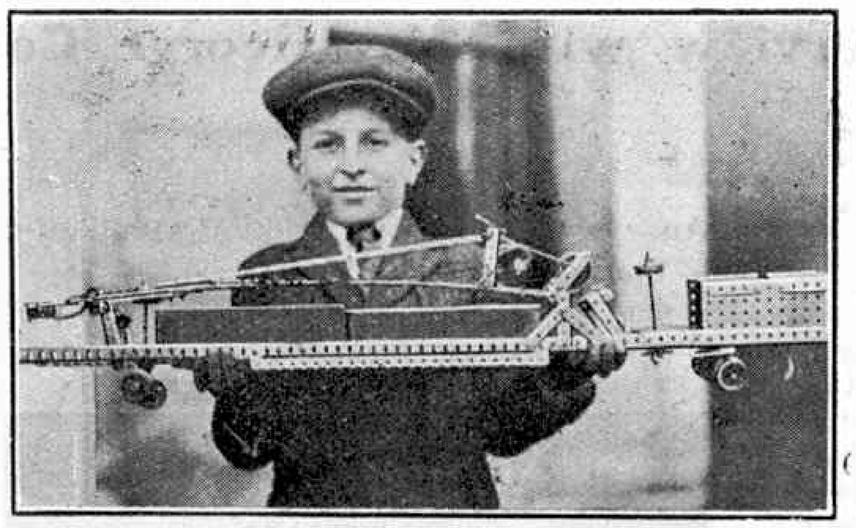
It is, of course, essential that ball-bearings should be mounted with great accuracy. They must also be fully protected, because, owing to their highly-finished surfaces, they are peculiarly liable to rust. The slightest particle of dirt or grit that enters the bearing will quickly wear it slack. The best way to protect bearings from wet or damp is to fill the bearing with some grease about as thick as vaseline. Further protection is desirable by using dust-proof housings, and end covers that have a very fine clearance of the shaft.

The Meccano Ball-Bearing

The new Meccano ball-bearing movement is useful for cranes or any similar models in which one part of the model

(*Continued in next column*)

How Master Mortimer J. Fox Rose to Fame through Meccano



Mortimer J. Fox, Jr., and his model Fire Truck, which won him a pass into all the Fire Brigade Stations of New York

We all delight in watching a fire-engine turn out. Our imaginations are stirred as we hear it go clanging down the street. It is even more exciting to watch than an ambulance or a procession with a brass band at its head! We seem to see the smoke and smell the burning materials; to hear the hoarse shouts of the firemen and the cheers of the crowd as a rescue is effected, or a particularly smart piece of work carried out.

Every boy appreciates the opportunity of visiting a fire station to inspect the engines. Regulations do not often allow of this, however, and we think our readers will be interested to hear how fortunate is an American boy in this respect. Of course, this bright boy, Mortimer J. Fox, is a Meccano boy! He is 11 years of age, and the point of the story is that he recently received a pass from Captain John Kenlon, head of New York City's famous fire brigade. It all happened as a result of Mortimer showing Captain Kenlon a working Meccano model of a tractor-propelled fire truck. This model, which weighs 9 lbs., is operated by a Meccano Electric Motor, supplied by two dry batteries carried on the truck.

Mortimer's pass gives him the freedom of all the fire stations in the city, so that he may inspect the various fire engines in each town.

"Of course, I won't be able to visit all the fire-stations," Mortimer explained to our representative. "There are about 200, I think. I want to visit as many as I can, however, to get ideas for a Meccano model of a fire engine on which I soon hope to start work.

"I don't know that there is anything very unusual in my truck," he continued modestly, as he placed it on the floor and proceeded, with several interruptions from his big dog Renard, to show the principles of its construction. "I have made models of bridges and many other things from the Meccano Manuals, but that is the first time I have made anything out of my own head.

"Ever since I was two years old," he continued, as he lovingly fingered his truck, "I have been making something or other. I just want to go on working and working, making bigger and better things. When I grow up, I want to be a mechanical engineer. For my birthday I received a new Meccano Outfit, and not long after Christmas I began work on my truck. I've worked on it about an hour a day, after school, and a lot on Saturdays!

"This is the way my extension ladder works," he said, as he ran the ladder up and down. Then followed an interesting description of the features of the model, and also an accurate and comprehensive explanation of the principles of modern fire-fighting apparatus.

Our representative was astonished at Mortimer's knowledge of his subject, and it is no wonder that our young friend's father, who, by the way, is Vice-President of the Columbia Bank, is proud of his son!

Ball-Bearings—(*cont.*)

rotates horizontally on another part. Its use is well illustrated in Model No. 401, Elevated Jib Crane, under which model the construction of the bearing is described in the New Complete Manual.

In this model a ball race is introduced in order to enable the jib to swivel more freely on the main frame of the crane. The race is made by bolting to the top of the frame a 3″ pulley wheel (24) and a wheel flange (26). This provides a circular groove for the reception of the balls themselves (27). The pulley wheel (2), to which is bolted the gear box, is then placed over the rod (5) and so rests on the ball-bearings (27) forming the race.

The ingenious model builder will discover several other applications for the Meccano ball-bearings, and no doubt before long someone will devise a cage that will allow the ball-bearings to be used in a vertical position. Of course, this is possible even now with the present form of ball race as described above, but to make it a success it would be necessary that the pulley wheel (2) should always be tight up against the balls, otherwise they would drop out of the race—a mischance that would, of course, be prevented by a cage.

NEXT MONTH

Some More No. 4 Models

Storage Boxes

We have in stock a limited number of boxes, suitable for holding Meccano parts. These boxes are in polished oak, fitted with partitions, and hinged lids. They fasten with lock and key, and are provided with two drawers, also with locks and keys.

The dimensions of the boxes are 17″ × 15″ depth 9¼″, and the price is each 70/–, carriage forward.

As our stock is only small we advise those of our readers who are interested to take immediate advantage of this opportunity of securing a strong and serviceable box for storage of their Accessory Parts.

MECCANO LTD. LIVERPOOL

Lives of Famous Engineers

Next month we hope to print Part II of the story of George Stephenson's life. The second instalment of this popular article has been "crowded out" of this issue.

Motor Cars Without Gears

An Interview with Mr. George Constantinesco

A SHORT time ago we received information that a new device for motor cars had been invented by Mr. George Constantinesco. It was claimed that as a result of this invention it would be possible to construct motor cars without clutches or gears; that hills would be climbed with little—if any—loss of speed, and that the engine would always run at the correct speed, according to its particular load and gradient.

The news of so wonderful a device so impressed us that we wrote to the inventor telling him that we felt certain Meccano boys would be delighted to hear full details of his new mechanism. For this purpose we placed the columns of the *Meccano Magazine* at his disposal. Mr. Constantinesco's reply was brief and to the point. "Come and see me!" he wrote, and our readers may be sure that we lost no time in responding to this kind invitation.

A Mathematical Idea Successfully Applied

"You want me to tell Meccano boys about my new invention?" said Mr. Constantinesco kindly, when I called upon him. "I shall be very glad to do so, for I am particularly interested in the Meccano hobby. You see I have to be, because my small son owns a Meccano Outfit and is already an enthusiastic Meccano boy!

"This new device is called the Torque Converter. It is a mathematical idea applied to practical problems. I am afraid I cannot explain exactly how I obtain my results without falling back on advanced mathematics and highly technical engineering knowledge. What I am able to tell you, however, is that with this invention a motor car will run without gear-box or clutch, and will require an engine of only one cylinder to drive it.

"Some of my friends told me such a thing was impossible and would not work, so I built an experimental model, using a model that had been built for bench tests only, into an old 45 h.p. Sheffield-Simplex chassis. Instead of using the big engine I substituted a 10 h.p. Singer engine. The car went splendidly. It was driven about the outskirts of London, and later towed a lorry up a steep incline. When 6 inch wooden blocks were placed in front of the wheels and the engine started, the car climbed over the blocks without hesitation, to the great astonishment of the people who happened to be present.

An Invention that will Revolutionise Transport

"I believe that my invention will revolutionise all forms of transport, for

Mr. George Constantinesco, Inventor of the Torque Converter

it is not confined to the motor car alone. For instance, my first idea during the war was to apply such a Converter to the improvement of tanks used in warfare. It may also be applied to locomotives, aeroplanes, ploughs, tractors and all similar vehicles. At least a quarter of the cost of these vehicles will be saved by using this gear. Their engines will require to be only about half the size of engines used to-day, so that petrol and oil consumption will be considerably lower. By using an engine with a single cylinder—and very probably a cheap two-cycle engine—the four, six or eight-cylindered engine will be abolished and all the complicated mechanism in the working of such an engine will be eliminated. What is more important, we shall do away with the costly material and machinery entailed in the manufacture of multi-cylindered four-cycle engines.

"Then again, the control of all vehicles will be considerably simplified. A three-way switch will give the forward, neutral, and reverse positions. In the case of a motor car the engine is started, the throttle opened, and the car will immediately glide forward. Increased speed is obtained simply by opening the throttle and there is no trouble with gears or clutches.

"In actual practice the Converter will be built into the engine-casing, and for an average small four-seater car it will fit comfortably into a box of about one cubic foot dimension. No matter what type of an engine is used, its drive is converted into a smooth even-turning movement, without jerk even though the engine may be racing. The engine may be placed either horizontally or vertically, and may be air or water-cooled."

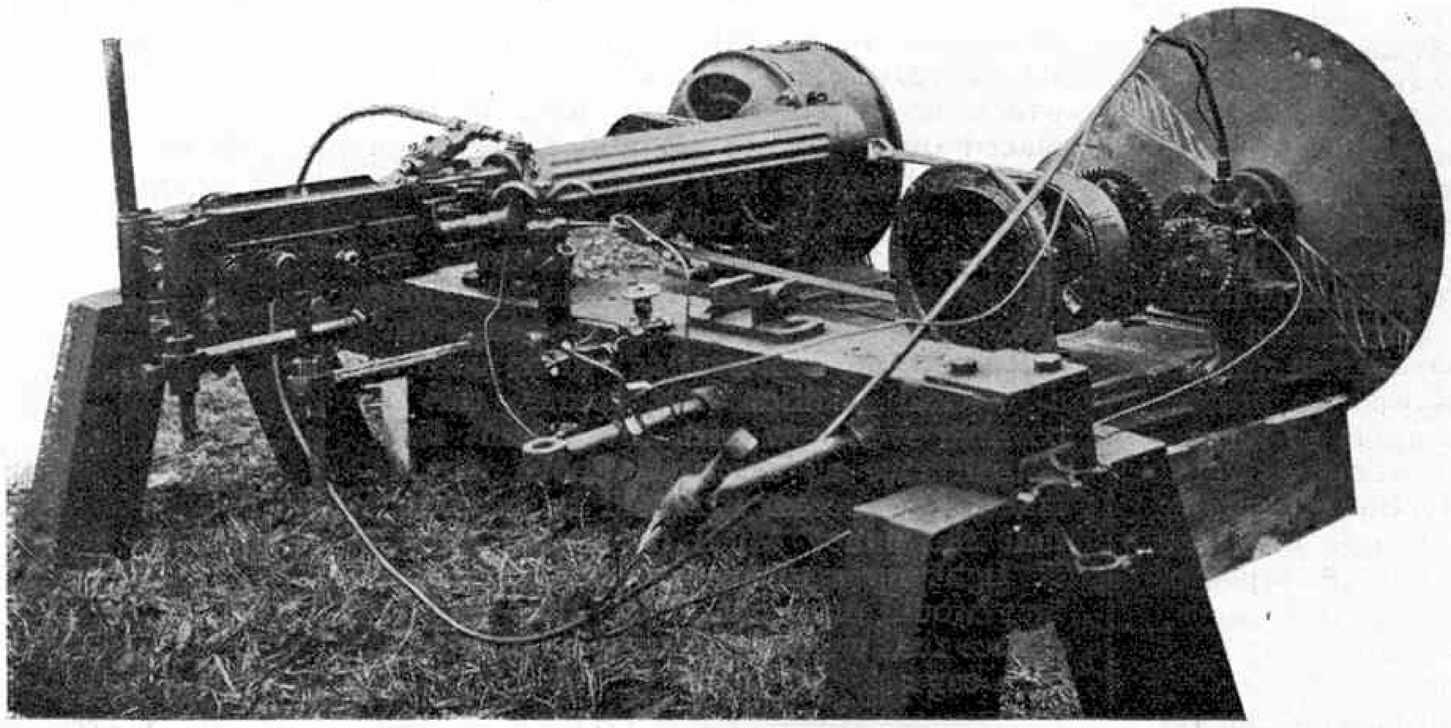
A Paradise for Meccano Boys

When I asked Mr. Constantinesco for a list of his other inventions he smilingly took down a couple of volumes filled with details of patents of every kind.

"There you are," he said, "you may make a list of them if you wish!"

Needless to say I did not "wish," for several hours would have been necessary to list them all. Turning over the leaves of the volumes, however, I had the opportunity of peeping into what would be a veritable paradise for Meccano boys. There were descriptions of patents covering every kind of mechanism:—Internal Combustion Engines, Reinforced Concrete Buildings, Carburettors, Depth-Charge Projectors, Bridge-Construction Plants, Motors, Firing Gears, Trench Mortars, Rock Drills and many other inventions of absorbing interest to Meccano boys.

"When I was 11 years of age," said Mr. Constantinesco in reply to my enquiry as to how he came to devote his attention to science and engineering, "I was greatly attracted



The world-famous "C.C." aeroplane gun, one of the most remarkable inventions of the war

by the mysteries of electricity. It seemed to me such a wonderful power, offering such a wide field for investigation, and yet nobody seemed to know exactly what it is. That alone was enough to arouse the liveliest curiosity in a small boy! My first experiments were made with the household bell, but as all the bells in the house went out of order as soon as I started my investigations, my experiments were not exactly popular! But I had learned something, and setting to work I was eventually able to invent an electrical apparatus used in the treatment of paralysis. After several minor improvements had been made on this invention, it was found to be superior to any apparatus used for the purpose at that time. I think I was forgiven for the bell experiments after that!

Musical Harmony and Transmission of Energy by Sound

"When I was 17 years of age I used to play the piano, and so I became interested in musical harmony and therefore in the theory of sound. I read and studied everything bearing on sound, and the more I learned the more interested I became. I found with surprise that there was no scientific theory for musical harmony and I determined to study this subject. Three years later I had my reward, for I was able to discover the correct mathematical laws of musical harmony. This led me to study the theory of sound on an entirely new basis and by new methods. Finally I was led to the discovery of my method of transmitting energy through water by enclosing the sound waves in a pipe full of water—hitherto an unheard-of feat! It is to those years of study and to the knowledge that I then acquired, that I undoubtedly owe my successes, for at least one of my most successful inventions is based on the theory of vibrations and of sound waves.

"But now," continued Mr. Constantinesco, "Meccano boys are not interested in the theory of sound. I'm sure they would much rather hear about that part of my work that concerns my inventions." Saying which he opened a drawer in his desk and took out several photographs of his inventions.

A Famous Invention

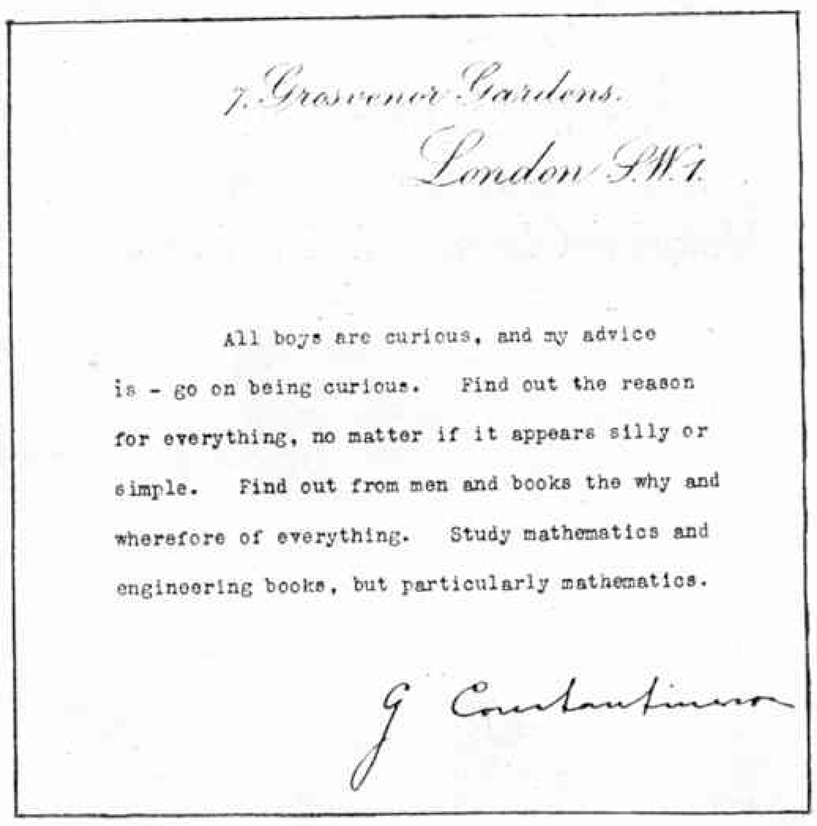
"Perhaps the best-known of my inventions," he continued, "was this timing apparatus for machine guns. In 1915-16 the German airmen with their Fokker 'planes were far in advance of those of the Allies so far as their method of shooting was concerned, and I determined to 'turn the tables' on the Germans at the earliest opportunity.

"I therefore undertook several experiments, the result of which was a high-speed timing apparatus that enabled two machine guns to fire at the same time over 2,000 rounds per minute. They fired in this way through the aeroplane propeller, even though this was revolving at the rate of 1,500 revolutions per minute. My invention made any aeroplane to which it was fitted immensely superior to the German aeroplanes, and over 40,000 of these 'C.C.' firing gears were made for the British Air Service and about 10,000 for the American Forces."

Our illustration shows Mr. Constantinesco's invention fitted to a Vickers Machine Gun. An outline resembling a propeller is marked on a disc, which is rotated in front of the machine gun, through gearing from an electric motor. Between the two propeller blades are to be seen two holes. The larger one was made by firing 140 rounds at the rate of 600 rounds per minute. The smaller hole near it was caused by a round having been discharged one two-thousandth part of a second slower than the other rounds. The wonderful accuracy of the invention is shown by the fact that all the bullets fired (with the exception of the "slow" one already mentioned) passed through the same hole, with the disc revolving 1,500 times per minute.

A hitherto unpublished photograph of the Constantinesco Trench Mortar

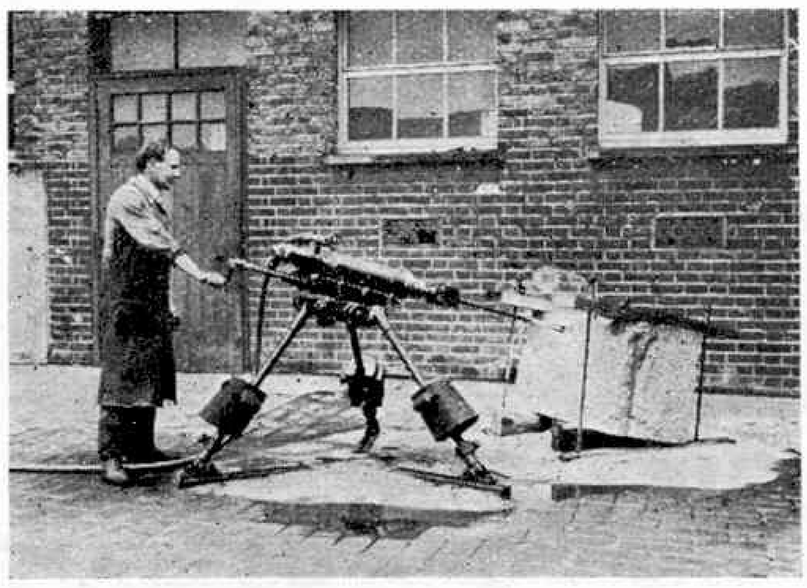
A Message to Meccano Boys



7, Grosvenor Gardens,
London S.W.1.

All boys are curious, and my advice is - go on being curious. Find out the reason for everything, no matter if it appears silly or simple. Find out from men and books the why and wherefore of everything. Study mathematics and engineering books, but particularly mathematics.

G Constantinesco



A Rock Drill driven by a 2 h.p. engine, and invented in 1914

Pianos to Aeroplanes

In answer to my enquiry as to how this result is obtained, Mr. Constantinesco said:—"I am afraid I could not tell you without falling back on a highly technical explanation that would occupy many pages of your Magazine. Broadly speaking, however, the firing mechanism of the gun is controlled by an ingenious method employing sound waves, the energy of which is transmitted through a pipe containing paraffin oil. The idea of using sound waves occurred to me as a matter of course. As I have told you already, while I was a boy I was interested in music and later on, having mastered the theory of sound waves, it was not difficult to invent—when the need arose—this firing mechanism which uses waves passed through liquid contained in a pipe."

I could not help remarking how interesting this was, for there seems to be not the slightest connection between piano-playing and firing a machine gun from an aeroplane!

Machines for Throwing Explosives

Another of Mr. Constantinesco's war-time inventions was a trench mortar, which fires a 200 lb. bomb without any noise or flash. In its original form this trench mortar was submitted to the War Office, but as it fired a bomb weighing only 2 lbs. and was limited to a range of 150 yards it was not considered serviceable, because the trenches were in many places over 150 yards apart. Improvements were made, however, and a new mortar, with an increased range of over 1,500 yards and capable of firing such gigantic bombs, was completed and successfully tried just before the Armistice.

Mr. Constantinesco also invented and made a very successful device capable of throwing two depth charges, each containing 400 lbs. of high explosive, to the left and right simultaneously to be used against submarines. This machine was also noiseless and flashless.

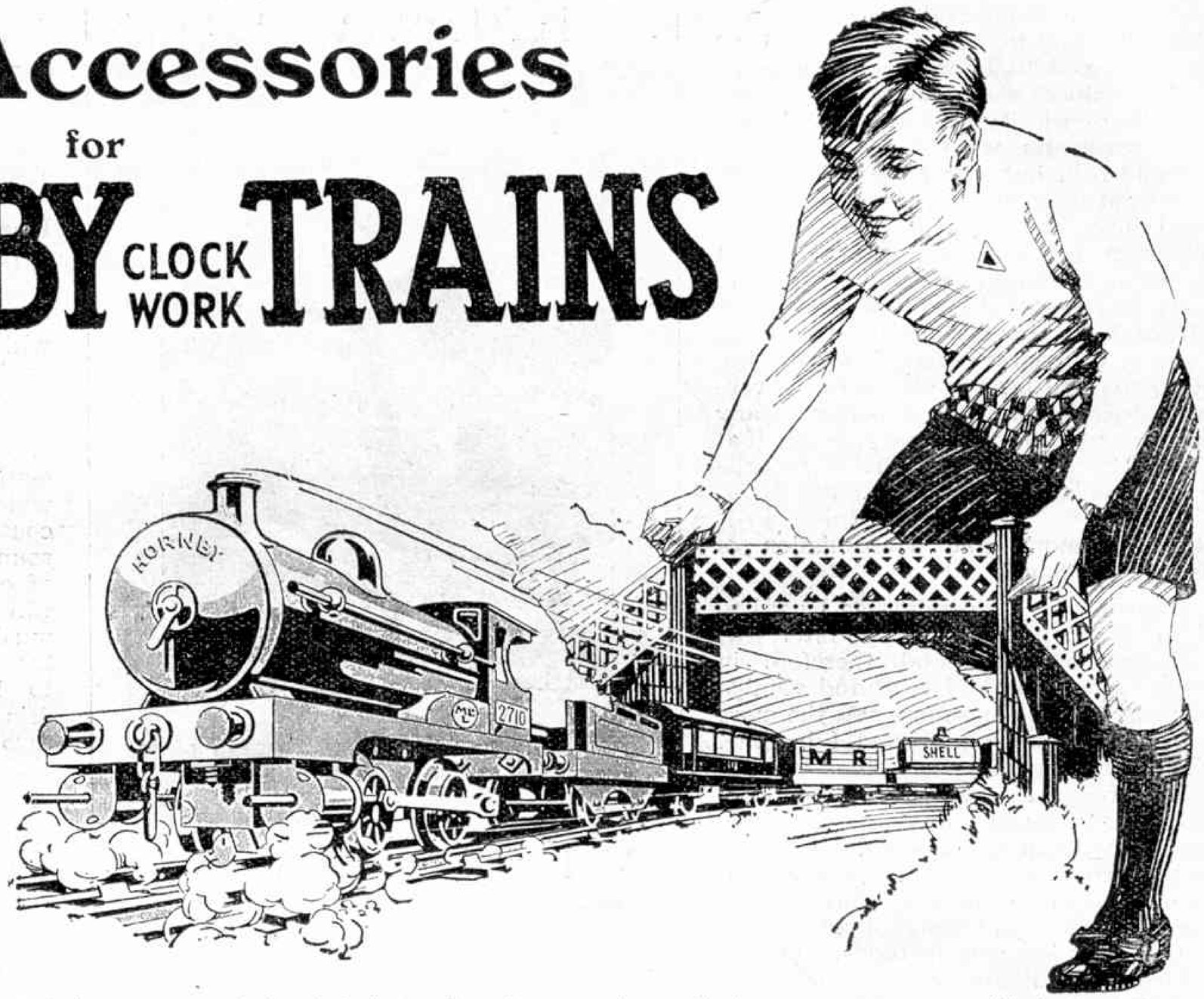
Peace-time Inventions

"And now," said Mr. Constantinesco, "we have seen enough of my 'frightful' machines. Let us turn to something of a more useful nature. Here is an interesting photograph of an invention that I brought out in 1911. It is a paraffin vaporiser, which was fitted to a four-seater car that was tested on a trip from London to Brighton and back. The journey required four gallons of crude paraffin-oil which at that time cost only 3d. a gallon. Just think of it—from London to Brighton and back for 1/-!

"This photo is of a rock-drill that I brought out in 1914. This drill requires only a 5 h.p. motor to work it through a length of over 500 ft. of pipe line. Under test it was found that the drill itself absorbed only about 2 h.p. Here again energy is transmitted through water by sound waves, and the drill is easily made to pierce even so hard a rock as granite."

(*Continued on page 56*).

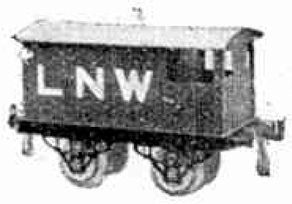
New Accessories for HORNBY CLOCK WORK TRAINS



THESE wagons, signals, lamps, stations and turntables are all built in correct proportion as regards size, gauge, method of coupling, etc., to the Hornby Trains. Most important of all they have the uniformly beautiful finish that is the great feature of the Hornby system. To use cheap-looking rolling stock or a foreign-looking station with a Hornby Train completely spoils the effect.

The Windsor Station, illustrated below, is a thing of beauty and its bright colouring and realistic appearance will bring joy to the heart of every boy who sees it.

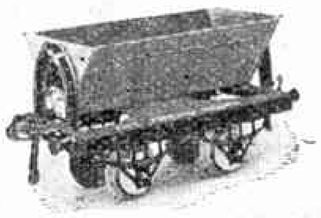
Write for illustrated leaflet of Hornby Clockwork Trains and complete range of accessories.



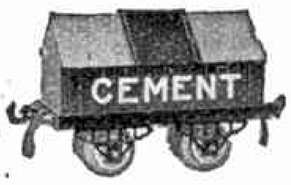
BRAKE VANS
Finished in colour.
Each **4/6**

WINDSOR STATIONS
Excellent models, beautifully designed and finished.
Dimensions: Length 2 ft. 9in., breadth 6 in., height 7 in. Each **12/6**

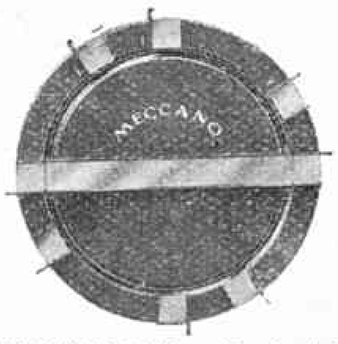
No. 1 LUGGAGE VANS
Lettered M.R. Representative colours. Each **4/6**



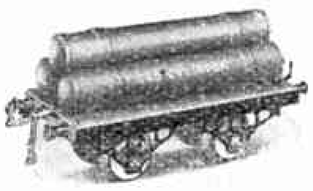
SIDE TIPPING WAGONS
Excellent design and finish.
Each **3/6**



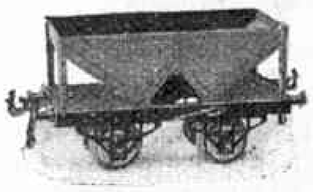
CEMENT WAGONS
Finished in colour.
Each **4/6**



TURNTABLES. Each **4/6**

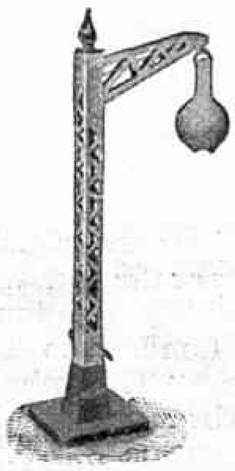


GAS CYLINDER WAGONS
Finished in colour.
Each **4/-**

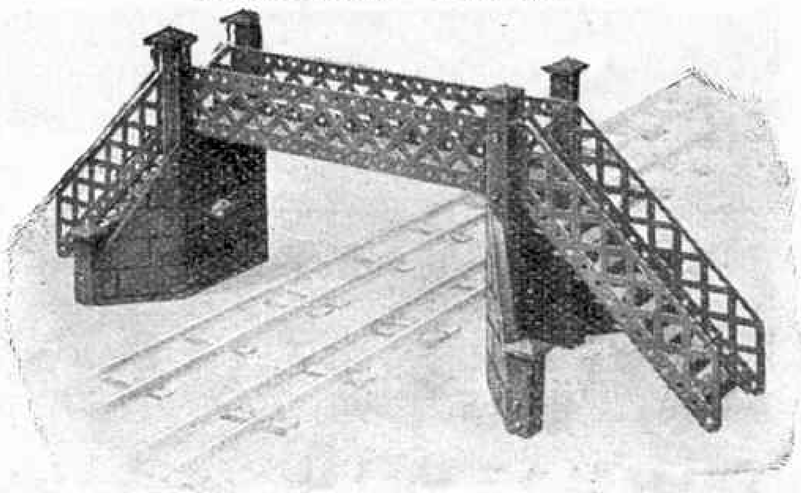


HOPPER WAGONS
Mechanically unloaded.
Finished in colour. Each **4/-**

DOUBLE LAMP STANDARDS
Four-volt bulbs may be fitted into the globes.
Each **4/-**

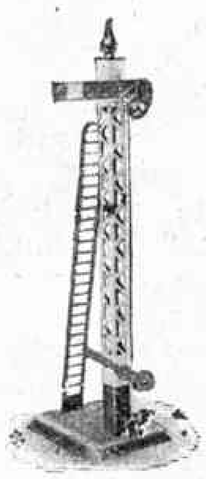


SINGLE LAMP STANDARDS
A four-volt bulb may be fitted into the globe.
Each **3/-**



LATTICE GIRDER BRIDGES
Constructional type. Strong and well proportioned.
Each **10/6**

TELEGRAPH POLES
Each **3/-**



SIGNALS
Each **2/6**

MECCANO LIMITED BINNS ROAD LIVERPOOL

New Railway Colours.

EVERY Meccano boy who is interested in railways knows that new colours have been adopted by the various companies, since the recent re-grouping. At present there are many variations in the colours of the rolling-stock used on each of the different lines, but in future there will be only four colour schemes, one for each of the amalgamated Companies. It is interesting to note that, in view of these changes in colouring, the Hornby locos of the future will be finished with the distinctive colours of the Company they represent, and lettered to suit.

Our illustration shows a 4-6-0 passenger locomotive and tender of the London, Midland & Scottish group, neatly painted in the old "Midland" crimson-lake. The tender carries large numerals, and the letters "L.M.S." of comparatively small size appear on the sides of the cab. The goods locos on this line will be painted all black with the lettering "L.M.S." in the same place as in passenger locos.

On the London & North Eastern Railway the carriages are to be red-brown in colour and the passenger locos green, while the goods locos will also be black.

Although the colour of the locomotives of the Southern Railway has not, so far, been definitely decided, the carriages will be finished in sage green.

The colours adopted by the Great Western Company for their carriages are Windsor brown, with cream upper panels. The locos on this line will be green and black.

These changes, of course, cannot be made all at once. They will come into use only as the coaches and locos pass through the repair shops for overhauling purposes. It will, therefore, be some time before a complete change is finally effected, and our readers will find it interesting to watch for locos of the new colours.

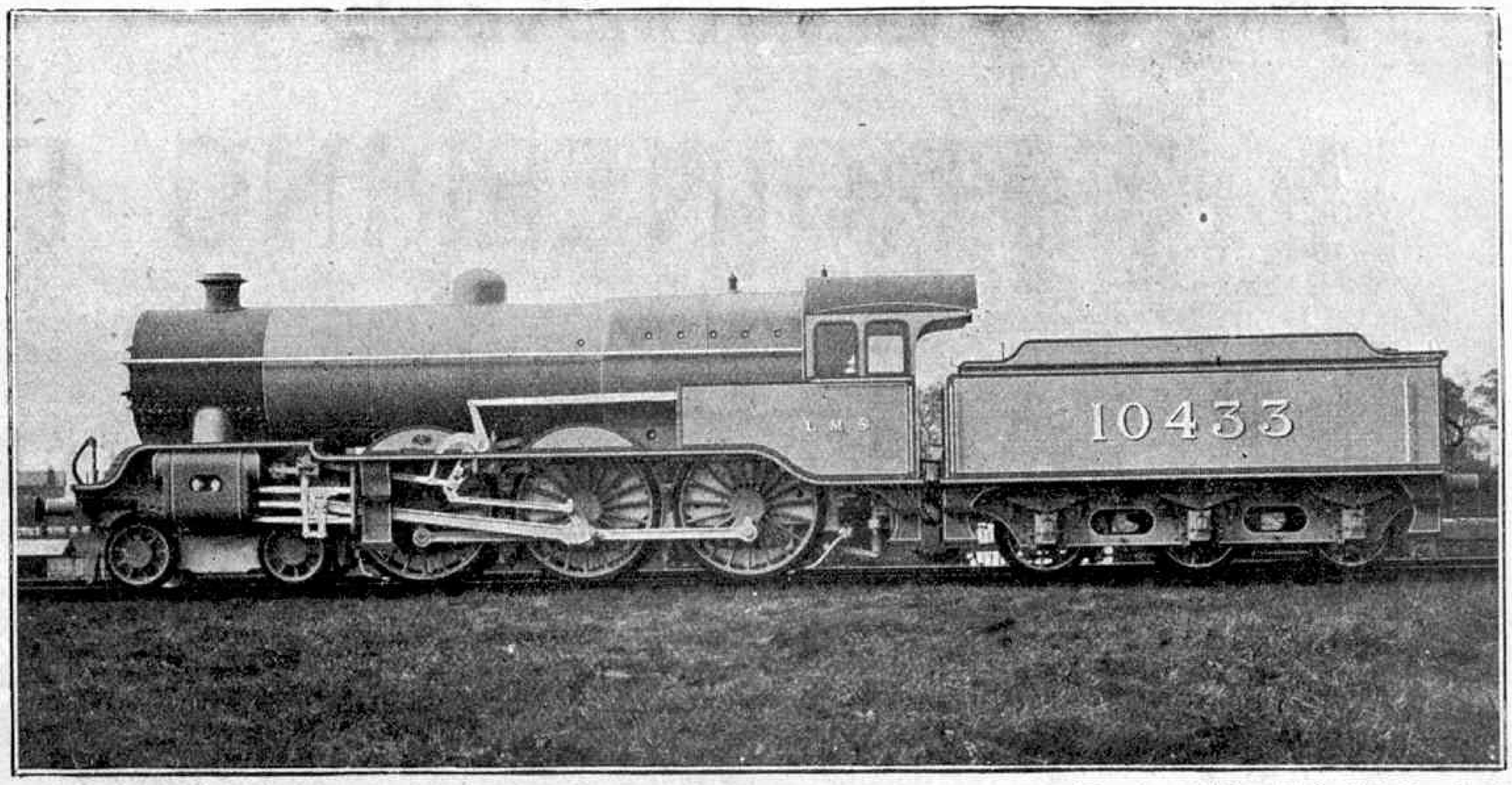


Photo by] [*London, Midland & Scottish Rly. Co.*

A 4-6-0 L.M.S. Passenger Loco painted in the new colours

A real boys' food

When you have "FORCE" for breakfast, you won't think anything more of a cold morning than the boy in the picture does. "FORCE" is the bone and muscle-building food that makes you feel fit for work, fine for play and ready for anything.

"FORCE" is the big fellow's food—it's whole wheat, all the wheat, bran and everything, made so good to eat that you'll wonder why wheat was ever prepared in any other way.

You must get into the habit of eating "FORCE" *every day* —it won't be difficult to persuade mother to get "FORCE" regularly for you because she'll appreciate the fact that it NEEDS NO COOKING. Just add hot milk.

SEND FOR FREE SAMPLE

Decide now to try "FORCE." Post coupon below to "Sunny Jim," Dept. A.Y.7, 197, Great Portland St., London, W.1.

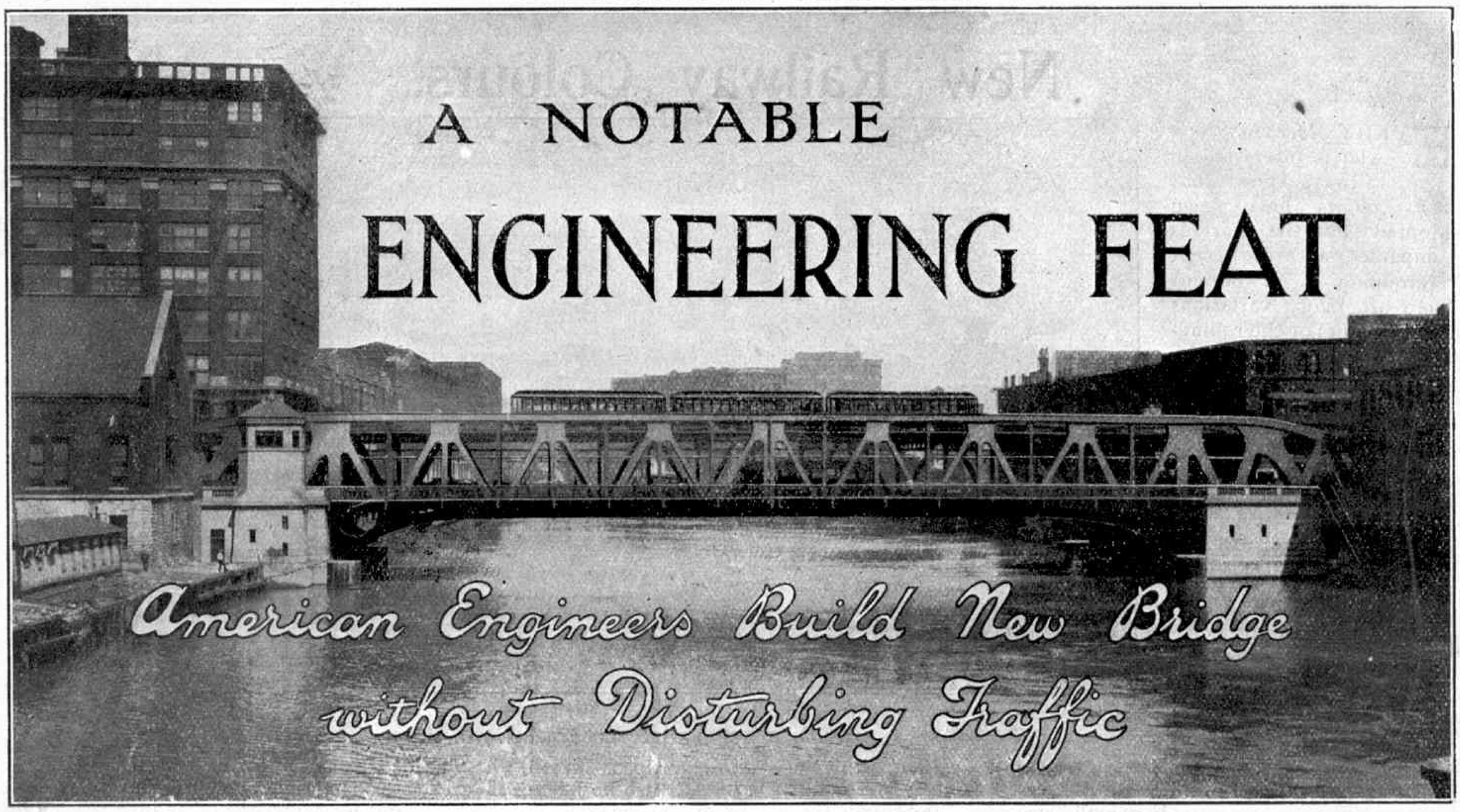
NAME.....

ADDRESS.....

.....

FORCE

WHOLE WHEAT FLAKES
MALTED AND TOASTED



A NOTABLE ENGINEERING FEAT

American Engineers Build New Bridge without Disturbing Traffic

With this article we conclude the account of the Chicago Bascule Bridge. Last month we showed how the Bridge was built in position, without interruption to traffic. Future articles of this series will include a description of Transporter Bridges, such as those at Runcorn and Newport, and Cantilever Bridges, including the Forth and Quebec Bridges.

A Quick Change-over

AT 8 p.m. on the 2nd December, 1921, all traffic crossing the river was suspended, and the old swing bridge was moved into the open position for the last time. In this position, as is shown in our illustration on the next page, the old bridge rested upon the piles and false-work that had been erected for it in mid-stream. The centre portion of the bridge was then cut away, by burning through the girders with oxy-acetylene torches, and a gap was thus made so that the new bridge might be lowered into position.

In the meantime the missing portions of the leaves of the new bridge were built in. The leaves were then lowered until horizontal, and after they had been adjusted, the track for the elevated railway was laid on the upper deck.

The New Bridge in Position

At 7 a.m. on the 5th December, only 58 hours after the work commenced, overhead railway traffic was resumed over the bridge, the trains running as usual.

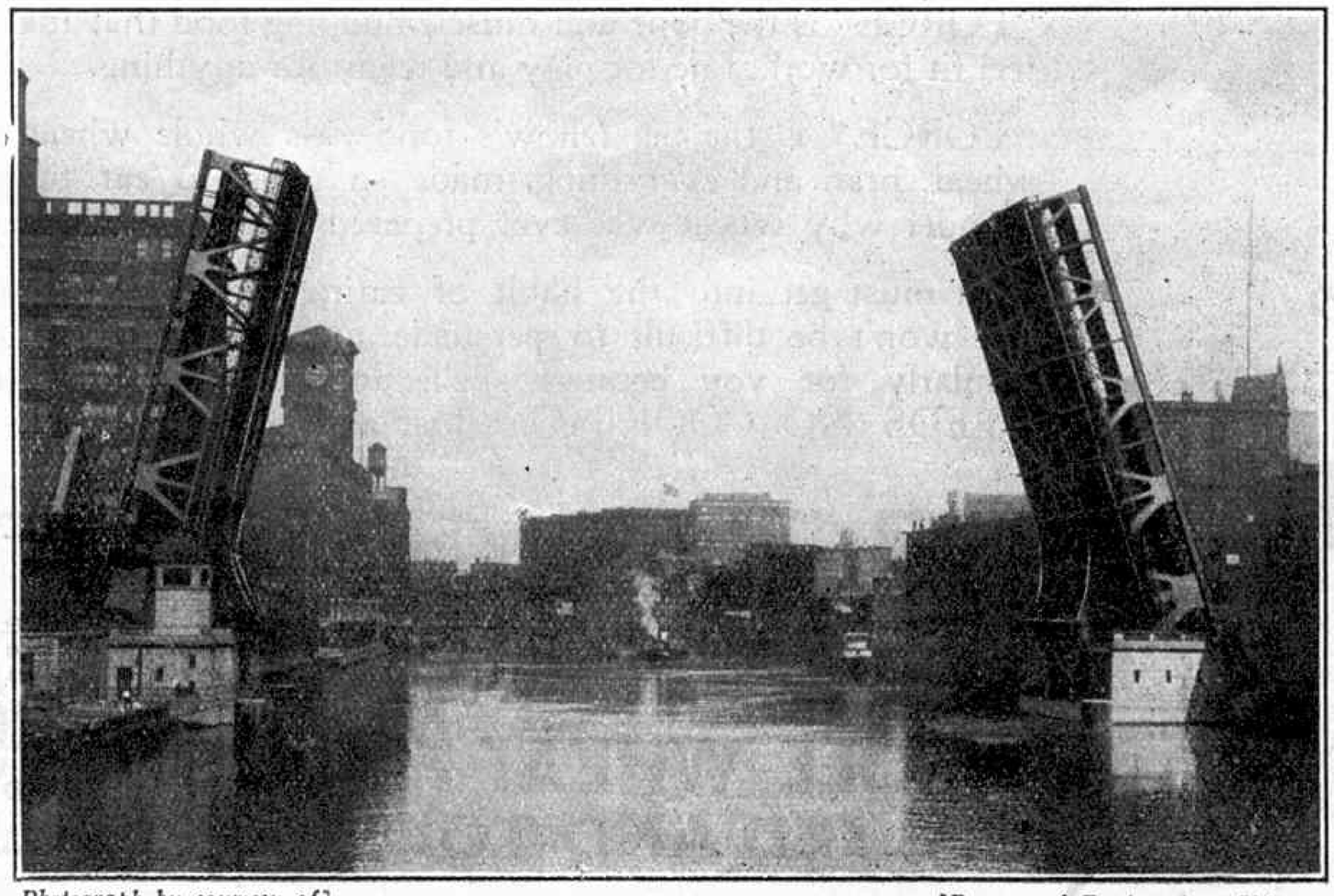
The illustration at the head of this article shows an elevated train passing over the bridge on the upper deck, and a street car, road traffic, and pedestrians crossing the bridge on the lower deck. It shows the bridge in its finished form, and it is interesting to note that every trace of the swing bridge shown in the other illustrations has been removed.

After the bridge had been lowered into position, work was commenced on the roadway and footpaths of the lower deck, and the trackways for the electric cars were laid. This work necessitated the closing of the bridge to street traffic for about four months. During this time the remaining portions of the old swing bridge, that had not been cut by oxy-acetylene, along with the centre pier, were removed.

Details of the Bridge

The piers upon which the new bridge rests are from 5 to 11 ft. in diameter. They are so placed as to allow the construction of sub-ways or railway tunnels beneath the river, should it be decided to introduce such "tubes" in the future. The sub-structure of the bridge contains 8,000 cubic yards of concrete and 236 tons of re-inforced steel. The total weight of steel in the bridge is over 2,800 tons.

The leaves are mounted on trunnions 27½ ins. in diameter and these leaves, with their massive counter-weights, weigh some 5,000 tons. The counter-weights are brought into use to give mechanical advantage to the elevating mechanism, which includes two 100 h.p. electric motors.



Photograph by courtesy of [*Bureau of Engineering, Chicago*

The new bridge opens to allow a boat to pass up the river

A Notable Engineering Feat—(*cont.*)

The Two Decks

The over-all length of steel-work is 385 ft. and the distance from centre to centre of the trunnions 268 ft. The bridge is 72 ft. in width and its height above the piers 231 ft., with a channel clearance of 220 ft.

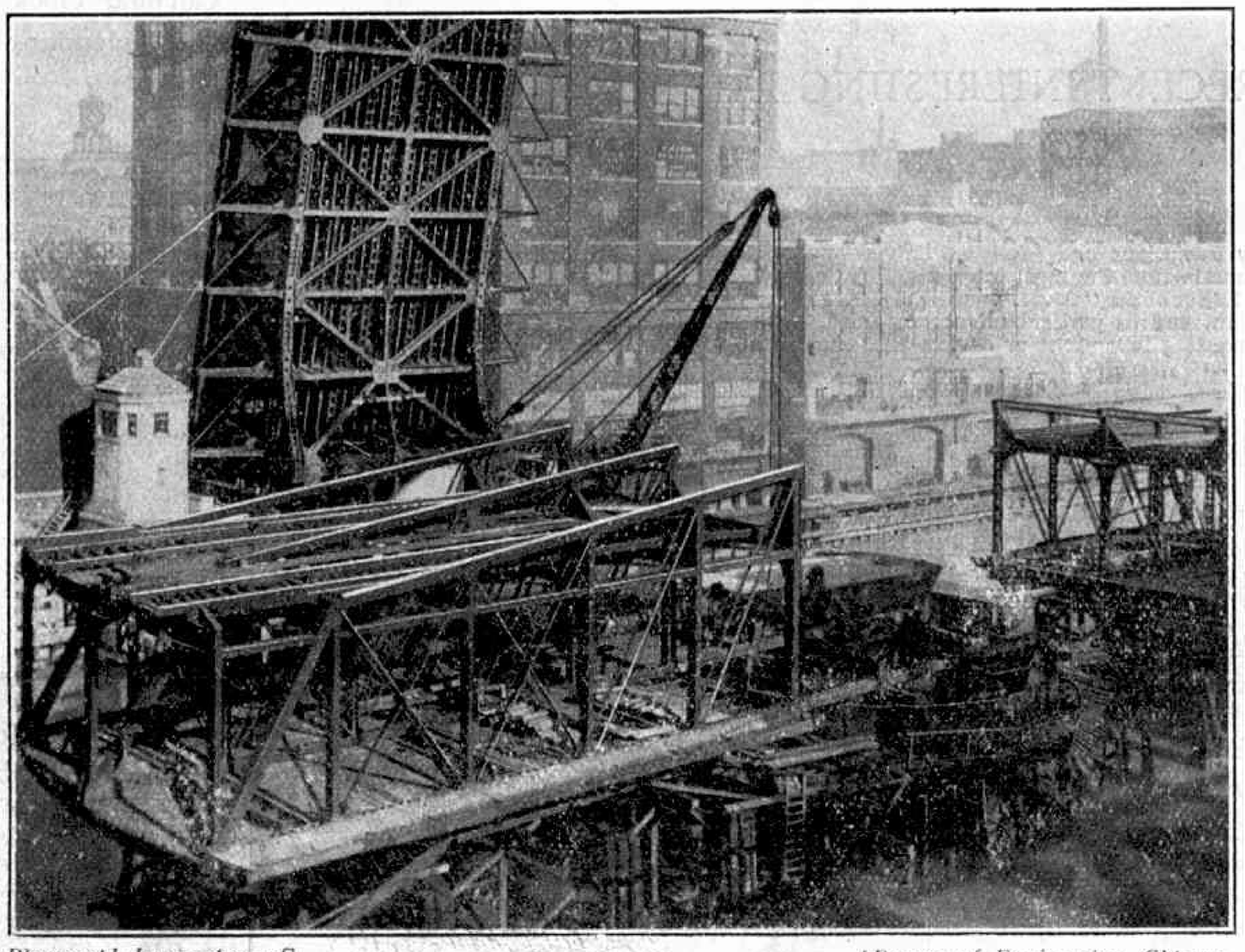
The roadway on the lower deck is 38 ft. in width, paved with wood blocks, and is available for electric cars and road vehicles. There are two footpaths, each 13½ ft. in width.

The upper deck carries the lines of the North Western Elevated Railway.

Bells and Danger Lights ensure Safety

The bridge is equipped with safety devices of the latest types. When it is about to open, gates close across the footpaths and roads, and stop-signals are exhibited. Warning bells ring, and at night red danger lights flash out.

These safety devices are inter-locked with the opening mechanism of the bridge, and with the signal system of the overhead railway. It is impossible for the bridge to be opened unless all safety devices are in operation and the overhead railway signals set at danger.



Photograph by courtesy of [*Bureau of Engineering, Chicago*

When this photograph was taken, the steel-work of one half of the structure was practically completed. A slot had been cut away in the old bridge to allow the new structure to fall into place, the old bridge being subsequently demolished as it stood inoperative on the piles in the centre of the river.

Advantage of Bascules

Where a narrow river is to be bridged, a bascule bridge is generally the type selected, because the central pier, which is necessary to pivot a swing bridge, obstructs the fairway of the river to a certain extent.

In the illustration at the foot of the previous page we are able to observe the advantages that the bascule possesses over the older type of bridge. The river is shown unobstructed by the open bascule bridge, whilst in the distance a swing bridge of the old type is to be seen. It will be noticed that the centre pier of this swing bridge takes up a considerable portion of the river.

THE END.

BRIGHT IDEAS

These columns are reserved for dealing with suggestions sent in by Meccano users for new parts, new models and new ways of making Meccano model-building attractive. We are always pleased to hear from any Meccano boy who has an idea which he considers will be useful in the Meccano system.

A. P. Mittra (Delhi, India).—Straight-toothed gear wheels cannot impart rotary action to a worm wheel. The only type of gear that is able to effect this is the skew or helical gear.

D. Lane (Kanturk, Co. Cork).—(1) We do not stock rubber "tyres" on account of their perishable nature. (2) The difficulty of extra long rods would be their boxing.

H. Eunson (Sparkhill, Birmingham).—We have found that nimble fingers are capable of dealing with isolated instances of awkwardly-placed nuts.

Geo. Burgess (North Kensington, Adelaide).—The existing type of coupling lends itself to a right-angle fastening.

L. Briggs (Birstall, nr. Leeds).—We shall go into the matter of the elimination of the flanges on the sector plate, as an addition to the range of flat plates.

James H. Field (Blackpool).—Your suggested spoked wheels for Hornby wagons would add unnecessary weight without increasing efficiency.

Walter H. Crawford (Dublin).—Your suggested crossover point is only applicable to a double track system, but we do not propose as yet introducing another radius to form this. We have in mind the question of a siding point.

D. H. N. Caley (E. Budleigh, Devon).—We should have to have some definite applications of the cam before introducing it. Perhaps you could suggest some.

T. Kernahan (Ilford).—We have been engaged in the complete revision of our models, and the operation of all the movements of the crane has been effected by the new construction, thereby obviating any departure from standard on the lines of your suggestion.

(Golcar, nr. Huddersfield).—(1) We shall consider your idea for a curved braced girder. (2) A circular saw has only an ornamental use. A 3" sprocket wheel gives a good representation of a circular saw.

Charles F. D. Hall (Cambridge).—We think you will find that an architrave acts admirably as a corner brace. This piece is similar in principle to the right-angled triangle you suggest.

B. Cook (Cottingham, nr. Hull).—Your suggested sliding action screw seems good, and we shall keep it before us.

John C. Potts (Catton, Queensland).—Why not bolt two existing cranks together to give the reversed formation? Set-screws could be used to prevent fouling.

V. Stensson (Sheridan, Ontario).—(1) A ¼" pinion has no scope in the Meccano system on account of its departure from the ½" standard. (2) What diameter do you suggest for the curved double angle strips you mention? (3) We fear that your suggested pointed rods and bearings to match would not be practicable.

Geo. Hillargan (Dunfermline).—Many thanks for your print of curved plate sections. We shall explore carefully their possibilities.

Edwin Cox (Rochester, Kent).—The flanged disc attached to the face plate will give you a flanged wheel of nearly 3" diameter.

O. Howes (Ilford).—We are considering the question of coupling the wheels of the Hornby loco.

N. Tilsley (Eccleston-on-Sea, Yarmouth).—We are considering the advisability of squaring the collar of the threaded pin to fit the spanner in order to obtain a firmer fastening. This will obviate lengthening the threaded portion.

E. A. Robbins (Kidderminster).—We contemplate revising the electrical Manual shortly, when several new examples of electrical experiments will be illustrated.

R. J. Peace (Ovenden, Halifax).—We note your idea for a greater lead angle worm wheel.

P. Nash (Abertillery, Mon.).—(1) There is not sufficient space on the 1" loose pulley for the bolting of double angle strips to form small cylinders. (2) There would be no object in manufacturing a variety of eccentrics. Our present design fulfils all the requirements of an eccentric movement.

Robt. A. Miller (Lincoln).—We have in mind the introduction of channel sections.

Stanley Wilkinson (Skegness).—A firm fastening is obtained by lapping the cord two or three times round the crank handle and knotting with two ordinary half hitches.

Cyril H. Shepherd (Bedford Park, W.).—We do not think that there is any advantage in the type of tooth you suggest. We have found the present type of toothed wheel quite efficient for every degree of Meccano practice.

Jack Jennings (Dublin).—(1) Your suggestion for the issue of the "cigarette card" illustrating items of engineering interest in conjunction with the "*M.M.*" coincides more or less with our future intentions. (2) The matter of the perforation of the sector plate is already under consideration.

V. J. Kitson (Ingeniero Blanco, Argentina).—We realise that a Meccano boat would be attractive, but the caulking of the joints would present difficulties.

W. G. F. Thorley (Wellingboro').—We would not care to undertake the manufacture of the types of rail you suggest as they come into the scale-model category. It would not be worth while going to the expense of tools to make larger size buffers for the limited number of Hornby trains in circulation fitted with the old style chain coupling. This type is now obsolete.

Harold Javer (Wolverhampton).—We have a flanged architrave already, R. and L. (No. 139 and 139a).

Leslie K. Thompson (S. Petherton).—Various types of combination points and crossings will be added to our list in due course.

Stanley and Philip Love (Bristol).—We shall go into the matter of the method of securing the signal to the track.

How to Obtain the "*M M.*"

The "*Meccano Magazine*" may be ordered from your Meccano dealer, or from any newsagent or bookseller, price 2d. If you are not able to obtain the "*M.M.*" from these sources it may be obtained direct from this office, post free, six issues 1/6, 12 issues 3/-.

The next number of the "*M.M.*" will be ready on 1st March. As we print only sufficient copies to supply orders received, you should place a regular order with your dealer or newsagent, or direct with this office, to avoid disappointment.

"*Meccano Magazine*"
Binns Road, Liverpool

OUR BUSY INVENTORS

RECENT INTERESTING PATENTS

Every day new inventions and ingenious labour-saving devices are being brought into existence. From time to time the most interesting of these will be described and illustrated in these columns. The Editor of the "*M.M.*" will be pleased to hear your opinion of this new feature. Readers are invited to send us particulars (accompanied, if possible, with photos, sketches or cuttings) of any interesting inventions or devices that may come to their notice.

TAKING out a patent is a long, intricate business, as we shall endeavour to explain in some future article on this page. Not every patent lives up to the claims of its owner. Very few arrive at the dignity of a commercial success, or bring real profit to the inventor. When a patentee does design something really new and useful, however, his reward is a generous one.

It is not always the largest mechanisms that bring the greatest return. Little inventions, such as the crimped hair-pin, the metal bottle-cap, or the rubber tip on a pencil, have all brought their inventors considerable sums. Gillette, it is reported, received £500,000 a year for his invention of the Gillette Safety Razor.

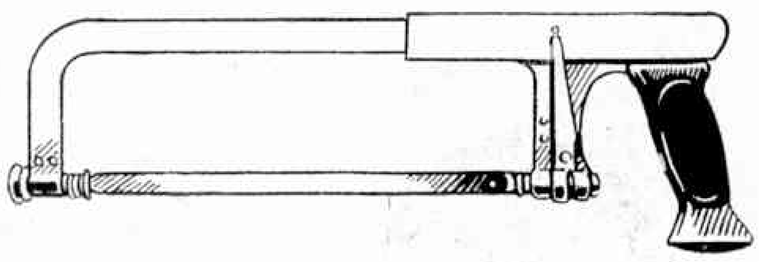
Among the more interesting patents this month we notice the following :—

Vest Pocket Gramophone

Particulars of a gramophone no larger than a watch come from Austria. It is wound in a similar manner to a watch and produces music from small records, ten of which are contained in an inside compartment. Some time ago an English inventor designed and marketed a midget machine that was only 6 inches in height and weighed 4 lbs. It had a collapsible horn, took full size records, and folded together like a camera.

Pistol Hack-Saw

This novel form of hack-saw has a handle shaped after the manner of a pistol grip. It is claimed that in this form the



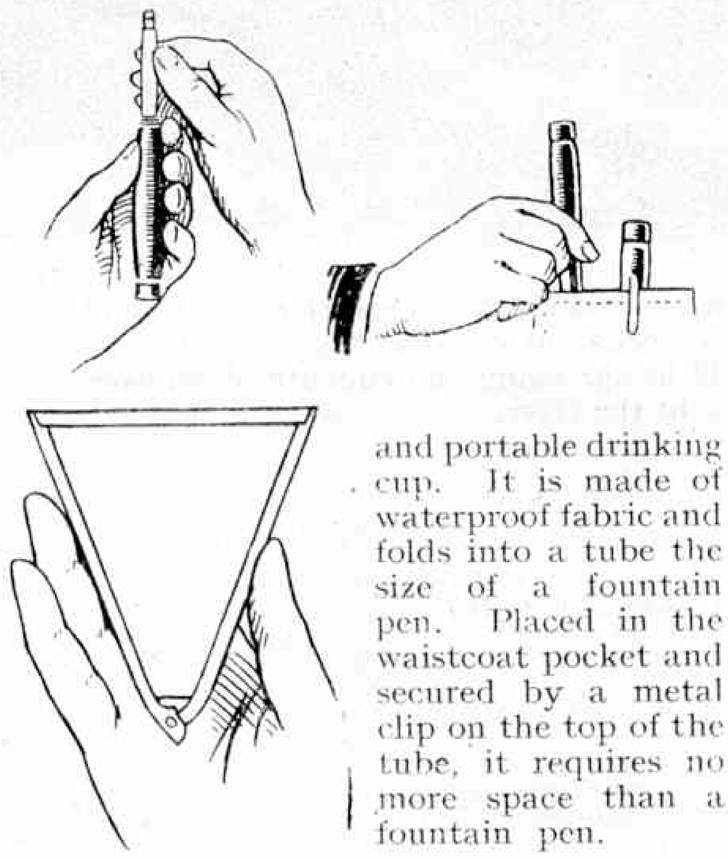
tool is not so tiring to use. Different sizes of blades may be fitted by sliding the frame backwards or forwards. The bolts that lock the saw in place are so arranged that if necessary it may be used sideways for horizontal cutting.

New "Movie" Invention

An American inventor has perfected a method of showing cinema films in which the films have so natural an appearance that the figures seem to stand out, as in a stereoscope. The camera with which the film is photographed has two lenses and takes two pictures, one on top of the other. The screen on which the new pictures are shown is about four times the size of the screen used at present. The first of these new films, which is to be shown in England shortly, is already being widely discussed.

A Collapsible Cup

An invention that will appeal to all boys fond of camping out is this compact



and portable drinking cup. It is made of waterproof fabric and folds into a tube the size of a fountain pen. Placed in the waistcoat pocket and secured by a metal clip on the top of the tube, it requires no more space than a fountain pen.

Gas-Mask For Engine Drivers

A gas-mask has been designed to protect engine drivers and others against the gases encountered in tunnels. It may also be used for many other purposes. In appearance the mask resembles to a certain extent the mask used for gas protection during the war, although there are several improvements. The mask also provides protection to the ears against loud noises, such as the engine exhaust when rushing through the tunnel.

An Old Secret Discovered

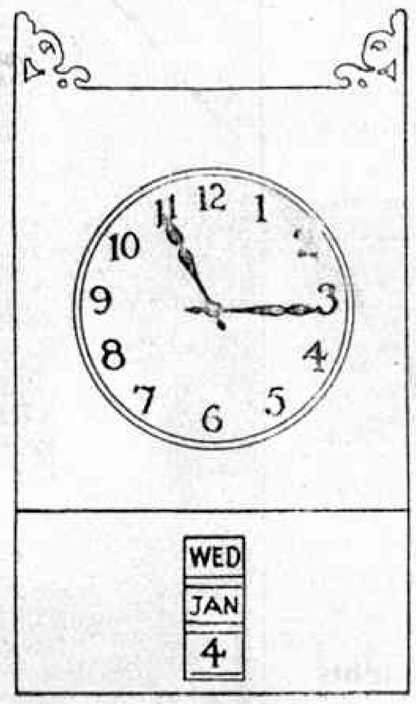
Another interesting invention this month is unbreakable glass. This is being made by a factory in Bohemia, from an old formula that has long been hidden away. This new glass resists heat, enabling it to be used in the manufacture of cooking utensils. As it will withstand high temperatures and destructive acids, it may also be used in the construction of laboratory vessels.

A Folding Tooth Brush

A new type of tooth brush folds into a metal case, and may be carried in the vest-pocket. This should prove very popular indeed, for though everyone knows how important it is to keep the teeth clean, it is no unusual thing to forget to take a tooth brush when leaving home.

Calendar Clock

A calendar-clock is a useful ornament, but none has been made to overcome the difficulty that all the months of the year do not contain the same number of days. A clock has recently been patented, however, that shows not only the date but also the week and the month. So simple and ingenious is the device that it may be attached to any existing clock.



Helping the Motorist

The automobile industry seems to offer a wide field for the inventor, and many of the latest patents are designed for the comfort and convenience of the motorist. Among the more recent inventions of this character is a new tyre which may be safely ridden under low air pressure. Rough roads and "pot-holes" will be shorn of their terrors, and the strain on the chassis will be considerably lessened. Several manufacturers are already introducing this new tyre to the market and it will be interesting to watch its progress.

Another device is one that enables the driver of a motor car to protect himself from the glare of the headlights of an approaching car. It consists of a small enamel plate of sheet metal attached to the wind-screen by a universal holder. In the daytime the metal shield is swung out of the way, and when in use at night it is brought down. The driver is thus able to look out under its lower edge and see several yards ahead, whilst protected by the enamel plate from the dazzling rays of the lights of the approaching car.

Stainless Metal

Stainless or rustless steel has been very much in evidence during the last few years. It has numerous advantages in pier construction, ship-building, bridge-building, and for a thousand and one domestic purposes. Now comes news of a new stainless alloy that has been developed by Sheffield manufacturers and which, it is claimed, more than equals stainless steel in utility. Spoons and forks made of this metal have been found absolutely stainless in domestic use. Vinegar, lemon juice, sauces, etc., appear to have no action on it whatever. This will indeed be a saving in housework! Tell mother about it!

Reversible Heels

A new type of rubber heel has been invented, and people who quickly wear out one side of their heels will find the new article both useful and economical. When the heels become worn they may be pulled off the shoe and used again without any injury to the ankle. They are held in place by means of nails with large heads driven into the heel so as to fit into holes in the rubber.

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

The Pigeon's Cave

by J. S. Fletcher

(*Pub. by Partridge. Price 2/- net*).

A story dealing with hidden treasure and sea fights is always welcome, for it may generally be counted on to provide something really exciting. This story deals with buried treasure on the rocky coast of Wales, and certainly comes up to our expectations. We learn how Hugh Pritchard helps his father and the mysterious Doctor Lorette in their search to discover the treasure buried in a cave near the Great Ormes' Head; how a French raider, with the bloodthirsty Monsieur Chabot aboard, arrives on the scene and takes a hand in the dangerous game. Of course, we are pleased when Hugh finally outwits the Frenchman and his ruffians by a clever ruse. Altogether a thrilling story well told.

Lost on Du-Corrig

by Standish O'Grady

(*Pub. by The Talbot Press. Price 5/- net*).

This is a book of thrilling interest, being the narratives of three brothers living on a wild portion of the sea-coast of Ireland. Two of them mysteriously disappear and, as may be imagined, we are held spellbound and mystified with a dozen different solutions to the problem. Finally the brothers relate their strange adventures—a tale of wonderful resourcefulness and strength of nerve. A fine spirit of adventure runs through the book. We feel ourselves clambering over rocks and clinging to dangerous ledges, as we follow the brothers through their hazardous experiences. As a simply-written tale of adventure and mystery this book is quite out of the ordinary.

The Practical Electrician's Pocket Book, 1924

(*Pub. by S. Rentell & Co. Price 3/- net*).

Though somewhat advanced for the very young model-builder, the new edition of "*The Practical Electrician's Pocket Book*" is a mine of information for anyone interested in either the theory or practice of electricity. It is packed from cover to cover with interesting facts and details, illustrated with figures. For anyone intending to take up Electrical Engineering as a profession, there are few books likely to prove of more value and assistance than this admirably compiled Pocket-Book. The book is well bound and of a handy pocket size. It contains over 570 pages, and is indispensable to those engaged in practical electrical work.

BOOKS RECEIVED

We have received copies of the undermentioned books during the past month, and these will be reviewed in this column in a future issue.

"THE WONDER BOOK OF NATURE" (Ward Lock & Co. Ltd.), 6/-

"300 THINGS THAT A BRIGHT BOY CAN DO"

"301 THINGS THAT A BRIGHT GIRL CAN DO" (Sampson, Low, Marston Co. Ltd.), 6/-

"INTRODUCTION TO WIRELESS TELEGRAPHY AND TELEPHONY" (Sir Isaac Pitman & Sons Ltd.), 3/6

PUBLICATIONS RECEIVED

We have received from Messrs. The Wireless Press (12 & 13, Henrietta St., London, W.C.2), copies of the "*Wireless World*" for January (price 4d.), containing interesting articles on an Inductance Calculator, a New Clock for Wireless Operators, Microphones for Divers, and other interesting articles. The January issue of "*Conquest*" (price 1/-), contains articles on Prehistoric Animals (of which the Diplodocus will be particularly interesting to Meccano boys as this creature is the subject of Meccano Model No. 403), Telescopes, Silk Worms, Hippopotami, Time-saving Devices, Atoms and many other interesting subjects are dealt with in this monthly magazine of popular science.

CATALOGUES RECEIVED

We have received the following catalogues this month. Should any of our readers write to the firms concerned, they will assist us by mentioning the "Meccano Magazine."

A new price list, which comes to us from the Midland Stamp Company Ltd. (78, Warwick Street, Leamington Spa), contains 40 pages of interest to stamp collectors. This firm make a speciality of cheap sets of stamps, and the list contains some choice lots. A copy of the list will be sent free on application to any reader mentioning the "*M.M.*"

* * * *

A very useful little paper model showing the coils necessary to receive various stations will be sent free on application to the Igranic Electric Co. (149, Queen Victoria Street, London). This firm also publish a fine catalogue of radio accessories. Both will be mailed free on request to readers mentioning the "*M.M.*"

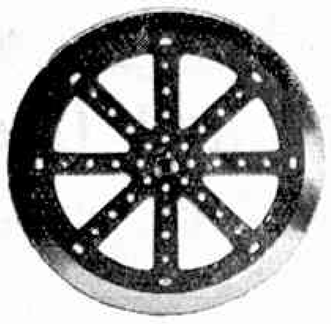
* * * *

Messrs. Norris & Co. (Leabrooks, Alfreton, Derbyshire), send us their new season's catalogue, containing many excellent offers. Some remarkably cheap sets are featured, and the catalogue also devotes several pages to stamp collectors' accessories. Messrs. Norris will be pleased to mail a copy post free on application.

* * * *

The "Boy's Own Paper" Publishers (4, Bouverie Street, London, E.C.4), have recently published many splendid new books, also new editions of old favourites. They will be pleased to forward to "*M.M.*" readers catalogues of adventure stories, historical stories, nature books, travel stories, and the hundred and one volumes that appeal to boys.

New Meccano Part



No. 19c.

Pulley Wheels,

6 in. diameter.

Price,

2/6 each.

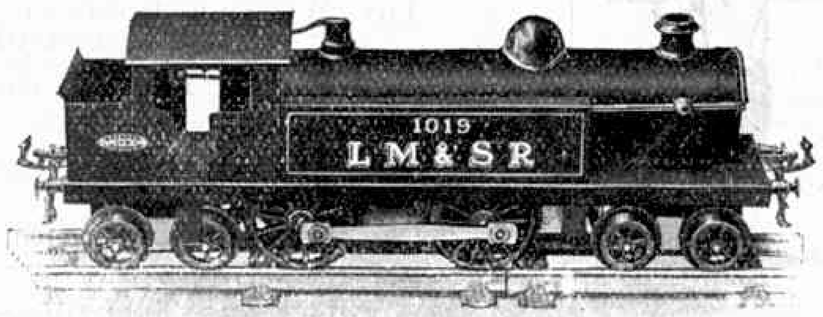
Dealer's Model-Building Competitions

Details of local model-building competitions have appeared in the last two issues of the "*M.M.*," together with the names and addresses of the dealers arranging them. This month we publish the names of further dealers arranging competitions, from whom all information may be obtained.

BLACKBURN—Mercer's, 68, Darwen Street.

BRISTOL—J. Williams & Son, 17, Church Road, Redfield.

Hornby Tank Locos.



This magnificent Tank Loco is a splendid addition to any train system. A glance at the above illustration shows how beautifully this Loco is designed. It is thoroughly representative of the latest type of its class. Measuring 11½ in. in length, it embodies all the characteristics of the Hornby Trains. Suitable for 2 ft. radius rails only.

Beautifully finished in colours; lettered L.M.S. and L.N.E.R. Fitted with reversing gear, brake and governor.

Price each 32/6

FROM ALL MECCANO DEALERS

Burbury Popular & Victor Cycles

FOR BOYS AND GIRLS.
All Models in Stock.

Gem, Victor and Quest Juvenile Tricycles to suit Children of all ages.

BRITISH MANUFACTURE THROUGHOUT

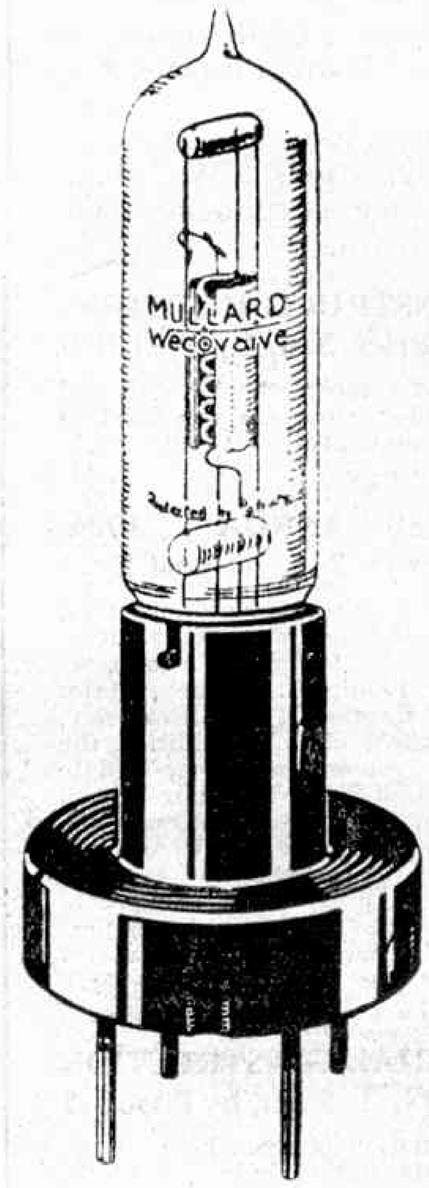
Send for Illustrated List and Quotations to:

The Victor Cycle Manufacturing Co.

Cycle, Tricycle and Sidecar Chassis Manufacturers,

389/397, FARM STREET, BIRMINGHAM.

WIRELESS VALVES.



Mullard Wecovalves.

The Mullard Wecovalve, fitted with a standard 4-pin base, is the last word in Wireless Valves. It takes but a single dry cell to operate the filament, and a cell of normal size will last for months.

The cost of the valve is 30/- and its life is therefore of great importance compared with that of inexpensive dry cells.

In normal use, the Mullard Wecovalve filament will last for 4,000 hours, whilst mechanically it is unbreakable.

It is short and robust in construction and has in no way been attenuated in order to reduce current consumption.

The life of the valve is no longer than that of its filament.

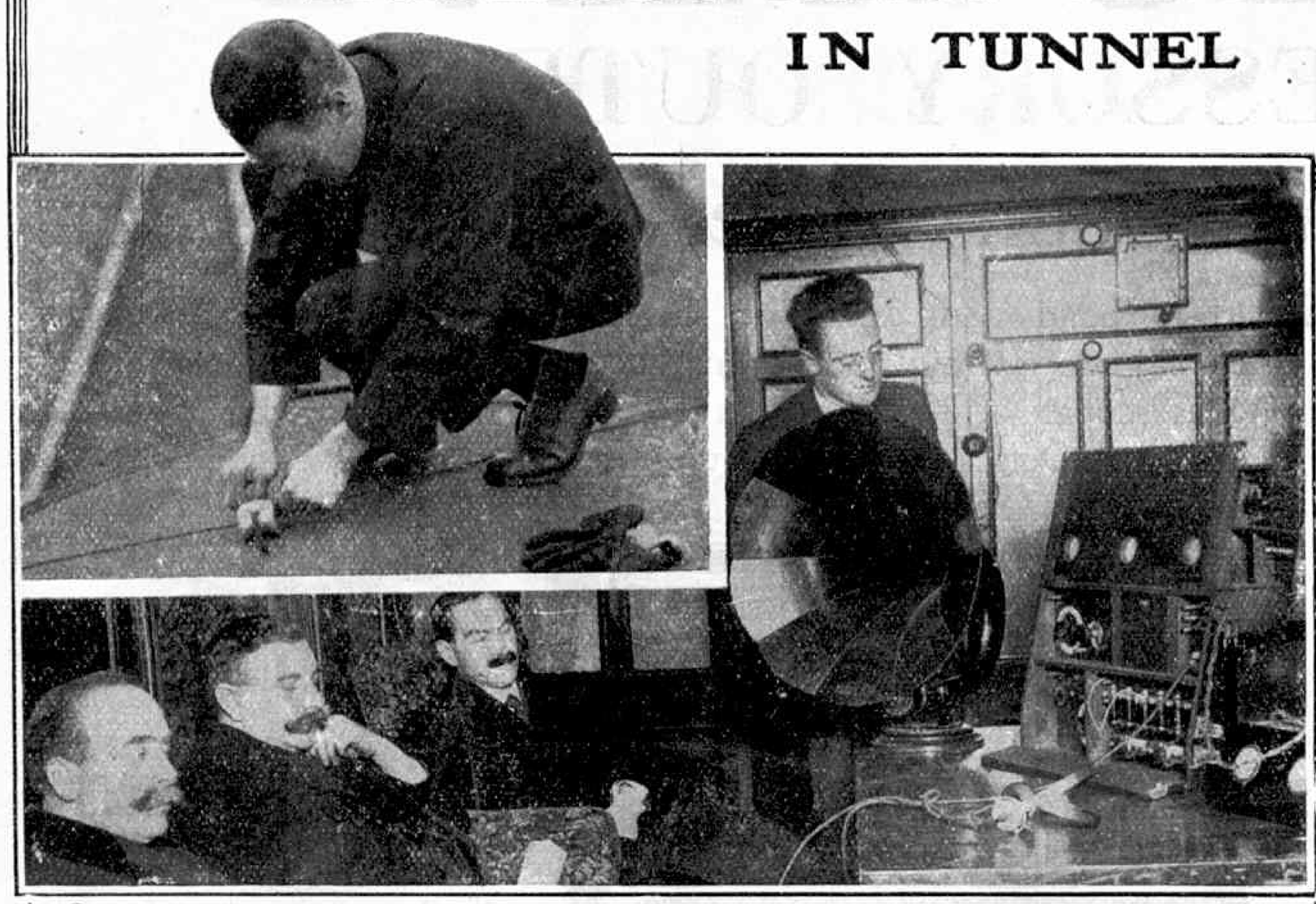
Turn these points over and then order Mullard Wecovalves for your set.

MULLARD

Advt.: The Mullard Radio Valve Co. Ltd., Balham, S.W.12
(E.P.S. 85)

CONCERTS WHILE TRAVELLING

BROADCAST HEARD CLEARLY EVEN IN TUNNEL



Passengers seated in Euston to Liverpool express listening-in to broadcast from Marconi House. Inset shows operator fixing aerial on the roof of the coach.

THE value to a business man of instant communication with his office or works, wherever he may be, has long been realised. Experiments are now being made with a view to installing wireless apparatus on long-distance trains in order that passengers may keep in touch with their offices whilst travelling on high-speed trains. Already the Hamburg-Berlin express is equipped with wireless telephony, which it is claimed gives excellent results. Passengers are able to converse with greater ease and clearness than if they were speaking over the ordinary land-line telephone, and may be "put through" to any telephone subscriber on the land lines.

Radio on Train Maintains Service

A recent instance of wireless being used on a railway was in November 1913, when the Lackawanna and Western Company (U.S.A.) fitted one of their trains with a wireless telegraph installation. This enabled communication to be maintained between the train and the Ringhampton Radio Station, and with other radio stations along the line.

Shortly after the introduction of this novelty the telegraph wires between Hoboken and Scranton were broken by a storm, and the train's wireless installation enabled traffic to be dealt with in the usual way. Had this installation not existed the line would have been completely blocked, resulting in a stoppage for three days, until the wires could have been repaired.

Recent Experiments

All experiments with wireless on trains were suspended when America entered the war, and it was not until March 1922, that the Lackawanna and Western Company re-commenced their trials. In these later experiments the train was equipped with a telephonic installation consisting of a 15-watt valve-transmitter, a valve-receiver and a cage type aerial. Experiments, both in transmission and reception, were successfully carried out over distances up to 25 miles.

Recently two more American railways have adopted wireless on their trains, namely the Chicago Elevated Railroad and the Southern Pacific Railroad. Loud-speakers have been installed in order that passengers may enjoy the broadcast concerts whilst on long journeys.

Experiments in England

Prior to 1919 no attempt was made in this country to experiment with wireless on trains, but in the autumn of that year, during the railway strike, the Government decided to link up all important railway centres by wireless telephony. It was also decided to make trials of wireless installations on trains, in view of the fact that it was possible that the ordinary telephone and telegraphic systems might be interfered with. Communication was successfully established between St. Pancras, London, and important railway centres such as Birmingham, Leicester, Leeds and Durham. The instruments used were Marconi ½ k.w. Portable Sets.

A special coach fitted with a loop aerial was then attached to the Paddington to Bristol train, and throughout the journey, signals from the Woolwich Experimental Station were satisfactorily received on a wave length of 150 metres.

In 1920 the Marconi Wireless Company carried out tests with wireless telephony on trains running between Euston and Crewe—a distance of 158 miles. The results were quite beyond expectation, and in fact it was said at the time that the speech was even clearer then over ordinary telephone lines.

Broadcasting on Trains

Recently a further experiment in this connection has been carried out on a train running from London to Liverpool, and the results obtained were very encouraging. A special saloon was fitted with two aerials, one an indoor and the other an outside aerial. The latter was composed of a length of wire stretched along the top of the carriage, a few inches above the roof.

As the train ran out of London a "bed-time story" was being broadcast from Marconi House, and was received perfectly on the out-door aerial, despite the fact that for a portion of the time the train was travelling through a tunnel. One small detail had, however, been overlooked, and this was the interference caused by the dynamo used for the electric lighting on the train. This interference was a source of great trouble, but it would be an easy matter to overcome the difficulty by screening the dynamo, thus preventing its influence reaching the receiver.

Speech received at 60 m.p.h.

Later in the journey, and whilst the train was travelling at over 60 miles an hour, the voice of an amateur, transmitting speech, was picked up by means of the frame aerial.

Broadcast from London was audible on the same aerial at 50 miles distant. Later the Birmingham Station was heard very clearly, one of the most interesting features being the reception of the news bulletin at 7.30 p.m. Another item of interest was a duet that was received quite well just before the train left Stafford.

In view of the success of this initial experiment further tests are to be carried out. It is hoped that, by effecting several slight improvements, it will very soon be possible for passengers journeying between London and Liverpool to enjoy all the latest news whilst dining on board the train. Thus another step will have been made in the forward progress of the wonderful science of Radio.

MECCANO

ACCESSORY OUTFITS

Make Your Outfit Bigger and Better

Once a boy has commenced to build with Meccano, he desires to build larger and more ambitious models. He may do so by adding an Accessory Outfit to his existing set, thereby greatly increasing its scope. The particulars below show how a boy who commences with one of the earlier Outfits may build up his equipment by easy stages, until he is the proud owner of a No. 7 Outfit.

PRICE LIST
Complete Outfits

No. 00	... ...	3/6
No. 0	... ...	5/–
No. 1	... ...	8/6
No. 2	... ...	15/–
No. 3	... ...	22/6
No. 4	... ...	40/–
No. 5	(In well-made carton)	55/–
No. 5	(In superior oak cabinet with lock & key)	85/–
No. 6	(In well-made carton)	105/–
No. 6	(In superior oak cabinet with lock & key)	140/–
No. 7	(In superior oak cabinet with lock & key)	370/–

PRICE LIST
Accessory Outfits

No. 00a	... ...	1/6
No. 0a	... ...	4/–
No. 1a	... ...	7/6
No. 2a	... ...	8/6
No. 3a	... ...	18/6
No. 4a	... ...	15/–
No. 5a	(carton) ...	50/–
No. 5a	(wood) ...	80/–
No. 6a	... ...	210/–

This illustration shows a No. 3a Outfit which converts a No. 3 into a No. 4 Outfit.

No. 00a OUTFIT
Costs 1/6, and converts No. 00 into a No. 0 Outfit. With it an additional 27 models may be built, making a total of 70 models in all.

No. 0a OUTFIT
Costs 4/-, and converts No. 0 into a No. 1 Outfit. With it an additional 36 models may be built, making a total of 106 models in all.

No. 1a OUTFIT
Costs 7/6, and converts No. 1 into a No. 2 Outfit. With it an additional 57 models may be built, making a total of 163 models in all.

No. 2a OUTFIT
Costs 8/6, and converts No. 2 into a No. 3 Outfit. With it an additional 43 models may be built, making a total of 206 models in all.

No. 3a OUTFIT
Costs 18/6, and converts No. 3 into a No. 4 Outfit. With it an additional 53 models may be built, making a total of 259 models in all.

No. 4a OUTFIT
Costs 15/-, and converts No. 4 into a No. 5 Outfit (carton). With it an additional 43 models may be built, making a total of 302 models in all.

No. 5a OUTFIT (Carton)
Costs 50/-, and converts No. 5 into a No. 6 Outfit (carton). With it an additional 51 models may be built, making a total of 353 models in all.

No. 5a OUTFIT (Wood)
Costs 80/-, and converts No. 5 into a No. 6 Outfit (wood). The parts are exactly the same as in the carton Outfit mentioned in the preceding panel, but the cabinet is in wood.

No. 6a OUTFIT
Costs 210/-, and converts No. 6 Outfit into a No. 7 Outfit (oak cabinet). This Outfit builds every one of the 393 models illustrated in the Complete Manual.

FROM ALL MECCANO DEALERS

The MECCANO CHAMPIONSHIP COMPETITION

21 Cups & 460 Medals: total value £250

DURING the past two or three years our annual Model-building Contest has assumed such proportions and has attracted such world-wide interest that we are now able to run it in a form we have long had in mind, and which we think will be greatly appreciated by Meccano model-builders all over the world. For the purpose of this Competition we have divided the various countries into the following groups:—(1) Great Britain. (2) Australasia, South Africa, Canada, India, and all Countries within the British Empire. (3) *America. (4) *France, Belgium and Switzerland. (5) *Scandinavia and Holland. (6) *Italy. (7) *Spain and Portugal.

In each of these groups, three Championship Cups will be awarded for the best models submitted, and the winner of each Cup will hold the title of "Meccano Champion" for his particular group and section for twelve months from the date of the awards. The Cups, which have been specially designed for us, are of superb quality, very handsome in appearance, standing over 8-in. in height. Each Cup will be engraved with the name of the winner, and will form a valuable reminder of his prowess and skill. A suitable plinth will be provided with each Cup.

In addition to these special awards, there will be Silver and Bronze Medals in each section and Certificates of Merit to a limited number of other entrants. The total value of the prizes to be awarded will amount to £250.

Complete List of Awards

SECTION A.—For competitors under 10 years of age on 15th April next. Championship Cup and the title of Meccano Champion for his group and section for the year commencing 1st July next. 20 Silver Medals. 50 Bronze Medals.

SECTION B.—For competitors over 10 years of age and under 14 years of age on 15th April next. Championship Cup and the title of Meccano Champion for his group and section for the year commencing 1st July next. 30 solid Silver Medals. 100 Bronze Medals.

SECTION C.—For competitors over 14 years of age on 15th April next. Championship Cup and the title of Meccano Champion for his group and section for the year commencing 1st July next. 60 solid Silver Medals. 200 Bronze Medals.

In all there will be 110 Silver and 350 Bronze Medals awarded to the competitors in order of merit, and a number of special Certificates of Merit in each section.

(*Including Colonies).

In making the awards the judges will pay special attention to the following points:—

ORIGINALITY.—Special points will be given to those models showing initiative and originality and which are not simply variations of those illustrated in the Manual of Instructions.

CORRECT CONSTRUCTION.—Models which in their details are constructed on correct mechanical and engineering principles will receive higher marks than those which are built incorrectly or carelessly. No special knowledge is necessary to build models correctly other than that which may be easily acquired from the Meccano Book of Instructions.

GENERAL INTEREST.—Preference will be given to those models which are likely to prove most interesting to Meccano users throughout the world. We shall publish the best models in all civilized countries.

Meccano Gold Medallist

The competitor who, in the opinion of the Judges, submits the best model in the entire Competition, will be awarded a specially-designed solid Gold Medal, and will be the "Meccano Gold Medallist" for a year. His name and the year in which he gained the title will be engraved on the medal, which will remain his own property.

Send for your Entry Form to-day. Post Free from Meccano Ltd., Binns Road, Liverpool.

These Will Interest You

The Meccano Writing Pad is specially made for Meccano boys. It consists of fifty sheets of tinted bank paper, with cover and blotting. Each sheet bears a reproduction of the block shown on the cover. Price 1/- from any Meccano Dealer, or 1/3 direct from this office.

Bind your "*M.M.*"

This spring-back binder for *Meccano Magazines* has a strong stiff back, covered with imitation leather, tastefully tooled. It takes a large number of copies and keeps them neat and clean. In black, lettered gold. Price 3/- each (post free).

Meccano Ltd., Binns Road, Liverpool

BOYS! Get the most out of life—buy an AUTO-SCOOTER

THE popularity of the AUTO-SCOOTER amongst boys and girls is becoming greater than ever. Think of the exhilarating joy of gliding along on a fine spring day with the wind cutting your face and your whole being thrilling with keen excitement! Isn't it a happy thought? Our AUTO-SCOOTERS are built on scientific lines and will give long and excellent service, even with the roughest handling.

Be sure you ask for an AUTO-SCOOTER for your next present!

THE AUTO-SCOOTER IS THE SPORTY TOY FOR THE SPORTY BOY.

Prices to suit all pockets. Send for list of 6 different models.

This is the FIRST PRIZE in our SPLENDID ESSAY COMPETITION

Model-de-Luxe Scooter

Splendid Essay Competition

for boys under 14

WHAT YOU HAVE TO DO.

Write an Essay of not more than 500 words on "Why I should like an AUTO-SCOOTER for my next present." Then send it to the Editor of the "*Meccano Magazine.*" Closing date for entries from the United Kingdom 31st March, Overseas 30th April next. The Editor of the "*M.M.*" has kindly consented to act as judge, and for the two best essays we will give the following—

First Prize: Our Model-de-Luxe Scooter, as illustrated.
Second Prize: Our Popular Model with Solid Tyres.

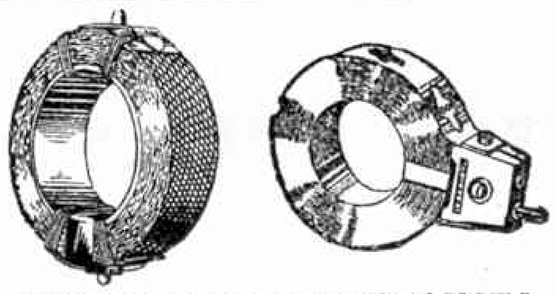
The New Auto-Scooter Company,

CHESTERGATE, STOCKPORT.

STOCKED BY ALL LEADING TOYSHOPS.

FOR DEPENDABILITY OF OPERATION USE

"IGRANIC" RADIO DEVICES

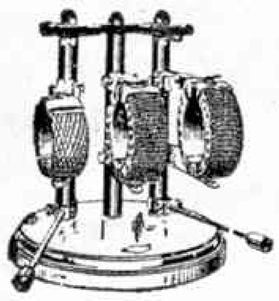


HONEYCOMB INDUCTANCES

(De Forest Patent No. 141344).

These world-famous coils are renowned for their high efficiency, low self-capacity, small absorption factor and minimum high frequency resistance. No dead-end losses. Each turn surrounded by air pocket. Made in two types, gimbal and plug mounted. Wave lengths approximately 100 to 25,000 metres. The only coils that uphold their claim for negligible losses. Prices vary with sizes.

GIMBOLDER TUNING STAND (Patent Applied for)



This coil holder has been designed and produced for accommodating gimbal mounted honeycomb coils, which enables extremely fine settings to be obtained. In addition to the angular relation of these coils being varied, they can also be rotated about their own axis, thus giving extremely fine and critical adjustment when used on selective and regenerative circuits.

INTERVALVE TRANSFORMERS

(Patent No. 205013).

Designed for the distortionless reproduction of speech and music. The steel shroud effectively shields from external interference. Recent improvements in design render it the finest amplifying transformer obtainable. Prices: Shrouded, 21/-. Open, 20/-.

Other manufactures include:—

VARIOMETERS. VARIOCOUPLERS

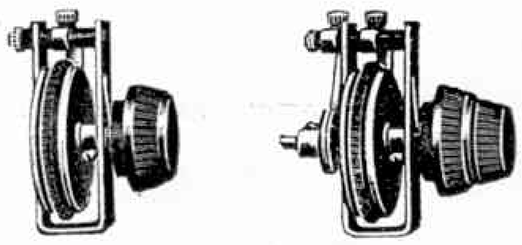
COIL HOLDERS.

TELEPHONE TRANSFORMERS.

VERNIER FRICTION PENCILS,

etc., etc.

Write for Lists Z.150.



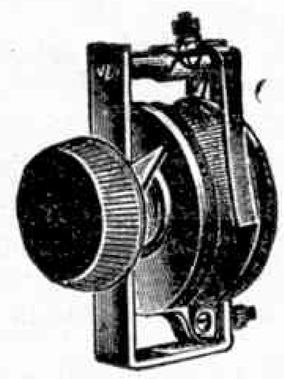
FILAMENT RHEOSTATS

(Patent No. 195903).

A splendid instrument for filament control under all conditions. Novel method of construction ensures smooth and silent operation. Designed for individual valve control. Adjustable contact finger permits of resistance values from zero to four ohms by fine variation. Supplied in two types, plain and vernier. Prices: Plain, 4/6. Vernier, 7/-.

BATTERY POTENTIOMETER

An Igranic Potentiometer is a necessity where one or more stages of high frequency amplification is used. Stabilises grid and eliminates noises and self-oscillation. Resistance 300 ohms. Current consumption negligible. Nickelled finish, complete with fixing screws, knob and pointer. Price 7/-.



Glasgow. *Manchester.* *Bradford.*

149, Queen Victoria St., LONDON.

RADIO IGRANIC ELECTRIC Co. Ltd. WINDINGS

Works: Elstow Road, BEDFORD.

Cardiff. *Newcastle.* *Birmingham*

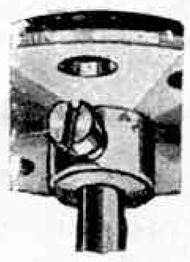
Competition Corner

Competitions are now a strong and popular feature of the "M.M." Some splendid new ones are being prepared and will be announced in our future issues. On page 47, particulars are given of the £250 Championship Contest for the best models, which every reader of the "M.M." should enter.

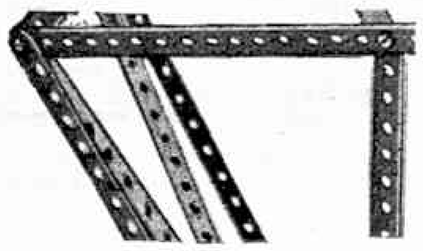
For Lynx-Eyed Readers

A New Series of Puzzle Pictures

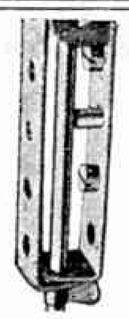
SECOND SET



No. 7 .....

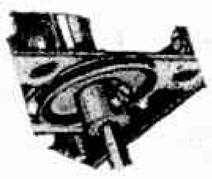


No. 8 .....



No. 9 .....

No. 10 .....



No. 11 .....

No. 12 .....

WHAT YOU HAVE TO DO

Illustrated above is the second set of Puzzle Pictures in this new and fascinating competition. Each picture represents part of some model in the current 0–3 Meccano Manual of Instructions. What you have to do is to find out from which model the Puzzle Picture has been taken.

If you know your Manual well, you should have no difficulty in identifying the pictures. When you have done so write their numbers beneath the Puzzle Pictures, and keep your list with the first set that appeared in the January "*M.M.*" The third and final set will appear next month and you will be told how and when to send in your solutions.

FIRST PRIZE—Hornby No. 2 Passenger Set. SECOND PRIZE—Zulu Goods Set. THIRD PRIZE—Electric Motor. CONSOLATION PRIZES—12 Meccano Writing Pads, and 12 Complete Manuals.

If no competitor succeeds in numbering all the models, the prize will be given to the reader who sends in the best attempt. The other prizes will be awarded in order of merit. In the event of a tie, the competitor's age and neatness of writing will be taken into consideration.

Order your March "*M.M.*" now so that you will not miss the final instalment of Puzzle Pictures.

Competition Closing Dates

1924	25 Feb.	Puzzles (see p. 55).
	29 ,,	Drawing.
	,,	Sixth Photographic.
	31 Mar.	Puzzle Pictures.
	,,	Stamp Essay.
	15 April	£250 Championship.

Overseas Closing Dates

1924	29 Feb.	Fifth Photographic.
	31 Mar.	Essay.
	30 April	Drawing.
	30 May	£250 Championship.
	30 June	Puzzle Pictures.
	31 Aug.	Stamp Essay.

Sixth Photographic Competition for Guild Members

Prizes will be awarded for the best indoor photographs of a Guild member or members, building a Meccano model. There will be two classes (A) for members of 14 years of age and under, and (B) for members over 14 years of age. Closing date 29th February next. Prizes in each section, Meccano goods to the value of 10/6, to be chosen by the winners from the Meccano catalogue.

For Artist Readers

This drawing competition has been arranged in response to numerous requests received from Meccano boys, the subject to be: "*The Editor of the 'M.M.' as I imagine him to be.*" In this competition the drawings may be of any size and the subject may be treated in any manner desired, i.e., it may be either in black and white, pencil, crayon or wash.

There are no restrictions, except that the drawing must, of course, be the unaided work of the competitor. The competition will be divided into two sections :—

(A) Boys under 12 years of age.

(B) Boys of 12 years of age and over.

A prize of a Hawk-Eye camera, manufactured by the Kodak Company, will be awarded in each section. The closing date is 29th February, 1924, in the United Kingdom, and for entries Overseas, 30th April, 1924. I hope to receive a large number of entries for this, our first drawing competition, which, if well supported, will be followed by other similar competitions. The winning drawings will be published in the April or May "*M.M.*"

New Competition for Stamp Collectors

Our last essay contest ("Why I collect Stamps") has proved beyond any doubt that there are many thousands of keen stamp collectors among readers of the "*M.M.*" The entries are now being judged and the results will be published in our next issue.

Meanwhile it has been decided to hold another essay competition, this time the subject is "My Favourite Stamps and why I like them." Some special set, or stamps of a certain colony or even stamps of a country should be chosen and described, and the reasons for your choice given. The essay must not exceed 500 words and is to be written neatly on one side of the paper only. Envelopes containing the entries should be marked "Stamp Contest" in the top left hand corner and sent to the Editor of the "*M.M.*," Binns Road, Liverpool.

The first prize will be stamps to the value of 10/6, to be chosen by the winner himself from any firm advertising in the pages of the "*M.M.*" Make your choice when you send in your essay, and give full particulars of the stamps required, so that the prize may be sent direct to you in the event of your success. Closing date March 31st (Overseas Readers: August 31st, 1924).

FOR OVERSEAS READERS

Results of Recent Competitions

Three Competitions for our Overseas readers closed last month, the Holiday Essay, Photo Essay and Tom Sawyer Competition. The many entries received have now been classified and judged, and we have pleasure in announcing the results.

In the Holiday Essay Competition the winner of Section A is Master James A. Blaikie, of Brisbane, Australia, who submitted a very well written and interesting account of "*An Australian Boy's Holidays.*" In Section B, Master C. Carroll, of Krugersdorp, South Africa, wins the prize for his description of the working of a modern Gold Mine. Hawk Eye Cameras, made by the Kodak Company, have been sent to these two boys, who will now be able to compete in future photographic contests.

The winner of the First Prize in the Photo Essay Competition is Master V. Halpé, of Maradana, Colombo, Ceylon, whose essay contained some very fine views of the island. Meccano goods to the value of £1/1/- have been sent to this successful competitor. The Second Prize of Meccano parts value 10/6 was won by Master R. G. Moses, of Calcutta, who sent in a very clever account of a visit to Tatanagar, a rising town in the province.

Judging by the number of entries, the Tom Sawyer Comments Competition was the most popular of the three competitions. The First Prize of Meccano Goods value £1/1/-, to be chosen from our current catalogue, was won by Master Ralph G. Moses, of Lansdown Road, Calcutta, to whom Tom Sawyer's ingenuity and wit in turning work into pleasure was the most striking point in the story. The Second Prize was won by Master N. Cole, of Observatory, Capetown, South Africa, and a prize of Meccano parts value half-a-guinea has been forwarded to him. We congratulate all our prize-winners on their successes and hope to see their names again in the lists of winners of competitions.

Stamps for Sale

(For Advertisement Rates see page 56).

100 Diff. Stamps Free, incl. Colonials, S. American, China, etc. (No Neurope) to applicants for appros. See my famous ½d. stamps. Fleming, Queen's Park, Chester.

25 Pictorial Stamps Free ! Venezuela, Crete, Tasmania, Martinique, 7 Ukraine, etc. Ask for appro. sheets, encl. postage. Felix Sykes, New Barnet.

STAMP COLLECTORS ! Be sure you get "*The Philatelic Magazine,*" the fortnightly stamp newspaper, 3d. from any newsagent, or 4d. post free from Publisher, 63, Windsor House, Westminster, S.W.1.

FREE ! Set 10 German 1 to 500 MILLIONS mint to purchasers of 1/- off approvals. Hooper, 90, Harcourt Avenue, Manor Park, E.

SIXTY DIFFERENT STAMPS FREE to applicants for approvals. All ½d. each. Send Postage. Cox, 135, Cambridge Road, Seven Kings.

CRETE PACKET, 7½d. Contains 25 splendid stamps, including 5 Crete 1906. Money returned if not satisfied. Stamplies & Co., 45, Kitchener Rd., Ipswich.

3 Mint U.S.A. Gratis appro. applicants. Postage 2d. Neave, 25, Portnall Rd., Paddington, W.9. No callers.

Stamps on Approval.—Half to one-third. Gibbons, good copies, state wants; collections and loose lots purchased.—Barlow, 18, Wish Road, Hove, Sussex.

1,000 Well Assorted Stamps, 100 Different Stamps and 1,000 Stamp Mounts, 2/-.—North Bros., Stamp Dealers, Abingdon.

FREE ! 25 Portuguese Colonials to those sending postage, and asking to see Approval Sheets.—C. Florick, 179, Asylum Road, London, S.E.15.

110 Superior Stamps from Tchad, Victoria, Madagascar, Togo, Sudan, Martinique, Senegal, Gabon, Dahomey, etc., 6d. Kraus & Co., 137, Cheapside, London

SET 12 CANADA FREE to appro. applicants. Try my ½d. Booklets. S. Huckle, 53, Birkenhead Avenue, Kingston-on-Thames.

THE HARDING MEMORIAL STAMP is likely to become scarce. One is given FREE to each purchaser of **Irish** BIJOU COLLECTION (24 stamps all different, values to 1/-), including Rialtas, Saorstat, Sword of Light, Arms, etc. 1/6 post free (abroad postage extra). **MARTIN** (N.R.P.), **68, Whetley Hill, Bradford.**

"MECCANO" STAMP COLLECTORS ! Write for our 1924 Price List, and "Select" Approval Sheets. **The Western Imperial Stamp Co.,** 46, Drynham Road. Trowbridge, Wilts.

FREE. Harding Memorial Stamp and Pictorial Set, with approvals, from 6 a penny. Send postage. Powell, 73, Bond Road, Surbiton, Surrey.

APPROVALS, ½ catalogue. Gift catalogued 2/- to applicants.—B. Harland, 9, Chatsworth Rd., Croydon.

NYASSA GIRAFFES FREE with approvals, ½d. and 1d. each. Bodman, 6, Alderman Road, Ipswich.

FREE ! Jamaica (surcharged Jud), 1/- and 2/- to applicants for approvals enclosing postage. **FREE ! 7 BOLIVIA** to purchasers of any of the following sets. Postage extra. 30 Danzig, 8d.; 20 Bavaria, 4d.; 50 Belgian, 10d.; 100 Germany, 9d.; 20 Salvador, 1/3; 20 Ecuador, 1/3; 50 Borneo, 10/6; 1000 All Different, 6/6; 100 French Colonials, 2/6; 5 Thessaly, 1/2.

C. LEWIS, 26, Lichfield Road, CRICKLEWOOD.

50 French Colonies	9d.	50 Roumania	1/-
100 United States	1/-	40 Argentine	1/-
150 Germany ..	1/-	300 Postage	1/-
150 Austria ..	1/-	500 Revenue	5/-
150 Hungary ..	1/-	50 Cards and Envs. ..	1/-

Fine selection of Postage or Revenue ready.
I. Russell, Chetwynd, Shanklin Drive, Westcliff-on-Sea.

FREE SET OF BAVARIA
Handsome embossed stamps (unused) to all applicants enclosing 3d. for copy of New 50 page Price List for 1924. Stamps, Albums and Accessories. Everything for the Stamp Collector at lowest prices.—**The Midland Stamp Co. Ltd., 78, Warwick Street, Leamington Spa.**

Why pay ½d. to 3d. for a stamp when I supply at **¼d. each ? I offer 12,000 at ¼d. each.** Ask the many readers of Meccano who are having regular weekly supplies. A postcard will bring a selection. Hale, 52, Kentish Town Road, London, N.W.

ST. HELENA (Ship), SOMALI (Elephant), Latvia (Lions), Austria (Triangular), Zanzibar, Saare (Coalmine), Philippines Revolutionary, Ceylon, etc., 90 different in all, 3d. if approvals requested (9d. without). 250 unused, 8d.
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BRITISH EMPIRE STAMPS
AUSTRALIA, King George, Set of 5, USED ... 1d.
CANADA, 1888, Queen Victoria, 3c. vermillion, USED ... ½d.
FEDERATED MALAY STATES, Set of 7, USED 2d.
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GOLD COAST, King George, 1½d. carmine, USED ½d.
NEW ZEALAND, Victory Issue, 1d. & 1½d. USED pair ... 1d.
POSTAGE EXTRA. ASK FOR PRICE LIST.
ALEC KRISTICH (N.R.P. 279), **82, Marchmont Street, Russell Square, LONDON, W.C.1.**

STAMPS OF ALL NATIONS. SELECTIONS ON APPROVAL FROM SIXTH CATALOGUE **18/6** Scarce pr. UKRAINE, cat. 7/6, Ceylon War, A. H. Monarchy, 10 BELGIUM 1902 mint, C. Slovakia, **6d.** Schleswig, 5 rare VENEZUELA, Bolivar, cat. 1/6, and others, cat. 18/6, the lot only 6d. free, 25, Helvetian to applicants for approvals enclosing 1½d.
HILLIER, Stamp Club, HORSMONDEN.

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200 diff. Austria, only 2/-. Post extra
A good collection of Austria, neatly mounted in booklet, by sets, with mint values to 10-kronen, and of very high catalogue value, for the ridiculous price of **2/-** plus postage ! **Money back always if dissatisfied.** 300 diff. AUSTRIA for 3/6; 400 for 10/-; 500 for 25/-; 600 for 42/-.

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25 Greece (cat. 3/6)	6d.		
100 Turkish War and Post-war ...			10/-

Full lists free. Approvals (any Country) against refs. or deposit.
NORRIS & CO. (Dept. M.M.), LEABROOKS, ALFRETON, Derbyshire, England.

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25 BRITISH COLONIALS FREE, including S. Nigeria, Jamaica, GOLD COAST, Newfoundland, Queensland, Travancore, B. Guiana. To all those asking for my approvals, including my famous ½d. sheets.
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GREAT RUSSIAN BARGAIN PACKET
40 different Stamps of Russia, and States which were originally part of her Empire, FOR **1/-**. Packet No. O.10 contains 40 different, including **Russia,** Romanoff Currency, Imperf. 2nd Denekin issues, unused, Finland (various issues), 4 Esthonia, unused, Lettland, **Armenia** (Eagle type), Georgia, Poland, **Batoum** (British Occupation), UKRAINE, Tridents from Kieff, Odessa, Kharkov, and permanent type, etc., etc. This fine lot (which is usually sold at over 10/-) for only **1/-**, post free 1/1½ (abroad 1/6). 48 pp. List of Novelties, Sets, Packets, Albums, etc., Post Free.
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Send 1d. stamp for longer list, and send for these special bargains. Postage 1½d. extra. 75 Bavaria, 9d.; 75 Belgium, 1/3; 200 Germany, 3/-; 40 Czecho-Slovakia, 9d.; 26 Denmark, 4d.; 38 Sweden, 8d.; 25 Greece, 4d.; 40 Italy, 6d.; 60 France, 6d.; 60 Roumania, 1/3; 77 Poland, 2/6; 20 Egypt, 5d.; 19 Trinidad, 1/-; 35 Hong Kong, 2/6; 50 India, 9d.; 15 Jamaica, 5d.; 6 Mauritius, 4d.; 41 Canada, 1/6; 50 Argentine, 1/-; 17 Brazil, 4d.; 25 Finland, 8d. 10% reduction to those mentioning *Meccano Magazine.*
ERNEST HARROD, 110, Pepys Rd., London, S.E.14.

30 British Colonials, 6d.; 50 1/-. 50 Used Foreign, 6d. 25 French Colonials, 6d.; 50 1/-. 50 Used Asiatic, 1/-. 100 Austria, 6d. 100 Hungary, 6d. 20 Danzig, 6d.
ANDREWS, 76, Prince of Wales Road, London, N.W.5.

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A most remarkable pkt., catalogued about 15/-. **Absolutely Free** if you send post-card requesting famous approvals. If you send 1½d. postage we include copy of the "*Junior Stamp News*"—the new fortnightly paper for young stamp collectors.
GRAVES & CO. (Dept. M.3.),
66, Cambridge Road, Seaforth, Liverpool.

All Sets Free
Genuine applicants for our Approvals receive ALL the following sets **Absolutely Free.**

25	different	Hungary, many fine pictorials.
25	,,	Germany, a collection itself.
13	,,	Ukraine, all pictorials.
15	,,	Austria, every one unused.
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We leave you to judge the value of this stupendous offer.
R. WILKINSON, Provincial Buildings, COLWYN BAY.

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400 Different Foreign Stamps for one shilling, post free, if you ask to see the WATERLOO APPROVAL BOOKS, which are full of bargains. Price of packet if no approvals required is 1/6 post free. Mention this paper.
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100 UNUSED STAMPS ALL DIFFERENT FREE ABSOLUTELY FREE
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FREE ! "SUDAN" PACKET
50 diff. stamps incl. pict. SUDAN showing Arab on Camel, crossing desert with mail bags for Khartoum and Berber. This stamp is enclosed in INVISIBLE POCKET, giving permanent protection from damage. Free to applicants sending postcard for approval sheets. COLLECTORS' GUIDE AND LIST, with Aid to Identification, Perf. Gauge, Dict. of Phil. Terms, etc., price 3d. post free. To Meccano readers, rare mint Venezuela (obs. 25 years) incl. with Guide.
BUTLER BROS. (Dept. M.), **Clevedon.** (Est. 1879).

Watermarks

SOMEONE once said that before valuing a stamp or even placing it in his album, a stamp collector not only "examines both back and front, but looks through it and even looks at it edgeways!" The remark was intended to imply that the collector wastes precious time over little details that, perhaps, would not count with the average person.

Stamp collecting is essentially a hobby in which minute details must be considered, however, and such criticisms as that mentioned obviously come from persons who do not understand the hobby. The consideration of details causes wealthy collectors to pay large sums for single stamps. Often £500 is reached in stamp auction rooms, and not very long ago one stamp (the 1c. black of the 1865 issue of British Guiana) fetched as much as £7,000! As the only difference between a common and a rare stamp may be a small matter—such as watermark, a size of perforation, or shade of colour—these details must be worth studying.

What is a Watermark?

Most stamps, if held to the light, will show some parts that seem more transparent than others. This transparency, which forms an orderly design in the stamp—such as, perhaps, a crown, star, or some initials—is the watermark. It is obtained by making the paper thinner in places, as desired, according to the pattern required.

Stamps are not the only articles with watermarks, and no doubt you have noticed that writing papers and envelopes often have watermarks. In these cases the watermark consists of the name of the maker or, perhaps, the brand of the paper, which may thus be identified, without the name being too prominent.

A Safeguard Against Forgery

The use of watermarks on stamp paper is somewhat different, however, for it is principally used as a precaution against forgery. A clever but dishonest printer might copy the engraving of a stamp, and having mixed his ink to the right tint, could print stamps on paper apparently the same as that on which the genuine stamps are printed. You would think that the result was a real stamp—*until you looked for the watermark!* The watermark is beyond the skill of the forger, and can only be placed on the paper while it is in a semi-fluid state, by passing it under what is called a "dandy roll." On this roller are a number of very fine wires arranged in a pattern. When the paper passes under these wires they make it a little thinner wherever they touch it, and so leave an impression of their pattern on the paper. We may easily see, then, that the person who wishes to watermark paper must be a paper-maker. Very few forgers would be able to make their own paper and, in fact, there is no case on record in which this has been done. Thus it is that the watermark is one of the chief safeguards against forgery.

The chief interest of watermarks to stamp-collectors lies in the fact that although two stamps may be alike in every respect except the watermark, they are considered to be "different" for collecting purposes, and consequently both stamps must be included in the album. Naturally, it often happens that one watermark is very much more uncommon than another on some particular variety of stamp. In such a case the watermark may send up the value of a stamp normally worth 1d. to £100!

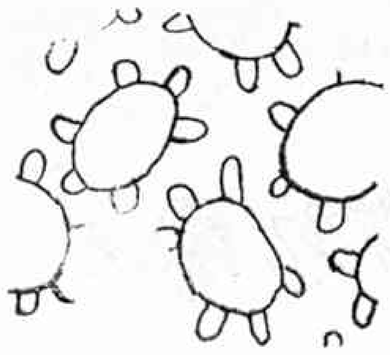


Fig. 1. Turtles (Tonga)

In foreign stamps we come across many peculiar watermarks. Sometimes such designs as turtles (Fig. 1), umbrellas, wire-netting and noughts-and-crosses appear as watermarks! The best the British Empire can offer in the pictorial watermarks is the Elephant's Head (Fig. 2) on certain early Indian stamps (1865–1876).

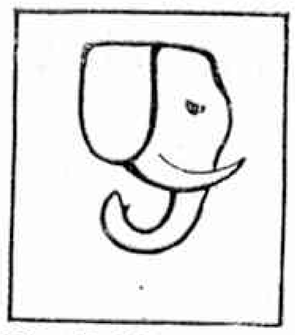


Fig. 2 Elephant's Head (India)

Not every stamp has a watermark, however, and in the case of stamps of many foreign countries no watermark is the rule, rather than the exception. Practically all the stamps of the British Empire have watermarks, the only notable exception being Canada, which has not had a watermark for some time, and several of the Indian Native States.

Watermarks of Great Britain

If we examine any current stamp of Great Britain we find that they are all watermarked with a design consisting of a small Crown over the initials "GR" in script type, with the Roman numeral "v" between. (Fig. 3). This "GvR" stands for "*Georgius v Rex*" which, as every boy knows, is Latin for "George the Fifth, King." A similar Royal Cipher may be seen on any pillar-box placed in position during the reign of King George V. Pillar boxes installed during Queen Victoria's reign had the Crown and "VR" ("*Victoria Regina*") and those during the reign of King Edward, the Crown and "EviiR."

Fig. 3 Gt. Britain Simple Royal Cipher

All the current stamps up to the 1/– value appear on paper watermarked with this design of the Royal Cipher, although there is some talk of this being altered in the future. The first King George stamps appeared with two watermarks, the Imperial Crown and the simple Royal Cipher, as it is called. The second issue of the ½d. and 1d. stamps was printed on three varieties of paper, watermarked Imperial Crown, simple Royal Cipher and multiple Royal Cipher (Fig. 4) respectively.

Fig. 4. Multiple Royal Cipher

"Simple" and "Multiple"

The words "simple" and "multiple" require some explanation, as applied to the watermark of the Royal Cipher. The stamps watermarked in the "simple" style have a large number of designs placed close together, one above the other. Thus two designs appear on each stamp, one above another, as may be seen in any current stamp of Great Britain.

In the "multiple" style a large number of the designs are placed in rows, each row being near the one above. Thus the centres of the lower designs come opposite the spaces between the individual designs of the upper row, as shown in our illustration.

NEXT MONTH:

COLONIAL WATERMARKS

Recent Issues

ST. KITTS-NEVIS. TERCENTENARY ISSUE.

To mark the Tercentenary of the colonization of St. Kitts (i.e. St. Christopher), a complete set of stamps of one type was issued in 1923. The stamps are perforated 14 and all are printed on the new script watermark paper with the exception of the 5/– and £1 values, which have the old watermark.

The stamps were used concurrently with the existing stamps for this colony and the general issue for the Leeward Islands, to which group the two islands of St. Kitts and Nevis belong. The design is a picture representing Old Road Bay, having in the background Mount Misery and in the foreground a seventeenth century ship. The values are as follows: ½, 1, 1½, 2, 2½, 3, 6d., 1/–, 2/–, 2/6, 5/–, 10/–, £1. The 10/– stamp was the first stamp of the Empire to appear on green paper with the script watermark.

UNITED STATES OF AMERICA.

HARDING MEMORIAL.

There is a rule in America that no President shall appear on any of the postage stamps during his lifetime. After the tragic end of the late President Harding, the authorities at once decided to issue a mourning stamp bearing his portrait. This magnificent stamp, known as the "Harding Memorial," is the subject of our illustration. It is of the value of 2 cents, and bears the name "Harding" under the head with the dates of the late President's birth and death in the upper corners. The stamp is appropriately printed in black. The likeness is most excellent; in fact it is, in our opinion, the best portrait that has ever appeared upon a postage stamp. Doubtless the plain, white background is a great help, and it is a hint that other countries would do well to follow.

A New Serial:

INTO A FORBIDDEN LAND

The Strange Search for the Gold Book of Gaz

By RAYMOND RAIFE

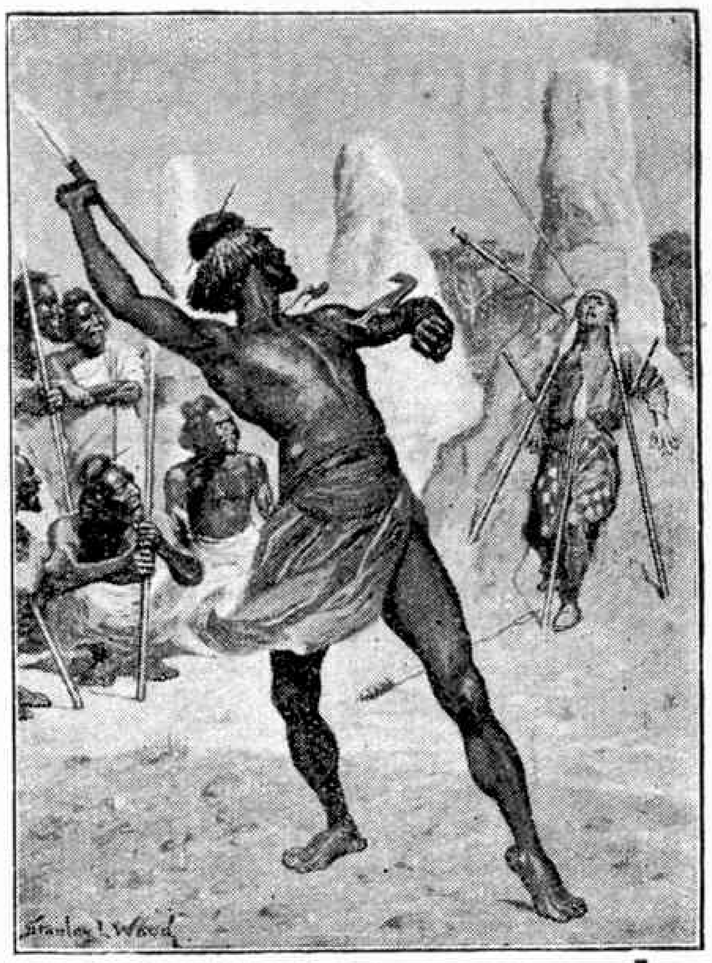
Author of "The Quest for the Arctic Poppy," "The Sheik's White Slave," etc.

ILLUSTRATED BY STANLEY L. WOOD

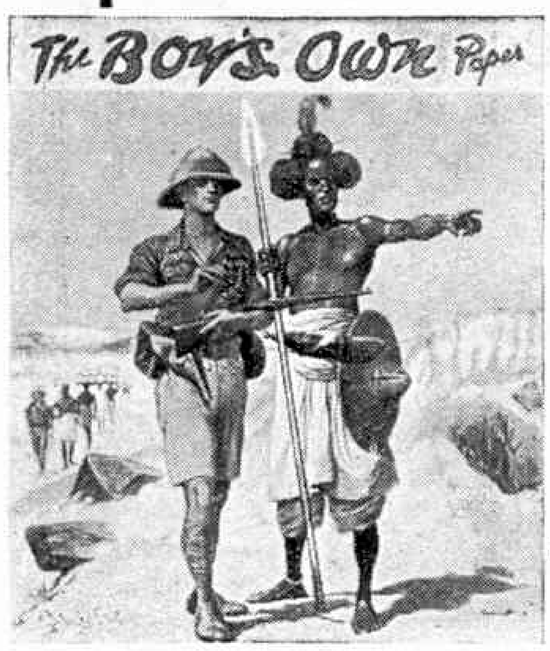
Commences in

The Boy's Own Paper

for FEBRUARY, 1924



Thus held in position, he was a human target for his foes



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The Secretary's Notes

This month I want to say a few words about the methods open to Clubs who wish to increase their membership. Now that the Christmas holidays are well over, with their many excitements, Club nights are once more coming into their own. The Second Winter Session is in full swing, and members are keenly anticipating the many interesting items that the New Year's programmes contain. I hear that various Exhibitions, Socials and Concerts held at the close of the past Session have in every case resulted in increased membership for the Clubs concerned. There is no doubt that activities of this kind, when they are made known to the public by wise and careful advertising, do help Meccano Clubs in many ways. Apart from the gain in new recruits, parents of members and other local people become interested in the progress of the Club, lecturers are more readily found, and visits to local works are more easily arranged.

The New Session

Amongst the important duties of Club Secretaries is the regular sending in of Club reports to Headquarters. I should like to remind Secretaries that I prefer to have a short report every month, rather than a long one at the end of the Session. I hope that Secretaries will bear this in mind in future and send in their reports of the Club's activities and the number of members attending, at the end of every month. The "*M.M.*" is the Official Organ of the Meccano Guild, and by sending in reports for inclusion in "Club Notes," Meccano Clubs obtain valuable publicity. In addition to this, the "Club Notes" suggest ideas for improvements to other Clubs and in this way Secretaries are able to contribute something to the general store of knowledge.

Request to Secretaries

Then, again, every Club wishing to increase its membership should interview the local Meccano dealer, with a courteous request that he will display a notice about the Club in his shop windows. This notice should be typewritten or neatly drawn on cardboard. It should include the name and address of the Club, time of meetings and the announcement that full particulars may be obtained from the Secretary, whose address should be given. As Clubs who have already adopted these measures have invariably increased their membership and their activities, it seems obvious that such methods are advantageous. By adopting such suggestions as these you show others that your Club is a really "live" one and you are sure to attract new members. Meccano boys cannot be expected to show any eagerness to belong to a "dead" or slack club.

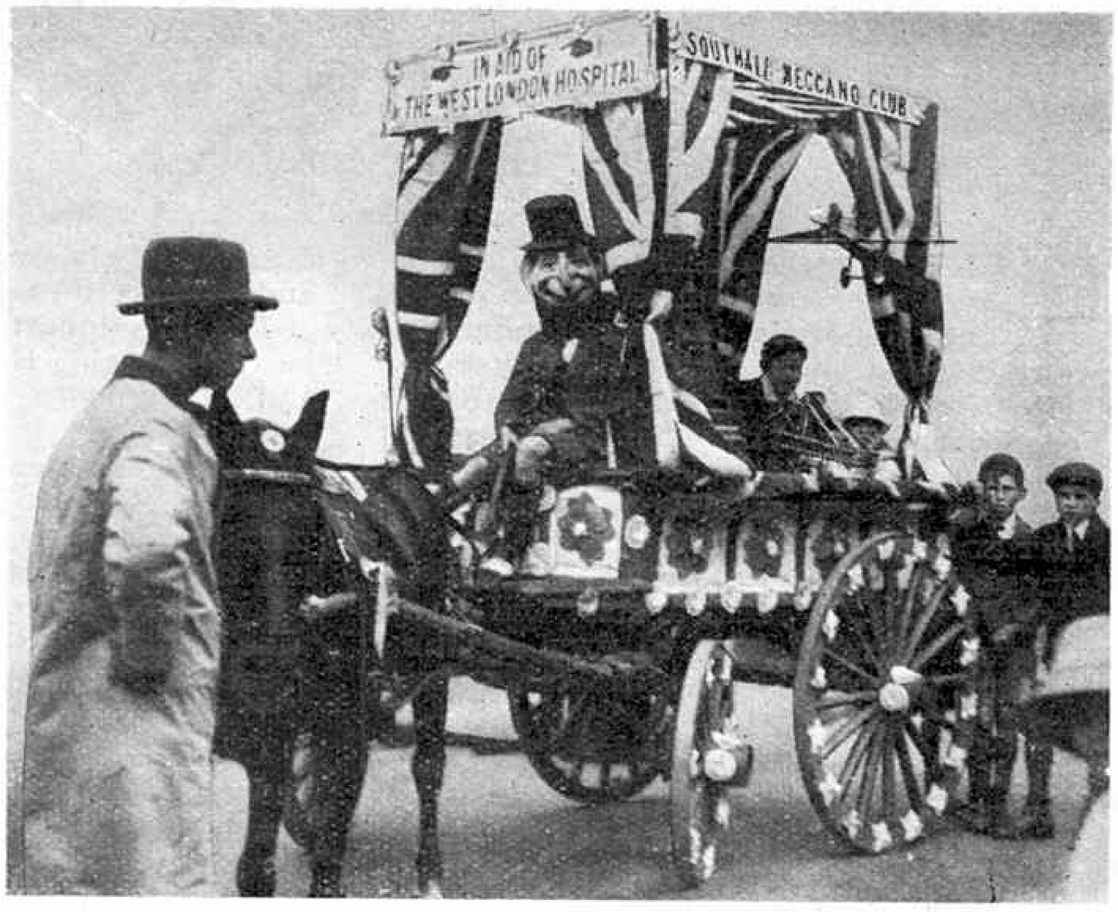
How Dealers can Help

Several Clubs have recently formed libraries for the use of members, and as these have proved very popular the idea might be of interest to other Clubs. When visiting the Leamington Club recently I inspected their well-stocked library and was informed that some benefactor had given the Club a very old book dealing with some historical subject. Not being of great interest to the members of this lively Club, the old volume had been sent to an antiquarian, who had in exchange sent the Club twenty volumes of splendid stories of adventure—much more to the taste of the members! Club libraries are very desirable and are already in existence in many instances. In some cases a small monthly subscription or the sum of 1d. per book, is charged; in other cases the library fee is covered by the Club subscription. A library committee should be formed to fix the subscription rates, times of borrowing, and to appoint a librarian and to decide on the books to be purchased. In this latter connection I am always very willing to assist by giving a list of interesting books suitable for boys and of engineering, adventure or general interests.

Club Libraries

I would like to remind all Club members that I am always very glad to receive any suggestions that might prove of value to other Clubs. Suggestions for lectures, means of obtaining new members, new model contests and particulars of popular round games are always welcome, and if suitable will be published in these columns.

Meccano Club Helps Hospital



A SHORT time ago a Church Parade was held at Southall in aid of the West London Hospital. Members of the Southall Meccano Club helped in the good work by entering a cart, cleverly decorated with hundreds of blue and white rosettes and several Union Jacks. The grotesque mask worn by the young driver of the cart was the cause of considerable amusement.

Numerous Meccano models exhibited on the cart aroused great interest. They included two large Aeroplanes hung from the top of the cart and working models of an Elevator 3 ft. in height (built by Master Haigh), and a large Swing Bridge (built by Master Gray). Two models of a Printing Machine and Rail Truck, which were awarded prizes in the last £250 Model Building Contest, were also exhibited, in addition to numerous smaller models such as Windmills, Cranes, Designing Machines, etc. It is gratifying to learn that over £80 was collected and handed over to the West London Hospital as a result of this Procession.

Mr. E. C. Carpenter, the Leader of the Southall Meccano Club, who was responsible for the decorative scheme, finds that activities of this character are very beneficial to the Club, making it known in its own locality so that an increase in membership is the invariable result.

Meccano Club Leaders

No. 10. Mr. E. C. CARPENTER.

Mr. E. C. Carpenter is the Leader of the "Southall Meccano Club," established in 1922. The present Club-room is in the Public Library, but more suitable accommodation has been found in the Scouts' Hall, Norwood, where the Club will soon take up their quarters. Mr. Carpenter has worked hard to make the Club the success it is. It has not been all plain sailing, and every credit is due to him for the manner in which the many difficulties have been overcome. Since the day of its inception, the Club has continued to make good progress, however, and to-day it is one of our most enthusiastic Clubs, and Mr. Carpenter is rightly very proud of it.

How to Run a Successful Meccano Club

by the

Guild Secretary

EVERY year thousands of new members are enrolled in the Guild, and hundreds of eager enquiries are received at Guild Headquarters asking "How can I form a Meccano Club?" For some time past I have felt the necessity for giving to Guild members more information than is possible to write in a letter and with this object in view I have arranged to publish a series of articles in the "*M.M.*" These articles will give full particulars of how to form a club and what is necessary to ensure its success, once it has been started.

How the Guild Commenced

First of all let me explain how the Meccano Guild came into existence. The principals and staff of Meccano Ltd. have worked amongst boys for more than twenty years. It cannot be any exaggeration to say that the number of Meccano boys at the present time runs into millions. We have corresponded with tens of thousands of them on all manner of subjects in which all boys are interested. We have interviewed hundreds of others and have been the confidants of their hopes, their ambitions, their difficulties and their fears. Through this long and close association with Meccano boys in all parts of the world we have been able to realise what wonderful hearts and brains they have, and how they understand and respond to help given to them.

Before the days of the Meccano Guild, many of these boys formed little clubs and societies amongst themselves. They repeatedly asked us to organise some form of central club to which they might all look for guidance. Realising the immense responsibility and work entailed by such a step, we delayed any action until we felt that we had the means and facilities for carrying it through successfully. Thus it was not until 1916 that the Meccano Guild came into existence. It is pleasing to remember that the Guild originated in the hearts and minds of hundreds of thousands of Meccano boys.

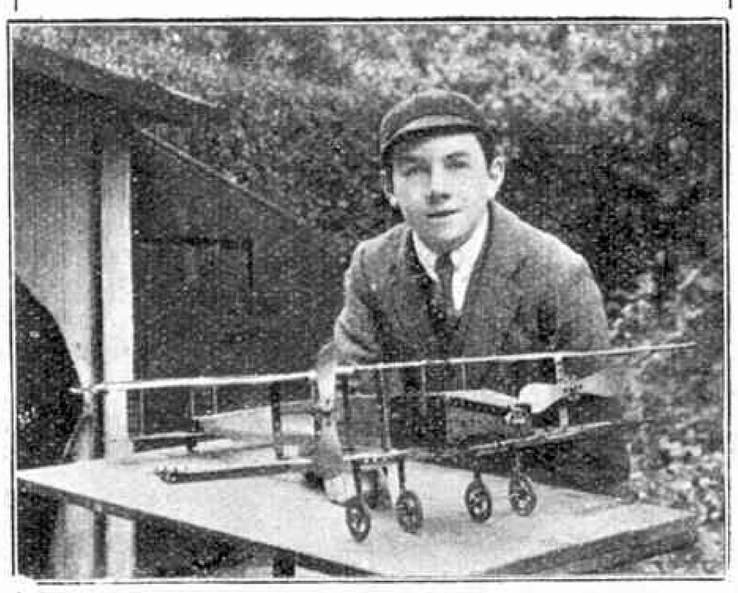
Objects of the Guild

The Guild has one main object, namely, to help every member to become a good man. It aims to do this by making members' lives brighter and happier; by fostering clean-mindedness, truthfulness, ambition, and initiative, and by encouraging its members in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles.

The Headquarters of the Guild are located at the Head Office of Meccano Ltd., Liverpool. The work is under my control, and I am assisted by a staff of experienced workers. To us falls the pleasant task of rendering every possible assistance to Guild members, not the least part of which work is the replying to numerous enquiries upon a wide variety of subjects, not necessarily connected with the Guild or even with Meccano.

The Headquarters staff also despatches badges and certificates to new Guild members and special medals and awards for members who show particular merit or aptitude for club work. We give advice to those boys who wish to form new clubs, and co-ordinate the work of existing clubs in various parts of the country, in the colonies and abroad. We assist clubs in the arrangement of their programmes, furnish all available information and generally help to make each club a success. We ensure the interchange of ideas between all Meccano clubs, and compile the Guild pages for the *Meccano Magazine*, the official organ of the Guild. As there are now about 150 clubs in this country and overseas, the members of the Headquarters staff find plenty of work to occupy the time!

A Giant Bomber



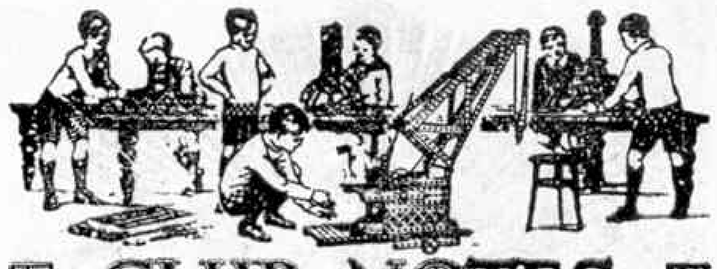
Our illustration shows Master Edward Roden, an enthusiastic Meccano boy, with his fine model of a Giant Bombing Aeroplane. Last year Edward was in hospital for many weeks and, of course, Meccano helped to pass the time.

Forming a Meccano Club

In every form of club there are four essentials. These are:—a common interest, a number of members, a Leader, and finally a club room. In the case of a Meccano Club, Meccano furnishes the common interest and the members, so that it only remains to secure a Leader and a suitable room.

A Meccano Club is a properly constituted club and manages its own affairs entirely. The club is organised in the first place by a few enthusiastic Guild members, who choose some adult as a Leader. Then a general meeting of all the Meccano boys in the district is held to decide on what lines the club shall be run. The name of the club will also have to be decided, the subscription rates fixed, and a programme for the session arranged, including—if desired—Lectures, Concerts, Exhibitions. In the summer months, outings will have to be arranged, and sports, cycle runs, etc., or any other outdoor pastime that interests the members.

(*To be continued*)



CLUB NOTES

Luton Meccano Club.—The last session of this steadily-growing club was brought to a close by a very enjoyable social evening. In a recent Model Building Competition one of the best models on view was a very delicate pair of scales. Master Jack Silbey has been recommended for a special Merit Medallion for a very interesting lecture on "*Light and its Mysteries.*" which proved exceedingly popular with the members. Active preparations have been made for the opening of the Second Winter Session. *Secretary*: Master W. Humby, 11, Napier Road, Luton, Beds.

West View (Nottingham) M.C.—Continues to increase its membership, and recently received applications from as far afield as South Africa. The First Winter Session terminated with a very successful conjuring entertainment, and members are now on the way to becoming enthusiastic wizards! The Second Session commenced on the 17th of last month, when several more new members were enrolled. *Leader*: Mr. H. W. R. Cousens, 494, Mansfield Road, Sherwood, Nottingham.

Barnetby (St. Barnabas) M.C.—A social evening held at the end of the First Winter Session proved such a success that it is hoped to make similar evenings a regular institution. The Stamp Collectors' Section is becoming increasingly popular, and the articles on the subject in the "*M.M.*" are proving of great value. Every endeavour is being made to ensure an even more successful Second Winter Session. *Secretary*: Master R. H. Ward, Laurel Villas, Victoria Road, Barnetby, Lincs.

Ethersall (Nelson) M.C.—This club has enjoyed a very pleasant session, the programme of which included exhibitions, concerts, model building, games, billiards and discussions on mechanical principles. A visit was also paid to a local printing works, where several ideas for models were obtained. Arrangements are at present being made to secure a new club room for the Second Winter Session. *Secretary*: Master H. Dewhurst, 145, Waids House Road, Nelson, Lancs.

Parkstone Congregational M.C.—A few weeks ago this club celebrated its third anniversary by a social, at which 20 members were present. The Club Leader, in the course of his speech referred to the original formation, the trials and triumphs, the ultimate success and future plans of the club. A vote of thanks was passed to Master Brumwell, the late Secretary, to whom a presentation was afterwards made. A syllabus for the next session is now being drawn up. *Secretary*: Stuart Bridle, "Newton Glen," Sandbanks Road, Parkstone, Dorset.

Combe St. Nicholas M.C.—Continues to make very satisfactory progress, and has recently started a branch club a few miles away. The story "*A Night at the Pool*" was very much enjoyed by members of both clubs, and the Second Winter Session has now commenced. *Secretary*: Master L. Bailey, Combe St. Nicholas School, near Chard, Somerset.

New Malden M.C.—A very well-organised and successful Exhibition and Concert was held by this club last month, and resulted in a welcome increase in membership. Master Wood, who was for some time Secretary, has now resigned, and is succeeded by Master E. Alcorn, 7, Poplar Grove, New Malden.

Club Recently Affiliated

Boroughmuir (Edinburgh) M.C.—All Guild members will join in congratulating this enthusiastic and promising club on its recent affiliation. There is already a membership of 51, and at a recent exhibition Meccano models, wireless sets, and Hornby trains running on a sixty ft. track were on view. Altogether £2 12s. 6d. was collected, and half of this was given to the Edinburgh Children's Hospital, the remainder going to the club funds. A photograph of the exhibition will be published in a future number of the "*M.M.*" *Secretary*: Master Colin Crichton, 105, Gilmore Place, Edinburgh.

Clubs not yet Affiliated

St. Catherine's (London) M.C.—An effort is being made to establish a Meccano Club in Shepherds Bush, London, and a suitable Club room has already been obtained. Any Guild member who lives in this district, and who is interested in the formation of a Club, should get into touch with the Secretary as soon as possible. *Secretary*: Master Wm. Crooks, 8, The Curve, Wormholt East, Shepherds Bush, London.

Watford M.C.—It is hoped to establish a club in this district in the near future, and all Guild members who would care to join should communicate with the *Secretary*: Master H. McKay, Wynton, King Street, Watford, Herts.

IN our last issue we announced a series of puzzle competitions, running over three months, for Guild members. We give below further puzzles in the series and would remind our readers that each puzzle is numbered, and that entrants are to write their solutions on a post card alongside the number of the puzzle concerned. Solutions must be received in this office before the 25th of each month, because the answers to the preceding month's puzzles will be published in the following month's "*M.M.*" On 25th March we shall classify all the entries received, and the winner will be the competitor who has given the greatest number of correct solutions to the three sets of puzzles.

Those who have sent in answers to the January puzzles should send in their replies to the puzzles on this page, even though their answers to January puzzles may not all be correct. It does not follow that the winner will be able to give correct answers to *all* the puzzles. We are giving some real "posers," as we know our readers are far too sharp and clever to be interested in "ordinary" puzzles!

The first prize will be Meccano Products to the value of £2 2s. 0d. Second and Third Prizes to the value of £1 1s. 0d. and 10s. 6d. respectively, all to be selected from our current catalogue by the winners.

February Puzzles

Remember that solutions to the puzzles on this page are to be sent in before 25th February because the answers will be published in the March "*M.M.*" Remember also that this Competition runs over three months, and in addition to the puzzles on this page, entrants are required to solve the puzzles in the January and March issues in order to qualify for a prize. This Competition is open to Guild members only, and full particulars in regard to joining the Guild will be sent (post free) on application, to any of our readers who are not already members. New members may obtain a copy of the January issue from *Meccano Magazine* Office, Binns Road, Liverpool, price 3d. (post free).

No. 6.

This is a shunting problem that will appeal more particularly to those interested in railways. Train A consists of a loco and 25 wagons. Another train, B, consists of a loco and 50 wagons. The railway on which they are running is a single track, and as the trains are travelling in opposite directions they require to pass each other. To do this they may make use of the siding S; but this will take only 15 wagons, exclusive of the loco. The puzzle is:—How can the trains A and B pass each other? This puzzle is illustrated by the figure at the foot of the page.

(*Contributed by Master H. M. Harper, West Kirby, to whom the monthly prize of 5/– has been awarded*).

* * *

No. 7.

Come landlord fill the flowing * * * * ,
Until the * * * * run over,
To-night we'll * * * * upon the * * * * ,
To-morrow * * * * to Dover.

This is another puzzle of the same order as No. 5, printed last month. Here again the missing word consists of four letters, re-arranged in each blank to form different words.

* * *

No. 8.

Five ladies, each accompanied by her daughter, visited the same establishment to buy fabric. Each of the ten bought as many feet of fabric as she paid farthings per foot. Each mother spent 8/5¼ more than her daughter. Mrs. Robinson spent 6/– more than Mrs. Evans, who spent only about a quarter the amount that Mrs. Jones spent. Mrs. Smith spent the most. Mrs. Brown bought 21 yards more than Bessie. Annie bought 16 yards more than Mary, and spent £3/0/8 more than Emily. The other girl's Christian name was Ada; what was her surname?

* * * *

No. 9.

The following lines seem to have been set up by a printer who stutters, or at any rate who is not very clear as to what he really wants to say! The addition of the necessary punctuation marks, however, will make a perfectly intelligible sentence. What is your solution of this puzzle?

Were but but and and and but but but and and were and and but and and and but but but and and and but and but but and and and and and and and but but and but.

* * * *

No. 10.

A steamer crossed from Dover to Calais in 2 hours. On returning, she proceeded at first 6 miles an hour more slowly than she went, but, the wind changing half way, she increased her speed 3 miles per hour, and reacher Dover sooner than she would have done, if the wind had not changed, in the proportion 6 : 7. What is the distance from Dover to Calais?

Answers to Last Month's Puzzles

No. 1 The niggers:—79 apples.
No. 2 The brick and a half weigh 21 lbs.
No. 3 44 triangles.
No. 4 105 triangles.
No. 5:—

A VILE old woman on EVIL bent,
Put on her VEIL and away she went,
And to her LEVI she did say,
What shall we do to LIVE to-day.

We offer a prize of 5/– for the best puzzle submitted each month, and prizes of 2/6 each for any other puzzles printed.

Puzzles should be expressed as clearly as possible and the answers should be given in each case. Diagrams should be clearly drawn and letters should be addressed "Puzzles," Meccano Magazine, Binns Road, Liverpool.

An article in a Danish newspaper "*Politiken*" shows how well-known is Meccano in Denmark. It appears that when the King of Denmark was on holiday in Iceland he visited one of the geysers for which that country is famous. Unfortunately, in climbing some rocks, the King had a slight mishap to a certain part of his clothing, and he anxiously enquired as to whether anyone had a needle and cotton and a trouser button. The report tells us that not one of his staff could produce the requisite articles. "In fact," said "*Politiken*," "no one could even produce a Meccano nut and bolt!"

* * *

Ned, the carter, meeting Jim, the stockman, in a dark lane at night, they converse:

Ned: "Where be ye a-goin' then, Jim?"

Jim: "I bain't be a-goin' nowheres."

Ned: "Ye be a-goin' somewhere, Jim, surely?"

Jim: "No, Ned, I bain't. I be a-comin' back!"

* * *

Shop Foreman: "You ain't one of them blokes wot drops their tools and scoots as soon as knock-off blows, are you?"

New-hand: "Not me. Why, I often have to wait five minutes after I put me tools away before the whistle goes!"

* * *

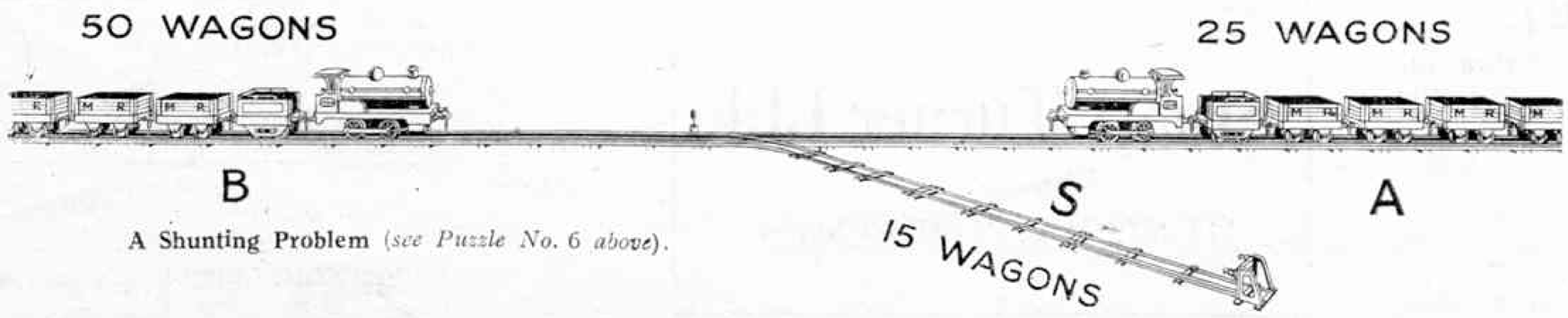
Q. What is the difference between a moor-hen and stagnant water?

A. One is a water-fowl and the other is foul water.

* * *

Q. Why are deaf people like Dutch cheese?

A. Because you can't make them here.



A Shunting Problem (*see Puzzle No. 6 above*).

Small Advertisements

(For Rates, see right-hand column on this page)

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A. W. NORTH, 47, Parchment Street, WINCHESTER.

CINEMA FILMS. 100 ft. 1/- Post Paid. Phillips, 64, Ewart Street, Brighton.

MODEL MAKER'S PARCEL containing brass tubing, rod and sheet, copper, zinc, aluminium, screws, nuts, washers, rivets, copper and iron wire, solder, etc., 1/6 post free. R. H. Christmas, Frome, Somerset.

Wireless! A Vest-Pocket Set. Guaranteed 20 miles. 2/4 Post Free. H. J. Hopkins, 8, Sparkenhoe St., Leicester

MEXICAN "MIRACLE" PLANT
You can **WATCH IT GROW!** Blooms in a few hours. **NEVER DIES!** Beautiful and novel house or table decoration, 3/9, post free, with instructions. Buy one or more **TO-DAY.**—A.G.K., 33b, Elms Rd., Aldershot.

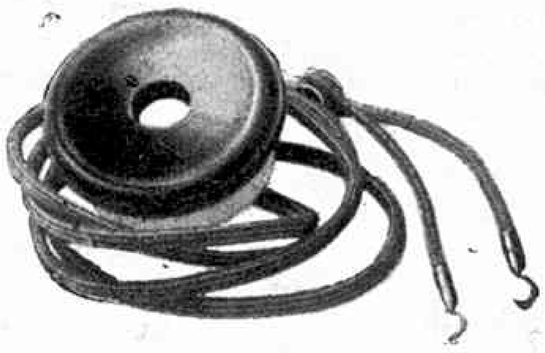
BOYS! Jack Knife with Tin Opener, Hoof Pick, Screw Driver, Leather Punch, two Blades. GIVEN FREE TO ALL sending for Two British-made Lever Self-Filling Fountain Pens. Price while they last, 3/9 for two. "Belhaven," Melling, nr. Liverpool.

FLIP-O-HOY. The new game based on aviation. Players fly to 8,000 ft., meeting with mishaps, stunting, etc., during flight. 2 to 6 players, 6 model aeroplanes. No dice, a swing of the propeller denotes scoring number. Good sport. Of all dealers, or direct from inventor, 3/6, postage 6d. H. W. Woods, Patent Games, Hillfield Road, Cove, Farnborough, Hants.

The Practical Electrician's Pocket Book contains 570 pages of useful text, tables and data simply and clearly worded. Officially recommended by the City and Guilds Institute. Price 3/4 post free from **Rentell, 36, Maiden Lane, Strand, London.**

Telephone Receivers

We have a limited number of single telephone ear-pieces similar to the illustration, of which we are disposing at 10/- each, postage 1½d. These telephone ear-pieces are of 2,000 ohms resistance. They are of the highest grade of British manufacture and give loud and clear reproduction, free from distortion.



They are suitable for use with any receiving set, and are useful as additional 'phones to enable a second person to listen in. They may be converted into a double head 'phone by attaching two together with a metal band, or with a 12½ inch Meccano strip.

Those desirous of acquiring a high-grade telephone are advised to take advantage of this opportunity, as our present stock is limited and will soon be exhausted.

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CUT THIS OUT.

"Meccano" Pen Coupon. Value 3d.
Send 5 of these coupons with only 2/9 direct to the **Fleet Pen Co., Fleet Street, E.C. 4.**
You will receive by return a splendid British 14-ct. Gold Nibbed Fleet Fountain Pen value 10/6 (Fine, Medium, or Broad Nib). If only 1 coupon is sent, the price is 3/9. 3d. less for each extra coupon up to 4 (Pocket Clip 4d.). Satisfaction guaranteed. Your own name gilt letters, either pen 1/- extra.
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Is your father alive?

Yes? That's good. That's why you can afford a Meccano Outfit. 165 years ago we began to take care of boys and girls whose fathers were dead—very often mother was dead, too. 7,000 orphans have been saved from poverty, fed, clothed, educated and started in life. 300 are now at our School at Haverstock Hill, dependent upon us for everything. Talk to your father about this. Tell him that our bread bill alone comes to £3 each day. Ask him if he can, and will, help us. Ask yourself too. Perhaps **you** would like to send something for our large family. Would you? Please reply to **Mr. Fred J. Robinson, Sec., 73, Cheapside, London, E.C.2.**

Alexandra Orphanage
(Incorporated as the Orphan Working School and Alexandra Orphanage).

YOUR "MECCANO MAGAZINES" BOUND 3/3 Vol., post 9d. "B.O.P.'s," "Captain's," "Harmsworth's" or "Hutchinson's" Fortnightly Part Publications Bound same price. **ANY BOOKS BOUND.** No matter what kind of books you have, write me **NOW.** Stamp.—C. Kent, Bookbinder, Elms Road, Aldershot.

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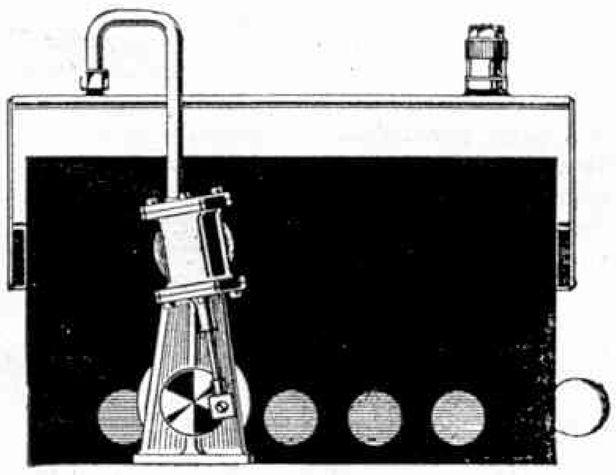
FOR BETTER RESULTS THIS WINTER GET YOUR AERIAL HIGHER
50 ft. 50/-
with Iron Fittings ready for immediate easy erection. *Sent anywhere.* **13 ft. MASTS,** for house fixing. **SPREADERS,** etc. *List 2d.* **Amateur Wireless Service, 33m, Elms Rd., Aldershot.** *Trade Supplied.*



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Specially designed for driving Meccano Toys. The engine you can build yourself with the aid of a screwdriver. It is perfectly safe and we absolutely guarantee that it will work when you have built it.

ENGINE PARTS, 5/-
Post 3d.
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If you want a bigger engine send 6d. for our complete 72 pp. catalogue.

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ENGINEERS,
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* * *

The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 2d. per copy. It will be mailed direct from this office 1/6 for six issues and 3/- for twelve issues (post free).

* * *

Small advertisements are inserted in these columns at 1/- per line (average seven words to the line), or 10/- per inch (average 12 lines to the inch). Cash with order.

* * *

BINDING CASES to take a large number of copies of the "*M.M.*" are supplied at 3/- each post free. These cases, which have a strong stiff back covered with imitation leather, are lettered in gold and fitted with special spring clip.

Obtaining the "*M.M*" Overseas

Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 2d. per copy, or mailed (post free) direct from Liverpool, 1/6 for six issues, or 3/- for twelve issues.

IMPORTANT.

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price-Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA:	Meccano Ltd., 45, Colborne Street, Toronto.
AUSTRALIA:	Messrs. E. G. Page & Co., 379, Kent Street, Sydney.
NEW ZEALAND:	Messrs. Browning & Rawlinson Ltd. P.O. Box 129, Auckland.
SOUTH AFRICA:	Mr. A. E. Harris, P.O. Box 1199, Johannesburg.

Motor Cars Without Gears—(*cont.*)

Before parting from Mr. Constantinesco he very kindly gave me a message for readers of the "*M.M.*" and this is reproduced on page 37. After thanking him for his courtesy in explaining all these things for the benefit of Meccano readers, I left this wonderful inventor with a feeling of deep admiration for his high scientific attainments and the original form which his investigations have taken. I feel sure that everyone of our tens of thousands of readers will join me in congratulating Mr. Constantinesco on his success. It is certain that we shall all follow the progress of his Torque Converter, and his other inventions, with the greatest possible interest.

STAMPS FOR SALE

FREE! FREE!! FREE!!! Packet containing scarce Fiume Provisionals, French Ant-Eater, old issues, and a Free Slip worth 5/-. Ask for approvals. Set of 12 mint pictorials free to those enclosing postage. Nethery, 32, Anfield Road, Liverpool.

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Write on foolscap and insert at the end the name and address of the Toyshop or Store nearest to where you live, which stocks the real Fairycycle, also your own name, address and age.

Be sure the shop stocks the Real FAIRYCYCLE, you can tell by looking for the Triangular Trademark and the word Fairycycle on the Frame.

The winners will receive their Fairycycles through the Shop they name in their letter as stocking them.

If no Toyshop or Store near you stocks the Fairycycle, then say so and give the name of one or two who should.

Entries must reach us not later than March 10th, 1924.

The decision of Lines Bros. will be final.

Names and addresses of winners will be published in the *April* issue of *Meccano Magazine*.

Mark your envelopes 'Fairycycle Competition' and send them to Lines Bros. Ltd., 9, Fore St., London, E.C.

No employee of Lines Bros. may compete.

The FAIRYCYCLE

THE CHILDREN'S BICYCLE

Patent No. 169294 Regd. Design 677489

As illustrated, only

59/6 each

at all good Toyshops and Stores.

As Advertised in the DAILY MAIL and DAILY MIRROR.

Note the ***Low Centre of Gravity***, this makes it safe for the Kiddies.

Insist on these:—Cone Bearing Steering Head, Brake, Freewheel, Adjustable Chain by means of Pedal Bracket (*you know how all chains stretch*), Reinforced Seat Pillar, Ball-Bearing Rubber Pedals, Mudguards—Back and Front, Highly-plated Fittings.

If you demand the **FAIRYCYCLE** (*Regd. Trade Mark*), you will get them, but look for the Triangle Trade Mark and the word FAIRYCYCLE on frame.

"***Be particular in this.***" Insist on seeing the celebrated Trade Mark on the Fairycycle and on all your toys. It is a guarantee of ***Quality and Value*** and of British Manufacture.

Also Supplied on Pneumatic Tyred Tangent Spoke B.B. Wheels.

Wholesale only from

LINES BROS. LTD., 9, Fore St., London, E.C.

TOY DEALERS! Why not put this page in your Window?

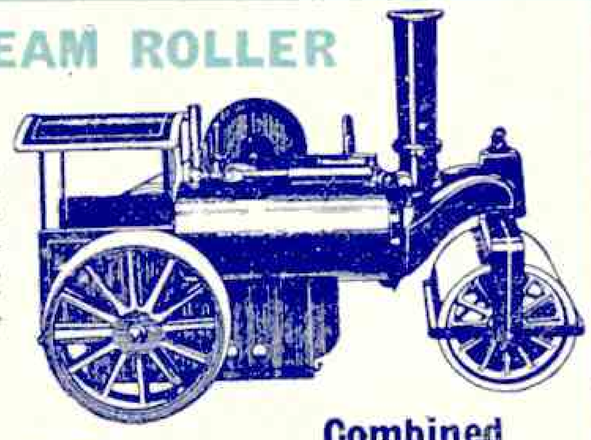
The Great Boys' Shop at Holborn

GAMAGES

There's so much to interest you boys at Gamages that it would seem almost folly to go elsewhere for your needs. No matter what the time of year, Gamages have everything to make it a jolly time. Pay a visit to this Great Holborn Store.

Come along and see for yourselves the splendid things on show at Gamages. But if a personal visit is impossible, write for a catalogue (mentioning in what you are interested) and we will send you one free. You can then send your order by post—you'll not be disappointed.

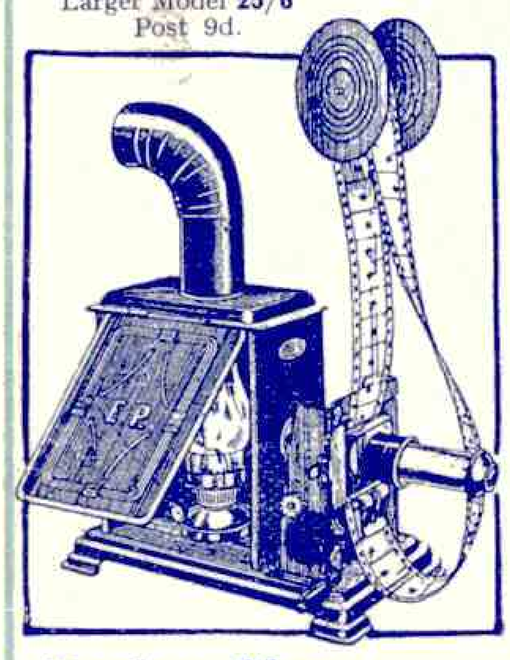
MODEL STEAM ROLLER



As sketch, with brass boiler, matt finish, oscillating brass cylinder, safety valve, steam whistle and solid flywheel. Reversing gear for running backwards or forwards. Height to top of chimney 5⅞ins. Diam. of boiler 1½ins.

Price **15/6**

Larger Model **25/6** Post 9d.



Combined Cinematograph & Magic Lantern

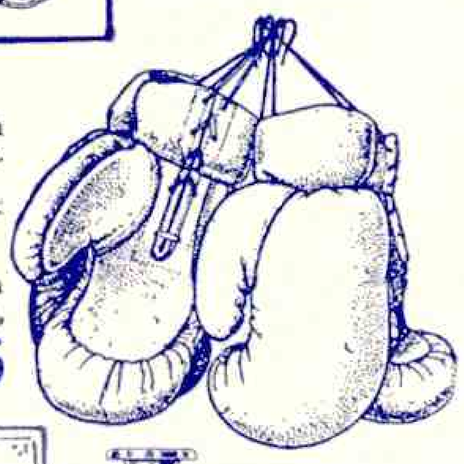
Reliable Mechanism, with flywheel suitable for all standard size films.

Height including Chimney	Supplied with Films	Supplied with Slid's	Prices with Oil Lamp
7 ins.	1	1	*5/6
11 ins.	1	1	*7/6
11 ins.	3	3	*12/6
13 ins.	3	6	21/–

*Post 9d.

Extra Films, 36 ft. **1/–**
Extra Slides, per box of 1 Dozen ... **10d.**
Acetylene Lamps **4/6**

Boxing Gloves



Boys' Tan Cape Gloves with laced palms, bar grip. Stuffed horse hair.
Boys' per Set **13/6** Post 6d. Youths' per Set **14/6**

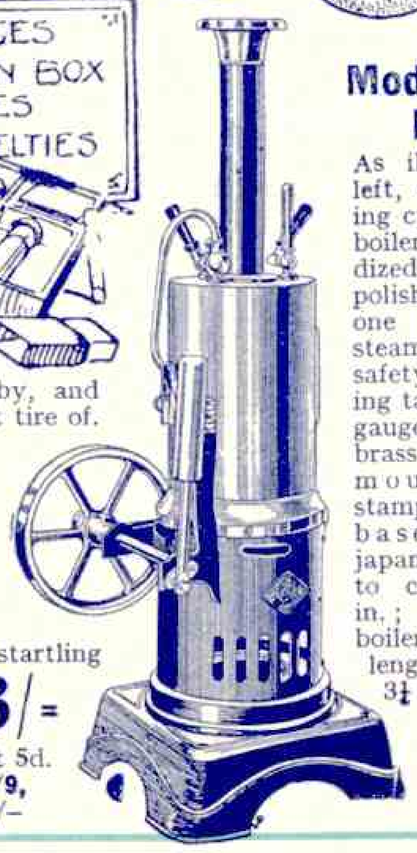
Superior quality strong Tan Cape, padded wrist, bar grip, laced palms.
Per Set. Post 6d. **19/6**

Take Up CONJURING

It's a splendid hobby, and one that you will not tire of. But be sure your tricks *always* work—get them at Gamages. Illustrated is a grand box of conjuring tricks for boys. It contains a wonderful assortment of startling tricks.

Small size Post 4d. **3/=**

Larger Size **4/6** Post 5d.
Larger Sizes **7/9, 10/9, 15/9, 22/6, 35/–, 42/–**



Model Steam Engine

As illustrated on left, with oscillating cylinder, brass boiler, blue oxydized, and finely polished. Made in one piece, with steam whistle safety valve, starting tap, and water gauge. Fittings brass polished, mounted on stamped metal base, nicely japanned, Height to chimney, 12⅜ in.; diameter of boiler, 2¼ in.; length of boiler 3¼ in. Price

10/6

Post 6d.

FOOTBALL!

Your *every* football need is at Gamages. Write for Football List—we will send you a copy free on request. Meanwhile here are some of the prices.

Jerseys	from	3/–
Knickers	,,	1/11
Stockings ...	,,	1/9
Boots	,,	10/9
Shin Guards ...	,,	1/–
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The "JUNIOR LEAGUE"

A Selected 12 Panel Hide Case. School size. Hand Sewn and Fitted with Superior Red Bladder. Price Post 6d. **16/6**

The "COLLEGE"

18 Panel Selected Hide Case. Hand Sewn. Junior Size. Fitted with Best Red Bladder. Price Post 6d. **12/6**

Also Rugby and Association Balls at prices from **9/-** upwards.

THE "SEVEN-IN-ONE"

Field or Opera Glass, Compass, Mirror, Reading Glass, Pocket Magnifying Glass (making simple microscope), Sunburner and Diminishing Glass for Sketching, etc. All mounted in superior quality ivorine frame Price **1/=**

Write for Optical List. Full of novelties. Post free on request

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I.72/2 contains 12 in. Frame, Hammer, Steel Rule, Sandpapering Block, Half Dozen Saw Blades, Bradawl and Design. Price Post 9d. **5/6**

I.72/2½ contains 12 in. Frame, Archimedean Drill, with Bit and Nickelled Drill Box, Steel Cutting Table, Iron Cramp, Half Dozen Saw Blades, Sandpapering Block and Design. Price Post 9d. **6/6**

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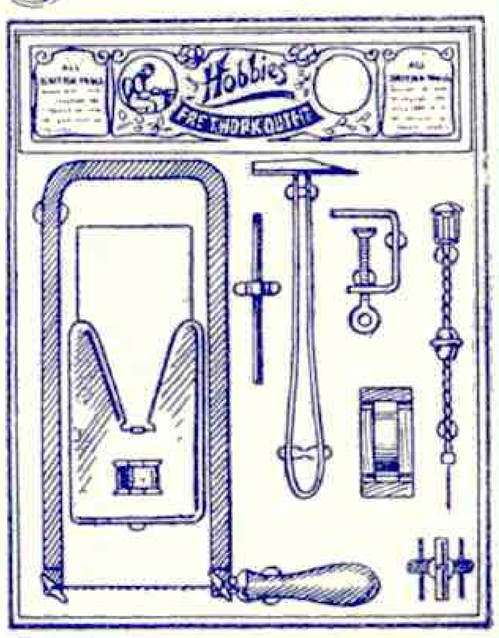
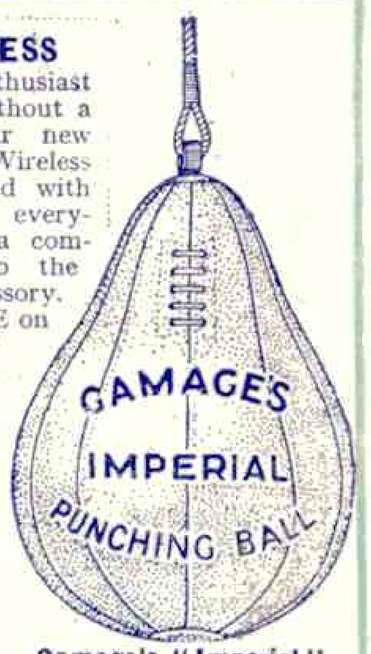


Swiss-Made Watch

A splendid watch for boys. Good timekeepers, bold clear numerals, blue hands, ½ in. thick, 1⅛ in. dial. Keyless winding and nickel finished case. Price Post 4d. **5/=**

WIRELESS

No Radio enthusiast should be without a copy of our new illustrated Wireless List. Packed with bargains in everything from a complete set to the smallest accessory. POST FREE on REQUEST

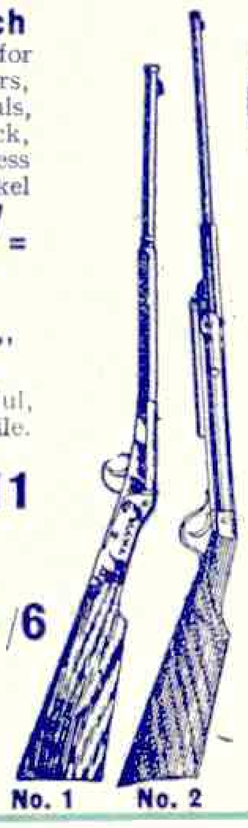


AIR GUNS

"The Light Diana"
(As sketch No. 1).
Strong and powerful, yet light to handle. Single shot. Nickel finish Carriage 1/– **4/11**

"The Gamage"
(As sketch No. 2).
No. 1 bore only. Beautifully made and finished. Price **24/6**
Carriage Paid.

Slugs **1/2** per 1000
Darts **6d.** per doz.
Other Air Guns at **12/6, 18/6,** etc.



Gamage's "Imperial" PUNCH BALL

Made expressly for hard work. Pear shape. A splendid ball for the Club or the "Gym."

No. B1. In Buff Leather with Cord ... **14/6**
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Post 9d.

Bladders for Punch Balls. Best red rubber, strongly made. From **1/6** Post 2d.

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