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MECCANO

MAGAZINE



Published in the interests of Boys

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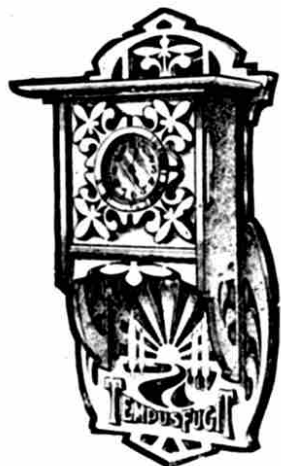
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VOL. VIII

No. 11



THIS CLOCK STANDS 6FT HIGH AND KEEPS PERFECT TIME



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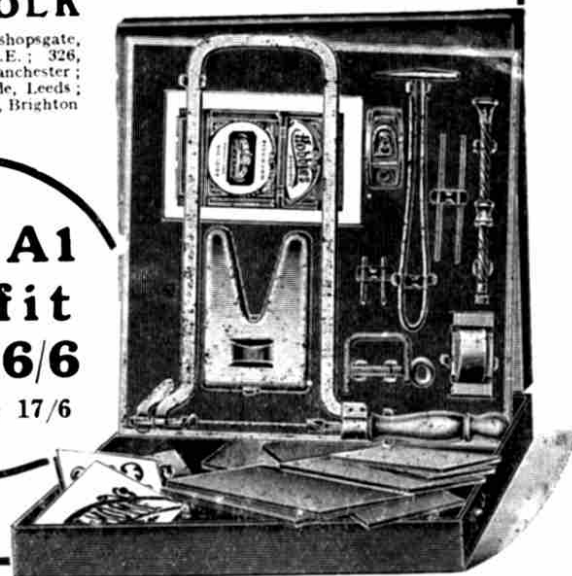
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EDITORIAL OFFICE

Binns Road,
LIVERPOOL

MECCANO

MAGAZINE



PUBLISHED IN THE
INTERESTS OF BOYS

on the
15th of each month



EDITORIAL

It is a pleasure for me to acknowledge letters from hundreds of enthusiastic readers, with congratulations on the increased number of pages, and the improved appearance of the recent issues of the "M.M." Some time ago I mentioned that it was my intention to make this the brightest and best paper for boys, and now scores of boys tell me that I have done that already. This does not mean that we have arrived at the end, however, for the "M.M." will continue to improve with every issue.

For our future issues I have a number of good things and several surprises in store. At the moment I am not able to disclose the preparations that are being made for your interest in the forthcoming numbers. For many months past there have been two insistent demands from our readers. One has been that we add more literary pages and increase the price to 2d., and the other that we publish fortnightly, or even weekly! After careful consideration I have decided to adopt the former course—the latter demand will be further considered later. The increased price will come into operation next month, with a special large Xmas number.

The "M.M." is considerably heavier than it was in the old days, when we had only 12 pages, and the postage is now 1d. It will, therefore, be necessary to increase the subscription rates for Magazines mailed from Liverpool to 1/6 for six months or 3/- for twelve months. From the date of this notice the subscription for copies to be mailed direct will be at the above-mentioned rates, but we shall keep faith with our existing subscribers and execute all orders on our books at the old rates until the subscriptions expire. This remark does not apply to the Xmas number, for which each subscriber will be debited 3d. The "M.M." is now included in Messrs. W. H. Smith

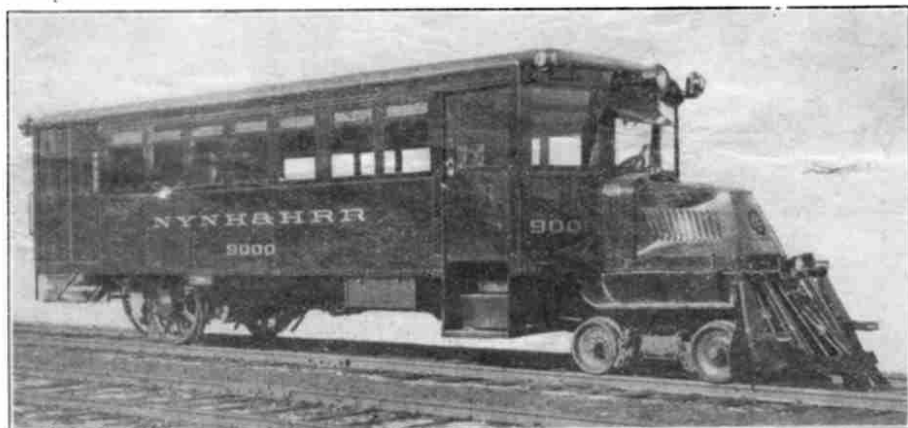
Motor Cars to Run on Railways

THE New York, New Haven, and Hartford Railway has recently introduced a new type of vehicle, consisting of a kind of motor 'bus that runs on railway lines. The cars seat 35 passengers, carry 2,000 lbs. of luggage and travel at a speed of 45 miles per hour. A driver and a conductor constitute the crew.

The mechanical construction, which is practically the same as that of a motor

car in use on roads, includes petrol-engine, clutch, gear-box, propeller shaft and bevel-gear rear-end drive. No differential is necessary, however, and reverse is obtained by a separate set of levers and gears, the cars having four speeds forward and four speeds reverse. They are worked much more severely than a road car, however, because their engines must operate at high speed, hour after hour

(Continued on page 168)



The New Railway Motor 'Bus

& Son's wholesale list and is thus available to newsagents. It may be ordered from all regular Meccano dealers and also from any newsagent or bookstall, price 2d. Should any reader have difficulty in obtaining the "M.M." from his Meccano dealer or newsagent, he should write to me, giving full particulars.

And now just a word in connection with the special Christmas number that is being prepared. This will appeal to all my readers, both at home and abroad, and will have more pages than the "M.M." has ever had before. It will contain a host of good things. There will be articles on Meccano Model Building, Radio, Stamps, Books, Presents to Buy, and some new features including a Puzzle and Joke Column that will appeal very strongly to Guild Members. New Competitions will be announced, and there will be a special splendid article on a proposed new structure that, when completed, will be one of the world's largest bridges. Be sure that you order your copy of the December "M.M." in good time.

Special
Xmas
Number

In this issue I am announcing a new competition, the subject of which is "Drawing the Editor." During the past twelve months I have received thousands of requests from all over the world for copies of my photograph.

Do
you
Sketch?

Some of my readers imagine me with a long grey beard, and others have guessed that I have red hair! Many readers have asked whether the little sketch at the head of this column shows me as I really am. To tell the truth, I am not able to answer this conundrum, for I have never seen myself! My friends tell me that the sketch is not at all like me, and that I am not nearly so good-looking as the young gentleman depicted there! It has occurred to me that it would be rather interesting to ask those who enter our first drawing competition to send sketches of the Editor as they imagine him to be. I expect we shall have some very humorous entries, and I am looking forward with interest to seeing the efforts of those of my readers who are fond of sketching! Of course, the winning sketches will be printed in the "M.M."! Full particulars on page 161.

THE MECCANO CLOCK

Full Instructions for Building this Interesting Model

WE have pleasure in publishing the first instalment of the instructions for building a "grandfather's clock" with Meccano.

This clock stands well over 6 ft. in height and keeps perfect time. With the exception of the 17 lb. weight, the wire by which it hangs, the cardboard-face and the light spring (80 Fig. B), the model is made entirely of Meccano. The clock keeps perfect time, and is the outcome of experiments conducted over the last twelve months in the Meccano model-building department. A large number of these clocks have been constructed, and have been tested out very thoroughly. With careful adjustment every clock has been made to keep perfect time. The construction of the clock is not difficult, and we hope that many of our readers will set to work and build this interesting and instructive model right away!

Constructing the Frame

Begin by making the frame to carry the gear trains. This frame (shown in Fig. A) consists of vertical $12\frac{1}{2}$ " angle girders (1), connected by $5\frac{1}{2}$ " angle girders (2) and $5\frac{1}{2}$ " strips (3). Bolt three $5\frac{1}{2}$ " x $2\frac{1}{2}$ " flat plates (4) to the $5\frac{1}{2}$ " strips (5) above and below, and two $2\frac{1}{2}$ " x $2\frac{1}{2}$ " flat plates (6) to the plates (4) but on the other sides of the lower strips (5) and overlapped two holes with the larger plates (4). Cranks (7) bolted to trunnions (8) on the top of the frame form the pivotal bearings for the pendulum. A 12 " strip (9) is bolted vertically to one of the trunnions and to the $5\frac{1}{2}$ " strips (10) to form bearings for the main gear train. A double bent strip (11) is bolted on the left side of the frame to form a bearing for the

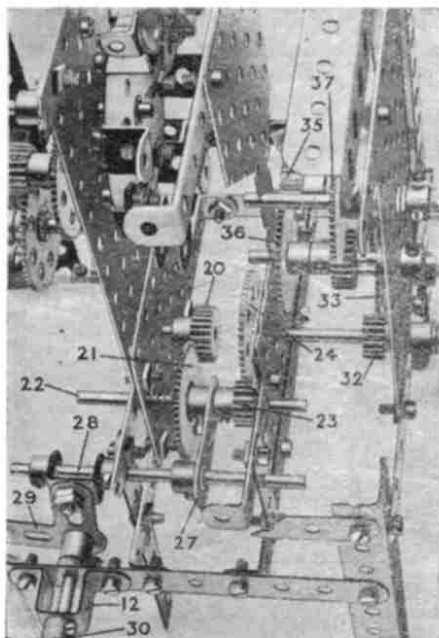


Fig. C

winding handle (65 Fig. B). A second double bent strip (12) is provided, to form a bearing for the gear that disconnects the driving train from the gearing of the hands, when the clock is being wound up.

A flat trunnion (13 Fig. A) is bolted below the left perforated plate (6) to form a bearing for the lowest 3 " rod of the clock train (18 Fig. B). The position of the other perforated strips will be easily seen from Fig. A.

The Main Gear Train

When the frame has been constructed, proceed to build the main driving gear train, as shown in Fig. B. This consists of three $\frac{1}{2}$ " pinions (14) connected with 57-toothed gear wheels (16) and three $\frac{3}{4}$ " pinions (16) connected with 50-toothed gear wheels (17). These are secured on the rods 18, the top rod

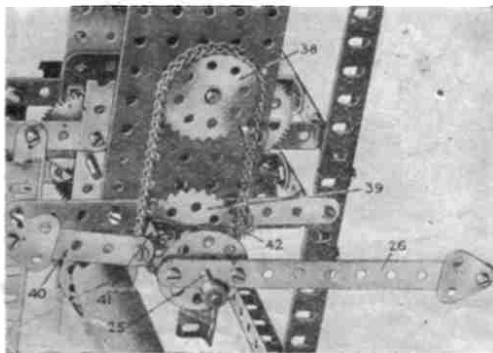


Fig. D

being $3\frac{1}{2}$ " long and the remainder 3 " long. They pass through holes in the left-hand plates (4 and 6) and the strip 9, collars (102) being fitted on each rod on each side of the strip 9. No collars are necessary at the other ends of the rods.

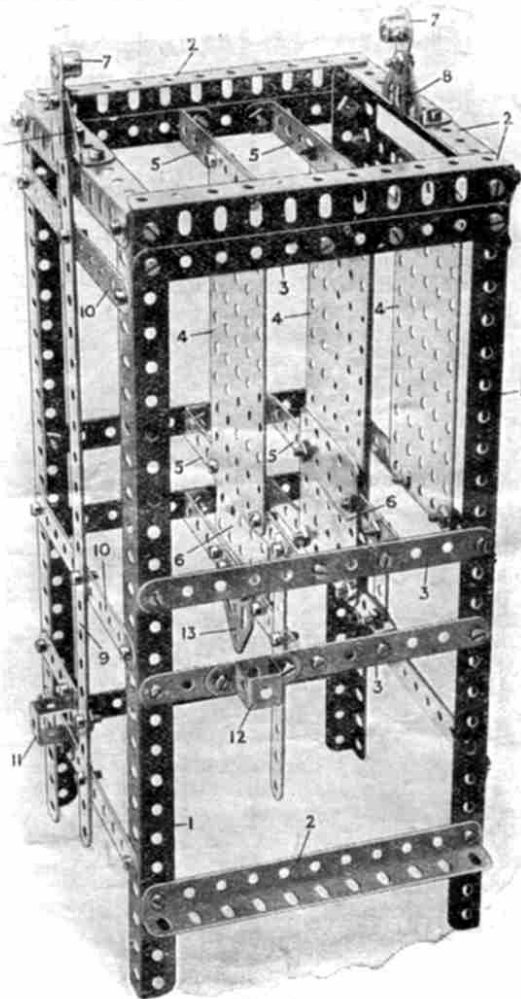


Fig. A

On the end of the $3\frac{1}{2}$ " rod (19) is a $\frac{3}{4}$ " pinion (20), which is seen more clearly in Fig. C. This pinion gears with a 50-toothed gear wheel (21) fixed on a 2 " rod (22) which is able to slide in the plates (6). On this rod also is a $\frac{1}{2}$ " pinion (23) geared with a 57-toothed wheel (24) on a $4\frac{1}{2}$ " rod (25) carrying the minute hand (26 Fig. B). The web of a crank (27 Fig. C) engages the 2 " rod (22), the crank being bolted to a $3\frac{1}{2}$ " rod (28) carrying

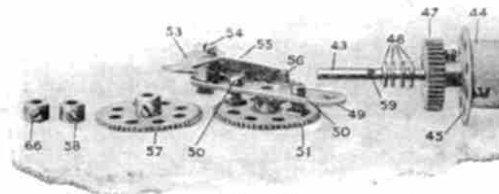


Fig. E

a double bracket bolted to a bell crank (29) and pivoted on a rod (30) in the double bent strip (12).

Adjusting the Hands

A cord (31) is connected to the bell crank (29), and by pulling on this cord, the rod (28) is caused to slide and move the gear (21) in or out of engagement with the pinion (20). This releases the driving train from the clock hands and enables the hands to be freely adjusted.

In order to drive the hour hand from the minute hand rod (25), a $\frac{1}{2}$ " pinion (32) on this rod drives a 57-toothed gear (33) mounted on a 2" rod. This engages a second 57-toothed gear (34 Fig. B), the $\frac{3}{4}$ " pinion (35) on the same 2" rod driving a 50-toothed gear (36). Another $\frac{3}{4}$ " pinion (see Fig. B) on this rod drives a 50-toothed gear (37). On the $2\frac{1}{2}$ " rod of this last wheel is a $1\frac{1}{2}$ " sprocket wheel (38 Fig. B and Fig. D) which is coupled to a similar sprocket (39) loose on the rod 25. The hour hand (40 Fig. D), consists of a $2\frac{1}{2}$ " strip and is connected by a $\frac{1}{2}$ " reversed angle bracket (41) to a $1\frac{1}{2}$ " strip (42). This is bolted to the sprocket wheel (39) and spaced by two washers to give clearance for the sprocket chain. The reversed angle bracket (41) is necessary to enable the hour hand 40 to be brought clear of the dial plate.

Ratchet Winding Mechanism

The ratchet mechanism permitting the winding of the weight is built up as shown in Figs. E, F and G. As will be seen from the two first-mentioned, the complete ratchet element is made by passing a 6" rod (43) through a wood roller (44), the ends of which are clamped between two bush wheels (45) secured on the rod. The bosses of the bush wheels are entered into the ends of the wood roller and the bolts (46) engage in the end notches of the wood roller to key the roller to the bush wheel (45).

A 1" gear wheel (47) is then bolted on the rod (43) with its boss close against the end bush wheel (45). Four washers (48) are then threaded on the rod.

The element shown in the centre of Fig. E is next passed over the rod. This element is made as follows:—

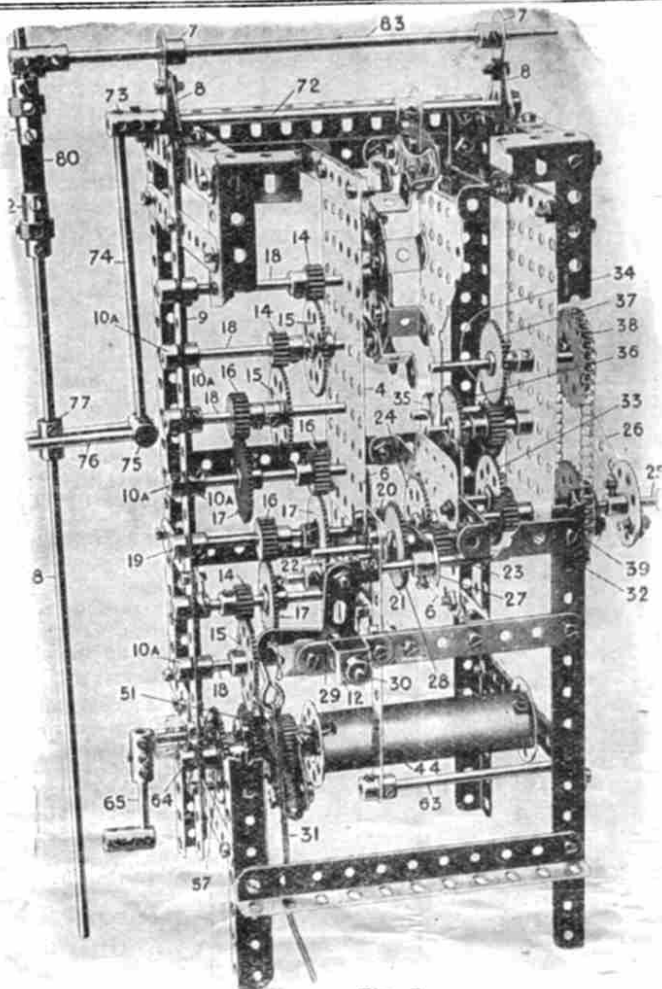


Fig. B

Two $2\frac{1}{2}$ " strips (49) are bolted by $\frac{3}{4}$ " bolts (50) to a 57-toothed gear wheel (51), lock-nuts (52 Fig. F) being fitted on the bolts on each side of the gear wheel (51) and also beneath the strips (49). A pawl (53) is pivoted at (54) in the end hole of the strips (49) and a spring (55) is connected to the pawl boss by a screw, and also to a $\frac{3}{4}$ " bolt (56) on the gear wheel (51) and lock-nutted. The element so built up is passed over the rod (43), being loose thereon, and the pawl engaged with the gear wheel (47) (see Fig. F).

(To be continued)

NEXT MONTH:

We shall print the Final Instalment of this article on the Meccano Clock.

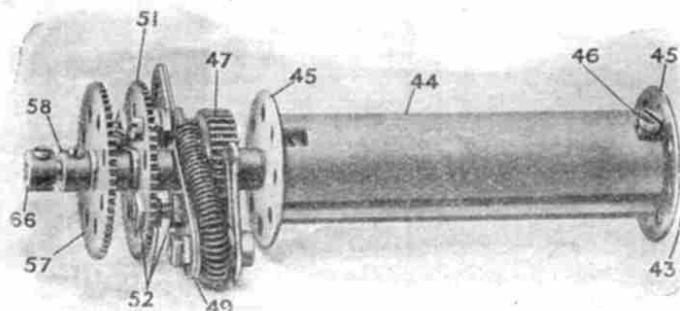


Fig. F

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.

Ian MacDonald (?).—We have received your letter enclosing 1/8 subscription for the "M.M." You have not sent us your address, however, and we shall be glad if you will kindly do so in order to enable us to trace.

H. Dewhurst (Nelson).—You are indeed fortunate in having secured a Club Leader who has given his members the use of his Art Gallery, Library, Billiard Table and Lathe. No wonder you enjoy the club nights so much. Your club magazine is very creditable.

M. J. Rowlands (Trawsfynydd).—"Meccano Encourages Concentration, Carefulness, Alertness, Neatness, Originality." Very neatly put and quite true.

W. G. Ford (West Croydon).—"Your articles are always so ripping that it makes us emulate Oliver Twist." It is through having so many Oliver Twists amongst our readers that we have been compelled to increase the size of the "M.M." so many times. We think our Christmas Number will satisfy even your own voracious appetite.

L. C. Denis (London).—Your solution to J. Miller's puzzle in the October Magazine is quite correct: "J. Miller first had 7 strips and his chum had 5. The chum divided his strips with his brother and then they all had 4 each." We were interested to hear that you solved the problem by Algebra. We have happy (!) memories of trying to make ~~any~~ solve the puzzle. We see that we shall have to think of something really difficult for our new Puzzle Column!

D. O. Boyd (Callestick).—A Competition for the best photograph of the nest and eggs of a British bird would, we fear, scarcely bring sufficient entries. We are, however, always glad to receive and pay for any such photographs that are suitable for reproduction.

L. B. Perkins (Bradford).—We appreciate your praise for the "M.M." Sorry we said "Photographic." Our printers try to explain it by saying that the compositor had the hump when he set the word.

W. Tomsett (Saundersfoot).—If you order the "M.M." from Messrs. W. H. Smith & Sons they will supply it to you regularly. We shall reprint "Dick's visit to Meccanoland" later, possibly in the "M.M."

H. E. Hulse (Paddington).—"A fine way of keeping the muscles strong is to get on all-fours so that the soles and heels of your boots touch a wall. Now, walk up it by moving the hands towards the wall and the feet up it." Excellent for light-weights, Herbert, but not for the poor Editor. He must just jog along with flabby muscles!

A. J. Lewis (Wynberg, S.A.).—Your letters are always welcome, and we are particularly pleased to hear of your early promotion. We hope the Wynberg Meccano Club and its fifty members will have a successful winter.

E. R. Whiting (Claremont, W.A.).—Your cryptogram "How I snacco 2 todemansrig" is ingenious, but we fear it is a little too difficult for most people. Don't waste too much time on perpetual motion. Mr. Hornby once tried it, but he failed, just as everyone must. We hope you will write to us often.

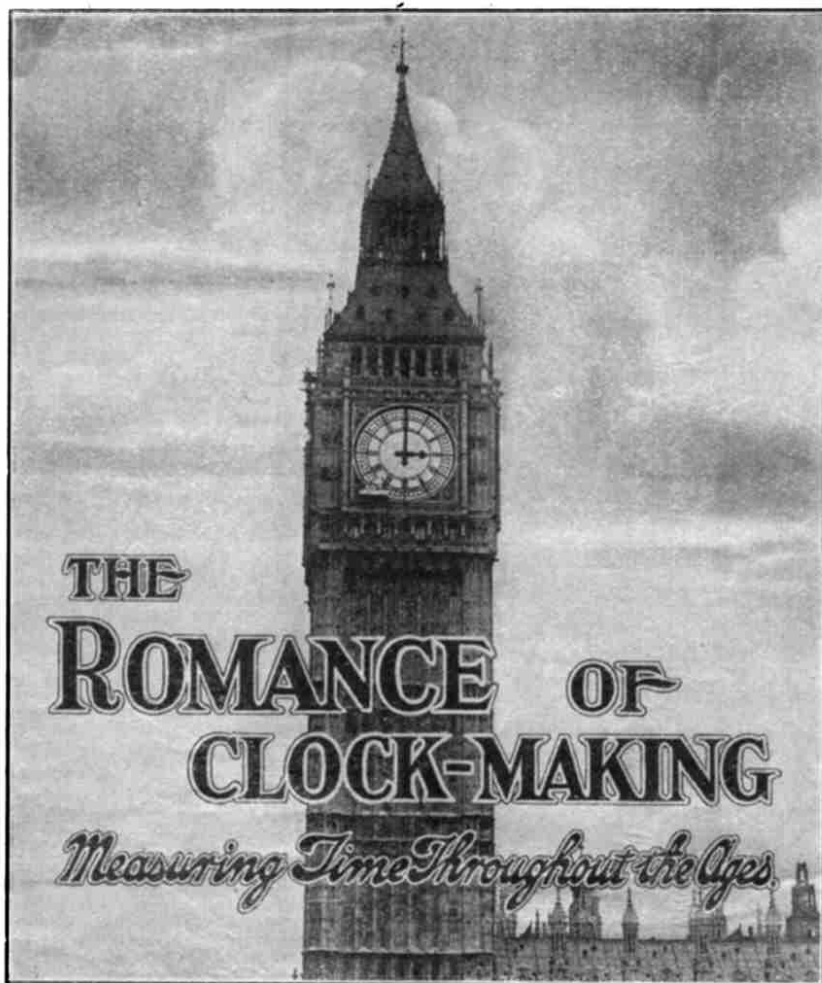
F.A. Neilson (Buenos Aires).—We are very glad to hear of your safe arrival home, and to know that you retain such pleasant memories of your visit to the Meccano factory and of your talk with Mr. Hornby. We hope to deal with your suggestions in a later issue.

E. Shipley (Walsall).—"W21l Ni S4imv6 e slev q22 ko21h5i2 3m h163mt qslq s4imv6 q13mh 2cx20 100 4qseih." Mr. Hornby thanks you for the message in your cryptogram, and for all the good things you say in your letter.

W. S. Lee (Clinton, B.C.).—We are sorry your club broke up on account of counter attractions. Now is the time to start it again. By all means send us particulars of the radio set that is giving such good results. We are pleased Meccano helped you so much.

S. Johnson (Bedford).—"The poor benighted Hindoo, He does the best he kindoo, From first to last, He keeps his caste, And for clothes he makes his skindoo."

You have a well-developed sense of humour, Sidney, and we are sorry we are only able to find room for one of your little poems. If you ever write similar life stories of other native tribes we will try to make room for them.



HOW few of us realise the tremendous amount of thought and work that has been necessary to bring to perfection the mechanism of a clock. In these days clocks and watches are so numerous, and may be purchased for so little, that we forget the wonderful story that lies behind the measuring of time throughout the ages.

How many of us realise, for instance, that the accuracy of our time depends upon an astronomer's observations at Greenwich Observatory? Although it is very interesting to learn about the canals of Mars; about the wonderful clouds of Jupiter; or about the mountains of the Moon, a study of these objects does not fall within the duties of the astronomers at Greenwich. They are more concerned in checking and keeping correct their master clocks that give the time to all the clocks in the country.

Astronomers Keep Our Clocks Right

Every night the astronomers watch with a large telescope for the passing of a star across a particular part of the sky, which passage denotes the correct time. The diagram on this page illustrates what the astronomers see when they are checking the time. In the telescope are several vertical lines, which are actually portions of a spider's web placed in the eye-piece of the instrument. It is possible to calculate the exact instant when a star should pass each of these lines, and the observer watches for this to take place. The star

enters the field of view from the left and passes each of the lines in turn. In the accompanying figure the star lettered A has passed the second line and is approaching the centre of the field. The star B is exactly on the second line. When the observer sees that the star is on a vertical line he presses a key, which completes an electric circuit and the exact instant is marked on the cylinder of a recording machine.

The work of the astronomers enables us all to get up punctually; school to start to the minute; and express trains to depart "on the tick." Imagine the chaos that would result if the astronomers set the nation's clocks half-an-hour late! We should all be up late; schools would be late; trains would be all wrong and everyone would be in a bad temper as a result!

Even greater confusion would result at sea, however, for a sailor cannot find the exact position of his ship unless he is provided with the correct time. He obtains this information by wireless, time signals being sent out at stated periods by the Eiffel Tower and other large stations. It is the astronomer who ensures that the radio signals are broadcast at the correct instant. In the case of the Eiffel Tower, for instance, transmissions are actually sent out by a master clock at Paris Observatory, the time of which is checked with the passage of different stars several times during the night.

Primitive Measuring Devices

Have any of you boys ever wondered how the people of old were able to tell the time, long before watches and clocks were invented? They did so either by the Sun or the Moon, noting their position in the heavens by day or night. In those days time was not measured by hours, minutes, or seconds as it is to-day. Instead, it was divided into "years," according to the apparent motion of the Sun among the stars; into "months" by the revolution of the Moon around the earth (the word "month" indicates this); and into "days" by the alternate light and darkness, caused by the rising and setting of the Sun.

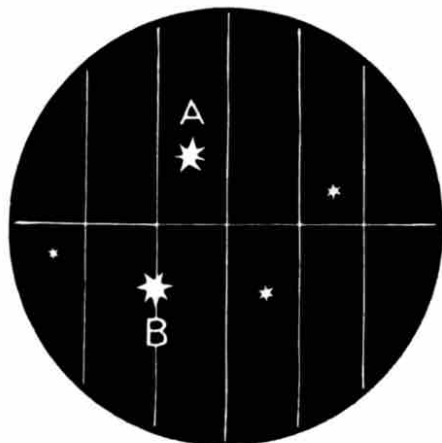
Later, the day was divided into several equal portions by watching the movement of a shadow; for as the Sun moves through the sky the position of a shadow continually changes. The different positions were marked by means of pieces of wood or stone, placed on the ground. By these means the ancients were able to measure the passage of time, principally with a view to obtaining a more accurate idea as to when to expect darkness to descend upon the land.

A development of this early device was the sun-dial, examples of which are to be seen to-day outside some old churches or in old-world gardens. The earliest record of a sun-dial is found in the Bible, where in the II Book of Kings, chap. xx., v. 11, we read of "the dial of Ahaz." The Sun does not always shine, however, and when it is cloudy sun-dials are useless.

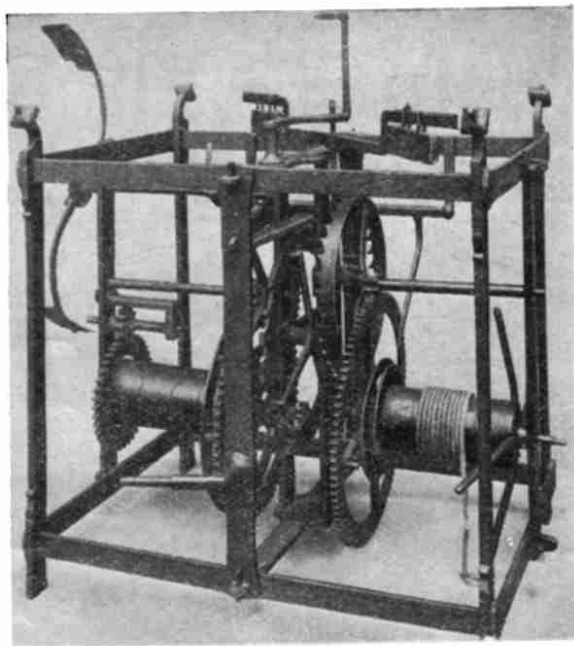
The Water-Clock

As civilisation spread, and the lives of people become more ordered and regular, there was an increasing demand for some other device for measuring time. This resulted in the introduction of the *Clepsydra* or Water-Clock, which is of great antiquity. From old models discovered, and from references in ancient documents, we know that water-clocks were used by the Greeks and also by the Indian tribes of America. Julius Cæsar, when he invaded Britain in B.C. 55 found water-clocks in use among the natives, and with these clocks is said to have observed that the summer nights in Britain were shorter than those in Italy.

In its original form the water-clock consisted of a vessel filled with water, which was allowed to escape through a



What the astronomer sees when he looks through the transit instrument—a telescope with lines marked in the eye-piece.



The Famous Dover Castle Clock

small hole. By noting how far the level of the water had fallen, it was not difficult to determine the interval of time that had passed since the vessel was filled.

Water-clocks—which could, of course, be used by day or by night—were subsequently improved, and in a later form the water dripped into a second vessel, in which a wooden figure was placed. As the level of the water rose in the second vessel the wooden figure floated higher and higher, and the intervals of time were thus more easily noticed.

Soon afterwards hour symbols were painted on the inside of the vessel and a figure with an outstretched arm was used as a float. As the figure rose, the outstretched arm pointed to the hour on the inner side of the vessel, ultimately resulting in the hour-hand of our present day clocks.

How the Clock-Face Originated

In another type of water-clock a dial similar to a clock-face was placed over the vessel containing the water. On the water floated a piece of wood attached to which was a string running over a wheel connected to the hands on the dial. The water was allowed to drip from the vessel so that it took exactly a day to empty. As the floating wood sank lower and lower, the string pulled the hand around the dial. In this form of water-clock the face had twenty-four figures. The device could only record the hours, however, because it had only one hand.

A considerable amount of skill was exercised in the construction of these water-clocks, as is evident from models to be seen in many of our museums. Some of these models are of very beautiful design and clever craftsmanship. One famous example, in brass, was sent in the year 800 by the King of Persia to the Emperor Charlemagne. In

this clock twelve figures of horsemen marched out of twelve windows one by one, according to the hour. When twelve hours had passed the figures returned again, closing the windows after them as they marched back!

Measuring Time with Sand

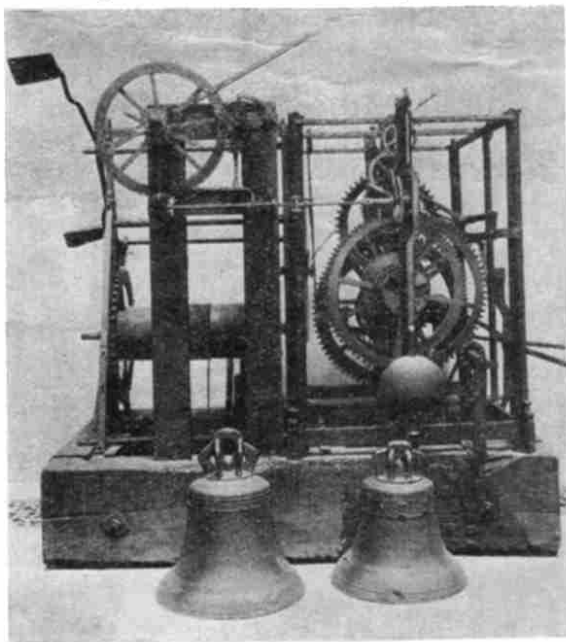
About the year 330 A.D. sand-glasses were introduced. These were glass vessels shaped something like a figure 8, the narrow waist of which only allowed the sand placed in the top half of the glass to run through grain by grain. It required an hour for the sand to pass from the top to the lower half of the glass, after which the glass had to be turned upside down again so that the next hour could be measured by the sand running back again. Although it was not difficult to roughly ascertain how much of the hour had gone by the quantity of sand that had fallen, the great

disadvantage of sand-glasses was that people often forgot to turn them back after the hour was run, and so lost the correct time. Then again, unless they were continually attended to during the night, the time was lost and the hours could only be counted from the time at which the owner of the glass awakened and started off the sand-glass! Because of these disadvantages it is not surprising to learn that sand-glasses were not in use for very long.

Candle-Clocks

Another early method of measuring time was by burning long candles, made to burn for a certain number of hours. These candles had divisions down their sides, each mark showing when an hour had passed. Candle clocks were very unreliable, however, for the slightest draught would alter the rate at which the candles burned, causing them to incorrectly measure time.

(To be continued)



The Ancient Clock from Glastonbury Abbey



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.

Leonard Powell (Crewe).—A crank on the lines of your suggestion may be constructed from two crank pieces, spaced by a coupling mounted on a $1\frac{1}{2}$ " rod at the flat ends, and secured on the outsides by collars. The centre grub-screws may then be removed and the screwed rod inserted in this hole.

Lance Kramer (Cheltenham).—Wire wheels would be expensive to make, and in our opinion would not be any more useful than the existing large pulley. In our Chassis Leaflet we illustrate these wheels fitted with a thick rubber ring to represent tyres. We do not stock the rubber rings on account of their perishable nature.

H. Leslie Brook (Cranlie Cottage).—(1) We shall consider carefully the matter of your suggested double crank. (2) What is the object of your suggestion to remove the groove in the 1" pulley? (3) The present 3" pulley serves the purpose of your suggestion. (4) We already list a 1" reversed bracket (No. 124).

B. C. Curby (Wooden Ferries).—We already have the matter of curved girders under consideration.

E. C. Robinson (Leeds).—Forked couplings have a very wide range. Several combinations suggest themselves and we shall go carefully into their adaptability and cost of manufacture.

L. Burstert (Marseilles).—Grooves in our rod are not practical on account of the smallness of the diameter. We are examining a method for giving a sliding action.

Harold Green.—(1) Your suggested sprocket wheel is not possible on account of the width of the boss being more than $\frac{1}{4}$ ". (2) We have not yet found any mechanical combination requiring a cone sprocket, and we should be interested to hear whether you have.

A. Despeyroux (Mezin, Nord).—(1) We do not stock rubber rings on account of their highly perishable nature. (2) We do not as yet contemplate manufacturing steam models, but probably we shall go into the matter at some future date.

A. de Vaucleroy (Moulton).—(1) Sectional pieces for constructing ships' hulls are scarcely practical. Efficient sealing of the joints would be a difficulty, and a further disadvantage is that such sectional pieces do not lend themselves to general model construction. (2) The reason we brass our nuts and screws is to give a more pleasing contrast to the nickel strips. (3) We shall probably increase the range of bevel gears shortly. We do not employ bevel gears in our differential and suggest you send for a copy of the Chassis Leaflet.

Robert A. Harvey (London, S.W.).—There may be possibilities in a ratchet wheel, and we shall go into the matter.

C. Manclair (Fretigny).—(1) Secured to the face plate our present flanged disc gives a flanged wheel. (2) We do not see any general use for your suggested thin steel strips for centrifugal governors.

G. A. Liarde (Bradford).—(1) We have already considered a groove in our rod for a sliding action, but it was found to be impracticable on account of the smallness of the diameter. (2) Will you give us instances where your suggested threaded wheels could be employed?

F. Harper (Wakefield).—With a constructional motor there is always the possibility of the standard of efficiency not being attained. For this reason we refrain from issuing the Meccano Motor in constructional form.

S. Cough (Smethwick).—We are interested in your special nut, and would like to have further details of its employment in any of the models you mention.

A. Dakin (Bradford).—We shall go into the matter of a suitable mounting for models.

H. P. Croom-Johnson (Babey).—We are constantly increasing our range of train accessories, and shall no doubt include such a carriage as you suggest, and also signals.

E. Thomson (Crieff).—We have in mind the question of flat angle strips on the lines of your suggestion.

E. C. Corps (Northampton).—A double angle strip, with flanges such as you suggest, may be constructed from a $1\frac{1}{2}$ ", or any strip of the desired length, secured to reversed angle brackets.

H. R. Stafford (Sutton).—As far as we can make out from your sketch your suggested piston rod appears to be more on the lines of a crank shaft, similar to accessory part No. 134.

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

James Stevens (Kingston Hill, Surrey).—We have in mind new types of rolling stock for Hornby Trains, which it is our intention to make as comprehensive a system as possible.

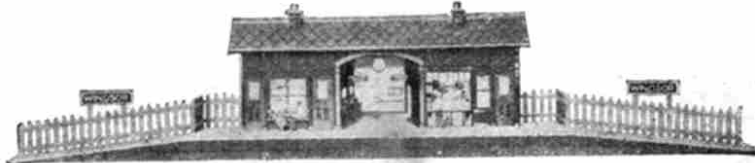
New Rolling Stock and Accessories

THERE are new Wagons, Signals, Lamps, Stations, Turntables this year, all built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains. Most important of all they have the uniformly beautiful finish which 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 is a thing of beauty—the only really British station obtainable. Its bright colouring and realistic appearance will bring joy to the heart of every boy who sees it.



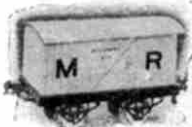
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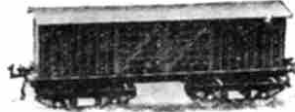
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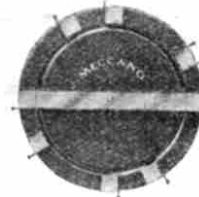
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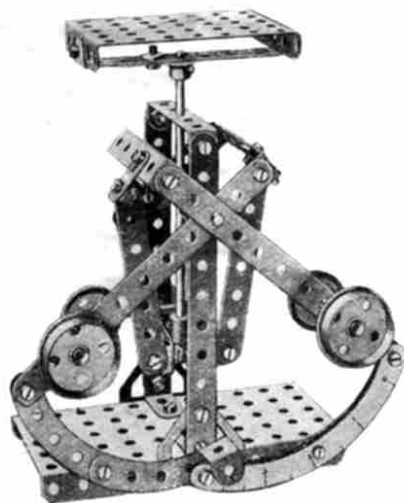


It seems strange to me that any boy should be content to build only those models that are shown in the Meccano Manuals. Yet I meet many such boys in my travels, and I always think that they are missing more than half the fun of Meccano. I sometimes wish I could take these boys over to Liverpool, and show them the wonderful model building room at the Meccano factory. I'll warrant that my young friends would be so inspired that they would return home and build a new model every day for the remainder of their lives!

I mentioned this matter to Mr. Hornby on the last occasion that I was over at Liverpool. His reply was so interesting that I made a note of it.

"Yes," he said, "it is as you say many boys do not realise the wonderful possibilities of the Meccano system. We illustrate in our Manuals only a small number of the models that may be constructed with each Outfit. We show representative types, as it were, and leave it to the Meccano boy to build others. Come with me!" saying which he led the way to the model-room.

"Here," he said, indicating hundreds of models, "are some of the experimental models we have built during the past twelve months. From them we have selected a number of representative types for inclusion in our new Complete Manual. Every one is a splendid model, and we should like to include them all, but what can we do? Our Complete Manual



Model 306. Letter Balance

already illustrates nearly 400 models, and it is really quite impossible to include any others on account of the lack of space. If we were to show all the models that can be built with Meccano we should require a manual with 10,000 pages!"

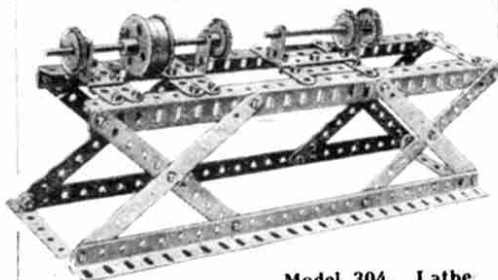
I quite agreed with Mr. Hornby, but I could not help feeling sorry that all Meccano boys could not see the rows and rows of splendid models that stood before me—Cranes, Bridges, Dredgers, Dredgers, Guns, Motors, Engines, and a host of others too numerous to mention. "Tell your Meccano boys," concluded Mr. Hornby, "that if they use their brains they can build hundreds of models not shown in any of our Manuals, and from them they will obtain any amount of pleasure."

It struck me after leaving the factory that the prize-winners in the £250 Model-Building Competitions were the boys who had used their brains in the manner Mr. Hornby suggested, and I pictured to myself what wonderful fun these prize-winning Meccano boys must have had thinking out the new models—models which in many cases differ entirely from any of those shown in the Meccano Manuals.

I think that one of the greatest charms of the Meccano system lies in its never ending variety. There is no need to build the same things over again,

and to the Meccano boy of ability and intelligence—the boy who wishes to "get on" in the world—there is nothing so pleasurable as inventing some new model or improving an existing model. There is so much scope for such a boy, for he has "the whole world to go at," as the saying is. Of course, in the more complicated models a greater number of parts are required, but these may be added to existing Outfits from time to time, or an Accessory Outfit may be purchased, converting the original Outfit into the next higher and so making possible a large number of new models.

Perhaps one of the finest examples of the cleverness and resource of a Meccano boy is shown in the Oscillating Steam Engine (Model No. 307). The original of this model was built by a boy a fortnight after converting his No. 2 Outfit with the addition of a No. 2a. The model is composed of ninety-nine



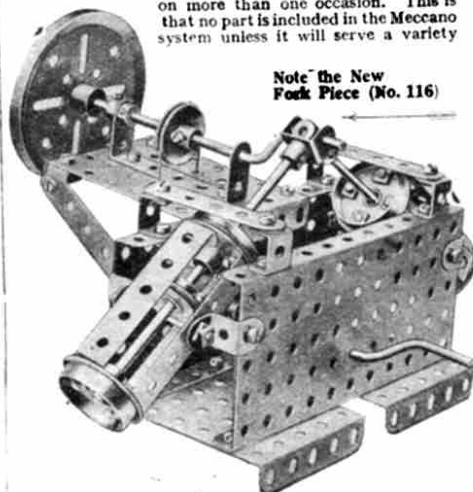
Model 304. Lathe

parts and is an accurate copy of this type of engine. When the oscillating steam engine is made to work, by turning the crank handle, the piston rods drive up and down in the cylinders in a very realistic manner. I have been told that before being published in the Manual, the original model was only slightly improved by the model-building staff at the Meccano factory. For instance, advantage was taken of a new part, the Fork Piece (No. 116), which came in very conveniently for use in the piston heads, where they join the crank-shaft.

Another model that is both interesting and useful to those possessing a No. 3 Outfit is the Letter Balance (Model No. 306). In the illustration the arms of the Balance have been fixed wide apart to show the construction of the model. In practice, however, the two flanged wheels should be touching until a weight is placed on the balance, when the curved strips open out and the double bracket piece shows the weight registered.

In the construction of this model a new and much-needed part will be found useful. This is the $3\frac{1}{2} \times 2\frac{1}{2}$ " perforated flange plate (No. 53) that forms the top of the balance. This part is first met with in the 2a Outfit.

It is often surprising to me to find how the addition of only one or two extra parts to an Outfit immensely widens its building scope. This is chiefly due to a principle that Mr. Hornby has discussed on more than one occasion. This is that no part is included in the Meccano system unless it will serve a variety



Note the New Fork Piece (No. 116)

Model 307. Oscillating Steam Engine

of purposes and is applicable to several different models. Thus the Worm Wheel (No. 32), the Double Angle Strips (Nos. 46 and 48), and the $1\frac{1}{2}$ " Pulley Wheel (No. 21) included in the 2a Outfit will, later on, be found indispensable in building many of the more advanced models.

Another type of balance (Scales, Model No. 343) may also be made with a No. 3 Outfit, and is an interesting model, if only because an entirely different principle is employed to that of the Letter Balance. The Scales are very simple to construct and the counterpoise weights, for which flanged wheels are used, are screwed on to a 5" axle rod (No. 15). Incidentally, it is very interesting to notice the great variety of purposes for which the flanged wheels may be used. For instance, in the four models illustrated on this page they are used respectively as weights, lathe-pulleys and cylinder heads. There are, in fact, very few models in which these handy wheels may not be employed in one capacity or another.

A model that gives a very good idea of the general working principles of a lathe is Model No. 304. This is an example of a simple form of lathe, such as is used in big engineering shops for turning metal, screw-cutting, boring and a number of other purposes.

Each of these four models, and the four described last month, are only a few of the very many illustrated in the new Complete Manual, a special section of which has been devoted to models that may be constructed with a No. 3 Outfit.



Model 343. Scales

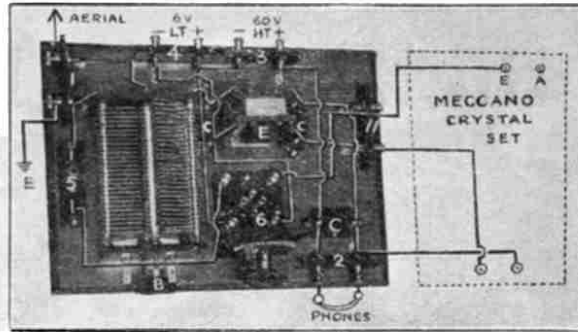
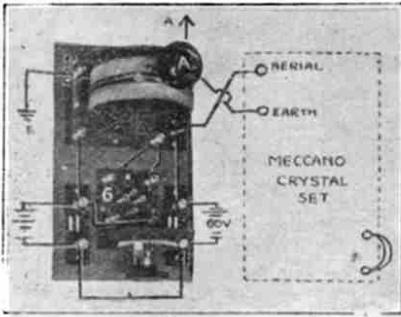
Incidentally, I should like to take this opportunity of congratulating those responsible for the system of numbering followed in the new Manuals. All models that may be made with a No. 2 Outfit, for instance, fall between the numbers 200 and 299. Models for a No. 3 Outfit are numbered 300 etc., No. 4, 400 etc., and so on. Thus it may be seen at a glance what Outfit is required to build any given model, by simply noting the first figure in its number. This saves a great deal of labour looking up the models, as was necessary under the old arrangement.

May I also take this opportunity of saying that I very much prefer the new type of illustrations in these Manuals, adopted for the first time last year. I believe these illustrations are printed by what printers technically describe as the "half-tone process." At any rate, the new method clearly shows all the component parts of the models and makes model-building very much easier. As I remarked last month, the Manual should be in the hands of every Meccano boy.

NEXT MONTH

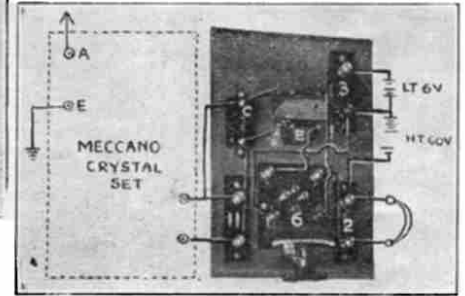
Some Interesting No. 4 Models.

Unit No. 1 (complete)



Unit No. 2 (complete)

Unit No. 3 (complete)



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TO INCREASE ITS RANGE
(See Unit 1).

As you know, boys, the Crystal Set is not much good for long distance work, although for use within 20 miles from a Broadcasting Station it gives splendid results. But there is a way to increase the range of the excellent Meccano Set to as much as 70 or 100 miles—even more under favourable circumstances—and that is by using a Valve in front of it. Look at the illustration above, and note how easily with only four components you can build up Unit No. 1 and increase the range of your Set at least three times.

TO MAKE IT LOUDER
(See Unit 3)

No Crystal Set gives sufficiently loud speech to work a Loud Speaker, and as most of you at some time or another will want to entertain your friends in this way, we show you in Unit No. 3 how you can add to your Meccano Set an Amplifier which will give you speech five times as loud. For this Unit you only require components No. 2, 3, 7, 11, C, E, nothing could be easier.

TO INCREASE ITS RANGE AND MAKE IT LOUDER AT THE SAME TIME
(See Unit 2)

This method is a combination of Units No. 1 and 3, but only one Valve is used. The Circuit used in this set is known as a Dual Amplification Circuit, and is very similar to the famous "P.W." Circuit which you have no doubt read quite a lot about in "Popular Wireless." Here again, you will be able to see by the illustration, exactly what components you need, but if you have any doubt, write to us and we will be pleased to tell you more.

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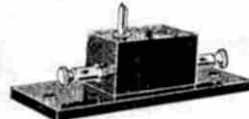


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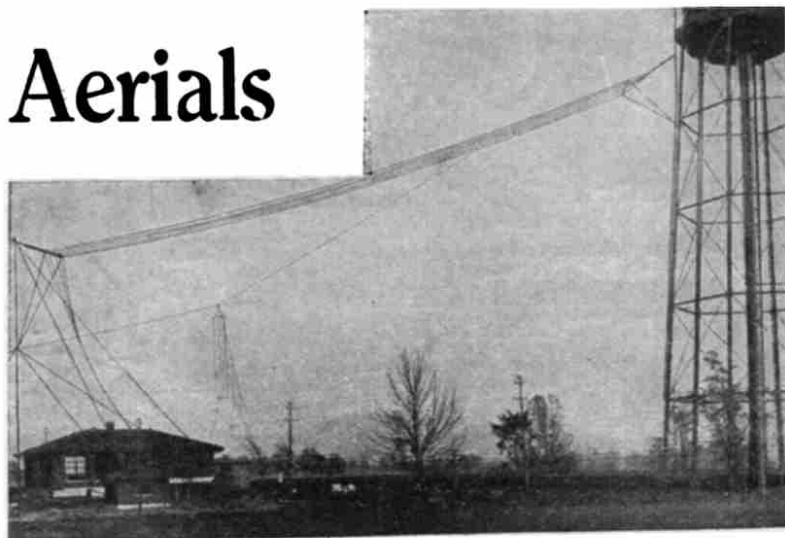
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A Talk about Aerials

BY THE RADIO EDITOR

These articles describe the best type of aerial to erect and give suggestions for the erection of different aerials. When you have put up your aerial and connected to it your receiver you will be able to listen all night long to all manner of good things from the nearest broadcasting station. There need be no more dull evenings, and you will be able to entertain your friends by allowing them to listen-in.



Our illustration shows a very efficient aerial for both transmitting and receiving. The amateur to whom it belongs is fortunate in having been able to take advantage of a high water-tower near his house. The aerial is of the inverted "L" type

I.

THE aerial is, perhaps, the most important part of a crystal receiving set, for unless it is absolutely efficient, signals will either not be received at all, or if they are received they may be so faint as to be almost unrecognisable. To be efficient, an aerial must be perfectly insulated, as high up as possible, and of as great a length as the regulations permit. Whether the type of aerial employed is T-shaped or L-shaped is a secondary consideration, height and length being of the greatest importance.

We all know that there are many difficulties in erecting an aerial. First of all there is a plan to be made, and this is, perhaps, the least difficult part of the business. Those boys who cannot have a straight span of, say, 40 ft. between two supports have to think out some alternative scheme whereby the necessary length and height may be obtained.

Next comes the question of erecting the poles that are necessary in the majority of cases. Permission has to be obtained from father or mother—or sometimes from both! If the poles are to be attached to the brick-work of the house, permission may have to be obtained also from the landlord.

Having obtained these permits and the poles, the next thing is to secure the latter in position. Here more difficulties

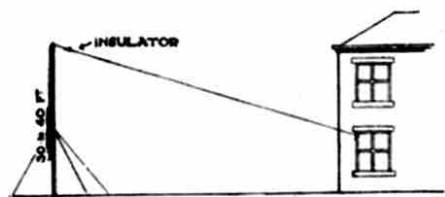


Fig. 1

may be encountered, especially if you get stuck on the roof with a 20 ft. pole in one hand and a hammer and staples in the other—then you really do begin to wonder who invented wireless, and why! Generally it is best to have the poles fixed by some local firm of builders, or by some "handy-man." In some towns there are now firms who specialise in the erection of aerials, and their charges are generally quite reasonable.

Difficulties were made to be overcome. The ingenious boy will not be prevented from participating in the joys of Radio because of any difficulty in erecting his aerial.

II.

Although almost any kind of wire will enable signals to be received, a wire made of an alloy of copper—such as phosphor-bronze—is more susceptible to radio impulses than other metals. Even better is an all-copper wire. The wire

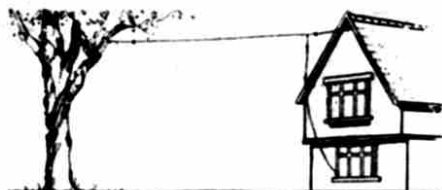


Fig. 2

should be fairly thick—gauge 14, 16 or 18, for single wire, or if the greatest efficiency is desired, a stranded copper wire should be used. (7/72's is perhaps the best of all). The wire may be bare or covered with insulation, which does not affect the impulses in any way. The Postmaster General allows an aerial length of up to 100 ft., including the height of the leading-in wire measured vertically from the leading-in point. In other words the combined height and length of the aerial must not exceed 100 ft. Any number of wires may be used in the aerial.

The "antenna," as the aerial wire is called, whether composed of bare or covered wire, must itself be insulated from the earth. Poles, house-walls, rope and such substances all conduct electric currents more or less completely, especially when wet. The antenna must not touch anything that is capable of conducting



Fig. 3

an electric current, or the impulses will be led to earth instead of to the receiving apparatus.

The best way of insulating the antenna is to fasten it to porcelain insulators, themselves suspended from the two points of suspension by rope or string. If the distance between the two points of suspension exceeds the desired length, the space may be bridged by suspending the insulators with a longer rope at either or both ends.

III.

Nearly every mail brings me letters from the readers of the "M.M." asking "Which is the best type of aerial to erect?" This is a question that opens up a large subject. In the first place nearly every aerial that is erected is different to other aerials, because the situation of nearly every "listener-in" varies. One boy may be very fortunate and have a 30—40 ft. flag-pole at the bottom of his garden. He then has no difficulty in erecting his aerial by attaching one end to the pole and taking the other end directly into the house (Fig. 1). He is able to obtain a straight run of

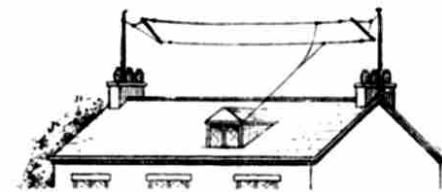


Fig. 4

say 60 ft. across the lawn, and so he uses only a single wire.

Another boy has no flag-pole, but there is a tall tree in the garden, and this he uses to support one end of the aerial.* He is more anxious than boy

(Continued on page 155)

*Note.—When fastening the aerial to a branch of a tree, it is a good plan to introduce a light spring between the insulator and the branch. This allows for slight movements of the tree in the wind.

Have you a Wireless Set?

Mr. E. J. BARNARD, Welling, Kent, writes :

"I think I ought to tell you how much I value 'The Amateur Mechanic.' It has proved of great assistance in a variety of jobs, and especially as to the article on WIRELESS TELEGRAPHY. I constructed an instrument entirely according to the instructions, and was rewarded with success on the first trial. Considering that my aerial is only 42 feet long and 18 feet high, I think these are grounds for self-congratulation. I may add that until I became interested in the article in your 'Amateur Mechanic' I had not the slightest elementary knowledge of Wireless Telegraphy."

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piano—To make a padded chair from an old cask—To stuff animals—To dress furs—To stuff and mount birds—Wood inlaying—To prepare working drawings—To renovate a grandfather's clock—To make garden arbours, arches, seats, summerhouses, etc.—To use metal drilling tools—To renovate mirrors—To mend china—To do fretwork—To limewhite poultry houses—To do gold-plating and silver-plating—To clean a watch—To mend keyless watches and ordinary watches—To distemper ceilings and walls—To make picture-frames and frame pictures—Curtain fitting—Metal castings—To clean paint off glass—To clean boilers—To fix an anthracite stove—To re-gild and restore picture frames—How to use spanners—To make doors and windows draught-proof—To paint walls—To do nickel-plating—To cure noises in hot-water pipes—India and glue varnishes—To make plaster casts, etc., etc.

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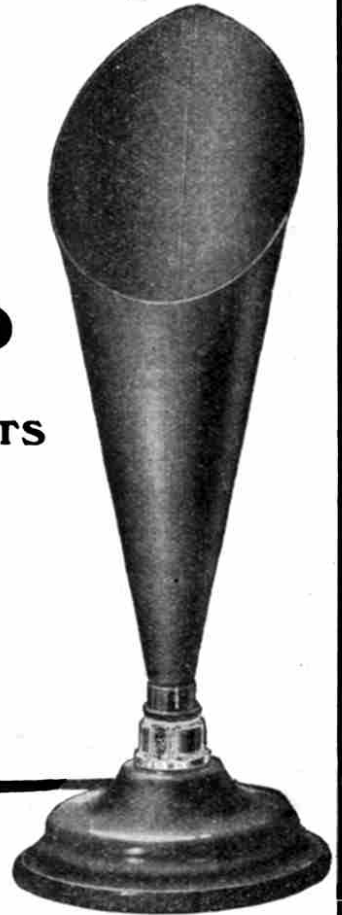
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The Men Who Gave Us Radio:

VI. HUGHES, HERTZ, ONESTI, and BRANLEY.

In previous instalments of this article we have described the work of those scientists who, in the nineteenth century and previously, contributed to the discovery of the principles of wireless telegraphy.

Hughes

UNTIL the end of the nineteenth century two methods had been used to transmit messages from one place to another without wires. These were (1) Conduction, or the use of the conductive properties of the earth and of water for conveying the electric force, and (2) Induction by which the electric impulse is transferred from one circuit to another, without there being connection between the two circuits.

Towards the end of the century, however, these two methods were superseded by the discovery that electro-magnetic waves may be radiated through space, and it is upon this fact that present-day Radio depends. Credit for this discovery is generally accorded to a German named Hertz, but—although Hertz certainly was the first to publicly make known the existence of these waves—we now know that they were first discovered by a British scientist, Professor D. E. Hughes.

Hughes, who was the inventor of the microphone and of the printing telegraph, had been engaged in a study of wireless telegraphy from 1879 to 1886. He discovered that when a current passing through a coil of wire was interrupted it caused such intense currents at the exact instant of interruption in a second coil near by that the atmosphere was momentarily disturbed. Solid objects did not seem to present any obstacle to these disturbances, which seemed to be able even to pass through walls with ease.

Using this discovery, Hughes devised a means of transmitting signals to a considerable distance, and several leading scientists witnessed his demonstrations. In 1892 Sir William Crookes wrote that: "Even now, telegraphing without wires

fixed at the opposite end of these rods and when these were connected to an induction coil they became charged. This caused a spark to jump across the small gap that separated the two balls. When this occurred, electric waves were

radiated from the apparatus, each oscillation causing, as it were, a ripple in the ether.

Hertz next bent a wire into a circular shape, cut it and placed a small metal knob at the end of each wire. This part of the apparatus, called the "resonator," was placed a short distance away from the oscillator. When the latter was set in action, sparks were seen to jump across the gap in the resonator, although the latter was not connected in any way with the oscillator.

Hertz showed that the waves in the ether caused by the oscillation closely resemble waves of light. He showed also that they might be reflected, refracted and even polarised, just as may light. He thus brilliantly demonstrated beyond doubt Clerk-Maxwell's theory that light and electricity are identical in their essential details.

Onesti

Before wireless telegraphy could become possible, some more delicate apparatus than a resonator spark-gap was necessary for the detection of the Hertzian waves. In 1885 Professor Galzecchi Onesti, an Italian, introduced a more sensitive detector. He used a small quantity of iron filings, enclosed in a glass tube, between two corks. Through each cork there

(Continued on page 168)

As will be seen from these articles, the invention of wireless telegraphy was not solely due to Marconi, although he was the first to put into operation a practical system. Many boys are surprised to find that Radio is the result of researches that extend over the past century. Progress may be traced by studying the lives of those men who devoted themselves to the science. The manner in which they overcame difficulties and step by step gained the desired end, is a splendid object lesson for every Meccano boy. In this series of articles we are outlining the development of Radio by briefly describing the researches of those scientists who, before Marconi's time, laid the foundation of communication without wires.

is possible within a restricted radius of a few hundred yards. Messages may be transmitted from one part of a house to another, without intervening wires."

Professor Hughes believed his success was made possible by electric waves. He did not announce his results, however, because three eminent scientists expressed the opinion that his achievement did not involve any new discovery. They stated that the results could all be explained by known electro-magnetic induction effects, and that therefore Professor Hughes's view, that there existed unknown electric waves, could not be accepted. In the face of this discouraging report, Hughes did not devote further time to the matter and the great opportunity passed him.

Hertz

Although the secret of wireless communication had not yet been solved, the triumph of science was rapidly drawing near, for a new era was to commence with the notable discoveries of Heinrich Hertz, of Munich. Hertz greatly advanced the science of electricity, taking up the subject at the point to which it had been advanced by Faraday and Clerk-Maxwell.

Hertz studied at Berlin, where in 1880 he became assistant to Helmholtz, a notable physicist. He was particularly attracted by Clerk-Maxwell's theory regarding light and electro-magnetic waves in the ether, and (in 1888) commenced to investigate the subject at the suggestion of Helmholtz. His object was to establish the existence of the waves by actual experiment, and at last, after considerable work and study, he succeeded in doing so.

In these experiments Hertz used an apparatus, called an "oscillator," consisting of two metal discs each mounted at the end of a rod. Metal knobs were



HERTZ

Heinrich Rudolph Hertz was born at Hamburg on 22nd February, 1857. He determined to enter the Engineering profession, but devoted his attention to Physical Science. He studied successively at Munich, Berlin, and Keil, where he commenced his investigations on Clerk-Maxwell's Electro-Magnetic theory. He died at Bonn on 1st January, 1894.



BRANLEY

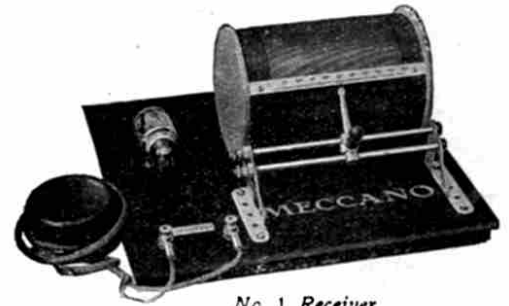
Edouard Branley was born at Amiens in 1846 and was educated at St. Quentin College and Henry IV. College, Paris. He is a Professor of Physics at the Catholic Institute, Paris, and a Member of the Institute of France. His discovery of the coherer in 1890 marked a distinct stepping-stone in the history of Radio.

Listen-in with a Meccano Receiver

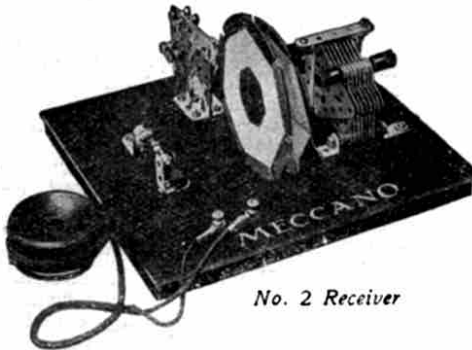
No. 1 Meccano Crystal Receiver

With a good aerial this set will receive telephony up to about 25 miles from a broadcasting station, and Morse signals up to, and exceeding, 100 miles. The set, which may be used with a broadcasting licence obtainable from any Post Office at a cost of 10/-, will receive on wave lengths from zero to approximately 1,000 metres.

R.S. 1—Receiving Set complete, tested and guaranteed, price 29/-
Compulsory Broadcasting Fee 1/-
Price 30/-



No. 1 Receiver



No. 2 Receiver

No. 2 Meccano Crystal Receiver

This set is of the constructional type and is specially adapted to the requirements of those who wish to carry out simple experiments. Its range is the same as that of No. 1 set described above, and it receives on wave lengths of approximately 300-500 metres. It may only be used with a constructor's licence, which costs 15/-, and is obtainable from any Post Office.

R.S. 2—Complete Set of Parts, in strong carton, including single telephone
2,000 ohms resistance, price 25/-
R.S. 2a—Complete Set of Parts, in strong carton, without telephone, price 15/-

MECCANO AERIAL OUTFIT

The Meccano Aerial Outfit contains everything for the erection of a regulation aerial with the exception of poles. The contents are as follows: Antenna 65 ft. 18 Gauge Bare Copper Wire. Lead-in (soldered to Antenna) 29 ft. 18 Gauge Bare Copper Wire coupled to 6 ft. of insulated 18 Gauge Bare Copper Wire. Earth Wire 30 ft. 18 Gauge Bare Copper Wire. Insulators (egg-shaped) 2. Pulleys (porcelain) 2. Price 12/6

MECCANO LIMITED

BINNS ROAD

LIVERPOOL



R. Griffiths (Doncaster).—The No. 2 Crystal Receiver is constructed of Meccano parts. These parts are particularly suitable for carrying out experiments.

C. Andrews (Maidenhead).—(1) As you are approximately 26 miles from London you should have no difficulty in receiving broadcast from 2 L.O. with a Meccano Crystal Receiver, provided your aerial is erected as high as possible and carefully insulated. (2) Although it is possible to use two crystals on a set it would not materially affect its power of reception, and I would advise you to use one crystal only. (3) Marconi House is the nearest broadcasting station to Maidenhead.

P. Scott (Stratford-on-Avon).—The Meccano Crystal Set No. 1 may be used with a broadcasting licence. The Meccano Crystal Set No. 2 may only be used with a constructor's licence (15/-). Either is obtainable from any Post Office.

J. E. Savidge (Southborough).—It is generally recognised that a Crystal Receiver is capable of receiving telephony up to a distance of 15-20 miles, but much depends upon local conditions, and sometimes this distance is increased to 25-35 miles.

R. S. Sanderson (Edinburgh).—The size of the former disc is 3 1/2" diameter. (2) 120 turns of 22 G. enamelled copper wire. (3) Yes, you may purchase the scale separately.

A. J. Riley (London, E. 11).—I trust that you have had satisfactory results from your set using the revised circuit I sent you. Your suggestion for a new Meccano part was duly passed to the Editor of the Bright Ideas column.

H. Critchley (Southport) and **R. Carman** (Chester).—(1) 28 turns of 23 G.S.S.C. wire. (2) 32 turns of 36 G.S.S.C. wire.

A. Illingworth (Bradford).—It will be impossible to receive telephone broadcast from Manchester with a Crystal Receiver, owing to the screening effect of the Pennine Range.

L. Hart (Liverpool).—It is immaterial if there are any joints in the wire of a tuning coil, providing they are soldered and insulated.

H. J. Bowers (Surbiton).—The Postmaster General limits the length of an aerial to 100 feet, including lead-in wire.

Rowland Hill (Kettering).—(1) The Meccano Receivers may be supplemented with a high frequency amplifying valve, which would increase the distance of reception. (2) I have never heard of steel plates being treated in the way you mention.

D. Parker (Newport).—An extra inductance disc may be added to the No. 2 Meccano Receiver by bolting an extra hinge on the fibre plate.

R. Kirkwood (Holt).—To carry out your suggested programme, you will require to obtain a 5-valve receiving set.



A specially-equipped radio station has been installed at the Vollet Observatory, on the peak of Mont Blanc. Climbing parties in the Alps are now warned to carry radio apparatus with them so that help may be called from the Observatory in case of emergency.

To a great extent this innovation eliminates the splendid rescue work hitherto carried out by the St. Bernard dogs of the Alpine Monasteries.

Beyond the cost of a licence, amounting to one dollar, radio amateurs in Canada have no restrictions whatever to contend with.

A man who has been deaf for thirty years has recently heard a wireless concert.

The desolate reef of Cabras Island, Porto Rico's leper colony, has been considerably brightened by the installation of a radio set. This enables the unfortunate exiles to enjoy concerts and orchestral recitals broadcast from New York and Chicago.

Whilst on a voyage to Australia, the Aberdeen liner "Thomistocles"—fitted with the latest Marconi Radio apparatus—was constantly in communication with land stations in Great Britain. During the voyage no less than 65,000 words of news were received.

The record for Canadian long-distance broadcasting is held by an enthusiast living in Darlington, England. On September 23rd, he heard a service broadcast from the Grace Presbyterian Church in Calgary, a distance of over 6,000 miles.

Recent changes in wave lengths have been announced by the British Broadcasting Company for the following stations:—Aberdeen, 495 metres; Bournemouth, 385 metres; London, 363 metres; Manchester, 370 metres. The wave lengths of other stations remain unchanged.

To decide whether it was possible for radio waves to penetrate thick walls an interesting experiment was carried out in America. Three Bank officials were locked inside the four-foot walls of a burglar-proof vault and clearly heard a radio concert broadcasted from New York, 60 miles distant. The aerial used was of the loop type, and, with the rest of the apparatus, was inside the vault.

King Christian has opened the new wireless telephone system between Copenhagen and the island of Bornholm, in the Baltic, a distance of about 100 miles. The wireless is linked up at each end with the ordinary telephone system, and the ceremony demonstrated the ease with which communication can be carried on.

The installation of a relay station on the outskirts of the city, enables owners of crystal sets in Sheffield to hear broadcast from Manchester, and other distant stations. A special land-line has been laid to the station from Manchester, so that the whole programme may be re-transmitted from the Sheffield station. To prevent any distortion of the sound, amplifiers are used at each end of the line and the signals are then sent out on a wave length of 350 metres. The relay station also transmits local talent once a week in response to repeated requests from listeners.

The Sheffield relay station is the first of eleven that are to be erected all over the country. The scheme includes stations for Plymouth, Liverpool, Leeds, Bristol, Hull, Bradford, Wokingham, Portsmouth, Stoke-on-Trent, Leicester and Edinburgh.

BELOW a RIVER on an EXPRESS ENGINE A Run Through the Severn Tunnel

By Master Harold Simpson

THE safety valve was lifting gently and the Westinghouse pump clicking softly, as I swung myself on to the footplate of the huge express engine. The driver, an old grizzled veteran of the iron road, welcomed me with a smile and a nod, and advised me to hold on to my hat when we started. Meanwhile



the stoker was scrambling, Tarzan fashion, over the wheel-guards towards the cab. He carried an oil-can in his hand and had been oiling a slide-valve.

Just then the signal fell with a crash, and the driver immediately crossed over to the other side of the cab and, leaning out, looked down the platform for the guard's "Right-away!" The slamming of doors denoted that all the passengers were aboard. The stoker scrambled in, the guard's whistle blew. Giving a warning blast on the whistle, the driver moved the regulator, and with a tightening of couplings, we were off on our long journey.



Chattering and lurching over the points and crossings we soon joined the main track, and with the engine purring contentedly we quickly left the smoky city behind us. With a glance at the steam-gauge, the driver "let her rip," as he laughingly described it. Signal-boxes, telegraph posts, bridges, deep and narrow cuttings, wayside stations—all flashed past so swiftly that I was bewildered. Not until we approached Severn Valley Junction did the driver check the pace.

Speeding again, we crashed over points, and past a long goods train, laden with red-stone and drawn by a fussy tank engine. Then we reached another clear stretch. A signalman waved his hand as we passed his box, shouting some unintelligible words. "Speed, speed" was our only cry, as we thundered over an iron bridge spanning a canal.



Suddenly the driver applied the steam brake and shouted to me to hold tight. Far off I could see what looked like a tiny dot upon the red cliff ahead.

"That's the Severn Tunnel," shouted the driver, above the noise and clatter. "it's over four miles long."



We were now tearing down the long incline at over sixty miles an hour. A prolonged shriek of the whistle, then daylight was gone! The darkness seemed full of flying shadows, and the driver and stoker looked like dim, shadowy outlines. Sparks rising in front of us from the now invisible funnel, flew backwards like fire-flies.

In the middle of the tunnel I noticed what seemed like a group of pin-points of light in the distance. These swiftly grew larger and larger, and I saw the blurred outline of another train approaching. It passed us as a long stream of light, which lit up our eager faces. The



roar and rattle it raised was deafening, yet shrill above it rose the scream of our whistle.

Once the stoker threw open the furnace door, and I was startled by the sudden, unexpected glare and heat. I had a view of the sooty and dripping walls of the tunnel above,



with the shadow of the stoker assuming gigantic proportions. The carriages behind looked an enormous size, as they rushed along under the rounded roof. Only for a second or two did the glimpse remain, however, and with the shutting of the furnace door we swept again into the darksome cavern. It seemed wonderful to think that on the broad river above there were huge ships steaming or lying at anchor.

We were ascending the upgrade now and ahead I saw a spot of light, which slowly took a rounded shape. Then came a sort of green faintness of light which increased in power, until at last we burst through again into the brilliant daylight. The engine, puffing like a worn-out beast, yet strong enough to haul the train for many miles more, went speeding on its way and seemed almost to rejoice at being in the bright sunshine once again.

Then came a sort of green faintness of light which increased in power, until at last we burst through again into the brilliant daylight. The engine, puffing like a worn-out beast, yet strong enough to haul the train for many miles more, went speeding on its way and seemed almost to rejoice at being in the bright sunshine once again.



Interesting Paragraphs

A tree-doctor in America is said to earn £200,000 a year by curing the various ills to which all trees are subject. When this man, whose name is John Davey, was 27 years of age, he went to America as a farm labourer and bought books on trees. Later he became a prosperous farmer, and wrote a book called "The Tree Doctor" which made him famous. He has now earned for himself the title of "The Father of Tree Surgery," and is the head of the Davey Institute.

The Big Wheel at Paris has now been dismantled, and all that remains of the massive structure are the two pylons which supported the 36-ton axle.

In a new twisting machine recently invented for the textile industry, the bobbins rotate simultaneously with the spools that receive the spun thread. This causes both ends to twist and gives great firmness and strength to the thread. It is claimed that the new machine twists seven times as fast as machines of the present type.

The contract for the construction of a new reservoir and dam for the Belfast Water Commissioners has been secured by a London firm, Messrs. S. Pearson & Sons Ltd., who estimate the work will cost £1,035,000. The reservoir will be built in the Mourne Mountains area, County Down, and will supply 10,000,000 gallons of water a day. Its construction is expected to take several years.

Our Special Xmas Number

A special double number, combining the December and January issues of the "M.M." will be ready on or before the 15th December. Price 2d. from any Meccano dealer or newsagent or bookstall. (3d. post free from this office).

Order your copy now, as only sufficient magazines will be printed to fill actual orders.

Meccano Magazine,
Binns Road, Liverpool.

Two New Books *by the Editor* of the *Meccano Magazine*

Engineering for Boys.

6/- net.

By ELLISON HAWKS, Editor of the *Meccano Magazine*.

This book has been specially written in response to the many appeals that Mr. Hawks receives every year from boys who are keen on engineering, asking him to tell them of a book that describes engineering subjects in which they are particularly interested. As Editor of the *Meccano Magazine* Mr. Hawks is in a position to speak with authority.

Nearly 400 pages are packed with just that kind of information that Meccano boys want, while there are over 100 pictures from unique photographs of marine engines, liners, warships, docks, lighthouses, locomotives, bridges, dams, canals, engineering shops and machinery, generating stations, etc., beautifully printed on plate paper, besides many text cuts.

Boys who wish to become engineers will be specially interested in the chapter "The Making of an Engineer," which will enable them to decide which branch of engineering they will take up.



The Romance and Reality of Radio. 3/6 net.

By ELLISON HAWKS, Editor of the *Meccano Magazine*.

This book is intended for those who wish to obtain, as briefly and as clearly as possible, a comprehensive knowledge of Radio.

It brings together, in one cover, a brief account of the History, Theory and Practice of the highly-important and rapidly-growing science of Radio, from the early experiments of Morse to the wonderful trans-oceanic Radio communication of to-day.

No mathematical symbols, forbidding-looking formulae, or other technicalities find place in the pages of this book, which will show the beginner that Radio is one of the most fascinating of sciences, and as a hobby, a pleasant and instructive pastime. Fully illustrated with plates and text cuts.

All About Our British Railways.

6/- net.

By G. GIBBARD JACKSON.

All boys of a mechanical turn of mind know the fascination of railways, and this book will satisfy their curiosity and scientific leanings. The author has had the help of the chief mechanical engineers and superintendents of the line of the great railway companies. Nearly 120 pictures from photographs on plate paper, together with numerous cuts, illustrate the interesting text.



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Geology. By A. R. DWERRYHOUSE, D.Sc.

How Animals Work.

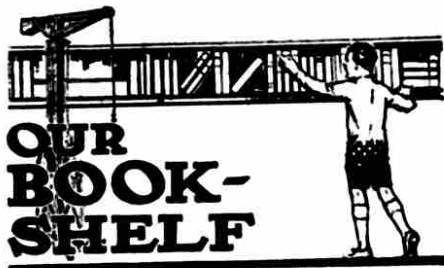
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Etc.

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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 last three months of the year are the best for book lovers, because there are then so many new books to read, and one is able to enjoy them in comfort at the fireside during the dark, cold nights.

Surely boys get the best books these days, because there are such wonderful stories written for their entertainment. Since such masters as R. L. Stevenson, Mark Twain, Rudyard Kipling, and J. M. Barrie established the fashion, our best writers have not disdained to set their hands and brains to the writing of boys' books, to the permanent eclipse, one hopes, of the futile "blood-and-thunder" and "penny-dreadful."

"Carpentry and Bench Work"

(Pub. by "B.O.P." Office. Price 1/6 net).

This is a wonderfully handy little book, belonging to the "How to Make" series. The 200 pages are packed with useful information on all kinds of wood-working. A very wide field is covered, dealing with the making of a simple tool box; a variety of book cases and picture-frames; rustic garden seats and arches, and fancy occasional tables; beehives; steam and water turbines, etc. Written in a simple manner, and clearly illustrated, this book also contains warning hints regarding many common errors. The articles on chip-carving and the making of one's own tools alone make the book worthy of a place on the practical boy's bookshelf. Any Meccano boy who is handy with his tools, and interested in model yachts and boats, is advised to add this volume to his bookshelf.

"The Romance and Reality of Radio"

by Ellison Hawks

(Pub. by T. C. & E. C. Jack. Price 3/6).

This book tells the story of wireless telegraphy and telephony in a clear and simple style that compels the interest of the reader. It is the only book published containing historical, theoretical, and practical information regarding Radio. Radio is not an easy subject, and we should be grateful to the author for explaining the principles of this new science in a manner which the non-technical mind can easily follow. In addition to describing the work of the pioneers—the "Men who gave us Radio"—their disappointments and their triumphs, the book also deals with the construction of receiving sets, types of aeriols, and other useful information. There are many plates and figures in the text to help to make everything plain. Altogether this is a well-written and well-illustrated book.

The Last Secrets

by John Buchan

(Pub. by Nelson. Price 5/- net).

It is the privilege of the reader of this thrilling book to accompany some of the world's bravest men on wonderful journeys of endurance and exploration. Among other adventures the author lays bare the mysteries of the impregnable fortress of Lhassa, that stronghold of worshippers of a strange religion. The Mountains of the Moon, situated in equatorial Africa yet covered in snow all the year round, are discovered and climbed. The holy Cities of Islam, the virgin forests of New Guinea, and the mighty splendour of Mount Everest deliver up their age-old secrets to the courageous explorer. Last but not least is the memorable dash across snow and ice to plant Peary's victorious standard at the North Pole, and the account of Scott's daring expedition, with references to Capt. Oates, "a very gallant gentleman."

Jack Without a Roof

by Major Charles Gibson

(Pub. by "B.O.P." Office. Price 4/6 net).

This is a tale of the French Revolution, and the author has well preserved the atmosphere and spirit of this period. A boy of three, the son of my Lord Marquis de Savenay, escapes one day from his nurse and is lost in the woods. He is found by a dwarf, who takes this "cub of an aristocrat" to his own home. Under his new name of Jacques Sansabri he is reared in squalor and misery until he is eighteen, when he takes part in the storming of the Bastille. Unknowingly he saves the life of his father, and the two come together later under tragic circumstances. The story of the reunion of father and son is vividly told.

The Empire Annual for Boys

(Pub. by "B.O.P." Office. Price 6/- net).

This volume, which makes a welcome reappearance, contains splendid school stories and tales of adventure in India, North America, Greenland, Central Africa and Mexico. It concludes with a diverting ghost story from New Zealand. Thirty stories in all by well-known writers. A handsome volume well illustrated.

A Scout of '45

by E. Charles Vivian

(Pub. by "B.O.P." Office. Price 3/6).

Amongst the many good books published this month I have read this one with interest. It is a tale of the Jacobite Rising in which Arthur Wyland, heir to Sonsett, leaves his guardian's roof and sets out to make his fortune. He encounters Gay Harry, a "knight of the road," and the two join in the pursuit and rescue of Mistress Dorothy Trafford, who has been carried off by the Jacobites and held as hostage for her father. It is a stirring tale of the road, of nightly encounters with desperate men and a final clash of arms on the bridge at dawn. Illustrations by Gordon Browne, R.I.

Model of Wireless Receiver.

(Pub. by Geo. Philip & Sons Ltd. Price 2/6).

This is an excellent cardboard model of a two-valve receiving set, which, by means of a very ingenious device, shows exactly how the valves function. Seven different positions are obtainable, and in each, the changes in the circuit are shown by recognised symbols which automatically become visible.

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.

- "ENGINEERING FOR BOYS"
by Ellison Hawks (T. C. & E. C. Jack), 6/-
- "TODDY SCORES AGAIN"
by Alfred Judd (Nelson), 5/-
- "BETWEEN TWO SCHOOLS"
by Harold Avery (Nelson), 5/-
- "JACK O' LANGSETT"
by R. A. H. Goodyear (Nelson), 5/-
- "MORE ABOUT P. J., THE SECRET SERVICE BOY" by Hamilton (Nelson), 5/-
- "THE BOY ELECTRICIAN"
by A. P. Morgan (Harrap & Co. Ltd.), 7/6
- "THE SCHOOLBOY'S ANNUAL"
("Boy's Own Paper" Publishers), 3/6 net.

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."

The Nelson Lists (issued by Messrs. T. Nelson & Sons Ltd., 35/8, Paternoster Row, E.C.), come to us with their dainty covers and capital illustrations of tempting books. It is much easier and more satisfactory to select from lists such as these, than to spend long hours in book-shops. Free on application.

The Peto-Scott Co. Ltd. (64, High Holborn, W.C. 1), send us a very complete list of Wireless Components. The wireless accessories supplied by this firm have a high reputation and their Unit System is reliable and efficient. The catalogue is exceptionally well illustrated and costs 3d.

The Games Dept. of Messrs. D. & W. Gibbs Ltd. ("Cold Cream Soap Works," London, E.1), add a joy to Christmas by publishing "Games for Children." If you are giving a party this book will help you wonderfully. The "Ivory Castles" books are good fairy stories. Each book costs 6d., but Messrs. Gibbs Ltd. will tell you how to get them free on receipt of a postcard.

From where do Dean & Son Ltd. (29, King St., W.C.2), get all their ideas for children's toy books? The "Youngster's Modeller" series of four books, are fine fun, and the new "Stencil Books" compel you to paint like a true artist. The Dean catalogue "What Every Youngster Wants" describes scores of dainty and pleasing painting and drawing books, plays for young actors, etc. Free on application.

From Lott's Bricks Ltd. (Watford, Herts.), we receive a list of their "Building Blocks" Outfits, 2/- to 35/-, and a further series containing Trees, Fences, Shrubs, Palings, etc. There are illustrations of villages, churches, skyscrapers, colleges, etc., which look astonishingly real. A well-designed building block system. Lists free on application.

A Talk About Aerials—(cont. from page 149)

No. 1 to obtain the very best results possible. Instead of taking the second end of the aerial directly to a room on the ground floor, he makes a bid for greater efficiency by fixing it to the gable-end of the roof. (Fig. 2).

A third boy has a flag-pole in the garden, but much nearer the house than the first boy's pole. Instead of using a single wire, therefore, he erects an aerial with a double antennæ, attaching the other end to a short pole, fixed to the chimney (Fig. 3).

Boy No. 4 has neither flag-pole nor tree, but he is able to obtain parents' and landlord's permission to fix two poles to the house chimneys, and with a span of 30 to 40 ft., finds his double aerial very efficient (Fig. 4).

We thus see that, in the first place, local conditions determine, to a large extent, the details of aerial erected.

NEXT MONTH.

"T" and "L" AERIALS. DIRECTIVE AERIALS. AERIALS WITHOUT POLES

To-day the world relies on Ingersolls for Time

In the Watch and Clock-making industry Ingersolls hold first place for accuracy, dependability and long faithful service.

Their reputation is world-wide. Whether you need an inexpensive sturdy watch for rough and tumble wear; a handsome jewelled model; or a reliable alarm clock; get an Ingersoll and you can depend upon it for years to come.



Yankee Improved Radiolite 17/6
Plain Dial 12/6
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INGERSOLL RADIOLITE SHOWS TIME DAY AND NIGHT

The Hands and Figures glow brightly in the dark, a valuable feature for almost everyone, and particularly for boys—in the dark room and under the pillow at night.

Look for the dealer who displays the sign:—

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REFUSE SUBSTITUTES.

Dealers who offer you a substitute have an ulterior motive for so doing. Insist on an Ingersoll and buy it at the sign of The Ingersoll Accredited Agent.

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The Hornby Tank Loco



We have pleasure in announcing that we have added a Heavy Tank Loco to the Hornby Clockwork Train system. A glance at the above illustration will show 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.

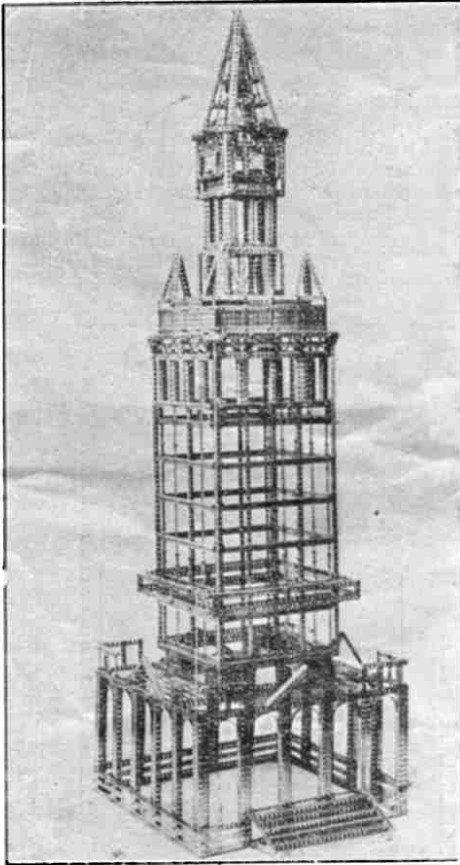
Beautifully finished in colours; lettered L.M.S. and L.N.E.R. Fitted with reversing gear, brake and governor.

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MECCANO LTD.,
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Government Sky-Scraper in Meccano

WHEN completed, the new Custom House at Boston, U.S.A., will be one of the finest buildings in Boston and will form an impressive landmark from the harbour. From a constructional point of view the building is interesting because it is being built on top of the existing Custom House!



The model illustrated is the new Custom House at Boston, U.S.A., described in the accompanying article.

The original building, which dates from 1847, was surrounded by tall granite columns and surmounted by a low dome. The interior is of beautiful design and contains marble columns, supposed to have been copies from the monument of Lysicrates at Athens.

Boston is an important port, and its traffic has increased considerably every year. In 1908 it became evident that it was impossible to carry out the increased work from so small a building, but as the Government refused to purchase land to accommodate a new building, matters were at a standstill. At last, however, it was suggested that a building of several stories built on the existing colonnade, would not only accommodate the increased staff but would also result in preserving the splendid architecture of the old building.

This idea was officially sanctioned, and it was decided that the new building should take the form of a tower, above the central part of the old Custom House. The tower is to be 504 ft. in height, 65 ft. in width and 70 ft. in breadth. In order to provide a firm foundation for the great weight, massive concrete caissons have been sunk a hundred feet below the street level.

One of the most prominent features of the building will be an immense clock with a 21 ft. dial and an 11½ ft. minute-hand. The clock-face will be of reinforced concrete, marble, and bronze. The numerals and minute-dots are to be formed by slits in the concrete, opening into a room lined with white-enamelled bricks. From this room light will be reflected through the openings.

In the building, now in the course of erection, there will be approximately three times as much office space as in the old Custom House, and the new building will be fireproof throughout and equipped with all the latest modern appliances.

It is not surprising to find that the new Custom House suggested itself as the



subject of a Meccano model to a smart American boy. We are able to illustrate his model, and a comparison of the two illustrations accompanying this article shows that the model is a very creditable reproduction of the original.

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The Secretary's Notes

From time to time I receive letters from Secretaries asking for advice in connection with the raising of Club funds. There is no better method

Club Funds

of raising funds than by organising Exhibitions and Concerts, which always prove a popular means of raising comparatively substantial amounts. In many cases Exhibitions and Concerts have been combined, and in this form also very successful appeals have been made. Exhibitions are best held towards the end of the Sessions, so that the members may work on their models for exhibition during the Session. Each member should undertake to provide at least one model for the Exhibition. Side shows may be organised and guessing competitions have proved both remunerative and interesting. For instance, a prize is offered for the best guess as to the number of parts employed in some particular model, or the number of Meccano nuts and bolts contained in a glass jug. With a little thought many other similar competitions may be arranged. It is customary for one or two prizes to be offered for the best model exhibited, and this leads to healthy rivalry and provides the members with some object for which to work. Parents and friends of members may be invited to these Exhibitions, being admitted at a moderate charge.

In addition to augmenting Club funds, functions of this nature arouse the interest of the general public in the work of the Club. When Concerts are given in conjunction with the Exhibition, it is best to run them under the supervision

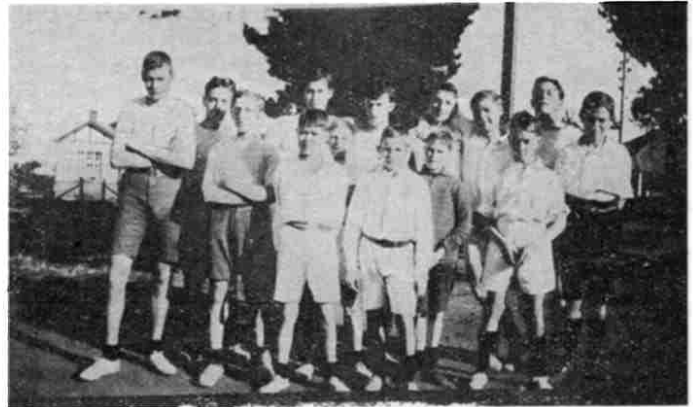
Successful Concerts

of the Club Leader, or one of his friends who is, perhaps, specially interested in such functions. Of course, where a Club runs a Concert Party or Minstrel Troupe in connection with the Club work, no difficulty is experienced in arranging a Concert at the shortest notice. In addition to raising funds for their own Club, many Clubs have loaned their exhibition models to bazaars, sales of work, etc., and Minstrel Troupes and Concert Parties have given entertainments in connection with local charities.

The Club Membership Cards for the Winter Sessions 1923-4 are now in my possession, and I shall be pleased to send

Meccano Guild Minstrels, Football and Cricket Teams have all been illustrated in these pages, and now I have pleasure in reproducing an interesting photograph of a pack of Meccano Harriers. These jolly-looking athletes are members of the Malvern (Johannesburg) Meccano Club, and a few weeks ago they held their first Annual Cross-Country Run.

Overseas Meccano Harriers



Competitors in the 9-Mile Run

Altogether there were 15 entries, and the first man got away exactly at 4 p.m., the remainder leaving at equal intervals up to 4.14. After a keenly-contested race Master H. Mumford began to draw ahead and finally arrived home first at 5.15. His time was 1 hour and 4 minutes with a start of 5 minutes. Master E. Sykes, who started from scratch, gained second place, with the excellent time of 1 hour and 2 minutes.

After the run the Club entertained to supper the members of the Jeppe Boys' Club, and finally a very successful meeting was closed by three hearty cheers for the Meccano Guild.

Club Membership Cards

copies to all Club Leaders who have not already had their regular supplies. The cards are tastefully printed in green, and include the rules of the Guild with space for the insertion of the programme of Club meetings for the two Winter Sessions. Each affiliated Club is provided with a card for every member of the Club.

I am pleased to notice the increased activities in connection with the Correspondence Club. Guild members have long felt that they belonged to a great brotherhood of boys, each having the same thoughts, sharing the same pleasures, and thrilled by the same ambitions. They often think of other Guild members in far corners of the earth, and wish that they might learn something of what they are doing in those far off countries. The Guild Correspondence Club makes this possible, and already many lasting friendships have been formed through its medium. Those members who are interested, and wish to take advantage of this opportunity of exchanging letters with other Guild members, should write to the Guild Secretary for further particulars.

I have several times had occasion to warn Guild members against begging letters received from abroad, and as the practice seems to be on the increase I am again mentioning the matter. The letters come principally from native boys on the West Coast of Africa who see the names and addresses of Meccano boys in the *Meccano Magazine*.

A Warning

either as prize-winners or in connection with the Guild. Sooner or later they ask for presents of fountain pens, silk handkerchiefs, etc., and offer to exchange native baskets and monkey-skins. I advise all Meccano boys to ignore communications of this type.

Meccano Club Leaders

No. 7. Mr. L. LEWIS



Mr. L. Lewis is the Leader of the "Dudley (Wolverhampton) M.C." This Club, inaugurated in October 1920, was affiliated with the Guild in February 1921, when Mr. Lewis accepted the Leadership. At present there are twenty-four members on the roll. The Club possesses a Wireless Outfit, and Mr. Lewis hopes to organise a Concert Party in connection with the Club next Winter. We have no doubt that, under his splendid leadership, this new departure will be a great success.