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MECCANO MAGAZINE

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No. 12

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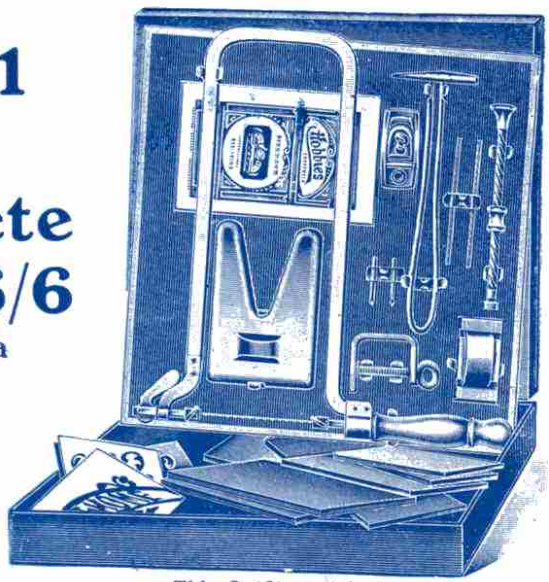

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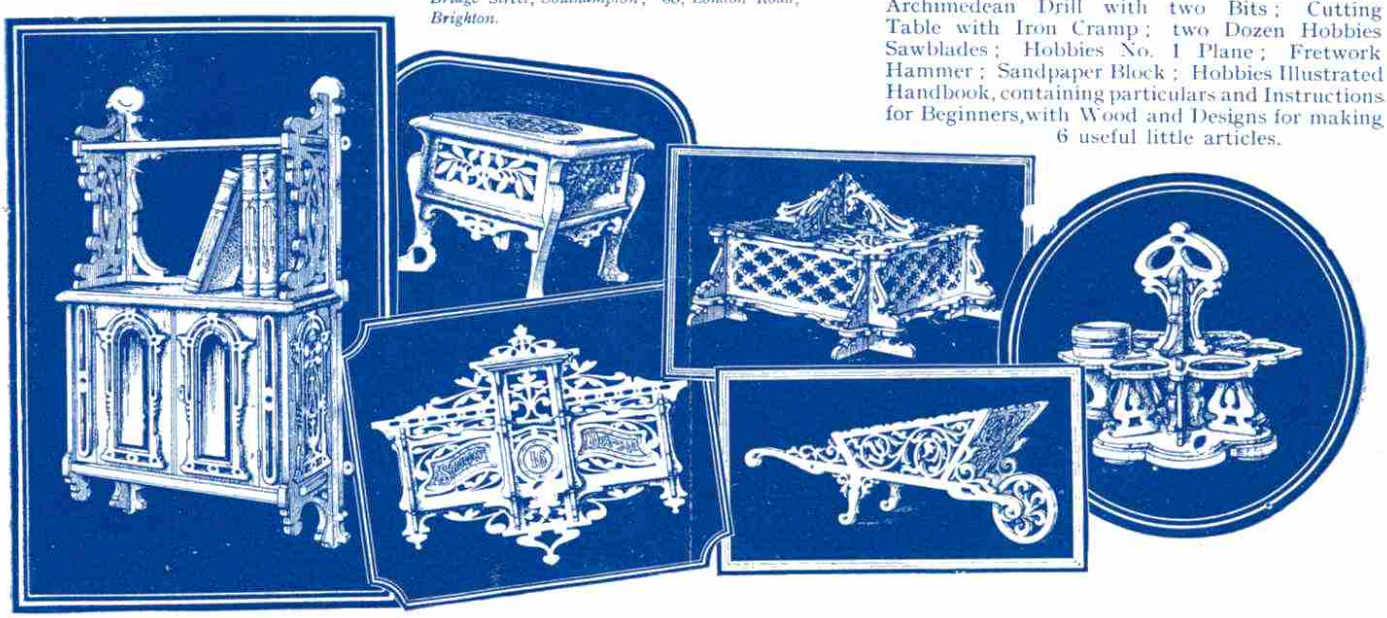

ORDER YOUR NEXT NUMBER OF THE "M.M." NOW! PUBLISHED 10th JANUARY. PRICE 2d

EDITORIAL OFFICE
Binns Road,
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MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

Keep the Money in Great Britain

Buy British Goods

IN a grave and earnest speech, one of our Cabinet Ministers recently stated that the only thing that matters in home politics at the present time is unemployment. No one who takes any interest in the conditions in his own town, or in the general conditions throughout the whole country, entertains any doubt whatever that this is a serious and deplorable truth. It is estimated that there are not less than 1,500,000 unemployed in Great Britain. Have you ever seen a crowd of 50,000 persons? Probably some of you have seen something approaching this number of spectators at a big football match. It is an awesome sight. Well! there are thirty crowds of this size walking the streets of the country with nothing to do and earning no money, because no employer is able to find work for them! The causes of this deplorable state of affairs are concerned with rates of exchange, diminution of exports, National Debt and an impoverished Europe.

Neither the causes nor the final remedies can be adequately dealt with in the pages of the "*Meccano Magazine.*" A question which, no doubt, every reader of the "*M.M.*" is asking himself, however, is "What can *I* do to help the situation?" The plain answer to this question is:—"*Buy British-made Goods!*"

No self-respecting person can do otherwise than buy British goods this Christmas. We have no word to say against foreign-made goods, but our nation is sick and we must apply a remedy. If you spend 20/- on a foreign-made present this Christmas, at least 10/- of that sum will go abroad to be paid to foreign work-people. If you spend the same sum on a British-made toy, the whole of the 20/- remains in this country. That is surely plain enough.

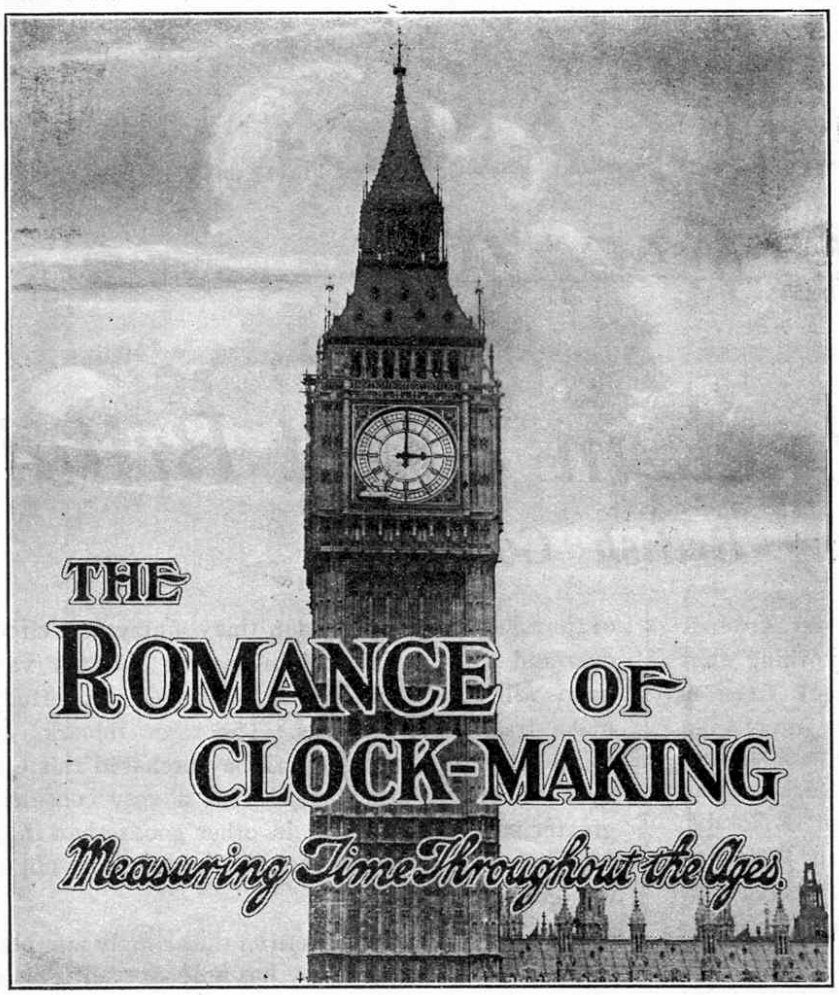
At least £500,000 will be spent on toys this Christmas in Great Britain, and if foreign-made toys are purchased we shall send out of the country £250,000 in good English money to assist other nations to get on their feet. If British-made toys are purchased the whole of the £500,000 will remain in this country, will circulate over and over again, and in passing through various hands will provide employment and help wonderfully to make trade better for us. The same remarks apply to all other presents that will be purchased this Christmas. The only difference is that a very considerably greater sum will be spent in other goods than in toys. It is up to us all to see that this money does not leave our country.

We have set out the situation thus simply and plainly, feeling that the British boy has only to realise the state of affairs to act definitely and as a patriot.

There need be no fear that in buying British-made goods there will be any sacrifice as regards quality, ingenuity or cleverness. Many British toys are better—most of them every whit as good—as the best foreign-made articles. We could name off-hand half-a-dozen British firms who produce toys that are better than anything ever imported from abroad. British toys are well-designed, well-constructed and they are good value.

One of the difficulties confronting purchasers is to know for certain what goods really are British. In this matter we can be of some assistance. Every toy advertised in this issue of the "*M.M.*" is made in this country and may be purchased with complete confidence. Every book and every other present advertised in our columns is the product of British labour. For quality and value they cannot be surpassed by any imported goods.

If you buy any of the splendid presents advertised in the "*M.M.*" you will be doing a wise thing, a patriotic thing, and, incidentally, a service to the "*M.M.*" If you purchase something else, then it is the patriotic thing to ask if it is British made. See that the money that you spend is retained in this country and devoted to softening the hard lot of the million and a half British citizens who are suffering through no fault of their own.



PART II.

OUR readers will remember that in the first instalment of this article, which appeared in our last issue, we dealt with the several ancient methods of measuring time. These included the sun-dial, water-clock and sand-glass. Another method of measuring time, before clocks were invented, was by means of long candles, which were made to burn for a certain number of hours.

These candle clocks were in use at the time of Alfred the Great, and whilst the King was a fugitive in his own country he vowed that if ever he were restored to his kingdom he would devote a third of his time to the service of God. Later, when he achieved his desire, he ordered a number of candles to be made so that he might divide his time in accordance with his vow. The candles burned for exactly four hours and were lighted one after another by one of Alfred's chaplains, who also gave the King due warning of the passing of the hours.

A New Type of Clock

Neither sun-dials, water-clocks, sand-glasses nor candles solved the problem of accurately measuring time. This did not become an accomplished fact until the invention of the weight-driven wheel clock. It is impossible to say exactly when this type of clock commenced to supersede the ancient time measures. Many vague allusions to wheel clocks occur at a very early period, but whether these were some form of water-clock or whether they were actually wheel and weight clocks seems doubtful. To a certain extent, wheel clocks were a development of water-clocks, in the later models of which a paddle-wheel took the place of the empty vessel and its floating figure. The water dropped on to the paddles of the wheel, driving it around; every time the wheel made a complete circuit a gong was struck.

It is believed that the Greeks introduced mechanical movements to take the place of the gong, and also that they connected the wheel with a series of cogs, moving an indicator on a dial. Later a falling weight took the place of the dripping water, and in this way the weight-driven clock came into existence. Some believe that credit for its invention is due to Archimedes, the famous mathematician, who lived in the third century B.C., but whether or not he really did invent the type we do not know.

The First Wheel Clocks

Although there is no record earlier than 1120 A.D. in which a weight-driven clock is definitely described, there seems to be little doubt that weight-clocks were used in the monasteries of Europe in the 11th century. Probably these clocks had no dial or hands, but only struck a bell at certain hours to call the monks to prayer. This was an improvement on the previous methods, however, for until then it was necessary for one of the monks to watch the stars in order to know when it was time to awaken his brethren for early morning prayers.

The wheel-clock was perfected by a German named Henry de Wyck. A rope with a weight attached was wound round a cylinder or barrel, which resembled the roller of a household mangle. As the weight dropped, the barrel revolved, moving the clock hand through a train of gear wheels.

In his early models, de Wyck found that as the weight dropped the speed at which the wheels revolved became faster and faster. When the end of the rope was reached the barrel revolved so rapidly that the hour hand was actually thrown off its spindle! De Wyck persevered in his experiments to overcome the difficulty, however, and did so by fitting a series of spikes to a small wheel, which then resembled a pawl and ratchet and checked the revolutions of the barrel. The King of France, Charles V., heard about de Wyck's wonderful clock, and asked for one to be made for his palace. Thus it was that the first mechanical clock to be made in France was made by a German citizen.

Discovery of the Pendulum

Shortly after De Wyck's success the whole principle of clock-making was revolutionised by the discovery of the pendulum by the famous Italian, Galileo Galilei, then a youth of 18 years of age. One day in the Cathedral at Pisa, he noticed the regular movements of a hanging lamp that had been set moving when being lighted. No doubt many people had seen a lamp swinging to and fro before, but had thought no more about it. Galileo was struck by the fact that the motion of the lamp never seemed to vary, however, and he decided to test its accuracy. Watches were unknown then, so holding his pulse and feeling his own heart-beats, he counted the time required for one swing of the lamp. To his amazement he found that the lamp required always the same amount of time to complete one swing, although the swings were becoming gradually of less extent each moment. Again and again he repeated the experiment, and each time the result was the same.

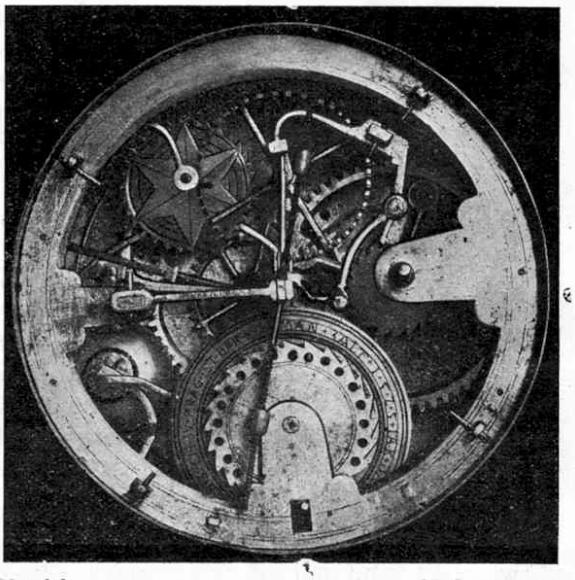


Photo by [R. S. Antiquities

The First Portable Clock made by Zech

Convinced of the value of his discovery, Galileo soon completed a model of the lamp by fixing a weight to the end of a long bar of metal, and it was not long before he had adapted this pendulum to work an astronomical clock.

Solving a Mystery

Once the principle had been established, pendulum clocks became common, and at last the world had a fairly accurate means of measuring time. The next step was to improve the clocks so that they were even more accurate.

In this connection there was one particular trouble to be overcome, which was to understand why the clocks always went faster in winter than in summer. In those days very little was known about the various properties and peculiarities of metal, and it was a long time before the mystery was solved. Popular opinion had it that in some unknown manner the sun affected the clocks in the summer. In the main this idea was quite correct, of course, for the difference in the clock's speed was actually due to the expansion or contraction of the metal of which it was constructed. In the hot days of summer the metal expanded, the pendulum-rod became longer, and the pendulum required longer to make its beat. In the winter the reverse was the case, and then the clocks always ran a little fast.

When more knowledge was obtained about metals, and when their different rates of expansion and contraction were discovered, the mystery was solved.

An Ingenious Device

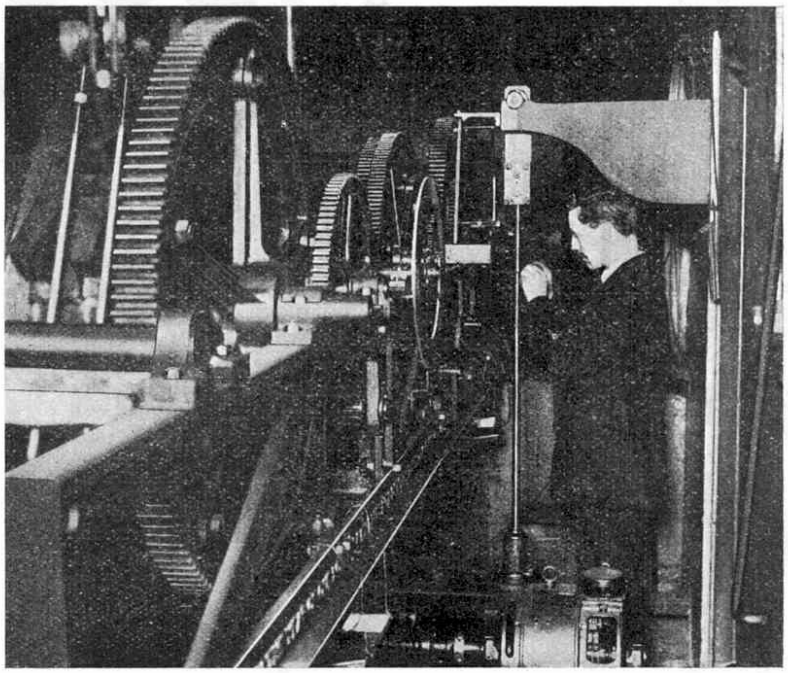
The difficulty was overcome in a very ingenious manner. The heavy metal weight of the pendulum was replaced with a vessel filled with mercury. Although the pendulum-rod continued to expand and lengthen during the summer, the mercury in the jar also expanded, rising higher in its containing vessel. This rising of the mercury had exactly the same effect as raising the weight further up the pendulum rod, a procedure that—as everyone knows—causes the pendulum to beat more quickly. The mercury therefore automatically compensated for the alteration in the length of the pendulum-rod, and the clock was able to keep perfect time without attention at any season of the year.

So accurate is this method of compensation by mercury that it is still used at the present time in astronomical clocks. It may also be sometimes seen in the clocks that register Greenwich time at large watch-makers and jewellers' shops. By the invention of the mercury compensating device, pendulum clocks were more or less perfected, though several minor improvements were afterwards made in the gearing and the method of indicating the hour.

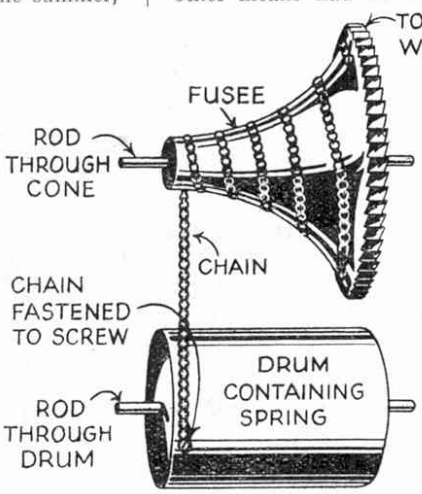
Portable Clocks

The first pendulum clocks were of the "grandfather" type. It is interesting to know that the Meccano Clock and other present-day clocks are constructed on exactly the same principle as the early clocks. After "grandfather" clocks had been in use for some time, clockmakers turned their attention to the construction of smaller clocks. These were called "portable clocks," and it is from them that our watches originated.

As it is obviously impossible to use a pendulum in a small portable clock, some other means had to be used for driving the mechanism.



"How it works." Adjusting the mechanism of "Big Ben," one of the most famous clocks in the world



The Fusee, the wonderful device that overcame a difficulty in clock and watch mechanism

About 1500 Peter Hele of Nuremberg found that a coiled spring might be used instead of a weight, for both store up energy of a similar nature.

Trouble was soon met with, however, for it was found that as the spring unwound itself and lost its tension, the speed of the wheels became slower and slower, and the clock would not keep accurate time. It was apparent that to overcome this difficulty the mechanism must be made easier to drive when the action of the spring became weaker.

A Wonderful Invention

Here was a problem, indeed! Watchmakers were not dismayed, however, and in 1525 Jacob Zech, of Prague, brought forward a solution. In his device the mainspring was contained in a drum, which revolved as the spring uncoiled. To the drum was attached one end of a tiny chain, or a string of cat-gut, which was wound on to a kind of conical roller called the "fusee." When the spring was fully wound, the chain lay at the small end of the fusee, where it had very little leverage on the clock mechanism. As the mainspring unwound, and its force became less, the chain came off a larger radius of the fusee, and thus a greater leverage was obtained by the spring, accurately compensating for the loss of energy due to its uncoiling.

There must have been hundreds of disappointments before the difficulty was solved, and although many years of patient study and careful work must have been expended over this problem, we are able to dismiss it in a few lines of print! Yet we may profitably pause to admire the ingenuity of the device, which made portable clocks and watches practicable, for in millions of watches made every year, the barrel and fusee are incorporated.

The Compensating Balance

In the earliest watches a small wheel was used in place of a pendulum. Its regular motion allows the mainspring to unwind a little at equal intervals in exactly the same manner as the pendulum allows the weight to fall a little at each swing in the heavier types of clocks. The difficulties of differences in temperature were overcome by Thomas Earnshaw, who invented the compensating balance. This uses the unequal expansion of different metals in an ingenious manner so as to keep the leverage of the rim of the wheel constant.

Zech's first clock is now in the possession of the Society of Antiquaries of England. It is inscribed in Bohemian "Made in Prague by Jacob Zech in 1525," has a spring as motive power with barrel and fusee, and is the oldest portable clock in existence.

Clocks and clock-making is indeed a romantic subject, and one that provides a very profitable field for ingenuity and inventiveness. Unfortunately, considerations of space forbid our describing any of the many famous clocks in this issue, but I hope in one of our future issues to briefly describe Big Ben and one or two other famous clocks.

(THE END).

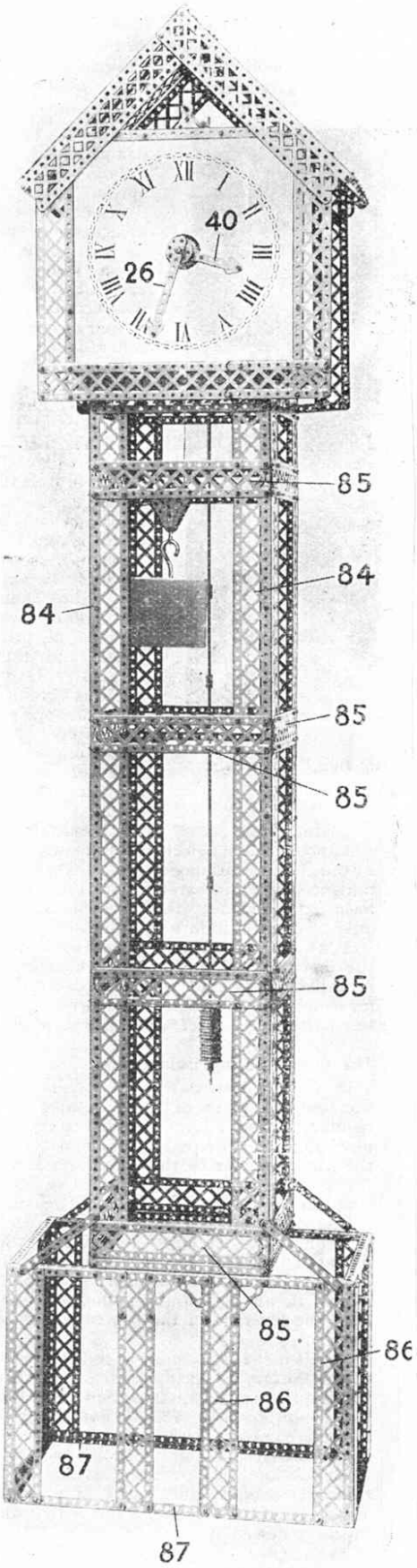


Fig. G. The Meccano Clock

Full Instructions for Building the

MECCANO CLOCK

PART II.

IN the first instalment of this article, which appeared in our November issue, instructions were given for the assembly of the Frame, Main Gear-Train, etc. The following details complete the instructions for building this remarkable model, which stands well over 6 ft. in height and keeps perfect time.

The Meccano clock is a triumph of model building, and with the exception of the 17 lb. weight, the wire by which it hangs (60 Fig. M), the cardboard face, and the light spring (80 Fig. B), it is made entirely from Meccano.

Non-Slipping Device

Having assembled the Ratchet-Winding Mechanism and the element shown in Fig. F*, a 57-toothed gear wheel (57 Fig. M) is passed over the rod and bolted thereon, and a collar (58) is bolted outside the gear wheel (57). In order that the gear wheel (57) may not slip on the rod (43) when taking the whole of the strain in winding the heavy clock weight, a flat (59 Fig. E*) is filed on the rod in the correct position for being engaged by the screw of the gear wheel (57). This gives the wheel a secure grip on the rod.

Winding the Clock

A stranded wire cord (60) is wound on the wood roller (44) and passes round a pulley (61) in the pulley block (62). This is made up of two 2½″ triangular plates bolted together with double brackets, and carries the 1½″ pulley wheel (61). The other end of the cord (60) is hooked (at 64) over the rod (63).

After the wood roller (44) has been inserted in place, another collar (66) is secured on the extreme end of rod (43). The clock is wound by a crank handle (65) provided with a ½″ pinion (not visible in the photograph), which engages the gear wheel (57). The roller (44) drives the main gear train, by reason of its gear wheel (51) engaging the first gear (15) of the train.

The Escapement Wheel and Pallet

Next, proceed to construct the escapement, which consists of an escapement wheel and a pallet mechanism. The former (Fig. H) consists of a face plate (66a) to which are attached eight reversed angle brackets (67). In order that these shall not move, they are pressed hard against the circular edge of the plate, and then bolted in position with washers (68) beneath the bolt-heads.

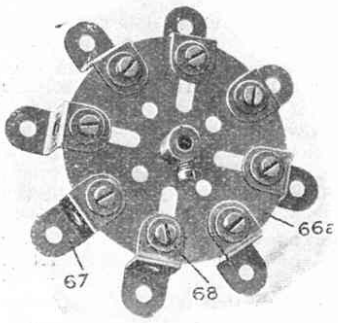


Fig. H. Escapement Wheel

The pallet mechanism (Fig. J) consists of two 2½″ reversed curved strips (69) with the web of a crank (70) bolted between. Angle brackets (71) are bolted in the end holes of the curved strips which form the pallets. The crank (70) is bolted on a 6″ rod (72, see Fig. B*) and a 5″ rod (74) is secured to a coupling (73) on the end of the rod (72). At the lower end of this is a coupling (75) carrying two 2″ rods (76) which engage on each side of a bush (77) on the pendulum rod (78).

The Pendulum

As shown in Fig. K, the pendulum consists of four 11½″ (78, 78a, 78c, and 78d) and a 5″ rod (78b) connected by couplings. As also shown in Fig. K, the pendulum is connected to the lower end of the 11½″ rod (78) (see Fig. B).

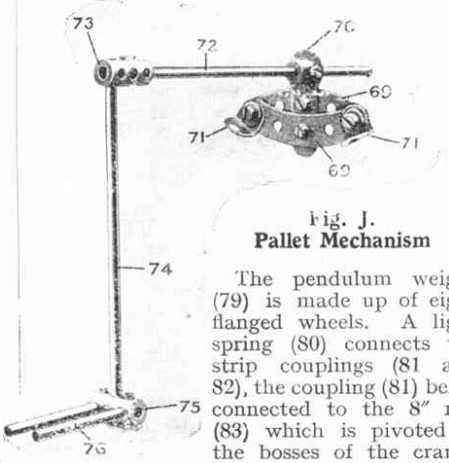


Fig. J.
Pallet Mechanism

The pendulum weight (79) is made up of eight flanged wheels. A light spring (80) connects the strip couplings (81 and 82), the coupling (81) being connected to the 8″ rod (83) which is pivoted in the bosses of the cranks (7). The spring (80) is

* Illustrated last month.

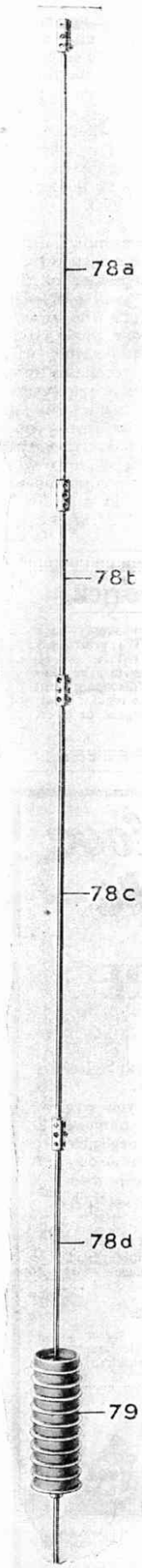


Fig. K. Pendulum

necessary in order to provide for an easy escapement movement of the pendulum.

Constructing the Main Frame

The main frame may now be built. This consists of two 24½″ angle girders at each vertical corner, overlapped three holes. To these are secured 12½″ braced girders (84) connected by 9½″ horizontal braced girders (85). The base consists of 12½″ vertical braced girders (86) and horizontal 18½″ angle girders (87), at the front and back.

The construction of the head of the clock will be clearly seen from Fig. L. It is built up of 12½″ angle girders (88) front and back, while 9½″ angle girders (89) connect the front and back girders. The feet of the vertical angle girders (Fig. A*) of the works casing are bolted by the bolts (91) to the 12½″ angle girders (90). These rest on the top of the side angle girders of the main frame (Fig. A*).

The dial should be attached and then the works casing placed in position from the rear. The hour and minute hands are then secured in place at the front of the dial and the model is complete.

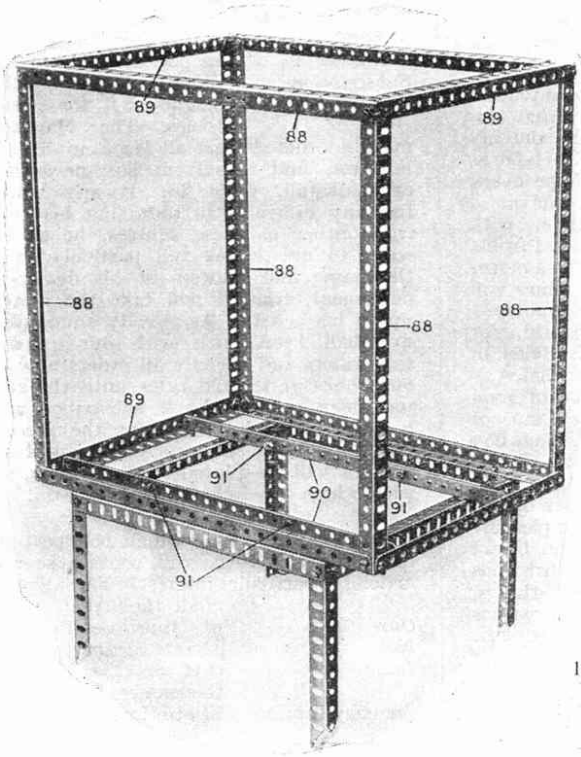


Fig. L. Clock Head

The Complete Instructions

The Meccano clock is a very interesting model to build and one that will always command admiration. During the past twelve months a large number of these clocks have been constructed in the Meccano model-building department 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 our readers will set to work and build this instructive model right away.

Complete instructions are being prepared in the form of a beautifully-printed and fully-illustrated leaflet, full particulars of which will be announced in the "*M.M.*" when ready. In the meantime if any readers wish a copy of this leaflet to be sent them, they should send their names and addresses, together with 4d. in stamps. Their names will be placed on a waiting list, and they will receive copies of the leaflet immediately it is ready, which we anticipate will be in about two months' time.

THE END.

* Illustrated last month.

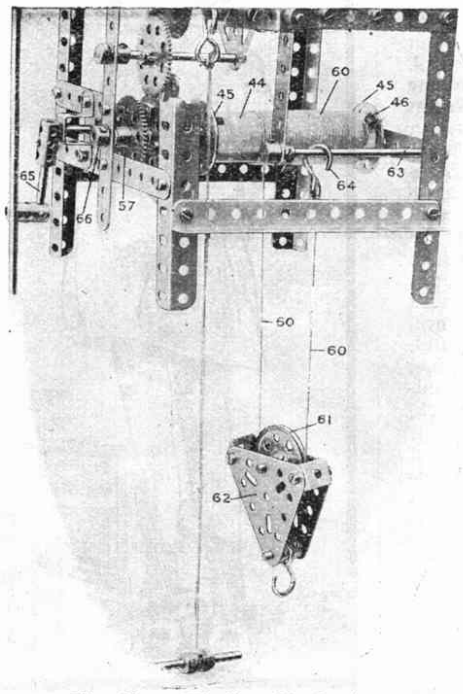


Fig. M. Winding Mechanism

Parts required for Clockwork Movement

1 Perf. Strip, 12½″
14 ,, ,, 5½″
1 ,, ,, 4½″
2 ,, ,, 3″
1 ,, ,, 2½″
1 ,, ,, 2″
2 ,, ,, 1½″
4 Angle Girders, 12½″
6 ,, ,, 5½″
3 Double Brackets
2 Angle ,,
4 Axle Rods, 11½″
1 ,, ,, 8″
2 ,, ,, 6″
3 ,, ,, 4½″
9 ,, ,, 3½″
1 ,, ,, 3″
1 ,, ,, 2½″
8 ,, ,, 2″
2 ,, ,, 1½″
2 ,, ,, 1″
10 Flanged Wheels
1 Pulley Wheel, 1½″
3 Bush Wheels
5 Pinion Wheels, ¾″
6 ,, ,, ½″
8 Gear Wheels, 57 Teeth
5 ,, ,, 50 ,,
1 ,, ,, 38 ,,
1 Pawl
106 Nuts and Bolts
20 Washers
1 Spring
2 Double Bent Strips
3 Hooks
35 Collars
6 Double Angle Strips 5½″ × ½″
4 Cranks
9 Couplings
2 Strip Couplings
3 Flat Plates, 5½″ × 2½″
2 ,, ,, 2½″ × 2½″
2 Triangular Plates, 2½″
2 ,, ,, 1″
2 Curved Strips, 2½″
10″ Sprocket Chain
2 Sprocket Wheels, 1½″
1 Wood Roller
1 Face Plate
2 Bolts, ¾″
9 Reversed Angle Brackets, ½″ × ½″
2 Trunnions
1 Flat Trunnion
1 Boss Bell Crank
10 ft. Flexible Steel Wire
1 Face

Parts required for Clock Case and Frame

51 Braced Girders, 12½″
24 ,, ,, 9½″
8 ,, ,, 3½″
8 Angle Girders, 24½″
4 ,, ,, 18½″
14 ,, ,, 12½″
14 ,, ,, 9½″
4 Perforated Strips, 5½″
2 ,, ,, 3½″
4 Architraves
329 Nuts and Bolts
8 Washers
10 Angle Brackets
1 17lb. Weight

A VERY merry Christmas to all readers of the "*M.M.!*" I feel that this must be my first thought and my first words in this special Christmas number. I hope every reader will have a real jolly time, with plenty of fun and frolic. I shall think of you all on Christmas morning, and shall imagine the good times you are having in all parts of the country—indeed, in all parts of the world, for Christmas is one of the few festivals in which the world partakes as a whole.

Good Wishes

Christmas is not only a season of good times, but it makes tens of thousands of new friends for Meccano boys. Each boy who receives a Meccano Outfit as a Christmas present, joins our great brotherhood of boys; each becomes a member of our world-wide movement. What vast pleasure is in store for these new Meccano boys! What jolly times ahead! And on Christmas Day we shall all think of these things, and wish we might have a great Christmas gathering of all Meccano boys, with Mr. Hornby as Chairman, supported by the Guild Secretary and myself. Such a gathering is impossible, of course. We could not find any building in the world large enough to hold us all! Instead we must content ourselves with knowing that every Meccano boy this Christmas is, in thought, broadcasting to every other Meccano boy a message of good-will and friendship.

I hope you all like the special Christmas cover in which this number of the "*M.M.*" comes to you. The idea, which the artist has so beautifully carried out, occurred to me one day a few weeks ago when passing through our Shipping Department here in Liverpool. All around me were hundreds of packing cases of Meccano and Hornby Trains labelled and addressed, waiting for our motor lorries to take them to the docks for shipment to their destinations. Consignments of goods were being despatched to all parts of the world, and I felt so certain that readers of the "*M.M.*" would be interested to hear of the countries to which Meccano was being sent, that I made a list of the destinations on the crates I saw around me. Here it is:—France, Chili, India, Norway, Italy, Holland, U.S.A., Spain, East Africa, Argentine, New Zealand, Australia, Switzerland, Demerara, Bolivia, Smyrna, Denmark, Sweden, Canada, Belgium, Asia Minor, Morocco, Malta, Egypt, South Africa, China, Japan. Even this list of countries does not exhaust the countries in which Meccano is sold, of course, and it is a wonderful tribute to Meccano to find that boys all over the world want it. Some day I hope to tell in greater detail of the manner in which Meccano is shipped. How we have to look well ahead and in some cases ship orders for Christmas goods even during the Summer months, in order that they may reach their far-off destinations in time for the festive season! These and many other facts in connection with this important Department of our factory, will make interesting reading some day.

Sending Meccano World-wide

As mentioned in our last issue, in view of the increased size of the "*M.M.*," the price will be 2d. in future. Subscription rates for Magazines mailed direct from this office will be 1/6 for six and 3/- for twelve issues. The Magazine may be ordered from all Meccano dealers, however, and also from any newsagent or bookstall, price 2d. If any reader has any difficulty in obtaining his copy from either of these sources, he should write to me, giving full particulars and the name and address of his dealer or newsagent, when I will take the matter up on his behalf. As already announced, we shall keep faith with our existing subscribers and execute all orders now on our books at the old rates until the subscriptions expire. Each subscriber will, however, be debited 3d. for the present Christmas number, including postage. A note will be placed in each magazine with which any subscription runs out.

Increased Subscription Rates

Our January issue, which will be published on the 10th, will contain several articles of particular interest. These will include the first of a series of four dealing with Giant Steam Shovels that do the work of thousands of men. The January number will also include the first instalment of "*A Remarkable Engineering Feat*," Puzzles, Competitions, and many other good things. We print only sufficient magazines to fill the orders on our books, and for the last three months there have been many disappointments, owing to our being "sold out." If you have not already done so, place a regular order for the "*M.M.*" to-day, either with this office, or from your Meccano dealer or local newsagent.

Our Next Issue

Many outside firms are now using the pages of the "*M.M.*" for their advertising. I hope that every reader of the "*M.M.*" will patronise those firms who advertise in our pages, and whenever possible will make his purchases from them. When ordering goods or requesting catalogues it will help considerably if readers will mention to the firms concerned that they saw their advertisement in the *Meccano Magazine*. That will encourage our advertisers to continue to use our pages, and this in turn will enable me to enlarge the "*M.M.*" even further.

Support our Advertisers

IMPORTANT NOTICE

We are constantly asked to supply back numbers of the "*M.M.*" We print only sufficient copies to fill our regular orders, and back numbers cannot therefore be supplied. In order to prevent disappointment our readers are advised to place a regular order, with a Meccano dealer, a newsagent, or direct with us.

Educate the Kiddies to love good Furniture—

Period

DOLL FURNITURE

Scale Model

British made

to an exact scale in modern or Old English Styles, and faithfully representing the real article.

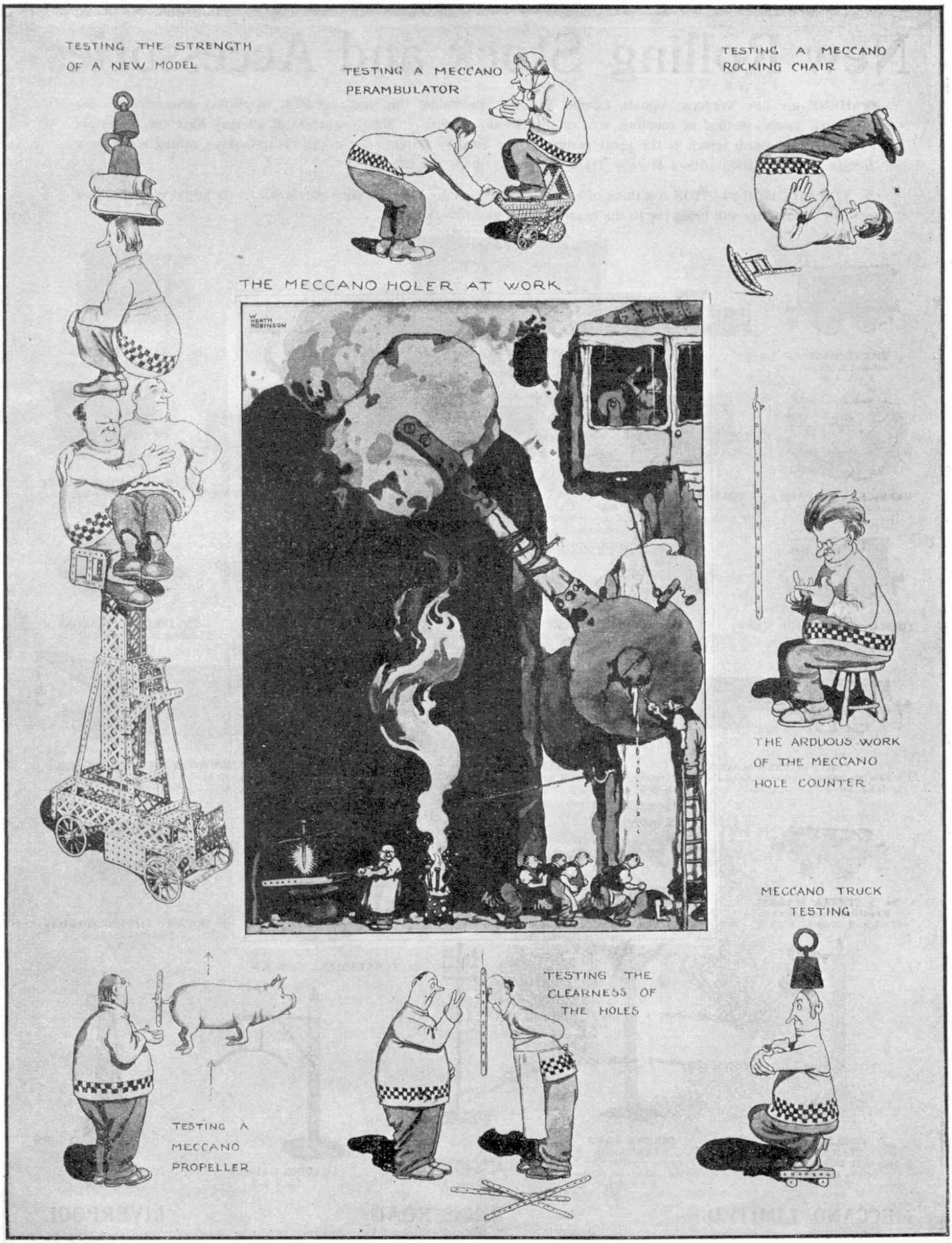
What better Christmas Presents could you give them than sets of this beautifully-made furniture for the Doll's House? The expense is negligible when you consider the hours of innocent amusement it will give them—and it will keep them out of mischief, too! Each Set packed carefully in a strong box 11 in. × 11 in. × 2½ in.

9/6 per set. There are four different sets.

If unobtainable locally, furniture will be sent direct, and necessary arrangements made with nearest dealer.

LINES BROS. LTD.,
9, FORE STREET, LONDON, E.C.2.

FREE A descriptive folder giving fuller particulars, and which will amuse the children, will be sent on application.



Mr. Heath Robinson's idea of how Meccano is made and tested.

New Rolling Stock and Accessories

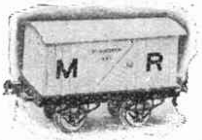
THERE are new Wagons, Signals, Lamps, Stations, Turntables this year, all built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains. Most important of all they have the uniformly beautiful finish which is the great feature of the Hornby system. To use cheap-looking 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.

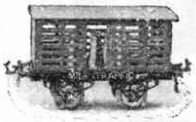
BRAKE VANS
Finished in colour.
Each **4/6**

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

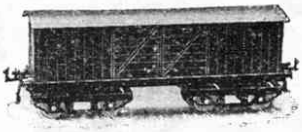
No. 1 LUGGAGE VANS
Letter M.R. Representative colours.
Each **4/6**



REFRIGERATOR VANS
Enamelled in white, lettered black. Each **4/6**

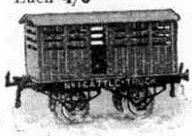


MILK TRAFFIC VANS
Fitted with sliding door, complete with milk cans. Each **5/-**

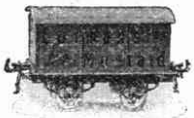


No. 2 LUGGAGE VANS
Finished in colour. Fitted with double doors. Suitable for 2 ft. radius rails only. Each **7/-**

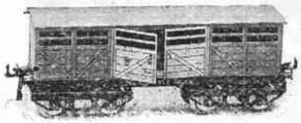
GUNPOWDER VANS
Finished in red.
Each **4/6**



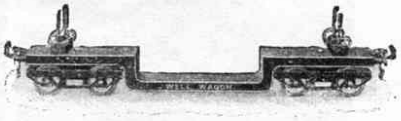
No. 1 CATTLE TRUCKS
Fitted with sliding door, Very realistic design.
Each **4/6**



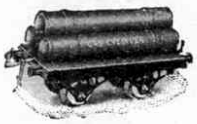
COLMAN'S MUSTARD VANS
Finished in colour.
Each **4/6**



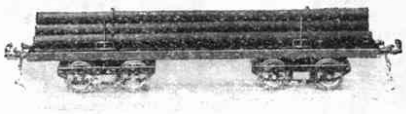
No. 2 CATTLE TRUCKS
Splendid models, fitted with double doors. Suitable for 2 ft. radius rails only. Each **7/-**



TROLLEY WAGONS. Finished in colour. Suitable for 2 ft. radius rails only. Each **6/6**

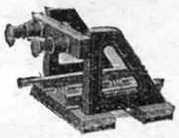


GAS CYLINDER WAGONS
Finished in red, lettered gold.
Each **4/-**

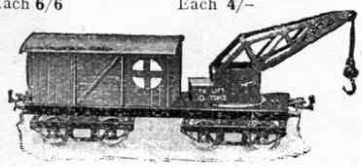


No. 2 LUMBER WAGONS
Fitted with bolsters and stanchions for log transport. Suitable for 2 ft. radius rails only. Each **5/6**

No. 1 LUMBER WAGONS
Fitted with bolsters and stanchions for log transport. Each **2/6**



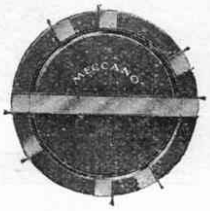
SPRING BUFFER STOPS. Each **2/-**



BREAKDOWN VANS AND CRANES
Excellent finish. Beautifully coloured.
Suitable for 2 ft. radius rails only. Each **7/-**

No. 1 TIMBER WAGONS
Beautifully enamelled in colour and stoved. Each **2/-**

No. 2 TIMBER WAGONS
Beautifully enamelled in colour and stoved. Suitable for 2 ft. radius rails only. Each **5/6**



TURNTABLES. Each **4/6**

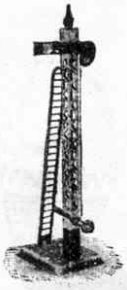
ROTARY TIPPING WAGONS
Finished in colour.
Each **3/6**

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

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

TELEGRAPH POLES
Each **3/-**

LOADING GAUGES
Each **1/9**



SIGNALS
Each **2/6**

MECCANO LIMITED BINNS ROAD LIVERPOOL

Into the Land of Fun

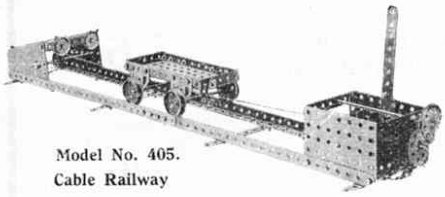
by

"SPANNER."

THERE are over a million boys to-day who regard Meccano as being the most fascinating hobby in the world. During my travels I have met many thousands of these boys, and I have been compelled to notice how full of enthusiasm and praise they are for everything that comes from Meccanotown.

Often during these dark December nights as I sit by the fire I like to think of these boys in all parts of the country. I think of them bringing out their well-worn boxes of Meccano and having real jolly evenings with their Outfits. They don't care whether it is raining or snowing, for their minds are away in the wonderful realms of engineering, planning wonderful structures or intricate mechanisms of iron and steel.

The boys I know never seem to come to the end of their Meccano fun, for somehow or other, no matter how many models they build, there always seem to be others ahead. One of them told me the other day that he thinks there are enough models illustrated in the Meccano Manuals to keep any boy busy for a couple of years! I quite agreed with him, but even when all these models have been constructed there are hundreds more to be thought out. Then, too, there are numbers of fascinating experiments to be made, improvements in existing models to be effected, or new ideas to be tried out.

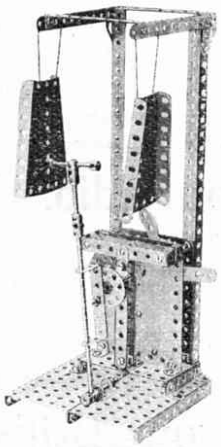


Model No. 405.
Cable Railway

I do not believe that there are many boys who build the same models more than once, because they always wish to "go one better," and having built a model they pass on to more complicated models. And when the models within the range of their Outfit have all been built it is a simple matter to add an Accessory Outfit, and the building power of the Outfit becomes enormously increased at once.

Some years ago I used a No. 4 Outfit and I have many pleasant memories of the good times I had with this Outfit. Though I used it every day, I never seemed to come to the end of the different models I could build with it. Looking through the pages of the new Complete Manual, I feel that I should have had even more enjoyable times if that Manual had been published then! In its pages all manner of new mechanical devices are shown, and the models have been so improved that some of them are quite unlike their predecessors in the former manuals, although bearing the same names.

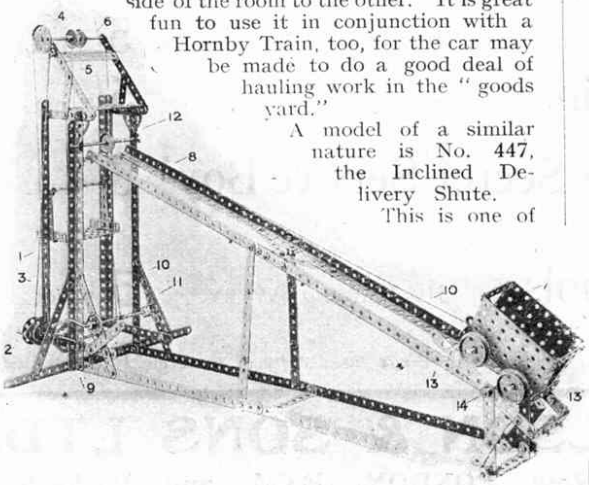
I like those models that continue to amuse after they have been built—the working models, I mean.



Model No. 413.
Automatic Gong

One, which a No. 4 Outfit builds, is No. 405, the Cable Railway, with which I have amused myself for hours on end. Unfortunately it is not possible to do justice to this model in a small illustration, but you may take it from me it is one of the most entertaining models in the book. Only one section of rails is shown in the illustration, but these may be extended to any length desired. The model may be worked by a Meccano electric or clockwork motor, through a belt, which is passed around the $1\frac{1}{2}''$ pulley. This drives through a clutch mechanism and pinion and gear wheels to the lower spindle on which the driving pulley is fixed. The driving cord passes over this pulley and over the second pulley at the other end of the railway, as shown in the illustration. A point to be remembered is that in fixing the lever for operating the clutch mechanism, the nuts should be locked to prevent the screw from working out. Hours of fun may be spent with this model, hauling goods from one side of the room to the other. It is great fun to use it in conjunction with a Hornby Train, too, for the car may be made to do a good deal of hauling work in the "goods yard."

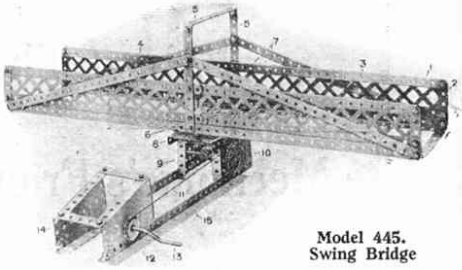
A model of a similar nature is No. 447, the Inclined Delivery Shute. This is one of the many models that have been greatly improved in the new Manual. The model works by gravity, the wagon running on an inclined plane. A hand wheel (on the left of the illustration) raises the cage and a crank handle enables the wagon to be drawn up the incline. When the truck reaches the top, the load is transferred from the cage to the truck, which then runs down the incline, its speed being controlled by a hand brake. When the end of the rails is reached the truck runs on to two pivoted $5\frac{1}{2}''$ strips, which are depressed by the weight and the truck thus automatically tips its load.



Model No. 447.
Inclined Delivery Shute

Model 413, Automatic Gong, will be useful for calling the family to Christmas dinner and other meals. It makes quite a respectable noise and may be operated by a string attached to the clockwork starting lever.

Bridges are always interesting to all Meccano builders, and Model No. 445, Swing Bridge, illustrated here, is a very clever example and one that won a prize in one of the recent competitions. This type of bridge is to be seen all over the country and is particularly common in Holland, where it is usually placed over the canals. When barges or ships wish to pass, the bridge is swung round on to the land, leaving the canal clear. The sides of this model are made of braced girders secured to upright strips and reinforced by inner strips. Diagonal strips brace the side girders to the top structure, thus forming a stay for the sides. The swing base of the bridge is composed of a 3" pulley wheel, bolted to two cross $5\frac{1}{2}''$ strips, which in turn are secured to the main base side girders. The bridge swings on the perforated plate on a short rod.



Model 445.
Swing Bridge

Those who own a Hornby Train will find this model very interesting, for it may be arranged to take the track across a "valley" or "river." Of course it adds to the fun if the bridge is worked by a clockwork or electric motor. In my own model railway system I had one of these bridges working in this way. It took one line of rails across another track, and I arranged it to operate with a Meccano electric motor. This was worked from a distant signal box, by switching on the current, and many times my Hornby Express only narrowly escaped disaster by the bridge not being opened in time! Those were exciting days indeed! Once my kitten nearly got electrocuted by becoming entangled in the wires—but that is another story!

NEXT MONTH
More No. 4 Models.

NELSON BOOKS for BOYS

Engineering for Boys. 6/- net.

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

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.

"A mine of information for the boy who intends to become an engineer."—*Yorkshire Observer.*

"The many photographs and drawings are admirable."—*Evening Dispatch.*

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

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

This book brings together, in one cover, a brief account of the History, Theory and Practice of Wireless Telegraphy and Telephony from the early experiments of Morse to the wonderful trans-oceanic Radio communication of to-day.

It shows 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.

"Lucid . . . helpful and practical information . . . distinctly to be recommended."—*Birmingham Post.*

All About our British Railways. 6/- net.

By G. GIBBARD JACKSON.

Every boy is tremendously interested in railways, and this book is so full of information, so clearly written, so plentifully illustrated, that it is assured of a widespread welcome. The author knows his subject from A to Z and 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, besides many text cuts.

"A book that any normal boy will gloat over; but father, I fear, will insist on reading it first."—*Edinburgh Evening Dispatch.*

"Most fascinating . . . tells the average boy just what he wants to know about railways."—*Court Journal.*

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"A volume it would be worth saving out of a wreck on a desert island."—*The Scotsman.*

The Mechanic's Friend. By ARCHIBALD WILLIAMS. 7/6 net.

Hints, Data, Suggestions, Recipes, Instructions on many Subjects. Useful information of interest to mechanics, professional and amateur.

The Last Secrets: The Final Mysteries of Exploration. 5/- net.

By JOHN BUCHAN. With Illustrations and Maps.

"A record of great deeds . . . fascinating reading for boys of seven to seventy."—*Glasgow Citizen.*

NEW STORY BOOKS.

Jack O' Langsett. A School Story. By R. A. H. GOODYEAR. 5/- net.

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The school adventures of no ordinary boy.

More about P.J., the Secret Service Boy. 5/- net.

By LORD FREDERIC HAMILTON.

A thrilling story of exciting adventures by sea and land.

Between Two Schools. By HAROLD AVERY. 5/- net.

A capital school yarn by a favourite author.

Supplied by all Booksellers. Write for a copy of the New Illustrated Catalogue.

THOMAS NELSON & SONS LTD. (Incorporating T. C. & E. C. JACK LTD.)

35 and 36, Paternoster Row, LONDON, E.C.4, and Parkside Works, EDINBURGH

Readers frequently write to me asking if I can recommend books that are both of interest and of use. In this column I 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.

EVERY year hundreds of new books are published, dealing with almost every subject under the sun. A hundred years ago it was difficult to obtain any books, other than those dealing with certain subjects, and often these subjects were "as dry as dust" and of no interest to anyone but the writers of the books themselves. To-day, however, all this is changed, and it would be difficult to find any subject on which some book has not been written. In this respect we are fortunate in living in an enlightened age. No matter of what we may wish to read—whether it be of ancient nations, of our work, hobbies, or even of our dreams—there are dozens of books that will give us information on the subject desired. We read for our living; and we read for our pleasure. It is impossible for us to imagine a world without books.

The Editor knows that readers of the "*M.M.*" are particularly fond of books. He also knows that it is impossible for anyone to read more than a fraction of the books that have been published. Much time may be wasted in reading books that do not matter, and we strongly urge every reader of the "*M.M.*" to choose very carefully the books that he reads. If you like fiction, read only good, clean stories of adventure or of school life. Do not read trashy stories of the "blood-and-thunder" type. They may be exciting but they do no good, and to read a book from which we learn nothing is a waste of time.

In this monthly column we describe only the best type of books, and no reviews will be found of books unsuitable for readers of the "*M.M.*" You may with safety choose any of the books mentioned here, or in our advertisement pages. Any book that does not conform to the high standard we have laid down, finds no space in these pages.

Robinson Crusoe
by Daniel Defoe
(*Pub. by Religious Tract Society, London. Price* 6/-).

This is a new edition of Defoe's masterpiece, the hero of which needs no introduction. Robinson Crusoe and his adventures are immortal and appeal to every generation of boys. The present edition is printed from new type and completely re-illustrated by Stanley L. Wood, who, as a result of careful study, has dealt with the subject in a distinctive manner. It is interesting to find that the edition includes part two, so often omitted in recent issues, and many of the illustrations depict scenes very seldom pictorially treated.

Engineering for Boys
by Ellison Hawks
(*Pub. by T. C. & E. C. Jack. Price* 6/-).

In his preface the author of this book writes:—"Every year I receive thousands of letters from boys, nearly all of whom are interested in Engineering . . . above all, every boy wishes to know how to become an engineer. . ." Such a book was wanted—and here it is. As Editor of the "*Meccano Magazine*" Mr. Ellison Hawks has greater opportunities for studying the mind of the boy than any other writer. Moreover, he knows how to allay the thirst for interesting knowledge possessed by every boy, wisely and to useful ends.

Ancient Engineering, Power, the Invention of the Steam Engine, Turbines, Railways, Breakwaters, Docks and Harbours, Lighthouses, Tunnels, Ships, Canals, Roadmaking, Bridge-building and Famous Bridges, are written of with a sure touch. All that is fascinating and informative in them is revealed in a striking manner, and every one of the 389 pages is packed with reading that will specially appeal to Meccano boys. Sixty-three half-tone illustrations, beautifully printed on art-paper, and 140 figures in the text, make everything clear. This book should be added to the private library of every Meccano boy. A.M.D.

The Boy's Own Annual
(*Pub. by The Religious Tract Society. Price* 12/6 *net.*)

Somehow or other Christmas would not seem complete without a copy of our old friend "The Boy's Own Annual." This year's volume is even bigger and better than its predecessors, and is full of real "live" stories of pirates, hidden treasures, school life and adventures. The stamp collector, naturalist, and model builder are not forgotten, and there are numerous excellent articles on these engrossing topics, all written by men with an expert knowledge.

The long stories are by such well-known and popular authors as Major Charles Gibson, Harold Avery, Charles Vivian, and there is not a dull page in this well-bound and profusely-illustrated volume.

Jack O' Langsett
by R. A. H. Goodyear.
(*Pub. by Nelson. Price* 5/- *net*).

This convincing school story of Blue Springs College and its pupils holds our interest from the time Jack is chosen to play for his second eleven until he finally becomes Captain of the School. When the Head decides to abolish all "caning and swishing," dire results are prophesied by the Blues, but they do not reckon with Mr. Smethwick, the new sports Master, who always manages to have the last word, which usually takes the form of "impots," There are many exciting incidents in the tale, chief of which are the Great Fire in Canvas City, and the wonderful game in which Jack saves Blue Springs College from defeat and gains his cricket colours.

Careers for Our Sons
by D. W. Hughes
(*Pub. by A. & C. Black Price* 5/-).

"What shall I be?" "How can I become a success?" "What is an Engineer's work?" These and a thousand other questions are answered in this book. Everything you want to know about a life at sea, abroad, at home or in

(*Continued foot of next col.*)

the air, is clearly and interestingly told. The training necessary for any particular career, the examinations to be passed, and the pay and prospects, are all contained in this mine of information.

"How to Identify" Series.

The price of these books is 1/6 each, and not 1/9 as stated in this column in our October issue.

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.

"CHILDREN'S COMPANION ANNUAL" ("Boy's Own Paper" Publishers), 4/6 net.
"THE MOTOR CYCLING MANUAL" (Temple Press), 2/- net.
"HANDICRAFTS FOR HANDY PEOPLE" (Educational Co. of Ireland Ltd.), 3/-
"LOST ON DU CORRIG" *by* S. O'Grady (T. Fisher Unwin), 5/- net.
"THE RADIO AMATEUR'S HANDBOOK" *by* A. F. Collins (Harrap & Co. Ltd.), 7/6
"THE BOY'S BOOK OF MODEL AEROPLANES" *by* Collins (Parsons & Co.), 8/6
"SOLDIER AND COWBOY" *by* Capt. G. Ash (Dranes), 3/6
"SHIPS OF THE ROYAL NAVY" *by* O. Parkes (Sampson, Lowe & Co. Ltd.), 2/6

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."

Messrs. Lott's Bricks (Watford, Herts.) are issuing a sheet of prize-winning plans for building with their bricks—bricks that embody far more than the old-fashioned wooden blocks and pillars. This sheet contains instructions for building forts, villas, cottages, and a mill, giving ground plans, north and south elevation, etc., and full architect's plans in miniature. This sheet, price 1/-, is a wonderful help in a truly fascinating hobby. Other lists free on application.

* * * *

We have received Messrs. Gamage's (Holborn, London) Christmas Catalogue—and what a catalogue it is! For variety and interest it excels all previous years' lists. It contains page after page of suggestions for Christmas gifts and is a production to delight the heart of any boy. No matter what are our requirements, they are met in these pages. 168 pages of delight. Post free on request.

* * * *

Radio enthusiasts will find something new in the "Polar-Blok" catalogue (Radio Communication Co. Ltd., 34-35, Norfolk Street, Strand, London, W.C.2.) This system makes it possible to add valves to a crystal detector and to alter the circuit exactly as desired, and yet allows the set to maintain a smart and a finished appearance. This clearly-written book will be sent to any Meccano boy, price 3d. post free.

* * * *

Messrs. Nelson & Sons, of 35-6, Paternoster Row, London, E.C., publish an exceptionally attractive list this year. The range of new books is excellent, covering everything from fairy stories to popular science. The list is illustrated and conveniently arranged in sections. A sure guide to good literature and acceptable Christmas presents. Messrs. Nelson will be pleased to mail their catalogue free upon request.

* * * *

We have received interesting leaflets from the New Auto Scooter Co. (Chestergate, Stockport), giving details of six different models that will appeal to our younger readers. This enterprising Company are organising a special Essay Competition for Meccano boys, full particulars of which appear in our advertising pages.

* * * *

McCaw, Stevenson & Orr Ltd. (Linenhall Works, Belfast), send us a descriptive leaflet of Seccotine which we really don't need to read, because we know all about it! It sticks everything to everything and holds it there for ever! "Firmas" is another form of Seccotine for repairing articles that will afterwards be subjected to heat or are required to hold hot or cold water.

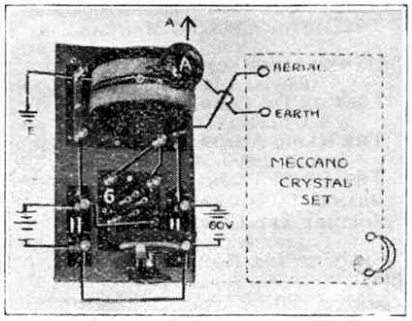
* * * *

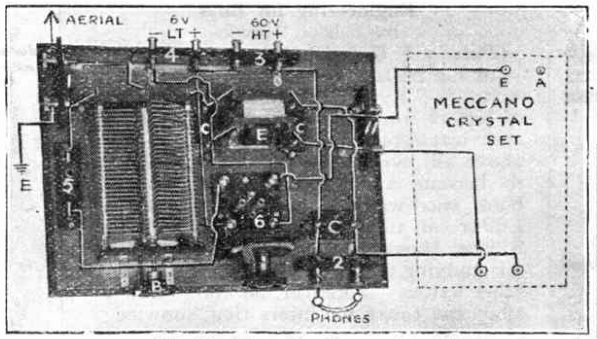
The Religious Tract Society (4, Bouverie St., E.C.), send us their booklet "*Books for Gifts.*" Most of the books listed are illustrated and shortly described, making it an easy matter to select a suitable volume for a present. Free on application.

* * * *

The Mullard Radio Valve Co. Ltd. (45, Nightingale Lane, Balham, S.W.12), send us lists of their well-known Valves and other Radio Accessories. The O.R.A. valve is, of course, known to all Radio users, and the firm is now introducing "Wecovalve," which requires no accumulators—just a dry cell. Double the life, and a fraction of the running cost of the older valves. For detecting, H. or L. frequency amplifying, this valve promises to be as successful here as in U.S.A. Lists free on application.

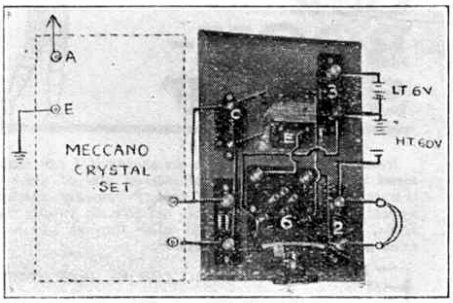
Unit No. 1 (*complete*)





Unit No. 2 (*complete*)

Unit No. 3 (*complete*)



If you have a MECCANO CRYSTAL SET

here are three ways of improving it

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.

PRICES AND KEY TO PHOTOS

1. A and E terminal strip ... ...10d.
2. TEL terminal strip 9d.
3. HT terminal strip ... 8d.
4. LT terminal strip ... 8d.
5. Single coil holder ... 1/3
6. Socostat (combined valve holder and filament resistance) 7/6

11. Output terminal strip 9d.

A. Variometer 7/3

B. .001 Variable condenser (assembled) 9/–

C. .001 fixed condensers 1/6

E. Max-Amp. Transformer 18/6

Rubber-covered connecting wire 2½d. per yd.

H. Fixing Brackets 1½d. each

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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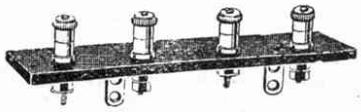
Send to-day for a copy of our big 40-page Catalogue—the largest in the Trade. Fully illustrated, post free 3d.



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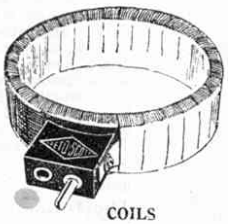
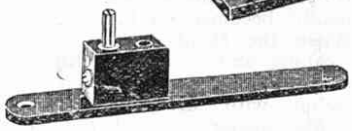
Sold in strips of 2 or 4. Engraved +HT—, +LT—, 'PHONES, price 8d. per pair of terminals. Ditto, but with telephone terminals throughout, 9d. per pair. Large ditto, engraved Aerial and Earth, Per pair 10d.



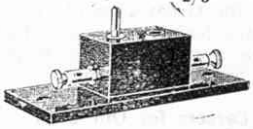
COILS

No.	Wavelength.	
1	290–390 mtrs.	2/–
2	340–470 ,,	2/6
3	420–650 ,,	3/–
4	570–900 ,,	3/6
5	780–1140 ,,	4/–



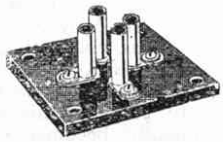
SWINGING COIL HOLDER

Enables coil to be moved through an angle to give coupling effects 2/3



COIL HOLDER

Very economical method of carrying any type of coil ... 1/9

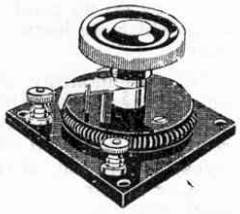


VALVE HOLDERS

Can be used also for carrying transformers, solid ebonite ... 1/3

VALVE RESISTANCES

Made in solid ebonite for mounting on board 4/–



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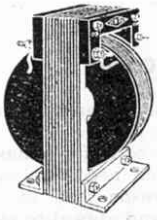

MAX-AMP. TRANSFORMERS

Finest quality Low Frequency Transformer made to give wonderfully loud speech without a trace of distortion ... 18/6

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The Men Who Gave Us Radio:

VII. LODGE, POPOFF, RIGHI, and MARCONI

This is the last of a series of articles giving an outline of the lives of the men who contributed to the invention of Radio as we know it to-day. Our articles have followed the progress of the wonderful science of Radio, dealing with the work of the various scientists who engaged themselves in the quest of a means of wireless transmission. This final instalment briefly outlines the work of Sir Oliver Lodge, Augusto Righi, and Senator Marconi. After reading these articles, Meccano boys will have a better realisation of the fact that the Radio of to-day is not the work of one man alone, but of many men, each of whom extended the field of research in turn.

Lodge

IN 1894, Sir Oliver Lodge, lecturing in London, repeated Hertz's experiments. He demonstrated the efficiency of the new Branley "coherer" as a detector of Hertzian waves generated some 150 yards distant. It is remarkable to find that although wireless telegraphy was at this time well within Sir Oliver's grasp, it did not seem to occur to him that the coherer and Hertz's oscillator might be adapted to long distance telegraphy without wires. "Stupidly enough," he wrote later, "no attempt was then made to apply any but the feeblest power, so as to test how far the disturbance could really be detected."

Popoff

In 1895, Popoff, a Russian physicist, introduced the automatic "tapper." This was necessary to restore the metallic dust used in the coherer to its normal condition after the passage of an electric wave.

Although progress had been slow during the preceding hundred years it was evident towards the close of the 19th century that the work of every investigator—in Britain, America, France, Italy and Germany—was gradually leading up to a great climax. The time was drawing near when, by the gifted genius of one man, the great labours of the earlier investigations were to bear fruit, and wireless telegraphy—the dream of the century—was to become an accomplished fact.

Augusto Righi, celebrated Italian physicist, carried out many experiments in electricity and magnetism. He was born at Bologna on 27 August 1850, and died there on 8 June 1920.

Sir Oliver Joseph Lodge, born at Penkhull, Staffs., in June, 1851, was educated at University College, London. He was Professor of Physics at Liverpool University from 1871 until 1900, when he went to Birmingham as Principal of the University. He was knighted in 1902.

Righi

In the meantime Righi, a Professor at Bologna University, was investigating the Hertzian waves from an optical point of view. Righi was an enthusiastic disciple of Hertz, and he effected a considerable improvement in the latter's "exciter." He used two metal balls in place of knobs, and by placing them in an ebonite frame and filling the spark-gap with oil, he made its action more regular, and also improved the apparatus in other details.

One of Righi's pupils was a bright boy named Marconi, who was particularly interested in his tutor's experiments. There can be little doubt but that Righi's enthusiasm had a marked influence on young Marconi, causing him to turn his attention to applying the Hertzian waves to wireless telegraphy.

Marconi

Guglielmo Marconi experimented on a small scale in 1895 at his father's farm. His first trials proved successful, and he came to England during the following year. He obtained an introduction to Sir William Preece, who (as we have already seen) himself had carried out experiments in wireless telegraphy and telephony. Sir William, in his official capacity, greatly aided Marconi in the development of his invention.

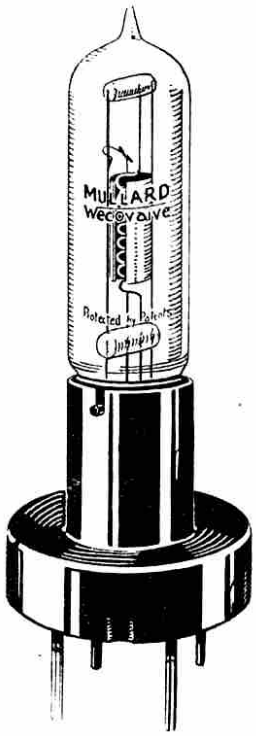
Marconi's system embodied the inventions of several previous workers. These inventions were improved in detail and so adapted that, collectively, they formed a practical working system. The "wave-exciter" of his original apparatus, consisting of brass balls or spheres separated by a short gap, closely resembled Righi's "three-spark exciter." The receiver consisted of a coherer similar to that used by Branley and Sir Oliver Lodge, but made much more sensitive by Marconi. The filings of this coherer were returned to their normal position, after cohesion, by a "tapper," exactly similar in principle to that invented by Popoff, but again improved in detail.

In combining these individual inventions Marconi showed himself to be possessed of far-seeing initiative. He was sufficiently alert and practical to bring into operation an apparatus that worked, whereas other scientists—who might have forestalled him, but did not—were still endeavouring to "make sure." Righi himself had said that Marconi "carried into the domain of practical reality that which had only floated indistinctly before the minds of others or had served them for modest experiments."

Great credit is due to Marconi for achieving a victory over innumerable practical difficulties. His success depended entirely on what were apparently but trivial matters of minor importance. It was only by unremitting study, perseverance and attention to detail, however, that the imperfections were finally eliminated, enabling the completed scheme as a whole to become a success.

THE END

Guglielmo Marconi, born at Bologna (Italy), 23rd September, 1875, and educated at Leghorn, evolved the first practical system of wireless telegraphy. He communicated across the English Channel in 1899, and two years later he succeeded in communicating across the Atlantic.



Mullard Wecovalves.

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

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

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

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

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

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

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Boys!

Learn

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Every boy should get his parents to buy him this book

In the evenings and over the week-ends a boy can soon become proficient in a number of trades with the aid of this wonderful book. The directions are easy to follow and the illustrations show clearly every stage of the job you want to do. Hundreds of hobbies that will delight every boy are also included.

The Amateur Mechanic

Shows you how to do over 400 useful jobs

Here are a few of the four hundred jobs you can learn to do :—How to install your own wireless set—To overhaul a motor-cycle, bicycle, motor car, etc.—To build a summer-house—How to mend windows—To paint and paper a room—To make boots and shoes—Simple bricklaying—Upholstering—To repair a hot-water cylinder—Glazing greenhouse windows—All about metal turners' lathes and other tools—Fitting stair carpets—To make a hot-water towel rail—All about the gramophone—To install a speaking-tube—Piano repairs—To make an ottoman chair from an old cask—How to join two pieces of iron—To repair plaster—To make a barometer—To make a rack for brooms—All kinds of rustic furniture for the garden—A brickwork pedestal for a sundial—Varnishing and staining—Scene painting for theatricals—To make an overdoor shelf—To mount maps, etc., etc.

This would make an Ideal Christmas Gift for boys of 15 years or over

What Parents say :

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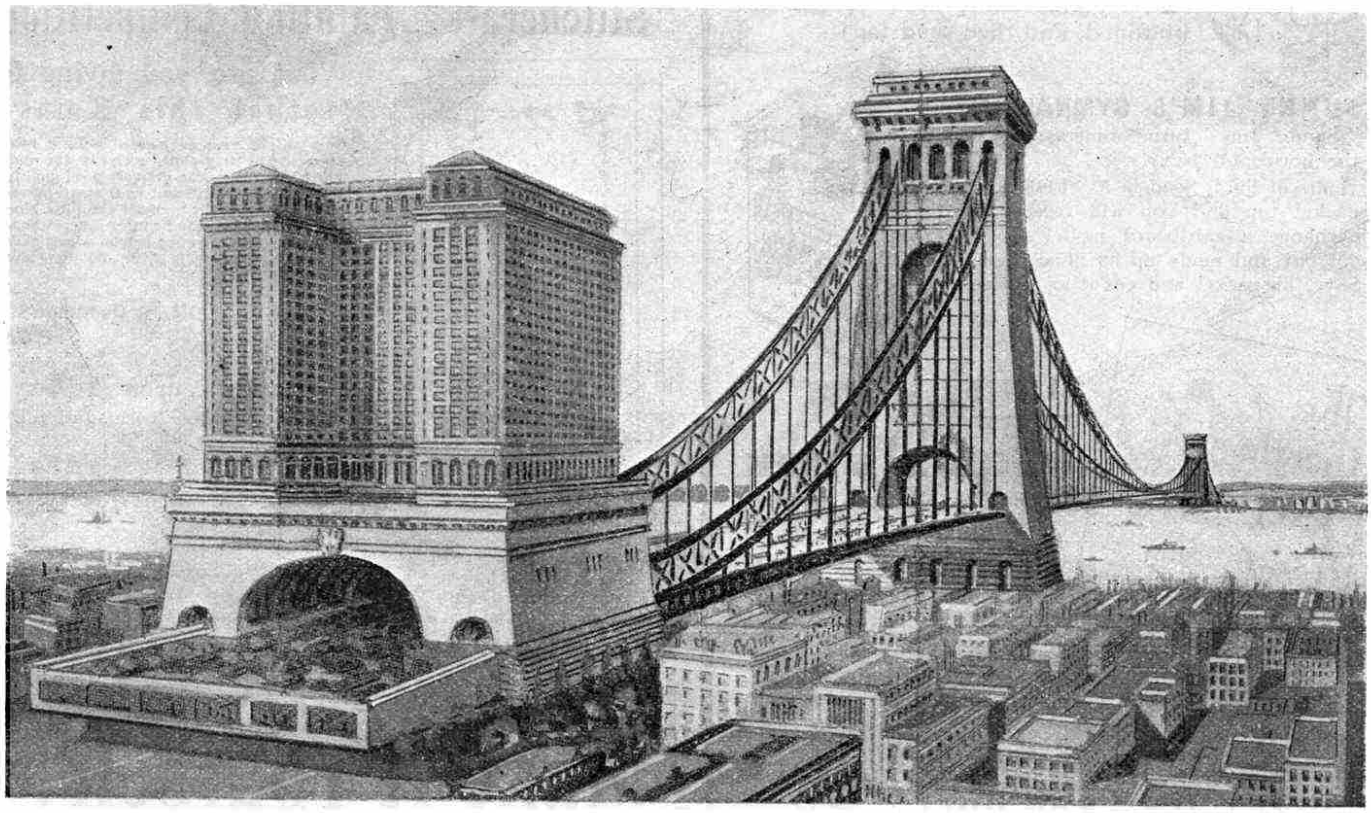
M.M.G., 1923. .....

Famous Bridges II.

A Monster Bridge:

Two Tramways, Two Railways and a Road Wider than Kingsway



The above drawing, which is reproduced by the courtesy of the "*Architect's Journal*" and "*Everyday Science*," gives a vivid representation of the completed appearance of the proposed new bridge at New York

ALTHOUGH the business section of the city of New York is located on the island of Manhattan, nearly everyone lives on the mainland, where the suburbs are situated. These residential districts are separated from the city by the East River and the Hudson River, the latter being almost a mile in width.

First Bridge at New York

It is not so very long since there were no bridges at New York, and city workers had to cross the East River and the Hudson River, morning and evening, by ferry steamers. As the numbers of workers in New York continued to increase, however, the accommodation provided by these ferry steamers became very much overcrowded. It was in the desire to ease the situation, created by the changed conditions, that the first suspension bridge across the East River was built. This bridge was rapidly followed by other bridges, until at length the great American city became famous for having more large bridges than any other city in the world.

In the meantime every year has brought more workers and more traffic. Now, even the present numerous bridges already existing are not sufficient to accommodate the increasing flow of pedestrians and vehicles from one shore to the other.

Largest Bridge in the World

Plans are therefore being made for the building of a new bridge, and this, although not the longest, will certainly be the largest bridge in the world. It may possibly be the last massive iron bridge to be built, for the cost of such heavy metal structures is now rapidly becoming prohibitive.

According to the present arrangements the bridge will be 6,600 ft. in length. It will be divided into two shore spans, each 1,710 ft. in length, and a central span of 3,240 ft. The distance between the anchorage on Manhattan Island and the anchorage on the mainland will be 7,460 ft.

Bridge Road Wider than Kingsway

The new bridge will not only accommodate vehicles and pedestrians, but will also carry trams and trains. It will have two decks, each 220 ft. in width. The upper deck will be divided into two roadways, one for motors and the other for vehicles. This roadway will be 155 ft. in width, and our London readers will be able to realise what this will look like when it is mentioned that it will be wider than Kingsway.

On each side of this roadway will be a tramway track, beyond which will be two footpaths 17 ft. in breadth. Access to the upper deck of the bridge will be gained by a central lofty arch, with two smaller side arches to admit the traffic to the bridge approach. The lower deck of the bridge will be used only by trains, and it will carry ten lines of railway track.

The bridge will be of the suspension type, the two decks being suspended from four steel cables, two on either side. These cables will consist of 80 lines of eye-bars, arranged in three banks and enclosed in tubular bronze casings 15 ft. in diameter.

Massive Towers

In order to obtain sufficient height to give the suspension cables the requisite curvature, it will be necessary for the suspending towers to be 840 ft. in height. Each tower will measure 400 ft. in breadth at the ground level, tapering to 200 ft.

(*Continued on page* 211)

SUNNY JIM'S CHRISTMAS STOCKING

Choose whatever you like from this list, read carefully how it can be obtained, and then send for it.

SUNNY JIM'S GYMNASIUM

"Sunny Jim" turns somersaults on the horizontal bar.

Hours of fun! Send in a "FORCE" packet top and you will receive in exchange a cardboard model to be cut out and made up as illustration. Save the packet and cut it as shewn.

SUNNY JIM'S FREE RECIPE BOOK

is sent to you for nothing. Just write and ask for it. Mother will find it specially useful in making delicious "FORCE" dishes that you will thoroughly enjoy eating.

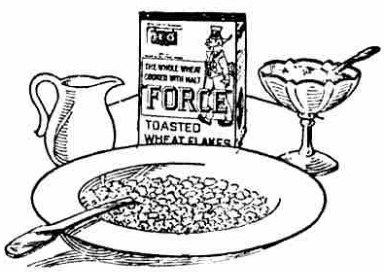
THE "SUNNY JIM" RAG DOLL

16 inches high, in bright colours, stuffed with kapok, is **wonderful value.** It can be had by sending 1s. P.O. and **two "FORCE" packet tops.**

Two "FORCE" packet tops and 6d. P.O. bring you the doll unstuffed. Two "FORCE" packet tops and 2d. in stamps bring you the **rag pattern** ready for making up.

Tell mother that "FORCE" is a fine food for all who want a food that is at once tasty, nourishing and easy to serve.

"FORCE" is delicious toated malted wheat flakes, the **whole** of the **wheat,** served in an instant by adding hot milk.



Address all letters to "Sunny Jim, Dept. A.Y.4, 197, Great Portland Street, London, W.1.

Mother can get the full size packet of "FORCE" from her grocer, price 9½d.

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250 Prizes

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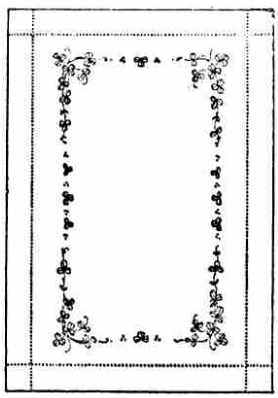

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A Talk About Aerials

BY THE RADIO EDITOR

This is the second instalment of a series of articles describing the best types of aerials to erect, according to local circumstances. In the last number of the "M.M." we described a simple aerial from a pole in the garden to the house, and from a tree to the house. On this page we deal with two types of aerials that are most often used, the "inverted-L" and the "T."

IV.

ONE of two types of aerial is usually employed by amateurs. One known as the inverted L-type (Fig. 5) and the other the T-type (Fig. 6). These aerials are so called because of their resemblance to the letters L ("upside-down") and T.

It has been found that the "orientation," or the direction of the compass in which an aerial runs, affects the strength of reception. To obtain the maximum strength the end of the aerial should be "end-on" to the transmitting station from which signals are being received.

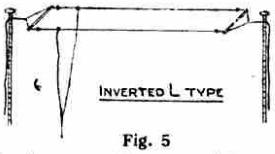


Fig. 5

That is to say, if an aerial points due north and south it will be most efficient in receiving from transmitting stations in the north and in the south, rather than from stations in the east and west. Such an aerial is called "directive," because it is most sensitive to signals from a particular direction.

Greater signal-strength is obtained by taking the lead-in wire from the end of the aerial that is nearest to the transmitting station. Thus, if you are due north of London, and wish to receive broadcast at the greatest possible strength from London, your aerial should be oriented north and south and your lead-in wire taken from the south end of the aerial. In this case, therefore, the aerial used will be of the inverted L-type (Fig. 7).

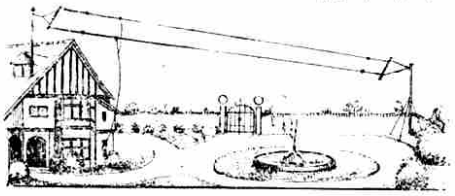


Fig. 7

Should you be situated midway between two broadcasting stations, and wish to receive signals of equal strength from each, the lead-in wire should be taken from the centre of the aerial. Such an aerial will be of the T-type (Fig. 8).

We thus see that the aerial is firstly governed by the circumstances in which you are situated—long garden, flag-pole, or house chimneys. Secondly, where the greatest efficiency is desired, the aerial is governed by the orientation, depending on the direction of the broadcasting station from which it is desired to receive the loudest signals.

V.

The fact that an aerial is directed towards one particular broadcasting station does not mean that signals will not be received from other stations. Much depends on the local surroundings, but it may be said that, as a general rule, a directive aerial will enable signals that would otherwise only be faintly heard, to be heard clearly or even loudly. At the same time,

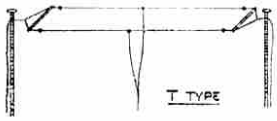


Fig. 6

the orientation of the aerial for this purpose may have no detrimental effect at all upon the loudness of signals from another broadcasting station that is situated at a shorter distance.

The following example will, perhaps, help to make clear my meaning. I have an inverted L aerial, of 60 ft. in length and 20 ft. in height, and situated at Liverpool. It points directly towards the Glasgow station and the lead-in wires are taken from the north end. Thus, everything is in favour of receiving good signals from Glasgow, and these signals do, in fact, come in very loudly (on a four-valve set). At the same time, I get almost equally loud signals from London, although my lead-in is at the wrong end for the *greatest* efficiency from London.

By altering my aerial to a T-aerial I get signals a shade louder from London, but less loud from Glasgow. But with either the L or the T-type, signals from Manchester (25 miles distant) are equal in volume, although in each case my aerial is "broadside-on" to Manchester. By altering the orientation of the aerial so that it points directly to Manchester, with the lead-in wires nearest to Manchester I get Manchester a little more loudly, but both London and Glasgow are very much fainter.

Thus, in my case it is best to have an inverted L-type aerial oriented on Glasgow, because I get both Glasgow and London satisfactorily with this type. It is better to have my lead-in wires from the north end, because I can afford to lose a little of the volume from London in order to gain more from Glasgow, which seems to transmit with slightly less power than London.

VI.

So far we have dealt with aerials of the standard types generally necessary with a crystal set, at distances over about 15 miles from a broadcasting station. It is not every boy who can erect such an aerial as these, however, and those who find none of the above aerials possible, and who live not more than 15 miles from a broadcasting station, may employ a more simple form of aerial. They are advised to experiment with an aerial

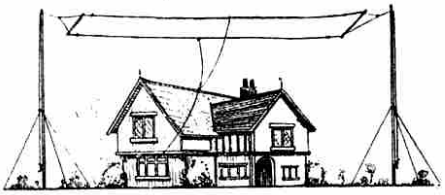
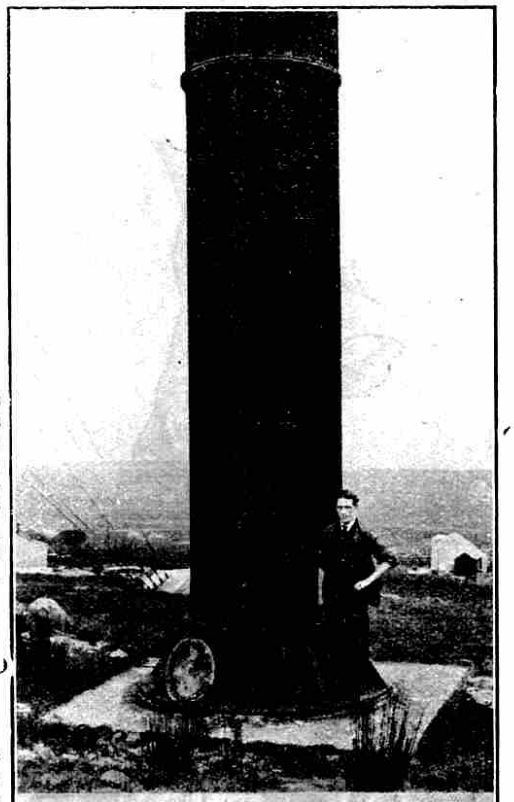


Fig. 8

suspended between two chimney stacks—either on their own house or from their house to that of a neighbour. If the full length of 100 ft. (less the height) cannot be obtained for a single wire, a shorter wire may be used, or, as an alternative a double antennæ wire may be erected. This consists of two lengths of wire, say 30 ft. each, or whatever other length is convenient. Each length is separated by a spreader formed by a light piece of wood or bamboo not less than 5 or 6 ft. in length. A treble antennæ may be employed if desired, although, except in special circumstances, it will probably be found that three wires are little better than two wires.

(To be continued



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