MECCANO MAGAZINE

for Boys

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Transatlantic Telephone Service—at the Rocky Point Station

The Editor's Own Page

Our Cover

IN this issue we continue the story of Transatlantic Telephone Service and our cover shows the operator monitoring on the incoming messages at Rocky Point. The romance of telephoning from New York to London has fired the imagination of our readers and I have received a great many letters, commending the publication of this article. Many of my correspondents have expressed a desire to test the service for themselves, but, they add, the charge of $75. would be too heavy a strain on their pocketbooks.

A New World's Record

Only a few days ago the whole world was thrilled by the remarkable record made by Major Segrave in Florida, when he drove his specially constructed Sunbeam Automobile at the phenomenal rate of 210 miles an hour, that is 3½ miles a minute. Major Segrave came over from England for the express purpose of making this record and having made it, has gone back. Hats off to the gallant Major! His record is likely to stand for a long time.

When he returned to New York after his great achievement, your Editor dispatched a representative to call on him, but unfortunately he was out. However, a member of his party received the *M.M.* representative very courteously and furnished him with the information and illustration that appears in the article commencing on the opposite page.

The illustration shows a good many details of construction and it ought not to be difficult for my readers to build a model of this remarkable car with Meccano. We understand the 1,000 horsepower Sunbeam Car, which was known as the Mystery S, will not be raced again but is to be placed in a museum in England. Major Segrave's parting words to America were that in spite of his record, America has forgotten more about motoring than Europe has ever learned, a graceful compliment from the world's greatest racing driver.

What Readers Want

I have just been reading a number of the entries in the "If I Were Editor" contest, and I was very very much impressed bv the fact that there was hardly one that did not ask for the *M.M.* to come out monthly. Now it is very pleasing to know how much you all like the *M.M.* but until our circulation increases considerably, it will not be possible to publish the *M.M.* monthly. My readers can help that time forward bv getting their friends to become subscribers. It would surprise you to know the number of boys who have never heard of the *M.M.* and time after time when sending in subscriptions, boys remark that they wish they had known of the *M.M.* earlier. Frequently they order copies of back issues. Therefore, tell your friends about your magazine; better still lend them your copy and in a little while you will be astonished at the number of new subscribers you have obtained.

The Story of Brass

In this issue we conclude "The Story of Brass," a series of articles that has won an unusually large number of new readers to the *M.M.* I regret that through an oversight, we did not give credit to the Bridgeport Brass Company for the excellent illustrations that appeared in our last issue. This company has been very generous in supplying us with illustrations and data for this series of articles and we wish to make our acknowledgments to them.

The Triumph of Television

Just as we go to press word comes of another great triumph of science, practical television, that is, the transmission of vision over a great distance practically instantaneously. The demonstration was carried out between New York and Washington. Calling from Washington, Secretary of Commerce Hoover spoke to Mr. Gifford of the American Telephone and Telegraph Company in New York, both his words and a moving picture of him speaking being transmitted simultaneously so that Mr. Gifford and party in New York not only heard Secretary Hoover's voice but had before them a picture of him uttering the words to which they were listening. This extraordinary accomplishment was effected by a combination of land wires and radio, the land wires covering the distance from Washington to Whippany whence it was broadcast to New York. And so scarcely have we finished recording the wonders of Radio Telephony across the ocean before we have to chronicle another of man's triumphs over nature, the annihilation of space by television. In the next issue of the *M.M.* there will be a full account of this remarkable demonstration and we shall explain in non-technical language how television-telephony was conducted.

In Our Next Issue

Unfortunately the article on Broadcasting that was announced for this issue has been crowded out, but it will appear in the next. There will be a further installment of the series on Standard Mechanisms, and we shall publish an article describing the operation of elevators, that carry us so swiftly and noislessly to any floor in our great buildings. Make sure of your copy now.

212 Miles an Hour in a 1000 h.p. Car

WHEN the Cunard Liner *Berengaria* sailed from England on March 2nd, it carried Major H. O. D. Segrave and party, and a queer looking automobile that has since become famous, the 1,000 horsepower "Mystery S" Sunbeam.

This car had been constructed for the express purpose of travelling at a speed of 200 miles or more per hour, and Major Segrave and his party, which included seven mechanics, were on their way to America for the tests. With the car were eighteen cases of spare parts and fifty spare tires.

To conduct such tests, more than six miles of track would be required—three miles and a half in which to attain full speed, a mile in which the car could be timed, and at least two miles more to stop. The track chosen was the one on the Ormond-Daytona Beach, Florida, the only place in the world, according to Major Segrave, where it was possible to give the car a try-out.

First Trial

At Daytona Beach, a nine mile straightaway was plotted with flags on the hard sand, and intricate equipment was erected to time the car in its mile of greatest speed.

A large crowd was gathered to see the first trial on March 24th. Using four miles to gather speed Major Segrave raced the one mile, was timed, and took four miles to stop, setting a new American record of 166.51 miles per hour. It was unofficial, however, for to be recognized as a new record the car had to travel back over the course within thirty minutes, being again timed and the average of the two times constituting the new record. In this way the car goes both with and against the wind, the effect of which is neutralized. The racing machine, however, stuck in high gear and before it was ready to start again the tide began to cover the course making any further trials impossible.

Still confident that the car would exceed a two hundred mile an hour pace, Major Segrave set the date for the second trial on March 29th.

With the exception of a fairly strong northeast wind, the day was ideal for the test. The sky was clear and the firm white sand stretched out for miles. The beauty of it, however, did not concern the famous English pilot as much as did the condition of the course for the waves had been breaking on the shore for the past three days and had formed little gullies in the beach—and the undertaking was dangerous enough without this added difficulty. The major, however, did not seem to worry, and was positive that he would reach his mark. He was so eager, in fact, that though the trial was set for 11:20 A. M. he had the car taken down to the starting point at 9 o'clock. After an hour's wait, word was sent that the tide had receded and the track was ready.

Major Segrave climbed into the cock-pit, his white continental helmet standing out against the red background of the car. Then a roar of the engine and he was off.

Breaking the Record

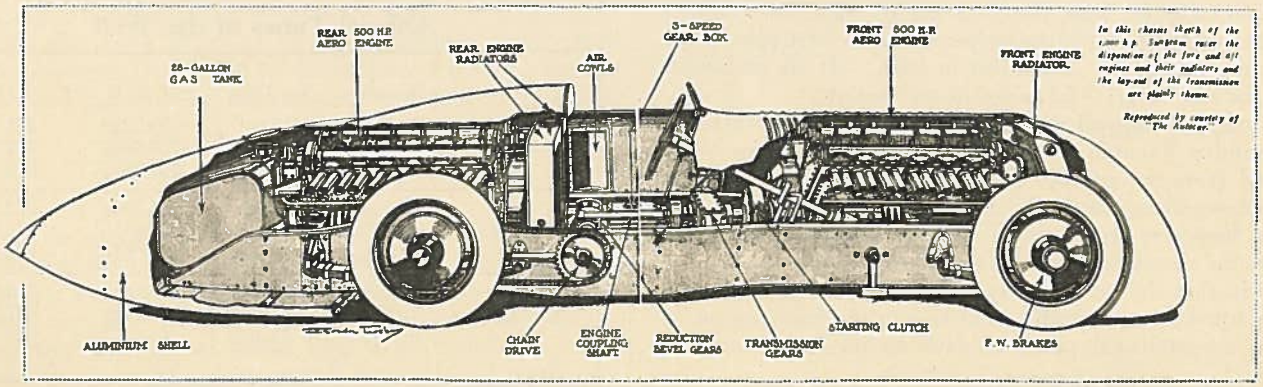
For ten miles spectators lined the course waiting eagerly. At last far down the track they saw what appeared to be a mere spot of red. Larger and larger it grew and as it roared past it was just a brilliant red streak, leaving in its wake an odor of burning castor oil. The timed mile completed, brakes were applied but two miles and a half were passed before the car could be stopped.

A few minutes later the return trip was undertaken, and once more the car flashed past, the roar of its two motors when still nearly a mile away, deadening the roar of the surf, while at times the car would strike the small gullies made by the waves and apparently clear the ground for yards. After the second timed mile was completed brakes were again applied, but had no effect. So great was the heat generated in stopping the first time that the brakes had become red hot and the brake shoes had melted!

In a few minutes Major Segrave drove slowly up to the judges' stand where Mr. Odis Porter, the official timer, and the two judges, T. E. Meyers and Gar Wood were computing the time. When the official record was announced as 203.79 miles per hour, a broad smile of satisfaction spread over the driver's face. The car had made good.

While the time was being taken for the mile, separate times were also taken for one and five kilometers. The official times are given in detail on the next page.

(*Continued on page* 116)



212 Miles an Hour in a 1000 H. P. Car

(*Continued from page* 115)

The mystery car was specially designed by Mr. Louis Coatalen, and was built by the Sunbeam Motor Car Company. Theoretically the car was designed to travel two hundred and twelve miles per hour, and how accurately this was figured out is shown by the speed the car actually attained during the trial, 210 miles per hour.

The chassis frame is a massive channel steel one, at each end of which, as may be seen in the diagram, is a powerful engine.

Each engine is 500 horsepower, twelve cylinder, Sunbeam-Coatalen. The cylinders are cast in blocks of three, set in two rows, six in a row, and placed at an angle of sixty degrees. Each cylinder has four valves operated by overhead camshafts and 500 horsepower is developed by each engine at 2000 revolutions per minute.

Gearing and Transmission

The gearing and transmission will probably be of great interest to Meccano boys. At the rear end of the forward engine is a plate clutch, which contains an additional dog clutch, and from this a shaft is coupled up to the rear engine.

When the car is to be started, the rear engine is started first by means of compressed air fed from cylinders. Then, with the rear engine running the starting clutch is engaged and the forward engine is started, a further movement of the clutch lever engaging the dog clutch and thus locking up solid the drive between the two engines. The drive then goes through a multiplying gear of approximately five to two, to a driven shaft on the end of which is the main clutch of multiplate type. The gear box with which this connects is of the ordinary sort with central control. The ratios of the three speeds and reverse are:

3rd speed	2nd speed	1st speed	Reverse
1.017 to 1	1.56 to 1	2.968 to 1	2.6215 to 1

From the gear box the drive is taken through a reduction gear of bevel type to a cross-shaft on which are mounted sprockets conveying the final drive to the road wheels by means of roller chains. By gearing up and then reducing transmission a main clutch and gear box can be used of similar dimensions to that in the usual Sunbeam racing car.

3.53 Miles in One Minute

At the normal maximum engine speed of 2000 revolutions per minute, with the gear ratios mentioned above, the car is capable of 73 miles per hour in first speed, 138 miles in second, and 212 miles in high. At its maximum speed the car covers 3.53 miles in one minute.

The car is equipped with four wheel brakes operated by a Dewandre Vacuum Servo motor, all four brakes being actuated from the pedal. There is also a hand brake that operates separate shoes in the rear wheel drums only. Brakes, however, are not much good at 200 miles per hour, as even the metal melts under the great heat.

Lubrication is on the dry sump principle, with two pumps fitted to each engine, and two to the rear engine, as well as a centrifugal pump to each engine for circulating water.

The car carries a 28-gallon gasoline tank, the contents of which are fed to the two carburetors on each engine by air pressure from the pump mounted on the rear engine. At full speed the car consumes one and a half gallons of gas a minute.

The springs are semi-elliptical front and rear and are fitted with double type shock absorbers. The wheels and tires are specially constructed and have been subjected to severe tests before using, yet when travelling at maximum speed, a tire will only last three minutes. To protect the driver from the danger of a tire bursting and the tread flying off, armor plates are fitted around the wheels, as well as around the driving chains.

The total cost of the car was $100,000. It is a huge size, the overall length being twenty-three feet, six inches, with a width of six feet, almost twice as long as an ordinary racing car. It has a wheel base of eleven feet nine inches, with a track of five feet two inches, and weighs over three tons.

Special Body

The special streamline body, with panels of eighteen guage aluminum sheet, is built up in sections on a framework of angle iron, so that any part of the car can be reached easily by just removing the section covering that particular part. As a means of protection to the driver, two steel hoops are fitted in front and behind the cockpit, and a steel plate running the whole length of the car is attached to the bottom flange of the frame side members.

In designing the car particular attention was given to the directional stability and to overcoming wind resistance. The peculiar shape of the car is the result of extensive wind tunnel tests conducted by the company, and with it the air resistance is reduced to an absolute minimum. Air resistance is a serious handicap to overcome, as will be seen by the following figures: At 180 miles per hour it is 740 pounds, at 190 miles per hour it is 830 pounds, while at 200 and 210 miles it is 920 and 1020 pounds respectively. Thus, when the car is going two hundred miles per hour, practically 500 horsepower or half the power of the car is required to overcome wind resistance alone. With the shape of car adopted, the wind is forced up over the car and as it rushes down over the rear it serves to push it forward.

There is no practical use for the huge red car, as it was constructed merely for experimental purposes to see just what a car could do.

Official Times of the Trial

Trip	*Distance*	*Net Time*	*M. P. H.*	*K. P. H.*
NORTH	1 *Kilo*	11.20	199.7259	321.4285
	1 *Mile*	17.94	200.6688	322.9364
	5 *Kilos*	56.47	198.0637	318.7533
SOUTH	1 *Kilo*	10.84	206.3590	332.1033
	1 *Mile*	17.39	207.0155	333.1500
	5 *Kilos*	53.90	207.5076	333.9517
Mean Average	1 *Kilo*	11.02	202.9883	326.6787
	1 *Mile*	17.665	203.7928	327.9637
	5 *Kilos*	55.185	202.6757	326.1755

Transatlantic Telephone Service

Between New York and London

Part II

In our last issue we described the inauguration of radio telephone service between New York and London and we shall now turn our attention to some of the remarkable equipment that made possible long distance radio telephony.

The equipment used on the New York-London service cost more than $5,000,000, and as might be expected, it has many improvements over the apparatus used in the transatlantic tests of 1915. Among them the new type of vacuum tube, which took three years to develop, calls for special note.

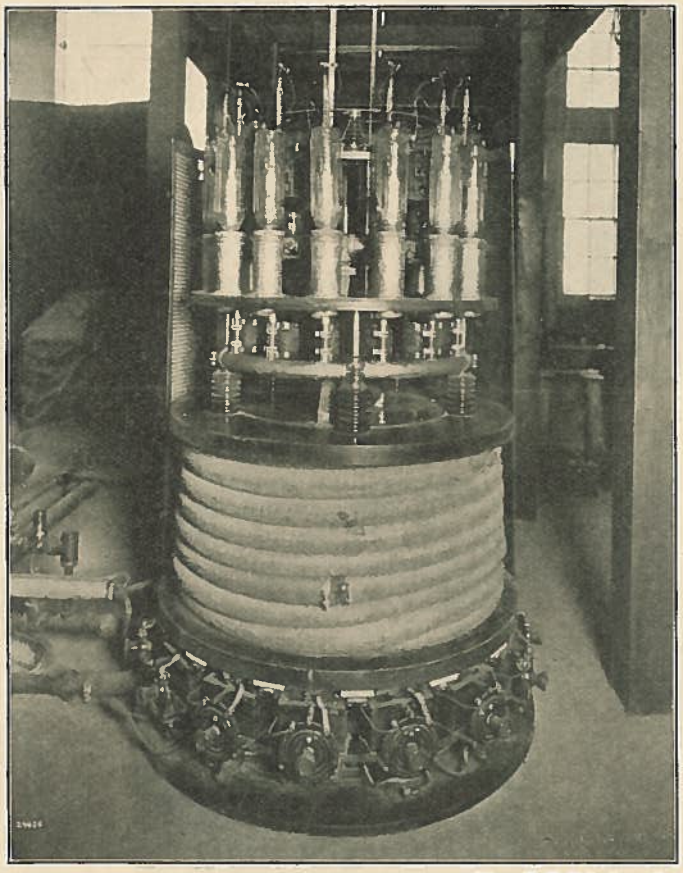


Photo N. Y. Telephone Co.

The last bank of amplifying tubes at the Rocky Point Station, consisting of 15 great water-cooled tubes

Vacuum Tube

This vacuum tube is one of the most important parts of the whole apparatus, for through it the human voice is amplified billions of times and cast across the ocean with the energy of the collective voices of about two billion people. Probably most of our readers are familiar with vacuum tubes as they are now used in every radio receiving set, and have been in use since 1914. The tubes used in the transatlantic set, however, are a great deal larger and more powerful, each one being two feet in length, water-cooled, and having about 400 times the power of the earlier type of tube. At the Rocky Point Station, where the voice is sent from New York City, there is a series of twenty-three of these giant tubes, divided into three groups or banks, the last bank consisting of fifteen tubes. Each group amplifies the voice millions of times before it is sent out through the ether in waves of 5000 meters (about three miles measured from crest to crest) with a power equal to the total of that used by 400 standard broadcasting stations.

The Piezo Crystal

With so much power behind the transmitter, ordinary methods of controlling the oscillations are insufficient to guarantee accuracy, and a method had to be worked out whereby the wave length would remain constant. If this varied, the receiving set would have to be tuned with every change, a proceeding that would naturally preclude any regular, satisfactory service.

The Piezo crystal was produced for just this purpose, and it is based on the Piezo electrical effect, discovered by J. & P. Curie in 1880. It is made of thin quartz, ground to a specified thinness and shape, and energized by an electric current. The peculiar property of this crystal is that when subject to stress it develops electrical polarization, and, conversely, when an electrical charge is applied, it dilates and produces stress. When vibrated by an oscillating circuit, the crystal has a natural period of vibration, which practically takes charge of the transmitter and prevents the wave length from varying in the slightest degree. Hence, the receiving apparatus, a very delicate, easily adjusted machine, can be tuned and set for a constant wave length.

Reduction of Wave

Another great step forward is the elimination of part of the wave that is broadcast. In ordinary broadcasting, the wave that is sent out through space consists of three divisions, the carrier wave and two sidebands. The sidebands carry the actual voice vibrations, while the carrier wave, although it consumes sixty per cent of the energy, is merely supplementary. It was planned that by filtering out the carrier wave, the extra energy could be diverted to the sidebands; but as one sideband is sufficient to carry the voice vibrations, the second sideband could be suppressed, the whole force thus being concentrated on the remaining side wave.

Suppressing the Carrier Wave

This is effected by having two frequencies, 30 and 90 kilocycles, generated by 250 watt tubes. The vibration of the voice coming over the telephone wire is used to modulate the 30 kilocycles frequency produced by the tubes, and forms two bands B and C. B is filtered out, but the second band, C, is used as in the first case to modulate the other frequency of 90 kilocycles, generated by the tubes,

(*Continued on page* 123)

The Story of Brass

Part III

Sheet Brass

LET us assume that we are about to start on a trip through a modern brass mill for the purpose of seeing sheet brass produced from copper and zinc. The first department that we enter is the metal stores where the various metals necessary for the production of brass are segregated in bins. The metals are principally copper, zinc, lead and tin. Brass scrap of known chemical analysis is used also in conjunction with pure copper and zinc to produce standard brass mixtures.

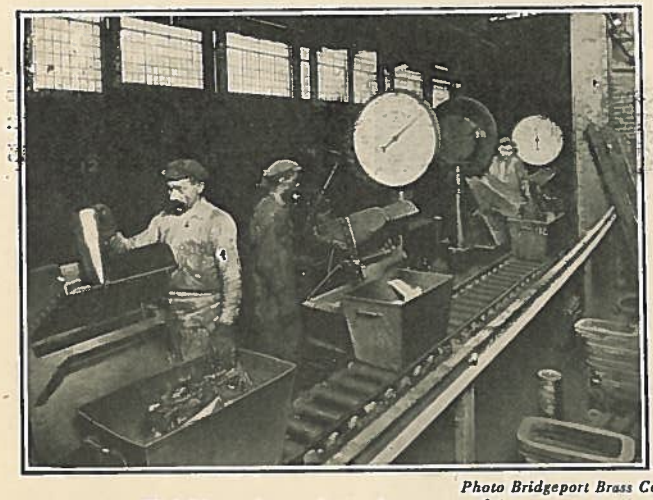


Photo Bridgeport Brass Co.

Weighing of metal previous to melting

Most of the sheet brass used in this country contains approximately 66% copper and 34% zinc. There are, of course, variations in sheet brass mixtures, one being the introduction of a small percentage of lead. As was explained in the last issue, the addition of lead makes brass freecutting and improves its machining properties, while the percentage of zinc and copper used determines the color, malleability and ductility of the finished metal.

Mixture

The persons in charge of mixture control lay out the kinds and quantities of the metals to be used and these are weighed and checked on platform scales and then dumped into boxes which are conveyed to the electric furnaces.

After going through the melting and mixing process, described earlier on, the production of sheet brass commences by the casting of flat bars of rectangular cross section. These bars are approximately one inch thick and vary in length and width, depending upon the size of the finished sheet. In sheet brass, however, the width remains fairly constant. Steel molds, the inside faces of which are coated with an oil graphite mixture, are caused to pass in a vertical position beneath the spout of the tilted furnace and the molten brass is poured into a reservoir or strainer which is placed directly over the top opening of the mold. The purpose of the strainer is to permit several small streams of molten metal to run directly to the bottom of the mold rather than in a large single stream from the furnace, this preventing splashing of the metal. After the metal solidifies the molds are separated into two parts and the solid cast bar is dropped to the casting shop floor. The top or gate end of the bar is cut off and the bar is then delivered to the rolling mill.

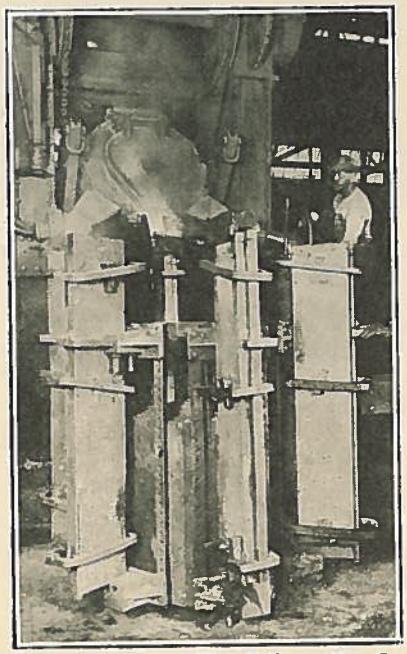


Photo Bridgeport Brass Co.

Pouring sheet brass bars

The operations necessary for the production of sheet brass are, Breakdown, Overhauling, Annealing, Pickling, Running Down and Finish Rolling.

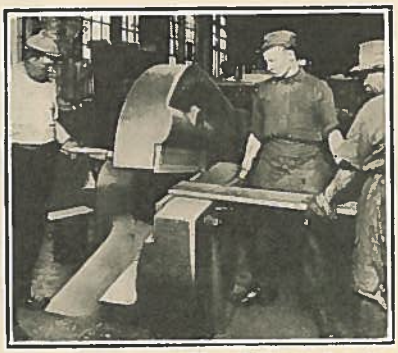


Photo Bridgeport Brass Co.

Visual inspection of gate end

Breakdown

When a solid is in molten form the atoms, or very minute parts of which the solid is composed, rush about with great energy; but as the liquid begins to harden the atoms find their activity impeded. When this occurs, they invariably commence to arrange themselves in orderly line and form into masses called crystals.

The purpose of the Breakdown operation is to destroy the crystalline structure and the physical characteristics typical of a casting, and to establish those of wrought metal. This is a kneading operation and is accomplished by passing the bars longitudinally between two horizontal chilled iron rolls rotating in opposite directions. The distance between these rolls determines the thickness to which the bar is rolled. The bar is given several passes, each time the rolls being

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MECCANO
STANDARD MECHANISMS

LEVERS

Lever of the First Order

THE lever is the simplest and perhaps most valuable of the various mechanical powers, for it forms a useful medium for increasing or changing the direction of a force in cases where it would be impracticable to employ pulleys. The lever is classed in three distinct groups, and is said to belong to the first, second or third "order," according to the relative position of the fulcrum, or point at which the lever pivots, to the "power" and the "load."

A lever of the first order is illustrated in Fig. 1. The upright member of this model is constructed from two 5½" Angle Girders (1) secured to the base (2) by 1" x 1" Angle Brackets (3) and held together at their tops by two ½"x½" Angle Brackets. A short Rod, which supports the lever, is passed through the upright and rigidly secured in a Crank bolted to the rear 5½" Angle Girder.

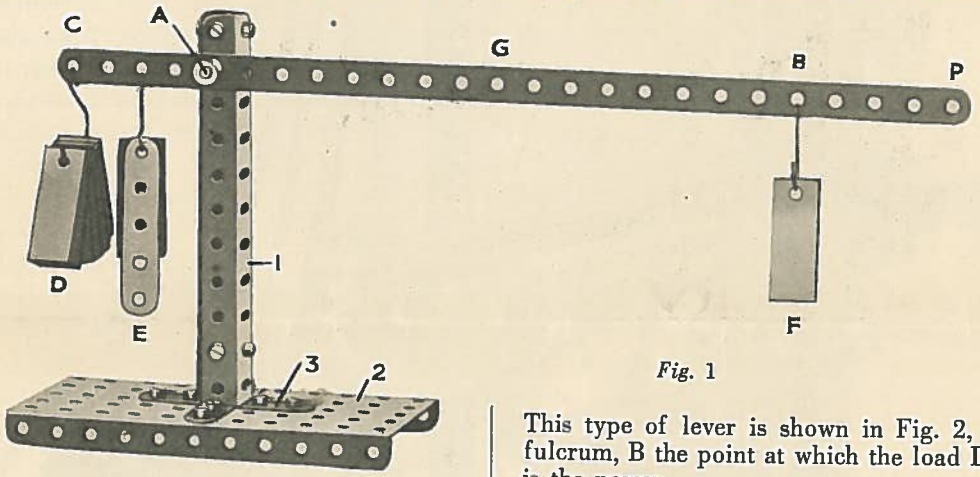


Fig. 1

As will be seen, the fulcrum A is situated between the load D and the power F. In order to experiment with the properties of the lever, we must first counterpoise the weight of the arm AP. This may be done by adding a weight E to the arm AC, and in the example illustrated, which shows the beam pivoted in its fifth hole, 125 grammes and two 2½" strips are found necessary to balance AP.

Example 1

It will now be found that a power load of 50 grammes at B is sufficient to balance a load of 200 grammes at C; therefore this arrangement of the simple lever gives a mechanical advantage of four. The arm AB is 8 in. in length and CA only 2 in. As the radius of the point B from the fulcrum A is four times that of the point C, point B must move through a distance four times greater than that through which the point C moves. Thus a power is increased proportionally to the distance through which it moves, or expressed more generally, the rule may be stated that the power is to the load as the distance of the load from the fulcrum is to the distance of the power from the fulcrum.

Further interesting experiments may be carried out with this model by altering the positions of the power and load, or by moving the fulcrum in either direction along the lever. In the latter case, it should be remembered that the weight E must be readjusted to balance the altered length of the arm AP.

Lever of the Second Order

In levers of the second order, the fulcrum is at one end, the power at the other, and the load lies between the two. This type of lever is shown in Fig. 2, in which A is the fulcrum, B the point at which the load D is applied, and C is the power.

The upright column (1) in this example is constructed in a similar manner to that shown in Fig. 1, but in this case the Girders are 9½" in length. The Pulley (2) runs freely on a short axle, and is held in place by a Collar (3). A 12½" Strip represents the lever, and pivots about a short axle journalled in a Fork Piece (4) carried from a Coupling (5) which may be secured by its set-screw in any position on the Rod (6). The latter passes through the upright Girders (1) and is secured in Cranks (7).

Example 2

The weight of the lever AC is balanced by placing 100 grammes and one 2" Strip on the load-hook at D. In addition to these weights, the hook D carries a further 150 grammes to represent the load. The load-hook is suspended from a cord passing over the 2" Pulley (2) and attached to the lever at B.

The power C is 12 in. from the fulcrum A, and the point B, at which the load D takes effect, is 2 in. distant. Therefore AC is six times as great as AB, and by applying the rule set out in Example 1, we know that the power required at C to balance the load D is one sixth of 150 grammes, that is, 25 grammes. It will be found, however, that a slight addition must be made to the power C in order to actually raise the load D, the weight added representing the force lost by friction.

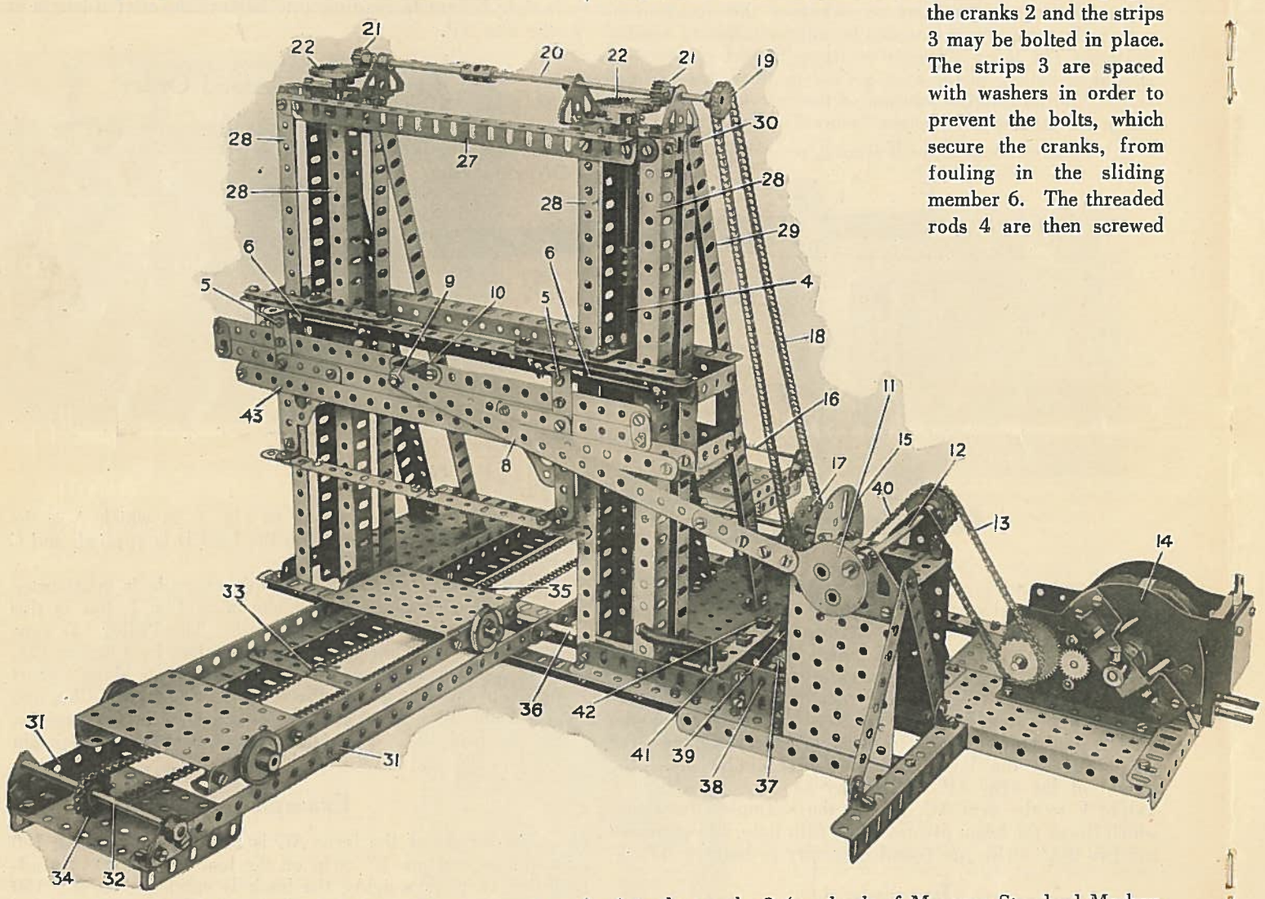
Further experiments may be carried out with this model

(*Continued on page* 122)

How to Build a Meccano Model Log Saw

AMERICA'S forests furnish a large proportion of the world's timber. Every year some millions of trees are cut down to be used eventually for a variety of purposes.

Trees to be cut down are selected with care, and whenever possible these are chosen near a river into which they may be rolled. Here they are gathered together in large quantities, and in the spring, when the snow melts and the streams are unusually high, the logs are floated down the river to the mill.



Once they reach the mill modern machinery takes hold and soon reduces them to the size and shape required. One of the many labor-saving devices that have superseded the old manual labor methods is the mechanical log saw.

Meccano Model

The general construction of the main framework of the model is clearly illustrated in Fig. C while details of the vertically adjustable frame and saw slide are shown in Fig. A and of the saw frame in Fig. B. When completed the frame (Fig. A) is slipped over the uprights 28. The 9½" angle girder 27 is then bolted to the 12½" angle girders 28 as shown and the 12½" angle girders 29 are joined at 30 to the top of the uprights. The threaded cranks 2 and the strips 3 (Fig. A) are not secured to the saw slide at this stage, but when the slide is in position on the uprights the cranks 2 and the strips 3 may be bolted in place. The strips 3 are spaced with washers in order to prevent the bolts, which secure the cranks, from fouling in the sliding member 6. The threaded rods 4 are then screwed into the cranks 2 (see book of Meccano Standard Mechanisms, Section IX).

Saw Frame

The saw frame Fig. B is bolted and spaced with washers at 5 to the couplings 6 which slide on two 3½" rods 7 secured to the frame (Fig. A) by rail supports and is reciprocated by means of a 9½" and 2½" strip 8 overlapping 3 holes and bolted at 9 to a double bent strip 10 on the frame. The saw frame is further retained on the slide by a 12½" strip 43. The strip 8 is also bolted to an eccentric 11 on the rod, which is driven by a sprocket chain 13 from the motor 14.

The saw slide is adjusted vertically by turning the face plate 15 mounted on a 4½" rod journalled in a 2½" x 1" double angle strip (Fig. C). This rod carries a 1½" sprocket wheel 17 coupled by a chain 18 to a ¾" sprocket wheel 19 on a rod 20 made up of 6" and 3½" rods coupled together. Two ½" pinions 21 engage 1½" contrate wheels 22 each secured to a 3½" rod and coupled to the 4½" screwed rods 4 which engage the cranks 2.

The saw is made of two rack strips 23 bolted to a 9½" strip 24 carried by architraves 25 from the saw frame. The latter consists of two 12½" strips 26 bolted together at the ends.

Feed Carriage

The feed carriage, which slowly moves the logs against the saw whilst they are being cut, runs on rails 31 formed from 12½" angle girders butted together, and is advanced by a sprocket chain 32 connected at 33 to the carriage. This chain passes over a ¾" sprocket wheel 34 at either end of the rails, while the lower part of the chain passes under and is driven by a 1" sprocket wheel 35 on the 8" rod 36. The latter is connected by a dog clutch to a 3½" rod carrying a ¾" pinion engaged by a worm wheel 37 on a 2½" rod, at the other end of which is a 2" sprocket wheel 39. This is driven by a chain 40 from the rod 12. The dog clutch is controlled by the hand lever 41 and pivoted at 42.

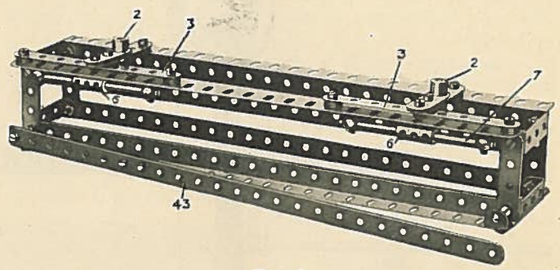


Fig. A

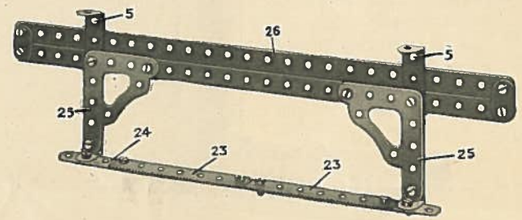


Fig. B

Parts Required

3 of No.	1	146 of No.	37
2 " "	1A	30 " "	38
4 " "	2A	1 " "	43
1 " "	3	1 " "	45
1 " "	4	4 " "	48
8 " "	5	1 " "	48A
10 " "	6	2 " "	48B
2 " "	6A	4 " "	52
23 " "	8	6 " "	53
4 " "	8A	13 " "	59
7 " "	9	2 " "	62A
2 " "	9D	5 " "	63
4 " "	9F	4 " "	77
6 " "	10	2 " "	80B
14 " "	12	2 " "	94
1 " "	12B	1 " "	95
1 " "	13	1 " "	95A
1 " "	14	4 " "	96
6 " "	15A	3 " "	96A
5 " "	16	3 " "	108
4 " "	22	1 " "	109
2 " "	25	2 " "	110
3 " "	26	2 " "	115
1 " "	27	3 " "	126
1 " "	27A	2 " "	126A
2 " "	28	1 " "	130
1 " "	32	4 " "	136

1 of No. 144
Electric Motor

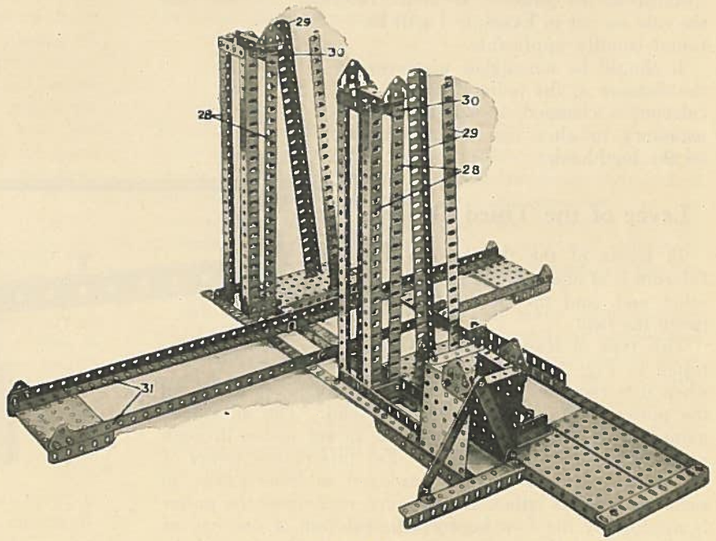


Fig. C

Meccano Standard Mechanisms

(*Continued from page* 119)

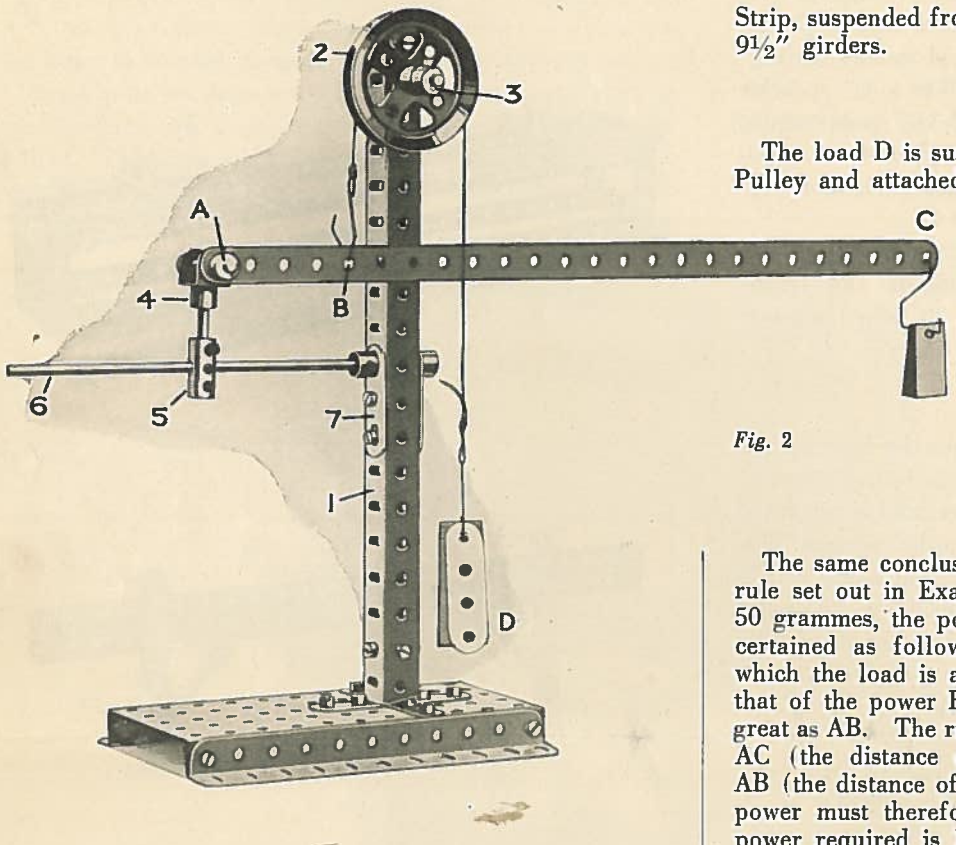


Fig. 2

by sliding the Coupling (5) along the Rod (6) and so altering the position of the point B, or by diminishing the distance of the power C from the fulcrum. In each case the rule set out in Example 1 will be found equally applicable.

It should be noted that whenever the distance of the point B from the fulcrum is changed, it will also be necessary to alter the counterpoise on the load-hook.

Lever of the Third Order

In levers of the third order the fulcrum is at one end, the load at the other end, and the power lies between the two.

This type of lever, which is illustrated in Fig. 3, is never employed when it is required to increase power; whenever it is used the power must always exceed the load. The advantage gained in its use is the fact that the power moves through a smaller space than the load. For this reason levers of the third order are usually employed as foot-treadles in such machines as lathes, grind-stones, etc., where the power is applied by the foot between the fulcrum at one end of the lever, and the load, or power required to move the crankshaft, at the other end.

The construction of the model is very similar to that shown in Fig. 2, except that in this case the lever is a 9½" Strip, suspended from an 11½" Rod secured in the upright 9½" girders.

Example 3

The load D is suspended from a cord passing over a 2" Pulley and attached to the lever at C, the power B lying between this point and the fulcrum A. Three 2½" Strips, which act as a counterpoise to the weight of the arm AC, are added to the load hook at D.

It will be seen that the distance of the load from the fulcrum is twice as great as the distance of the power from the fulcrum. Therefore the power, according to the principle of energy, must be twice as great as the load.

The same conclusion may be arrived at by means of the rule set out in Example 1. Supposing the load D to be 50 grammes, the power required to balance it may be ascertained as follows. The distance of the point C (at which the load is applied) from the fulcrum is 9in., and that of the power B is 4½" in.; therefore AC is twice as great as AB. The rule states that the power is to the load as AC (the distance of the load from the fulcrum) is to AB (the distance of the power from the fulcrum.) As the power must therefore be twice as great as the load, the power required is 100 grammes.

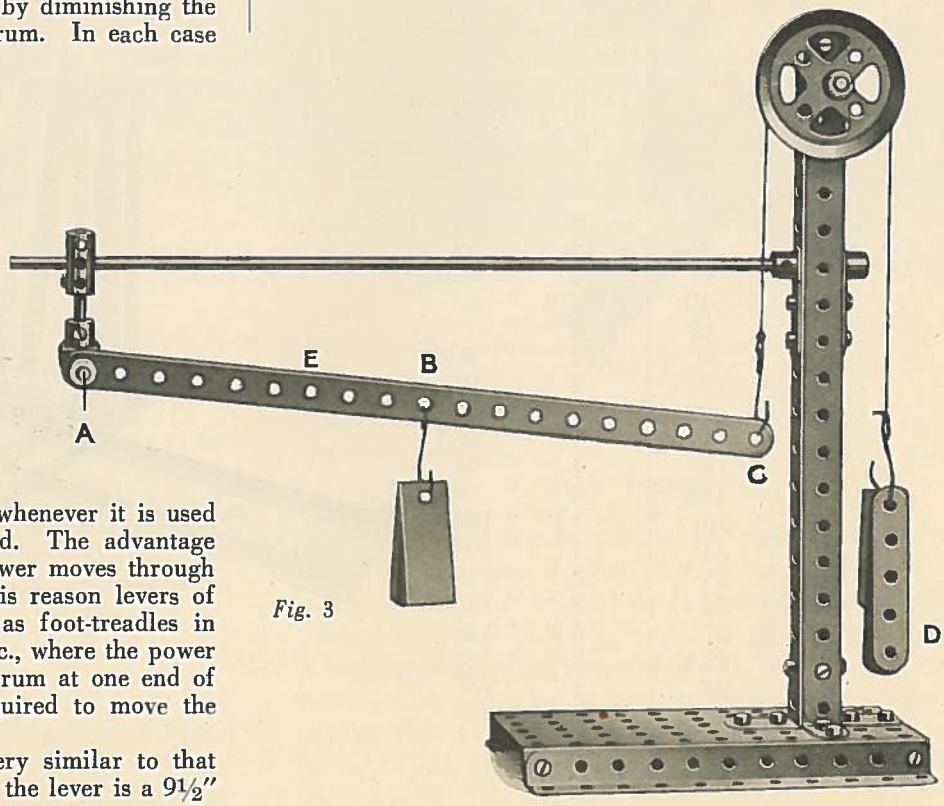


Fig. 3

Transatlantic Telephone Service

(*Continued from page* 117)

and these two produce two more bands, D and E. Then D is filtered out, and E, the remaining band, of the desired frequency, is amplified by the three banks of tubes and sent out from the station. The energy is now concentrated on the one band, and the interesting result of this is that ordinary receiving sets cannot pick up the message, because the carrier wave has been filtered out and without it the wave is soundless and useless. Therefore, before the voice can be heard again, the carrier wave and extra sideband must be restored, and that is what is done at the receiving station at Wroughton.

As the voice travels across the ocean, minus the carrier wave, it is really converted into a form of light that travels at the same rate of speed as light, 186,000 miles a second, and is received by special apparatus and converted back into sound again.

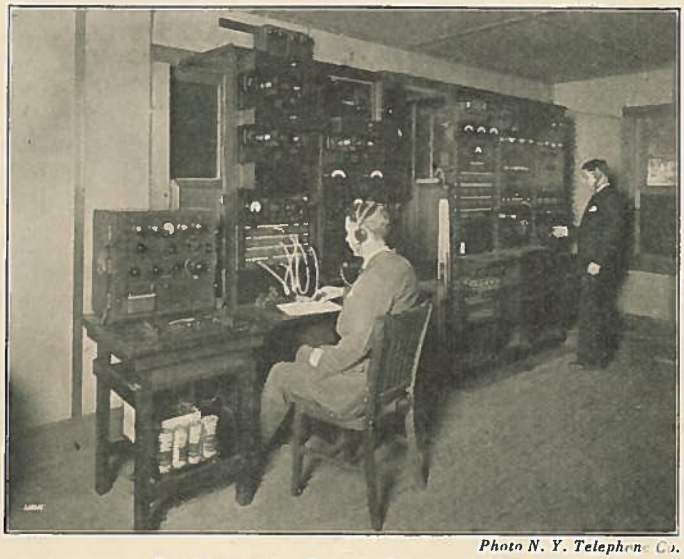


Photo N. Y. Telephone Co.

Interior of station at Houlton, Maine

From Light to Sound

Only low frequencies can be heard by the ear, that is frequencies up to 10,000 per second; but the electrical oscillations which are radio frequencies, may be 160,000 or more per second, and these are what come across the ocean in what is really a silent voice. At the receiving station, by means of the heterodyne oscillator, a different frequency is set up from that used at the transmitting end. These two frequencies then combine in a frequency which is the difference between the frequencies of the original waves, and under the impulse of the voice vibrations, form beats which are within the range of audibility. Thus the carrier wave has been restored, and the voice is again heard; not the same voice, as you can see, but a remarkably life-like imitation.

Current Control

Still another important development is an ingenious mechanism that permits conversation to be carried on two ways. This is accomplished by means of an electric valve which permits the current to flow in one direction only at a time. Ordinarily the valve on the transmitter line is closed, a relay shorting the line, and the receiving end is open; but when the voice comes over the wire, the voice currents operate the relay to open the transmitting and to short the receiving line. In this way the whole arrangement is automatic, and there is no chance of the speaker's voice coming back to him over the circuit.

Of course, a careful record must be kept of the operation of the station and at Rocky Point this is done by an attendant with a typewriter on a specially constructed desk. Let us examine this desk for a moment. At the extreme left we shall notice a group of about fifty switch board lights which serve as alarm signals on all circuits failing on the main power panel. If any one of the red lights go out, for example a light relay controlled by the filament of one of the tubes, the high voltage is automatically cut off.

At the right of the desk is a meter that is coupled to the antenna and records the amount of antenna current. In the middle of the desk is an instrument that indicates the volume.

The attendant is provided with head phones so that he can monitor on the incoming messages and his desk is equipped with a telegraph key which controls a 1500 cycle operator for signalling by radio to England; that is, radio telegraphy with a 1500 cycle tone.

The attendant's desk is in front of the main power panel which may be seen in our illustration. This is the panel for all circuits except the high voltage for the high power amplifier tubes. The incoming alternating current of 400 volts drives four motor generators, each of which is controlled by equipment on each of four panels.

Just a word about the huge antenna amplifier at Rocky Point. There are six great towers, 1250 ft. apart and this with the leads gives a total length of 7250 ft. for the antenna. At the base of each tower is a copper house, for housing the tuning coil for radio telephonic operation.

Incoming Calls

Calls coming from England are received at Houlton, Maine, and a view of the interior of the radio telephone receiving station there is shown on this page. At the right of the picture will be seen the radio receiving unit and at the left the telephone test board and amplifier for the wire transit to New York. When the operator gets the incoming signal transformed into a voice and sufficiently amplified, he plugs it in over the land wires to the required telephone instrument.

The service is not yet perfect, and many improvements will have to be made before twenty-four hour service can be rendered the year round. The developments have reached that stage, however, where it is felt that research work can best be carried on by putting the service into operation. For the present, therefore, transoceanic service is being given between the hours of 8:30 A.M. and 1 P.M., New York time.

Honest Harry

Little Harry was sent to the store for a measuring tape.
Clerk: Do you want a steel one?
Harry: No, of course not. I want to buy one.

COMPETITION PAGE

Doublet Word Puzzles

Lewis Carroll, the famous author of "Alice in Wonderland" and "Alice Through a Looking-Glass," was very popular and had a large circle of friends. To amuse them and to help pass the time away, Carroll invented the word game known as "Doublets." His friends received this game with so much enthusiasm that after a while he was persuaded to introduce it to the public. It "caught on" immediately and became quite a rage.

We are confident that our readers will find this form of puzzle very fascinating and at the same time amusing. The rules are very simple. Two words, each containing the same number of letters, are given and are termed the Doublet. It is required to change the first word into the second by placing connecting words between them, each new word differing from its predecessor only by the alteration of one letter. These connecting words are termed "links." It is obvious, of course, that only words of exactly the same length as those comprising the Doublet may be used.

It is important to note that only well-known English words are admissible and names of persons or places are not allowed.

To guide our readers in solving the Doublets given below, the following examples are given:

Fit	HOOK	to	BOLT	2 links wanted
	HOOK-book-boot-BOLT			
Change	PIG	to	RAT	2 links wanted
	PIG - pit - pat - RAT			

It will be seen that the changing of only one letter occurs in each link and that there is no reshuffling of the letters.

Below we give a list of Doubets to be solved and by their side the number of links required to complete the chain.

Change	BOY	to	MAN	2 links wanted
Burn	COAL	to	COKE	6 links wanted
Change	PLUM	to	PEAR	4 links wanted
Kick	BALL	with	FOOT	5 links wanted
Sting	LAD	with	BEE	2 links wanted
Complete	HOME	with	ROOF	4 links wanted
Fit	LOCK	on	DOOR	3 links wanted
Lift	BLOCK	with	CRANE	4 links wanted
Build	MODEL	with	PARTS	5 links wanted
Waft	SHIP	with	WIND	

In the case of the last Doublet, we leave the correct number of links to our readers' ingenuity—the lower the number, the better the solution.

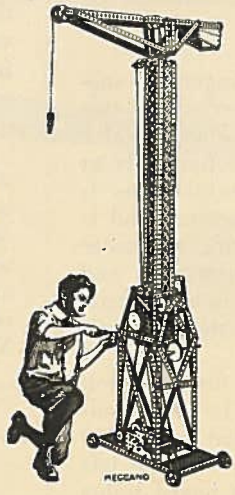
Prizes of Meccano goods to the value of $3.00 and $2.00 respectively will be awarded to the senders of the two best sets of solutions. Entries should be addressed to. Doublets, Meccano Magazine, Elizabeth, N. J., and sent to reach this office not later than May 25th.

The 1927 Model Building Contest

Competitors may be of any age or either sex, and there are no restrictions or entrance fees. The ingenuity and originality shown will guide the judges in their decisions, and no preference will be given to large, elaborate or complicated models. A small model well constructed, and demonstrating an ingenious idea, stands just as good a chance of winning a prize as a large and intricate one.

A competitor may enter any number of models for competition and there is no restriction as to the number of parts or make of toy which may be used.

The judge will be Frank Hornby, the inventor of Meccano, and his decision will be final. No photograph or sketches will be returned to competitors. No entry form is required, but each sheet or photo must bear the name and address of the entrant. The photographs or sketches need not be the work of the competitor.



THE PRIZES

First Prize.....	Meccano	goods,	value	$25.00
Second Prize.....	"	"	"	15.00
Third Prize.....	"	"	"	10.00

The closing date for this contest is October 1st, 1927, and the list of prize winners will be printed in the "Meccano Magazine," as soon thereafter as possible.

The actual model should not be sent. A clear photograph or drawing is all that is required.

The New Limerick Contest

Limerick contests are always very popular and we received many entries for this one. The entries, however, did not seem to be as original or as interesting as those received in past contests, and we have come to the conclusion that we picked a hard one for the boys to complete. Also many forgot that the last line of a limerick must rhyme with the first two lines, and instead made the last line rhyme with "new" and "too". The two winners are as follows:

GROUP 1

Boys over 10 years

Yorke Markham, Age 14 — 237 Seneca Place, Westfield, N. J.

Hurrah for the new colored parts,
My, how they've captured our hearts;
They make old models new,
And look much better too,
They're the greatest we've seen in the marts.

GROUP II

Boys under 10 years

Maurice Rahe, Age 9 — 1711 Florida Drive, Ft. Wayne, Ind.

Hurrah for the new colored parts,
My, how they've captured our hearts;
They make old models new,
And look much better too,
Our models are now classed as arts.

If I Were Editor—

The entries in this contest covered a wide variety of suggestions, the two most frequently made being, publish the *M.M.* monthly and print some jokes. While we cannot promise to introduce all the suggestions, new features will be incorporated as rapidly as possible. The successful competitors were:

1st Prize William M. Steiner, Brooklyn, N. Y.
2nd Prize John P. Richards, Mount Ayr, Iowa

FROM OUR READERS

Pooch

By Quentin Stiff

We found him on the morning of June 8, 1926, sitting on our back porch. This was the day after the mail plane piloted by Elmer Partridge crashed on our farm. The dog was thin, and hungry,—we never have filled him up yet—and looked so bewildered and foolish at the same time, that we just had to keep him.

He is part airedale, police dog, terrier, and, to look at his feet, part snowshoe rabbit. His paws are almost four inches across and he isn't much over a year old. I have seen him kill

Pooch

a big mouse with one blow of his paw. He weighs about fifty pounds, is about two feet high and his general build is that of a daschund on stilts.

We also have a ten year old "Pup" who has licked every dog in the country and is the gentlest dog that we ever saw. At first Pup wouldn't play with Pooch at all. In fact, he was very disgusted and jealous, but he soon got over that and for a while they beat any circus going. But now Pup is blind in one eye and is too old to play very much.

Pooch can run rings around Pup. I have seen him hold his own with a jack rabbit just after I had missed it. Once when my brother wounded a jack rabbit Pooch just followed it along and kept knocking it over as often as it got up, until my brother came up and killed it.

One of our neighbors, who lives just across the road, also has a dog and as soon as Pooch finishes his meal he races across the road and generally gets another meal. Once he couldn't eat all of the other dog's meal so he picked up the dish and carried it all the way home in his mouth where he could eat it at his leisure.

When he barks, if you couldn't see him, you would think that there were a couple of St. Bernards gone wild. Everything that moves, and he sees everything, must be informed of his presence, and he does inform them.

We don't know what he will be like when he is older, as he sometimes shows the utmost cunning, while at other times he acts dumb. His eyes are always void of any expression.

His real name is Rex, but Pooch fits him better than any other name we have ever heard of.

The Boy Who "Earned" Meccano

Thinking the Story of Edward and his Meccano might be of interest to the readers of the M.M., I am sending it with this letter. It is a true story of a little boy who wanted Meccano like his pals had and went after it.

Mrs. Charles R. Davenport.

Edward is a boy eleven years old, who has a great many things on his mind beside his school work. So when he asked his mother if he could have a Meccano set for Christmas, her first question was "How much will it cost?" To this he replied that the set he wanted would cost $5.00. His mother answered "No." She had two reasons for her answer. The reason she gave him was that a Meccano set would take his mind from his school work and would be time wasted. The other reason was that there was no money for a Meccano—Edward has a baby sister and two brothers and at Christmas time his mother was thinking of a new sport coat, new ties and blouses for Edward, instead of toys.

Edward had in the past weeks earned a little money by selling candy for an elderly lady, who made the very best home made candy. Somehow each week he found many things for which to spend his money,—ice cream, candy, gum and movies. Oh! there are so many things a boy thinks he needs. But still, he wanted that set and he made up his mind he would get it. His Mother's answer was different when he asked if he could buy a Meccano set if he saved up the money himself. She knew that if he wanted it badly enough to work and save for it, he would enjoy it.

So he began to save his money. He worked very hard for he really had an object in view, and when he wanted to play after school and on Saturday he worked instead. People in stores and shops are very glad to get fresh home made candy and he soon had a number of steady customers. He was also helping the lady who made candy as it was the only way she had of making a living. She had several little boys who sold candy for her, and she also placed it in stores about the city. And Edward's nickels and dimes did pile up.

The week before Christmas he won one dollar in cash as fourth prize in a magic picture contest one of the large department stores held for children. At last he had $5.00 and money enough for Christmas gifts for each member of the family.

He bought his 1x Meccano but these sets come in cardboard boxes which soon break with so much handling. The next thing was a strong box. He asked in the packing room of a store where he happened to be selling candy and the man offered him a toy case which was very badly smashed. Edward and his father fixed the smashed up toy case and it made an ideal box for his Meccano set.

Since Christmas he has added a transformer to his set. Every evening after the home work is finished, he gets out the Meccano set, and the three boys have many delightful hours making new models and playing make believe, and actually building.

The parents, who were afraid that Meccano would take Edward away from his studies, now see where Meccano is helping and teaching and keeping a restless little boy contented evenings, doing something that he likes.

Puzzles for You to Solve

Puzzle No. 69—A lady went to a bazaar with a sum of money in her purse. She paid $1.00 entrance fee, then spent half of what she had. She next spent $2.00 for the concert and spent half of what she had left for a souvenir. Going into the next room she paid another $2.00, then again spent half of her remaining money. Finally she paid $2.00 for a raffle, in the last room, and then spent half of what she had left on a bunch of violets. Going home she found she had only 30 cents left. How much money had she when she started?

Tombstone Puzzle

Puzzle No. 70—An old tombstone was found in the church yard of an East Anglian village. This stone bore the following inscription carved in old-fashioned letters. What does this inscription mean?

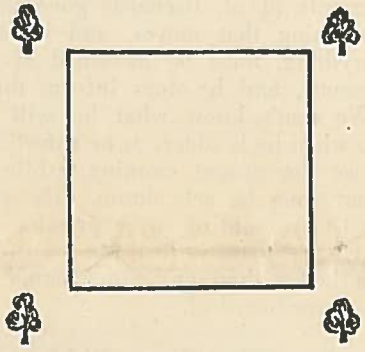
B E N E
AT. HTH. IS. ST
ONERE POS ET
H. CLAUDE COS. TERT
R I P
ES. ELLE. RO
F. IMP.
IN. G. TONAS. DO
TH. HISCO
N. SORTJ
A. N. E.

Problem in Railroading

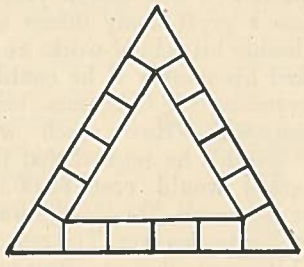
Puzzle No. 71—Train A consists of a loco and 25 cars. Another train B, consists of a loco and 50 cars. The railway on which they are running is a single track, and as the trains are travelling in opposite directions they require to pass each other. To do this they may make use of a siding but this will take only 15 cars, exclusive of the loco. How can trains A and B pass each other?

Puzzle No. 72—Three men fell asleep in a barn. One awoke and saw there a bag of apples. He found that if he threw one away the rest would divide into three equal shares, so he threw one away, took his share of the remainder, ate them, and fell asleep again. The second man awoke and went through the same performance, and after him the third man likewise. Lastly, all three awoke and found that the remaining apples would divide among them equally if one more were thrown away. How many apples were there at first?

Puzzle No. 73—A man has a square pond with a tree at each corner, as in the following diagram. How can he double the size of the pond, still keeping the pond square and the trees in the same position?



Puzzle No. 74—The triangular figure shown below contains fifteen compartments. What numbers must be placed in each compartment so that the total of all the numbers on each side of the triangle is 84?



Missing Word

Puzzle No. 75—Who can fill in the missing word from the last line of this verse?

With seven letters he spells his name;
Three letters he drops, he's just the same,
He drops two more, no change you view;
Nor when he drops another two:
He drops a dozen, he drops a score!
He drops a hundred and eighty more!
He drops a thousand and ninety-six!
The total's extremely hard to fix,
No matter the total that he may name
Our jolly.....is just the same.

Answers to Puzzles in the Last Issue

No. 63—The sum reduced to figures is as given below:

13) 8290 (637
78
—
49
39
—
100
91
—
9

No.64—The route is as follows:
B C M G A F K H B A C K M H F G

No. 65

Gin a body meet a body,
Comin' through the Rye,
Gin a body kiss a body
Need a body cry?

.....

Paddle your own canoe.

No. 66—Below is the rearranged square.

1	11	6	16
8	14	3	9
15	5	12	2
10	4	13	7

No. 67—The missing words follow in order:

strip, boss, eccentric, crank, grub, nuts, worm, screw, buffer, bush, set, teeth, braced, collar, pinion, pivot, pins, spring, bolt.

No. 68—1. Pink. 2. Iris. 3. Anemone. 4. Daisy. 5. Pansy. 6. Harebell. 7. Lobelia. 8. Rose. 9. Gentian.

The Story of Brass

(*Continued from page* 118)

brought closer together. The effect of this is a decrease in the guage, an increase in the length, and a harder metal with each rolling. Finally the metal becomes so hard and brittle that further passes would fracture the bar. The Breakdown, like all subsequent rolling operations, is done when the metal is cold.

Photo Bridgeport Brass Co.

Breakdown rolling of cast bar

Overhauling

In order to insure a perfect surface on the finished sheet the broken down bar is subjected to an overhauling operation. The bar is first flattened by being passed over and under small diameter rolls and then caused to pass over a milling cutter which removes the surface from one side. The bar is then turned over and a similar milling cutter overhauls the other side.

Annealing and Pickling

Before further cold working the bar, it must be annealed by heating to a red heat, for the crystalline structure of the metal, although crushed and flattened during the breakdown process still offers resistance, and the crystals have a tendency to return to their former shape. This results in strains within the brass, making the metal brittle. To do away with these strains, therefore, the brass is heated to a temperature sufficiently high to allow recrystallization, but not high enough to allow a change in the form. This may be done in a muffle whose fuel is wood, coal, coke, oil or electricity.

For normal annealing practice in the first few rolling operations a temperature of approxiately 700° C is used. This temperature is materially reduced for subsequent anneals.

In the annealing process, a scale of oxide is formed on the metal, by union with the oxygen of the air. It is necessary to remove this coating, so the metal is immersed in a weak sulphuric acid solution and then thoroughly cleaned in water.

Running Down

The bar at this point has been Broken Down, Overhauled, Annealed and Pickled. The Running Down is the further reduction in gauge by passing between rolls similar to the Breaking Down rolls. Particular attention is given to the amount of "pinch" of the metal, and as the bar increases in length it is automatically coiled as it leaves the rolls. Since the metal becomes hardened with cold working it is necessary to anneal and pickle further at various stages of Running Down.

Finish Rolling

It is during the operation of Finish Rolling where the final specifications as to guage, temper and surface are obtained. This operation is similar to Running Down, with the addition of exceptional care being given to the working of the metal. The rolls used must be expertly ground and kept in first class condition. Continuous check must be given the metal as it comes from the roll and the metal must be carefully coiled and handled.

If it is desired to ship the metal flat the coil is run through a series of horizontal straightening rolls and cut to length. Then, after being thoroughly cleaned and brushed in sawdust, the sheet brass is ready to be shipped.

SLIGHT DIFFERENCE

What is the difference between a barber and a sculptor?

One curls up and dyes and the other makes faces and busts.

RUBBER HEELS

What's good for my wife's fallen arches?
Rubber heels.
What shall I rub 'em with?

A BENEFACTOR IN DISGUISE

Larkson—I'm going up to the jail. I want to talk with the bandit who took my car.

Parkson—What's the use?

Larkson—Maybe he'll tell me how he got fifty miles an hour out of her.

Meccano Magazine

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CHANGE OF ADDRESS—Subscribers should notify the Editor at once of any change of address. Send a postcard,—*giving both old and new addresses*,—so that our records can be kept up-to-date.

Our Mail Bag

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives a great many letters each day, and correspondents will help him if they will write neatly and on one side of the paper only.

Keith Mason, Riverside, Calif.—"I have such good times with my Meccano. I get 25c a week and I am saving my money to buy an accessory outfit. Meccano is such fun that my little sister, whose birthday comes this month, wants a set." Lots of girls play with Meccano, Keith, and we hope your sister was fortunate on her birthday. We are always glad to hear from you.

Billy Hughes, Minneapolis, Minn.—"I am only nine years old and have 1x and 1a outfits. Recenty my father helped me make a street car, using the motor that came with the 1x set. He fixed the motor so our street car could go forward or backward." Somehow or other playing with Meccano is always double the fun when Dad joins in. A street car made from a 1x and a 1a ought to be an interesting model—can't you send us a photograph?

Edmund Philippi, San Francisco, Calif.—thinks The Story of Radio Telephony to London is "just wonderful." He writes that he uses his father's radio batteries to operate his Meccano motor and enquires naively, "Do I have to pay for a transformer? If I don't, send me one." We are afraid, Edmund, that you will have to continue to use Dad's batteries for the present.

John Stetson, Chevy Chase, Md.—"I got my first Meccano set when I was four years old and I have been getting larger and better sets until I now have set No. 5 and I am going to get a No. 5a soon. Once I got another building toy set and built a derrick with it and compared it with the Meccano derrick. I put my 12 lb. electric engine on the Meccano derrick and the Meccano motor pulled it up evenly and slowly just like a real one. Next I put it on the other derrick and the motor jerked so that I thought the engine would fall off. When it got half way up the motor stopped and the girders bent just like tin. The Meccano model did not bend at all." Your story is very interesting, Jack, and the moral of it is —never play wth imitations, stick to the original and best.

Everett W. Bovard, Jr., Port Chester, N. Y. —Your article on the Cathode-Ray Tube invented by Dr. Coolidge is very interesting, Everett, and reminded us of an article we read in another magazine.

Ernest Kilburn, Schuylkill Haven, Penna. —Ernest has a 1x, an electric train and transformer and he has made bridges and tunnels for his train with Meccano. He writes: "I have made several things that are not in the book. I have made an automobile that has steering knuckles. My mother is going to get me 'Standard Mechanisms' and a 1a set." Your mother is very good to you, Ernest—we hope you do your best to repay her.

William Meyer, Gross Point, Illinois.—William sent one of the most interesting letters we have received in a long time and sent a number of snapshots. We regret exceedingly that these are not suitable for reproduction in the *M.M.*

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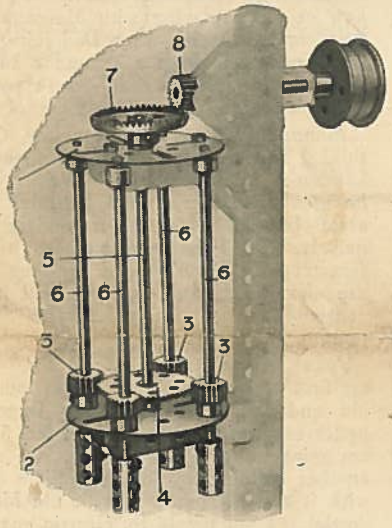

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