MECCANO MAGAZINE

for Boys

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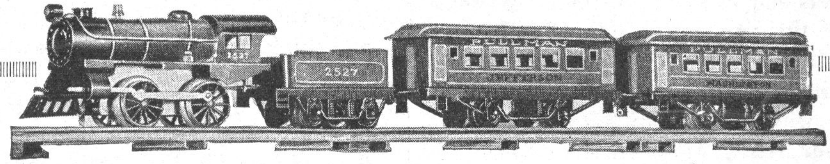
Contents



HORNBY MECHANICAL TRAINS

See announcement on page 157

The Editor's Own Page

No More Excuses

This month I am publishing a number of new models that have been made with the smaller outfits, and it will be a revelation to some of my readers to see the wonderful possibilities of even the smallest Meccano set. How many possessors of a No. 0 outfit, for example, ever thought that they could build a loom? Or a mechanical saw? Surely these models will be an incentive to all.

It is not uncommon to hear boys explaining that of course they cannot invent many new models because they only possess a small outfit—but what would they not do if they had, say, a No. 6! Now, the number of models you can build does not depend so much on your outfit as it does on you yourself. Moreover, if you are content just to copy the models shown in the manual you are missing a great deal of fun and also the benefit of the character-forming experience that comes from working things out for yourself. The creation and development of original models is a source of never ending pleasure.

You Can If You Will

But some will say "I don't seem to be able to think out new models." Naturally, this cannot be done in a moment: it requires thought and takes time but that is true of everything that is worth while. And the reward is the greater for the effort you expend. I can promise my readers that if they will make the effort and persevere, not giving up in discouragement if first attempts are not successful, they will be astonished at the models they will produce. Moreover, as each new model is built ideas for further models will come more readily and many original uses will suggest themselves for the various parts. Every Meccano outfit contains an unlimited amount of fun and it depends entirely on you how much you take out of it. The models shown in the manual represent but a fraction of this fun, yet so many boys seem to think that is all. The big model building contest that is now running presents a most suitable opportunity for boys with small outfits to commence inventing and thus extract for themselves some of the unused pleasure that lies dormant in their outfits.

Hornby Trains

On page 157 appears an important announcement. The world famous Hornby Mechanical Trains are now to be available in America and they will be made in the Meccano factory at Elizabeth, N. J. The richness of these trains and the minute care that has been given to every detail, resulting in the most unusual performance, will make a strong appeal to all Meccano boys. Stocks will be available in a few weeks now and you will be able to see them at your dealers shortly. Watch out for them.

B. & O. Centennial

The Baltimore & Ohio is the oldest railroad in America and the year 1927 marks the hundredth anniversary of the founding of the company. In order to celebrate the occasion, the B. & O. will hold a Centenary Exhibition and Pageant at Halethorpe, a suburb of Baltimore, from September 24th to October 8th, and this will be virtually a World's Fair of Transport. Dramatic and colorful, it will portray the birth and the development of inland transportation in America as it has progressed through the first hundred years. The Exhibition will be thoroughly interesting and unexpectedly educational and of such importance that President Coolidge has declared his intention of being present on the opening day. I heartily recommend all my readers who can possibly do so to attend this unique pageant. No admission will be charged and the railroad announces frequent shuttle-train and motor bus service from and to downtown Baltimore.

The Progress of Flying

Throughout the country today there is the greatest interest in aviation and for this the remarkable transatlantic flight of Colonel Lindbergh, supplemented by his tour of this country in "The Spirit of St. Louis," is mainly responsible.

One of the most thrilling episodes in the history of flying occurred two years ago when the North Pole was conquered by aeroplane and airship, and on page 150 we commence a story of this great achievement by tl Amundsen-Ellsworth Expedition.

As we cast our minds back to former expeditions and think of the privations, hardships and suffering that were entailed, to say nothing of the long months of loneliness, out of touch with the rest of the world, it brings home to us very forcibly the wonders that have been accomplished by flying. But we must not overlook the courage and daring of those brave explorers who made this possible. They risked all, dared and conquered, and their splendid qualities stand out the more because they were not exercised under the stress of patriotic emotion in time of war but were actuated solely by a desire for the advancement and knowledge for the benefit of humanity.

A Giant Electric Shovel

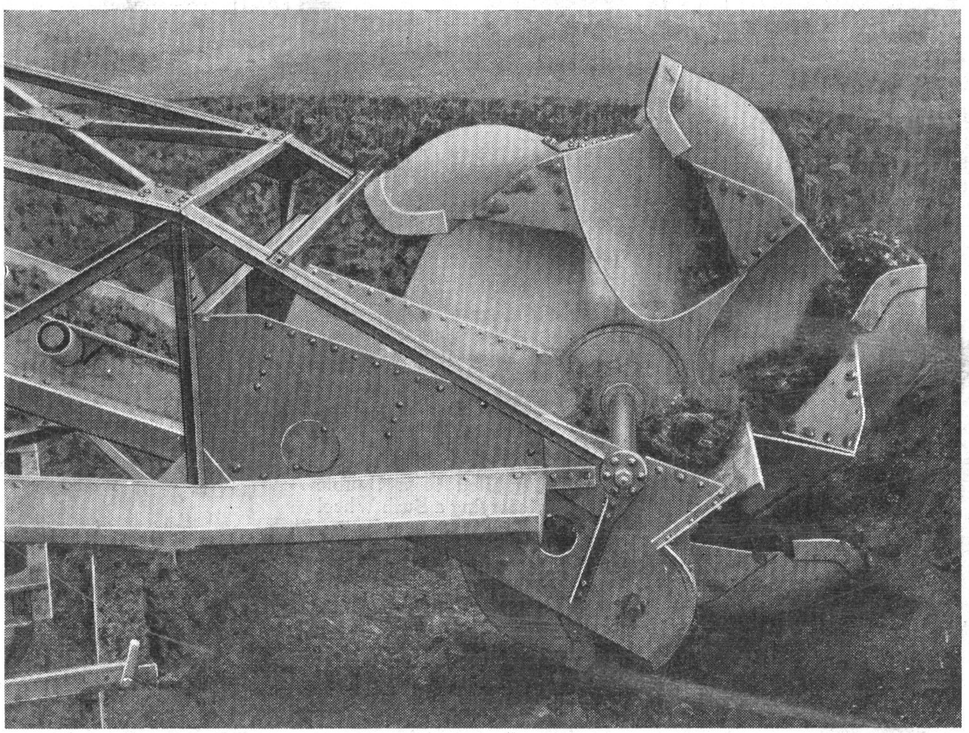
Rotating Monster that Handles 14,000 cubic feet per Hour

AMONG the many interesting types of mechanical shovels is the Clère Rotating Shovel, invented and manufactured in France. This shovel embodies a wheel composed of a number of buckets, generally six, forming a solid whole and turning about a fixed axis of rotation. The characteristic feature of the invention lies in the special shape given to the buckets, the edge being specially curved. This permits material to be lifted no matter in what position the shovel may be, whether working laterally to right or to left, or straight forward. Each bucket has its surface curved in such a way that the material is continually sliding towards the emptying channel, and this movement combined with the rotation of the bucket-wheel, causes the emptying of the material towards the external face of the shovel as it is lifted above the axis of rotation.

The emptying begins when the bucket is slightly above the axis of rotation and finishes before the emptying edge of the emptying channel has passed the edge of the chute hopper. The material received by the chute hopper is then fed on to a suitable transporter belt.

A Typical Shovel

We are able to illustrate a typical Clère shovel. The edge is of hard-tempered steel—the working part of which is sharpened—and it is riveted on to the buckets. In the case of very hard ground, teeth are added, the shape of which varies according to the nature and composition of the material to be worked. It is claimed for this shovel that it forms an indestructible whole of which no part is subjected to wear on account of friction, and that therefore it has a great advantage over bucket excavators in which the buckets are linked together by shackles and trunnions.



Shovel Wheel at Work *Courtesy of Louis Clère, Paris*

Dimensions of Shovel

The principal dimensions of the Clère shovel—its diameter and width—are determined by the output per hour demanded of the apparatus. The theoretical capacity of the shovels varies between 700 and 14,000 cubic feet per hour for shovel diameters of from 6½ ft. to 19½ ft.

The evacuation of the material handled by the shovel is effected by means of a transporter of almost any type—a belt of Balata or rubber, a toothed metallic transporter, etc.—travelling horizontally or ascending. When it is necessary to raise material to an exceptional height the total length of the apparatus may be too great, and in certain special cases it may be necessary to empty the shovel by means of chain and buckets.

The Clère shovel shown in our illustration is arranged as a revolving crane resting on a truck running on an ordinary track. This truck supports the upper part of the apparatus, which essentially comprises two elements, the shovel proper and the transporter belt. The whole of this upper part borne by the truck is capable of being completely rotated, and the shovel itself can be raised or lowered in relation to the ground upon which the truck rests. The travelling movements of the apparatus—the swivelling of the upper part, rotation of the shovel and movement of the transporter—are all mechanically obtained from one motor. The actual raising of the shovel, however, is effected by hand. The control levers are all assembled at a convenient point from which the engineer has a clear view over the whole machine.

The possible methods of working the shovel are varied. In consequence of the rotating movement of the whole of

(*Continued on page* 153)

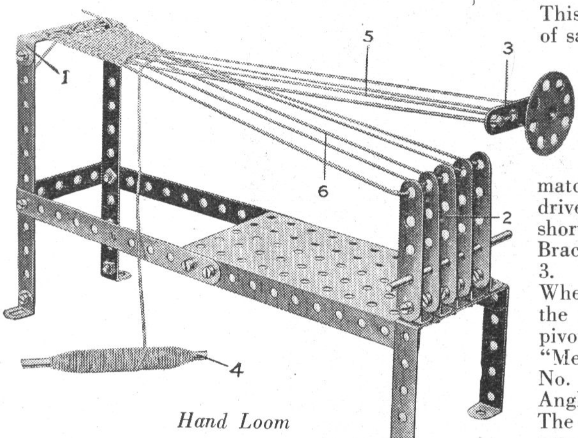
Models Made with a No. 0 Outfit

THERE was recently held in England a competition for original models made with a No. 0 Meccano outfit and a large number of exceedingly clever models were received. We are reproducing here a few of the prize winners and we are sure that they will be of great interest to our readers. Without doubt our English cousins have set a very high standard and the present Model Building Contest of which particulars are given on page 156 presents a splendid opportunity for our American boys in a spirit of friendly rivalry to go one better.

Hand Loom

The first prize was won by a Hand Loom and its construction is remarkably simple.

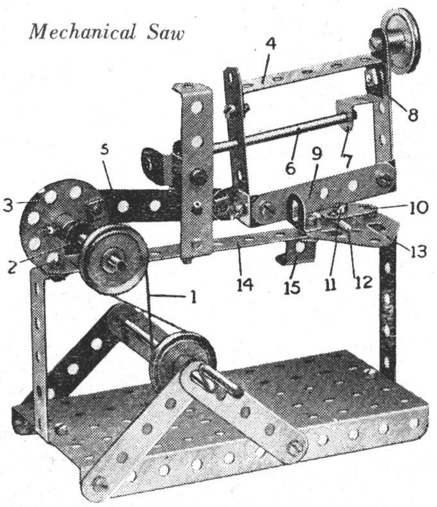
The warp threads of the loom are tied at one end to the Double Angle Strip 1, whilst their other ends are secured alternately to the tops of the five upright 2½" Strips 2, and the 2½" Strip 3. The "shedding"



Hand Loom

movement of the warp is obtained by moving the Strip 3 up or down, care being taken to see that each thread falls properly between the Strips 2. The shuttle 4—a 3½" Rod—which carries the weft, is passed between the two layers of warp 5 and 6 whilst they are in the position shown. The Strip 3 is then lowered, and the shuttle returned through the layers, but this time the threads 5 are beneath the threads 6. On the Strip 3 being returned to its original position, the operation is repeated as above. The strands 6 should be kept very taut, and for this reason the bolts securing the Strips 2 to the Angle Brackets on the base plate should be made as rigid as possible. Good strong wool or similar material may be used in this apparatus. The weft threads may be closed up with the woven portion of the material each time the shuttle passes, by means of an ordinary comb, representing the "reed" in the actual machine.

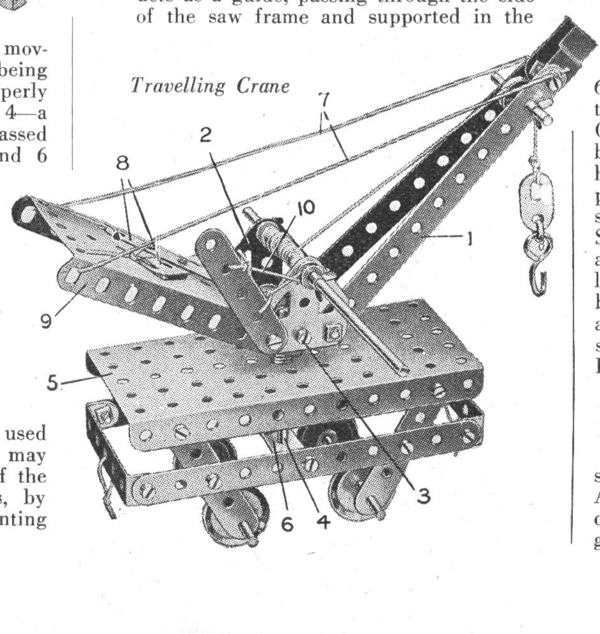
Mechanical Saw



Mechanical Saw

This is an ingenious model of the type of saw widely used in industry for cutting through bars of metal, etc. The Strip 9 represents the saw; this may be substituted by a piece of fret or hack-saw blade when the model may be put to really useful work, such as cutting through matchsticks, etc. The Crank Handle drives through a crossed belt 1, a short Rod journalled in a Double Bracket 2 and carrying a Bush Wheel 3. The rotary movement of the Bush Wheel imparts a reciprocating motion to the saw frame 4 through a 2½" Strip 5 pivoted by means of bolts and nuts (see "Meccano Standard Mechanisms," detail No. 262) to the Bush Wheel and to an Angle Bracket bolted to the saw frame. The latter slides on a 3½" Rod 6, which acts as a guide, passing through the side of the saw frame and supported in the Reversed Angle Bracket 7. A Washer is placed on the bolt 8 between the bracket 7 and the frame. A "vice" is provided to secure the objects in position for cutting. It consists of a Flat Bracket 10 mounted on a bolt 11, a few turns of which causes the Flat Bracket to grip or release the object 12. The bolt 11 enters a nut held between the Flat Trunnion 13 and 5½" Strip 14, which are spaced apart for the purpose by Washers placed on the two bolts holding the Trunnion in place. The saw-frame rests on a stop 15 when not in use. A 1" Pulley secured to the top of the frame acts as a weight and helps to steady the saw.

Travelling Crane



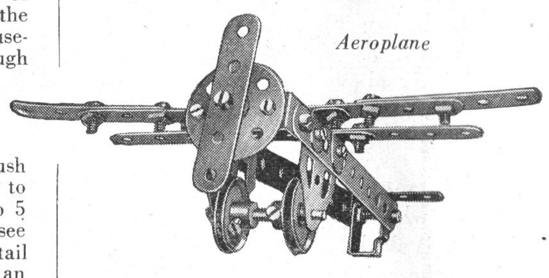
Travelling Crane

Two entries vied with each other very closely for the third prize, and as it was impossible to choose between the two, the judges decided to duplicate the prize and award it to both the competitors concerned.

One of these models, a Travelling Crane, makes excellent use of the contents of a No. 0 Outfit.

The jib 1 of this model is pivotly attached by nuts and bolts to the Flat Trunnions 2, which are bolted at 3 to Angle

Aeroplane



Brackets secured to the Bush Wheel forming the base of the swivelling portion of the crane. This Bush Wheel is nipped to a 2" Rod 4 passing through the centre of the hole of the Plate 5 and further supported in a 2½" x ½" Double Angle Strip 6. A Washer and Spring Clip mounted on the Rod 4 below the Strip 6 secures the Crane to the carriage. The jib is supported by means of cords 7 tied to 2½" Strips 8, the holes of which engage the shank of a bolt passed through the Sector Plate 9. By inserting this bolt into different holes in the Strips 8, the elevation of the jib may be altered as desired. The cord 10 of the brake lever is wound once round the Crank Handle, between two Washers. The model may be arranged to run on Hornby Rails by substituting Flanged Wheels for the four 1" Pulleys.

Aeroplane

The construction of this model is extremely simple, and requires but little explanation. A 2½" Strip representing the propeller is carried on a bolt, the shank of which is gripped by the set-screw of the Bush Wheel.

The Story of Lead

2. How Lead is used.

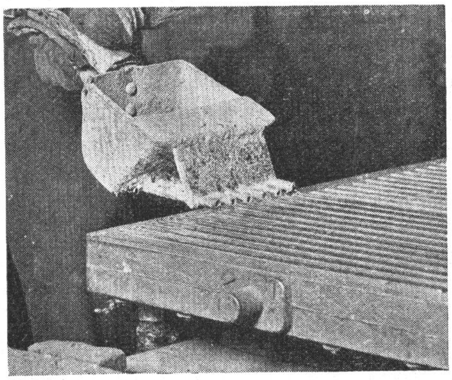
IN our last issue we described the mining of lead ore and the subsequent processes through which it passes before the pure metal is produced. This month we deal with the various practical applications of the metal.

We are all familiar with the lead in the form of pipes in our houses. Lead pipe has probably been in use in one form or another for some 2,000 years. In our June issue we mentioned this. Lead pipes laid down in Rome, Herculaneum, and Pompeii some 1800 years ago have lasted to the present day, the long life of these pipes being due to the fact that the coating of oxide that forms upon lead does not penetrate as deeply into the metal as does rust in iron pipes, but forms a protective coating which effectually prevents further corrosion.

The Latin word for lead is "plumbum," from which we get our English word plumber, which leads us to infer that the plumber's occupation is one of great antiquity.

Making Lead Pipe

The Romans made their lead pipe by bending over a piece of sheet lead until its edges touched and then burning these together. This method of making lead pipe is only used today for pipe of very large diameter. The majority of modern lead pipe is made by a process known as "extruding," which consists of forcing molten lead through a die by means of hydraulic pressure.



Courtesy of National Lead Co.

Pouring Solder Bars

The process is carried out in a large vertical cylinder at the top of which is a cylindrical plunger. In the centre of this plunger is a hole the diameter of which is the same as the outside diameter of the pipe to be made. A steel rod is fixed in the centre of the hole of the plunger. Molten lead is run into the cylinder and allowed to cool until it assumes a plastic condition. When all is ready for the process to commence, hydraulic pressure is applied to force the cylinder containing the lead up to and round the fixed plunger. The lead is then forced out of the opening in the plunger and round the steel rod, thus forming itself into a pipe of exactly the required diameter.

If lead rod is required instead of lead pipe, the same method of extruding is adopted, the only difference being that the steel rod round which the pipe forms itself is not used, so that a solid rod is formed. Lead wire also is extruded, for lead cannot be drawn out like steel or copper. Solder, to which we shall refer later, is also often extruded in the form of wire.

Lead has many advantages over iron for domestic piping. It does not corrode, it is less likely to burst as the result of frost, and if a burst does occur a temporary repair may be effected by hammering the edges of the break together, which of course cannot be done with iron piping.

Lead-Sheathed Cable

We are all familiar with the gigantic reels of lead-sheathed cable that are seen in our streets when electric light and power cables are being laid. It appears to be a common idea that a lead pipe of the correct size is made and that the cable is then drawn through the pipe. This idea is quite wrong, however, for the lead sheathing is formed round the cable by a process of extruding.

A hollow core is made and thus it is set in a proper relationship to the die and pipe is made in the manner that has just been described. In this case, however, the core and die are so constructed that the pipe when made contracts down on the cable and pulls it through along with it. The sheathing can be put on tightly or loosely at will, according to the nature of the particular cable.

Mysteries of Solder

We have all at one time or another watched a plumber at work with his soldering iron, neatly joining together two pieces of lead or tin, and probably it has not struck us that there was anything very remarkable about the process. As a matter of fact, however, soldering is a process that presents many peculiar features.

Solder is made of tin and lead, and it is a curious fact that the alloy melts at a lower temperature than either metal separately. The result is that, by use of his lead-tin mixture, lead or tin may be soldered without being melted in the process. The so-called soldering iron used by the plumber to supply the necessary heat to melt the solder is usually made of copper, as this metal conducts the heat better and is more readily followed by the solder.

Frequently soldering is done by machinery, as in the case of the manufacture of tin cans and the sealing of them after they are filled.

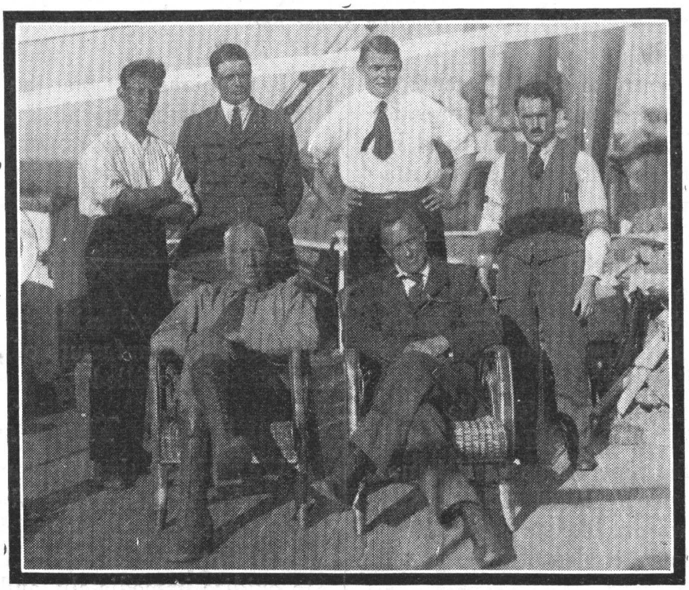
The Use of a Flux

We all know that the plumber in his soldering operations uses what is known as a "flux." Without the flux the solder could not be made to "stick." When the heated soldering iron is applied to the surface of a metal the latter tends to oxidize immediately, and the oxide forms a thin coating that effectually prevents the junction of the solder with the metal. (*Continued on page* 155)

AMONG the many beneficial uses arising from the invention of the aeroplane and the development of the dirigible, not the least is the fact that they promise to be of the greatest service to explorers in general and polar explorers in particular.

After the tragedy of Andree's balloon flight in 1897 (which we hope to describe in some future issue) it was some time before steps were again taken to explore the polar regions by air. A flight from inhabited land to the Pole and back again is at present impossible, but more than one explorer has taken an aeroplane or small airship with him, and sailed into the regions of perpetual ice with it on board.

Although Nansen, in the accounts of his polar explorations, repeatedly expressed a wish that he could have had wings in order to overcome the numerous icebergs that guard the pole, Amundsen—the first man to reach the South Pole, just before the fatal expedition of Scott arrived there—seems to have been the first to actually make use of the aeroplane for polar exploration.


Members of the Amundsen-Ellsworth Expedition who flew into the Polar Regions. Amundsen is seen seated on the left.

The Wrights had scarcely made their first flights, when Amundsen — who, incidentally was one of Nansen's assistants—contemplated using an aeroplane for polar exploration. He undoubtedly would have taken one in the "Fram" in his expedition of 1909, but the initial cost was too great. In 1914 he had actually arranged to take with him a Farman biplane mounted on skis, but he was disappointed for, owing to the outbreak of the War, the expedition had to be abandoned.

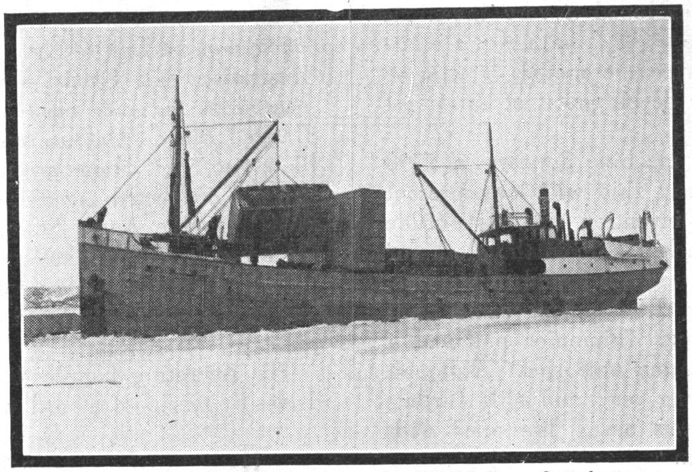
The First Aeroplane in the Arctic

Meantime, the War had a beneficial effect in that it considerably developed the aeroplane. In 1922 Amundsen set sail on the "Maud," taking with him a small Curtis Scouting Plane and a Junkers all-metal monoplane, which latter machine at that time held the duration record with a flight of 27 hours. His hopes were again doomed to disappointment, however, for an accident in the following year, by which the Junkers machine damaged its undercarriage in landing on the ice made it useless. Unfortunately the Curtis machine also crashed when landing on the ice, although not before two flights had been made.

Three years later Amundsen tried again. He left Tromso with the motor-ship "Hobby" carrying two Dornier-Wal seaplanes, and the "Fram" with the personnel of the expedition on board. The ships made for King's Bay, Spitzbergen, and here the aeroplanes, which were stored in huge packing cases, were unpacked and assembled.

The Dornier-Wal Flying Boats

Although no difficulty was anticipated in landing the seaplanes in the Polar regions, it was decided to use two machines, so that the expedition would not necessarily have to be abandoned if one machine should be damaged or if the engines of one should fail.



Unloading the seaplanes from the "Hobby" at Spitzbergen.

The Dornier - Wal machines were fitted with 720 h.p. Rolls-Royce Eagle IX, twin engines, mounted in tandem—that is to say, one behind the other. Thus each machine had a "tractor" propeller and a "pusher" propeller, each revolving in an opposite direction. Either engine, working alone, was capable of at least maintaining the 'plane in the air.

The machines themselves were constructed of duralumin throughout. They were so well designed that although specified to lift only 2,500 kilos, they could actually lift a weight almost equal to their own, which was 3,300 kilograms (7,276.5 lbs.). When they took the air, on their flight to the north, they were each called upon to lift in addition to their own weight, 3,100 kilograms (6,835.5 lbs.), which included, of course, gasoline and the water in the radiators.

When the machines had been assembled, and when the Rolls-Royce engines were running satisfactorily, final preparations were made for the flight to the Pole. In addition to carrying medicines and sufficient provisions for a month, each machine had also a collapsible boat, a small sledge, a tent, and a variety of tackle that might be required on the ice.

One of the wings of N-24 about to be fitted.

Flight Commences

All preparations having been completed, the flight was started at 4 p. m. on the 20th of May, 1925. Six members of the original expedition took part in the flight, three members being accommodated in each 'plane. The N. 24 carried Ellsworth in the observer's seat, Dietrichson as pilot, and Omdal as engineer, while N. 25 carried Amundsen, Larsen, and Feucht in similar capacities.

With the engines running at 1,800 revolutions per minute, N. 25 took the air first and got safely away. N. 24 was not so fortunate, however, for in taking off she sheared some rivets in the bottom of the boat, an accident that was undoubtedly due to her being overburdened by the great weight she was carrying. Realizing that something was wrong, the pilot did a quick piece of thinking, as a result of which he decided to carry on, believing that if he did not do so the N. 25 would certainly turn back and probably the whole expedition would have to be abandoned.

The route lay up the coast to the west of Spitzbergen, and at first a heavy mist made it necessary to fly at an altitude of over 3,200 ft. above the clouds. Soon after the start the two machines established contact, however, and flew towards the polar regions side by side.

Landing on the Ice

In this manner the flight continued for eight hours at an estimated speed of 87 miles per hour. Flying at this speed in calm air should have brought the expedition almost to the Pole, had it been possible to fly in a direct line. But strong winds and air currents drove the machines out of their course, causing considerable variations in the original plan so that, after flying for several hours until half the gasoline had been used, N. 25 decided to land on the ice. Narrowly escaping disaster by colliding with a mountain of ice, the machine became wedged in the ice.

After N. 25 had landed (in what subsequently turned out to be Lat. 88° 30′ N) N. 24 cruised around and chose a landing placed about a mile distant from N. 25. In view of the damage his machine had sustained at the start, the pilot of N. 24 decided to land on the ice, for he thought that if he landed on the water it would flood in through the damaged casing.

Having made a satisfactory landing, the crew managed to work the machine on to a large ice floe. Here they unsuccessfully endeavored to effect a repair and ultimately joined the N. 25, where their help was very welcome in getting her into a more satisfactory position, for it was expected that at any minute she would be crushed between two masses of moving ice.

It was very evident that the N. 24 was so damaged as to be unable to take off, and that she must therefore be abandoned. *(To be continued)*

Meccano Model Sewing Machine

A Clever Model Made From a No. 1 Outfit

THERE has recently been developed a very ingenious model of a Sewing Machine made from a No. 1 outfit and before proceeding to describe the model, it will be of interest to review briefly the development of this most useful machine.

The first record of a sewing machine appears in 1790 but it would be hard to connect this with our present efficient instrument. This first invention was very crude and made use of an awl to punch a hole in the cloth for the needle to pass through. It was not found to be practical, however, and no further development came until forty years later when Barthelmy Thimonier patented a machine in France for making army uniforms. Although slightly better than the preceding one, and still further improved by other patents, it was never developed with any degree of success. Then in 1846 an American, Elias Howe, brought forward his machine. Howe was a poor mechanic who labored all day in a machine shop and was forced to develop his invention at night. He put in several years of such work before he patented his machine, yet it was still crude and was developed later by Howe himself, by Singer and by others. Nevertheless it included practically all the essentials of the modern machine, the grooved eye, the pointed needle and the automatic feed, and produced a lock stitch by means of a shuttle on the opposite side of the cloth from the needle.

People in America, however, did not see the value of the invention and Howe, greatly discouraged, took his machine to England. Receiving no more encouragement here, he finally sold the English patent for approximately $1,200, plus a royalty of $14 a machine.

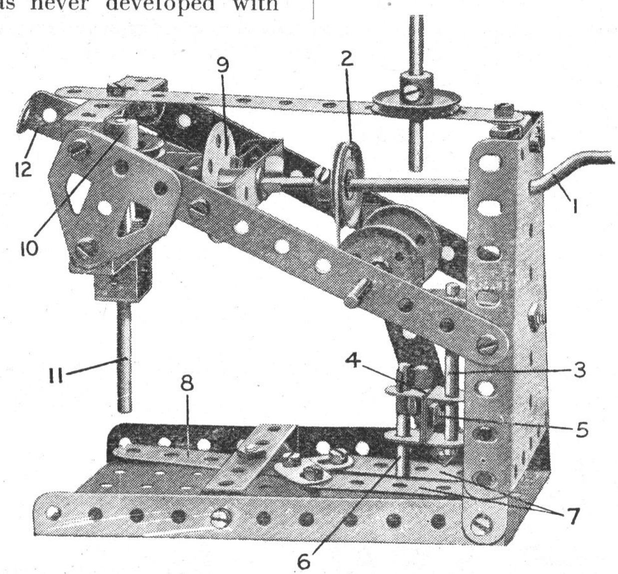
Upon his return to America, Howe found that a wealthy manufacturing concern had pirated his patent, and he immediately started suit to establish his rights. In the end he succeeded, became a wealthy man, and at the Paris exhibition in 1867 was personally honored with a gold medal and the Cross of the Legion of Honor.

The Meccano Model

The construction of the illustrated model is very ingenious, and makes use of the contents of a No. 1 Outfit in an excellent and novel manner. The machine comprises three essential movements as in actual practice—namely, the to-and-fro movement of the shuttle, the up-and-down motion of the needle, and the vibration of the lever by which the cotton is supplied from the reel to the needle.

The construction of the framework is fairly clear in the illustration, but I may mention that the Sector Plate is secured to the ends of a 2½" Strips bolted to the base Flanged Plate. On the same bolts that secure the Sector Plate two 5½" Strips are mounted at an angle, as shown, and are connected together at their outer ends by a 2½" x ½" Double Angle Strip. The sloping 5½" Strip on the far side of the machine is supported by a 3½" Strip bolted in its fifth hole (counting from the Sector Plate) and to the third hole from the end in the side of the base plate.

The operating handle 1 carries a 1" Pulley 2, which drives by means of a cord, a similar Pulley secured to a 2" Axle Rod 3. The latter is journalled in a Cranked Bent Strip bolted to the Sector Plate. Two Double Brackets 4 are secured together by a bolt 5, the shank of which presses very tightly on the Rod 3. This locks the Double Brackets in position, and they revolve with the Rod 3. The outer Double Bracket carries a 1½" Rod 6, the end of which lies between two 2½" Strips 7, arranged at a short distance apart from each other and bolted to two Flat Brackets secured to a further 2½" Strip 8.



Model Sewing Machine

The latter is attached by means of bolt and lock-nuts (Meccano Standard Mechanism No. 262) to a transverse 2½" x ½" Double Angle Strip in the base of the model. As the shaft 3 rotates, the Rod 6, in describing a circle, slides between the Strips 7 and so rocks the Strip 8 from side to side. This represents the movement of the shuttle.

The Bush Wheel 9 on the end of the Crank Handle carries in one of its holes two Angle Brackets placed together in the form of a Double Bracket, with their elongated holes overlapping, and in such a position that an imaginary line, drawn through their opposite round holes, would intercept the centre of the Bush Wheel. A Flat Bracket is bolted to the inner Angle Bracket in a line with the Crank Handle and forms a lever which engages a 1" Pulley 10 mounted on a vertical sliding Rod 11. This Rod is journalled in a 2½" x ½" Double Angle Strip bolted between the lower holes of the two Flat Trunnions, and is further supported by two ½" Reversed Angle Brackets secured to the Angle Strip. As the Bush Wheel rotates, the Flat Bracket imparts to the Rod 11 a movement corresponding to the action of the needle.

A Giant Electric Shovel

(*Continued from page 147*)

the upper part of the machine, it is possible to work either in prolongation of the track or laterally to it, which permits of the digging out of trenches of any desired width.

Work in Narrow Galleries

Another type of Clère shovel is modified by the addition of a second transporter that may be swivelled at will independently of the first one, which is fed by the shovel. This modification has been applied to the Clère machines in order to permit of their use in narrow galleries. The machine advances to the end of the track and digs alternately from left to right, so as to excavate the whole breadth of the gallery. The overhanging earth is made to fall in by hand or by mine according to its hardness. The rear transporter is of sufficient length to permit of the placing of three wagons on each loading track so that work may be carried on uninterruptedly.

For certain purposes it is desirable to get rid of the necessity of using the truck travelling on rails, and this may be accomplished very effectively by mounting the shovel on a caterpillar in the well-known manner of the "Tanks." Except so far as the method of transport is concerned, the arrangement of the apparatus remains the same as in the type travelling on rails.

Shovel Mounted on Gantry Crane

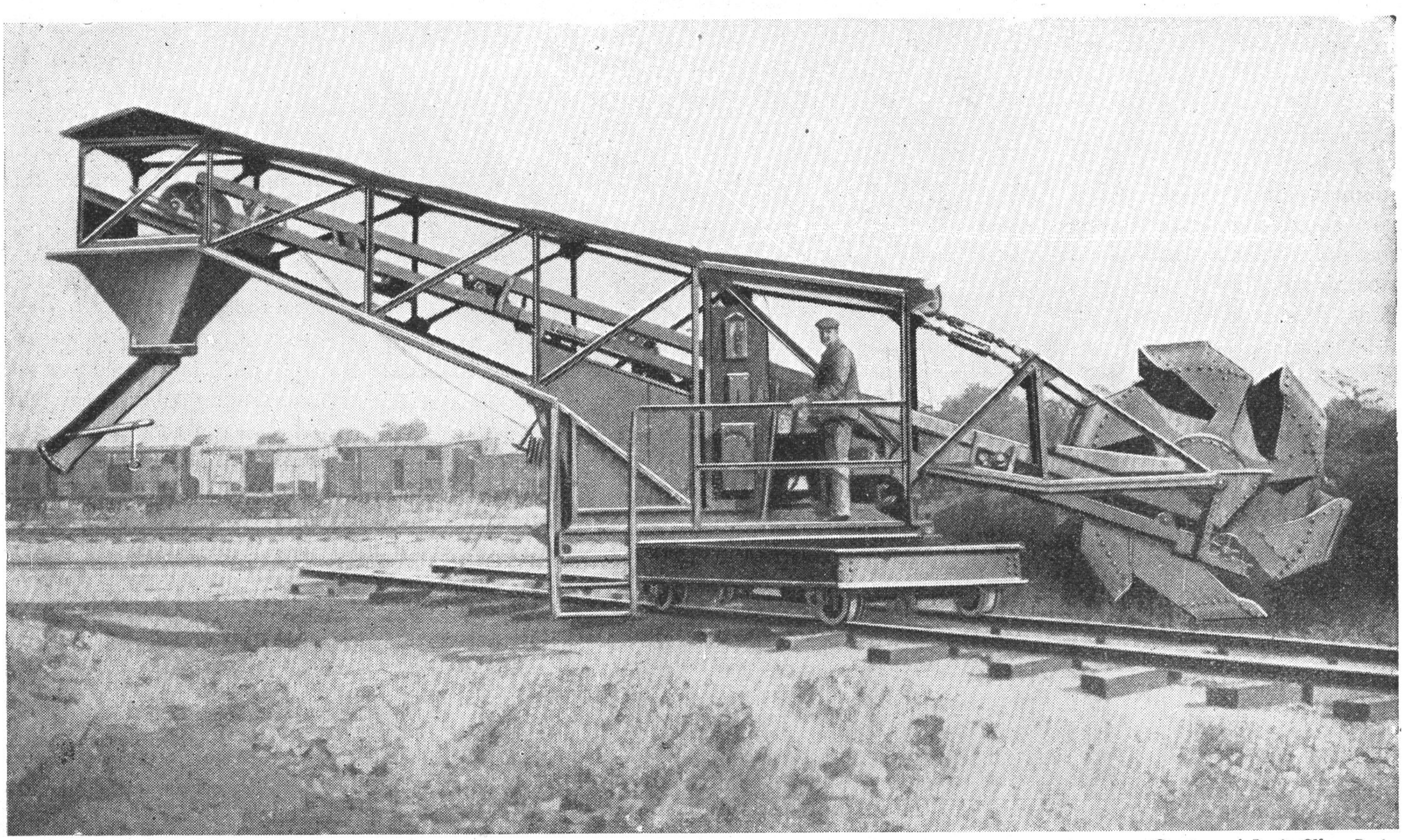
Large outputs are required in certain kinds of work, such as the construction of canals and railways or in mining operations, and for such purposes the Clère shovel is mounted on a gantry crane. Two men only are required to manipulate this apparatus. The motors working the shovel, the transporter, the winch and the rotating movements of the crane are placed in an upper cabin, while those working the travelling movements of the crane are placed in a lower cabin. The engineer of the lower cabin feeds the compressor and the closing hopper, while the engineer of the upper cabin is in charge of all the other manipulations.

In cases where the apparatus is opposed to a job offering too great a resistance, or has to lift blocks of too great dimensions, safety devices are provided in order to avoid the breakage of the wheel or any other part of the shovel. These safety devices consist of suitable couplings and maximum and minimum releases, which are brought into operation as required.

We are able to illustrate the Clère shovel at work, and our photograph gives an excellent idea of the manner in which it eats its way into the material with which it has to deal like a huge giant devouring his prey mouthful by mouthful—a fascinating spectacle.

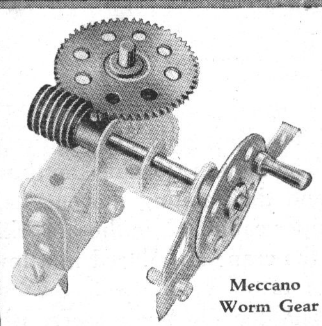
Excavators, like that shown in our illustration, have been most useful in modern engineering. It has even been said that without these huge shovels the Panama Canal would never have been built. Whether or not this is a fact, it is certainly true that without these wonderful machines the canal would never have been completed in one-tenth the time actually taken.

In Our Next Issue
"Oil vs. Steam on the High Seas The Twin Screw Liner, Gripsholm"



Courtesy of Louis Clère, Paris

A Typical Clere Shovel



Meccano Worm Gear

Suggestions Section

Edited by "Spanner"

Overhead Gear for Electric Loco

Fig. 1 illustrates an interesting Meccano model of a current collector, or pantagraph, of the type used on electric locomotives employing the overhead wire system. It is adaptable to all Meccano locos of this type, and its realistic appearance and design will be appreciated on comparison with Fig. 1a, which is reproduced from actual practice and shows the device fitted to the roof of an electric loco or motor coach. The pantagraph depicted in the latter illustration is a product of Brecknell, Munro & Rogers, Ltd., the well-known English firm of engineers.

The lower portion of the Meccano apparatus is built up from four 2″ Threaded Rods 1 rigidly connected to the 2″ Rods 2 and 2a by means of the Collars shown. Further Collars 3 are mounted on the Rods 1, but care should be taken to see that they are not screwed on too far as the 2″ Rods 4 should be able to turn freely in these Collars.

The upper 2″ Threaded Rods 5 enter four further Collars placed on the Rods 4; this time the Threaded Rods should be screwed up tightly, in order to grip the Rods 4. The other ends of the Threaded Rods partly enter four more Collars mounted on a 2″ Threaded Rod 6. The latter is capable of turning freely in all four Collars, and carries at either end a Threaded Boss 7.

A piece of stout copper wire, 8, is next bent as shown and inserted in the transverse holes of the Bosses; it may be secured in position by a grub screw 9 screwed into the end of each Boss.

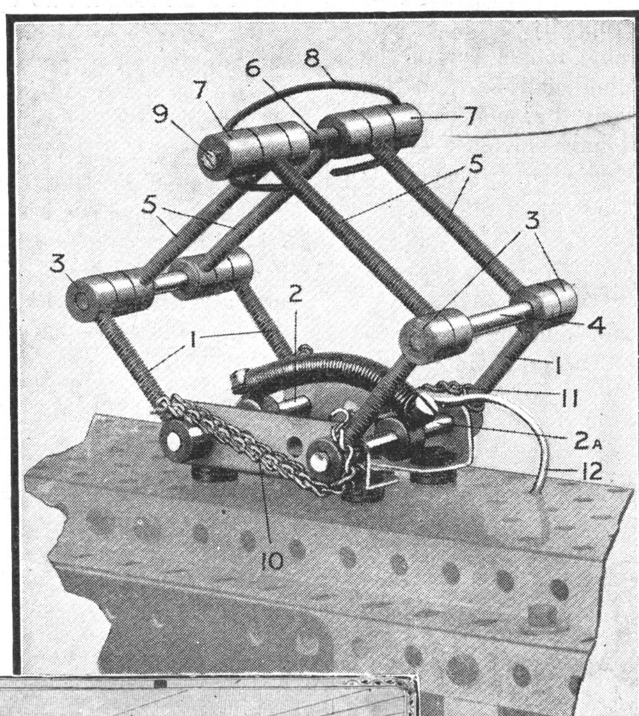


Fig. 1

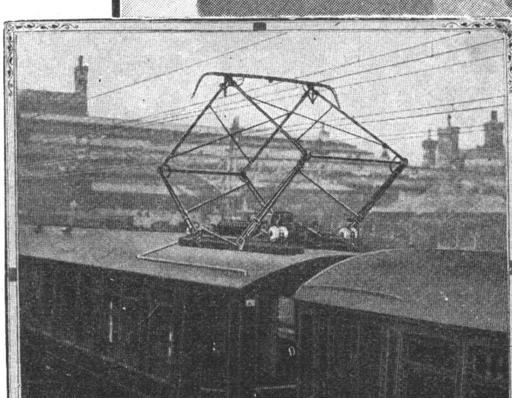


Fig. 1a

The pantagraph is prevented from toppling over or sagging to one side by means of pieces of Sprocket Chain 10 and 11, which are arranged to permit a vertically-folding or extending movement only. It should be noted that the chains are arranged oppositely — that is, while chain 10 passes under its respective Collar on the Rod 2a and over the Collar on Rod 2, chain 11 passes over the Collar on Rod 2a and under that on Rod 2. A Meccano Spring connecting the Rods 2 and 2a by means of Collars and set-screws tends to pull these screws together thus raising the Rods 1 and extending the pantagraph, with the result that the copper wire 8 presses against the overhead wire carrying the current.

The pantagraph is mounted on two 2″ Angle Girders which are secured to the loco roof by means of four 6 B.A. Screws, the necessary insulation being obtained by fiber bushes and washers. The current is led to the motors via the framework of the pantagraph and the insulated wire 12, which is bolted to one of the 2″ Girders.

Electric Fan

The well-designed and extremely practical model shown in Fig. 2 has a strong appeal these warm

(*Continued on page* 157)

The Story of Lead

(*Continued from page 149*)

The flux has two functions—it prevents the oxide from forming, or, in case any does form, it dissolves it immediately. Several fluxes of varying efficiency are in use, one of the commonest being a mixture of zinc chloride and sal ammoniac.

Lead Alloys for Sprinklers

We have already mentioned that an alloy of lead and tin melts at a lower temperature than either metal alone. By the addition of bismuth and cadmium, alloys with even lower melting points may be produced. Such alloys are employed in automatic sprinklers for large factories and works, where the danger of fire is always great. Under normal conditions the valves controlling the sprinklers are maintained in a closed position by means of a solder of the alloy. When a fire occurs the temperature quickly rises, and at a certain point the solder melts and the valves automatically open and release the water.

The melting points of the various metals to which we have just referred are as follows:—Lead 620°F, tin 450°F, bismuth 504°F, and cadmium 610°F. An alloy of all these metals may be made, however, that has a melting point as low as 158°F.

Rolling Lead Sheet

A large Rolling Mill is used to roll the lead into sheets. A slab of the metal is run backward and forward between the rollers, which are very gradually brought closer and closer together until the sheet reaches the required thickness. The mill in our illustration is electrically driven and is capable of applying enormous pressure. Lead sheet rolled out in this manner is used for covering and protecting large surfaces.

For some purposes, however, lead sheet is not suitable as steel sheet coated with lead. This coating may be effected by placing the steel sheet previously cleaned with acid and dipped into a flux—in a bath of molten lead, afterwards withdrawing it and draining off the excess lead.

Lining Iron Pipes

Sometimes a thicker coating of lead is required than can be secured by this dipping process. This is the case with iron pipes that require to be provided with a heavy acid-proof lining. Such a lining may be obtained by casting the lead.

Inside the iron pipe is placed a core of such diameter as to leave between it and the pipe a space equal to the thickness of the lining required, and molten lead is then poured into that space. As an alternative a lead pipe may be fitted closely inside the iron pipe and bonded to it by applying heat to the exterior of the latter. The lead pipe thus becomes "sweated" to the iron.

This sweating process is employed for lining large iron tanks with lead sheet in order to render them capable of holding corrosive liquids. Lead may be deposited also by means of an electroplating process.

From very ancient times lead has been used for fixing iron bolts to masonry, the molten metal being poured into a hole around the bolt so that when it cooled it united the bolt firmly to the masonry.

A modern and interesting development of this process is the use of lead wool or shredded lead. A mass of what may be called lead threads is pressed round the bolt with a hammer and a caulking tool. During the process the lead fibers become squeezed and pressed together into a solid mass as compact as if molten lead had been used.

Lead wool is made by passing the molten metal through a sprinkler perforated with extremely tiny holes. The threads of metal thus produced quickly solidify and are twisted loosely into a rope. Shredded lead consists of very fine thread-like shaving planed off from the cold metal.

Lead in Ammunition

Lead plays an extremely important part in the making of ammunition. The smallest shot are made by an interesting process of dropping from a shot tower. Molten lead, to which a minute quantity of arsenic has been added, is poured into a pan, the bottom of which is perforated with extremely small holes. The height up the tower at which this pan is placed is decided by the size of the shot to be made, the largest shot being dropped from the highest level.

The molten lead finds its way through the holes in the pan in the form of drops. These fall to the bottom of the tower into a tank of water, which breaks their fall and prevents them from flattening as they would if they fell upon a solid floor. From the tank of water the shot are dried and polished and are then carefully tested for uniformity in shape and size.

The dropping process can only be used for small shot and larger shot are therefore cast. At one time all such casting had to be done by hand, but of recent years mechanical moulding methods have been introduced.

A Sixteen Year Old Set

F. M. Schultz, North East, Pa., writes: "Sixteen years ago my father purchased a Meccano set for me from Harry Thompson of Erie, Pa. It is a Number 5 set, and is in excellent shape for my son to play with. It is apparently complete with the exception of keys. I am enclosing my check for one dollar; will you please mail me about four dozen keys, and an instruction book. It isn't often that gifts last through two generations of children, and I am still pleased with it, as my boy Bill seems to be."

Can any reader beat this record?

In Our Next Issue
"ALUMINUM"

COMPETITION PAGE

Ask Me Another

The prize for this contest was awarded to John L. Euart, 135 Pocasset Ave., Providence, R. I., whose answers are given below:

1. The Torque Converter, an invention that makes possible the construction of automobiles without clutches or gears and which contain a variable gear that automatically adjusts itself to the condition of the road or the load, was invented by Mr. Constantinesco who has made many valuable contributions to science.
2. The Bessemer Converter is a container which carries on the process of converting pig iron into steel. It is pear shaped and made of heavy steel plate on the outside and is lined with certain kinds of fireproof brick.
3. Dr. Denis Papin, a Frenchman, who about the year 1688 constructed a working model illustrating his idea. However, Thomas Newcomen, an Englishman, was the inventor of the first practical engine. It was used as a pumping engine.
4. Yes; in 1801 Colonel Paul Revere, the hero of "Paul Revere's Ride," converted an old powder mill at Canton, Massachusetts, into a plant for the manufacture of copper sheets and bars, operating under the name of Revere's Copper Company.
5. It was the airplane flown over the Potomac by Doctor Samuel Pierrpont Langley of the Smithsonian Institution in 1896. This airplane was steam-driven and was the first successful power-driven man-carrying aeroplane ever invented.
6. Meccano parts are made accurately to within two-thousandths of an inch.
7. Jackie Coogan made his first stage appearance at the age of twenty months. This appearance was impromptu however. At the age of four he appeared on the stage doing some dance steps with Annie Kellerman and this eventually led him to film stardom.
8. Doctor Alexander Bell was an instructor at Boston University.
9. Because this standard of spacing was carefully worked out and it has proven to be indispensable to sound model-building. It is because of the half-inch equidistant holes that Meccano parts are so adaptable and interchangeable.
10. Meccano nuts and bolts are brassed because it adds a greater resistance to the inroads of rust and also because it imparts a nicer appearance to the product.
11. In order that the gears may work more smoothly and mesh with a greater precision.
12. In order that the motor may be built into a model and make it operate like real machinery. Also these pierced side plates permit extra gears to be attached for obtaining various ratios of speed and power.
13. Meccano is the best construction toy because it was "Made First, Made Better and Builds Most."

For Artists Readers

This drawing contest has been arranged in response to numerous requests from Meccano boys, and the subject is: "The Editor of the "M.M." as I imagine him to be."

In this competition, the drawing may be of any size and the subject may be treated in any manner desired, i.e., it may be either in black or white, pencil, crayon, etc.

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

A boys under 10 years of age,
B boys 10 years of age and over.

A prize amounting to $3.00 in Meccano Goods will be awarded in each section. The closing date is September 25th.

Third Grand Photographic Contest

Photographic Contests are always interesting and the special Summer Vacation Contest announced in our last issue should be extremely so. The contest does not close until September 15th so there is still time to enter. Get out your cameras, if you have not done so already, and snap some of those interesting sights that are all around you. Subjects that are most likely to interest readers of the "M.M." will be prefered to those of merely local or personal interest.

The only requirements are that the photograph be taken by the competitor, that it depict a vacation view accompanied by a brief description of the scene, and that each photo bear the name, address and age of the entrant.

The 1927 Model Building Contest

Interest in this contest grows keener every day and during the past few weeks there has been a great increase in the number of entries. Without doubt Model Building Contests have a tremendous hold on our readers and it looks as though this contest is going to be the most successful we have ever run.

For the benefit of new readers full particulars of the contest are printed below and it should be stressed that the model does not have to be a large one in order to win a prize. It is the originality and ingenuity of the model that will carry most weight. Each boy has just as good an opportunity as every other boy.

Competitors may be of any age or either sex, and there **are no restrictions or entrance fees.** Any number of models may be entered and there is no restriction to the number of parts or material 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 photograph 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............. Meccano goods, value $15.00
Third Prize.............. Meccano goods, value $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.

Suggestions Section

(*Continued from page 154*)

days, and the new colored Meccano parts will add a very attractive finish to the apparatus. Indeed, the completed model forms an ornament suitable for use in any part of the house, or on the office desk. If the 100-250 volt Motor is used in its construction, the necessary current may be obtained by tapping the house supply through any convenient lamp-socket.

The fan unit is mounted on roller bearings consisting of fourteen Steel Balls arranged round the circumference of a Bush Wheel bolted to the interior of a Wheel Flange 1, with its boss protruding at 2. The Wheel Flange is bolted to a Double Bent Strip 3 carried on a ¾" Bolt in the top of the upright 5½" Girders. The pivot about which the fan turns consists of a Pivot Bolt passed through the centre hole of the 5½" x 2½" Flat Plate 4 and gripped by the set-screw in the boss 2 of the Bush Wheel.

A ½" Pulley 5 bolted to the motor armature immediately behind the fan wheel transmits motion to a 2" Pulley 6 by means

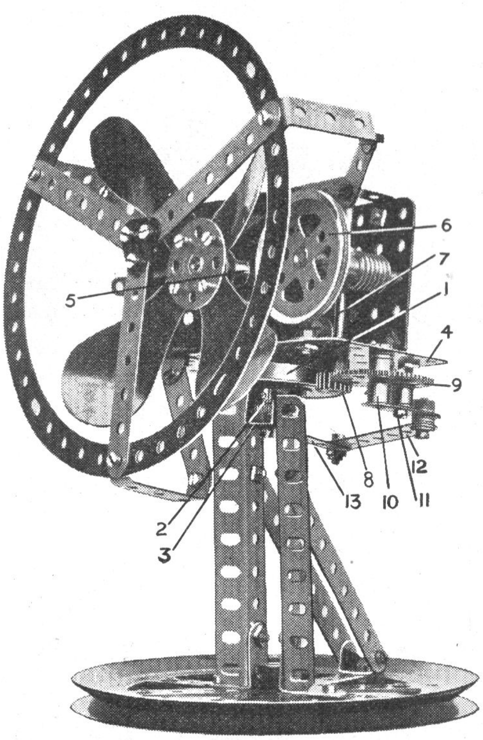


Fig. 2

of Meccano Spring Cord, and a Worm on the shaft of the latter Pulley engages with a ½" Pinion secured to the Rod 7. This Rod carries another ½" Pinion 8 gearing with a 57-teeth Gear Wheel 9 secured to a Pivot Bolt passed through the plate 4. The bolt also carries a Crank 10, which is further secured to the Wheel 9 by means of a ½" Bolt 11, and connected pivotally to a 3½" Strip 12. The latter is attached in a similar manner to a 2½" Strip 13 rigidly bolted to the Double Bent Strip 3. It will now be seen that as the Crank 10 slowly rotates through the action of the Worm, the fan moves to and fro in a semicircular path, so varying the direction of the powerful current of air produced by the revolving Propeller Blades.

Puzzle No. 81—On a sheet of paper draw a large square and divide it into 36 smaller equal squares. The problem is to arrange 12 coins in these small squares so that there are only two coins in each row of squares, horizontally, vertically or diagonally.

* * *

Puzzle No. 82—Arrange twenty coins, head and tail upward alternately, in four rows of five as shown in the following diagram. The problem is to rearrange these coins, in one move so that each of the five rows consists of coins either all head or all tail. The operation involves several coins, but the changes of position are to be carried out in one continuous move without stopping. No coin is to be reversed from head to tail or vice versa.

H	T	H	T	H
T	H	T	H	T
H	T	H	T	H
T	H	T	H	T

* * *

Puzzle No. 83—"How many miles did you motor yesterday and the day before?" inquired Mr. Brown of his neighbor. The neighbor replied: "The number of miles I motored was the number I motored the day before with the figures reversed, and the difference is one-eleventh of their total."

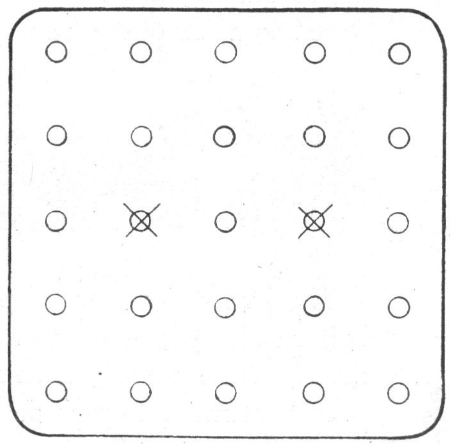
How many miles did Mr. Brown's neighbor motor on each of the two days?

* * *

Puzzle No. 84—Find 16 numbers which, when arranged in four lines of four numbers each, and added vertically, horizontally or diagonally, always amount to 34.

* * *

Puzzle No. 85—In the Meccano Flat Plate illustrated below, all the holes, with the exception of the two marked with a cross, are to be filled in with one of three different letters. No more than these three are to be used and the letters are to be arranged so that they spell a common English word in twelve different directions.



* * *

Puzzle No. 86—The names of several familiar flowers are hidden in the following story:

"Stop! Stop! Ink will stain your coat," said tabby. "I don't care. Oh, what larks!" purred the little white cat, trying to jump on to the table where were bread and butter, cups and saucers, as well as an inkstand. Tabby shut her mouth with a snap. "Dragons, or even wild boys shall not make me speak again," she thought. "If that beautiful jug, full of cream fresh from the cow, slips down, I will not stir a paw." The little white cat, looking sedate and prim, rose to reach the ink, but she did not speed well in her venture. The bottle broke, and on to pussy's coat of snow dropped a sable stream.

* * *

Puzzle No. 87—Give a list of all the words in the English language ending in "dous."

* * *

Puzzle No. 88—With slight changes in the order of the various letters the following four lines may be made into a charming little ballad:

Daroun em hslal verho,
Ni dasesns ro lege,
Lilt silfe' rdaems eb vero,
Twees riemem's fo ethe.

* * *

Answers to Last Month's Puzzles

No. 76—John is 18 years old.

* * *

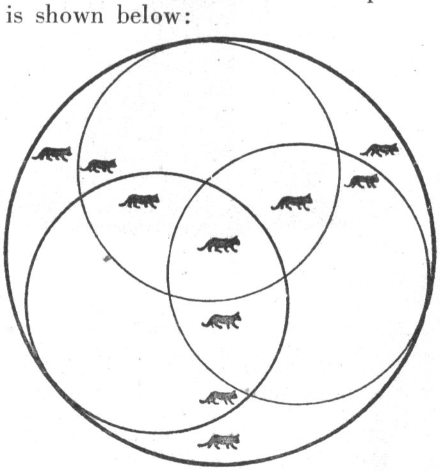
No. 77—That man says that Mary and Jack saw many small bags at an art bazaar at Mandalay.

* * *

No. 78—A map of the world.

* * *

No. 79—The solution of this puzzle is shown below:

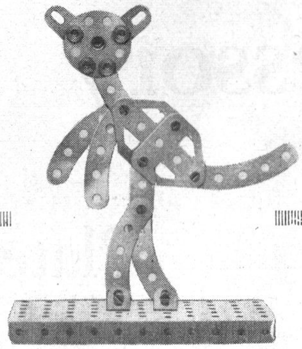


* * *

No. 80—The words are:

Candid
Ostler
Wooly
Pallid
Engage
Rattan

Fun Page



Old Gentlemen: "Now, my little boy, why aren't you at school?"

Small Boy: "It's no use my going to school, sir."

Old Gentlemen: "Why not?"

Small Boy: "Because, I wouldn't be any use; I can't read or write or do anything."

* * * * *

Not Likely

Judge (to prisoner): "When were you born?"
Prisoner remains silent.

Judge: "Did you hear me? When is your birthday?"

Prisoner (sullenly): "What do you care? You ain't going to give me a birthday present!"

* * * * *

Shop Foreman: "You're not one of those fellows that drop their tools and scoots as soon as the whistle blows, are you?"

New Hand: "Not me. Why I often have to wait five minutes after I put me tools away before the whistle blows!"

* * * * *

Good Advice

"There's a man outside, sir, that wants to see you about a bill you owe him. He wouldn't give his name."

"What does he look like?"

"Well, he looks as though you'd better pay it."

* * * * *

Shopkeeper: "What can I do for you, my boy?"

Boy: "Please, I've called about your advertisement for a man to retail canaries."

Shopkeeper: "Yes, and do you think you could sell the birds?"

Boy: "Oh, no sir! I only want to know how your canaries lost their tails!"

* * * * *

"Join team immediately. Catch first boat. Jones ill." Thus read a telegram received by one of the substitutes of the baseball team. Nobly he answered the call by jumping up from his unfinished meal, dashing to his room, seizing his bag, flinging in some things, donning his hat and coat, rushing into the street, and running to the boat-landing.

"There was the boat! Could he catch it? Flinging his way through the crowd he forced a passage to the landing, turning a deaf ear to the cries around him. The boat was barely a foot away from the landing. He took his courage in his hands, closed his eyes, and giving a tremendous bound, landed on the deck with a crash.

"If I'd been a few seconds later I'd have missed it!" he gasped.

"Missed it!" cried the sailor who helped him up, "Why this boat's just coming in."

* * * *

Brown: "Hello! Jones, are you off to the North Pole?"

Jones: "No, I'm going to paint the front door."

Brown: "Then, why are you wearing all those coats?"

Jones: "Well, it says on the can: 'To obtain first-class results put on three or four coats.'"

* * * *

A Short Story

Felix walking
On the rail,
Came a train,
Lost his tail.

* * * *

John had made quite a name for himself on the college football team, but his studies had suffered accordingly. One night his father took him to task.

"John," he said, "you lay too much stress on athletics, and forget that your studies are a great deal more important."

"That might be true," answered John, "but I never saw you get up and cheer when I quoted Latin."

* * * *

Billy, staying at his uncle's farm, rushed into the house, out of breath and excited.

"There's a mouse in the milk pail," he gasped.

"Well, Billie," said his uncle, "did you take it out?"

"No, uncle," said Billie, "I know better than that. I threw the cat in."

* * * *

Master (to man servant): "Did you deliver that letter to Mr. Smith?"

Man Servant: "Yes sir, but it's no use writing to him, he's blind."

Master: "Blind! What on earth do you mean?"

Man Servant: "Well, sir, he asked me three times where my hat was, and I had it on my head all the time."

* * * *

Prudent Bobbie

Bobbie: "Please can I change my name to-day, Mother?"

Mother: "What on earth for?"

Bobbie: "Because Dad says he will whip me when he gets home, as sure as my name's Bobbie!"

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.

Clem Brown, Adelaide, S. Australia, writes from far off Australia to say how much he likes his Meccano and that after seeing his outfit a number of his friends have bought Meccano. Clem also sent a new Canberra stamp that is very pretty, and has on it a picture of the new Parliament Building of Canberra. Many thanks indeed, I am always glad to hear from my friends in Australia.

Leland H. Proctor, Pleasantville, N. Y.—You will find particulars of a drawing contest on page 156.

Joseph Landon, Pasadena, Calif.—"When I received my *M.M.* I saw a model which I could not build because I have not enough parts. Immediately I set to work to simplify it. When I finished I had the model working on the same principle as the original." Yours is the kind of a letter I like to receive, Joseph. You are quite right when you say that there is an "unlimited amount of joy in the Meccano sets."

Richard Guiterman, Wheeling, W. Va.—"I like the *M.M.* very much, but I wish it would come every month. It is dandy." Much obliged Richard; I hope the day is not far off when we shall be able to publish the *M.M.* every month.

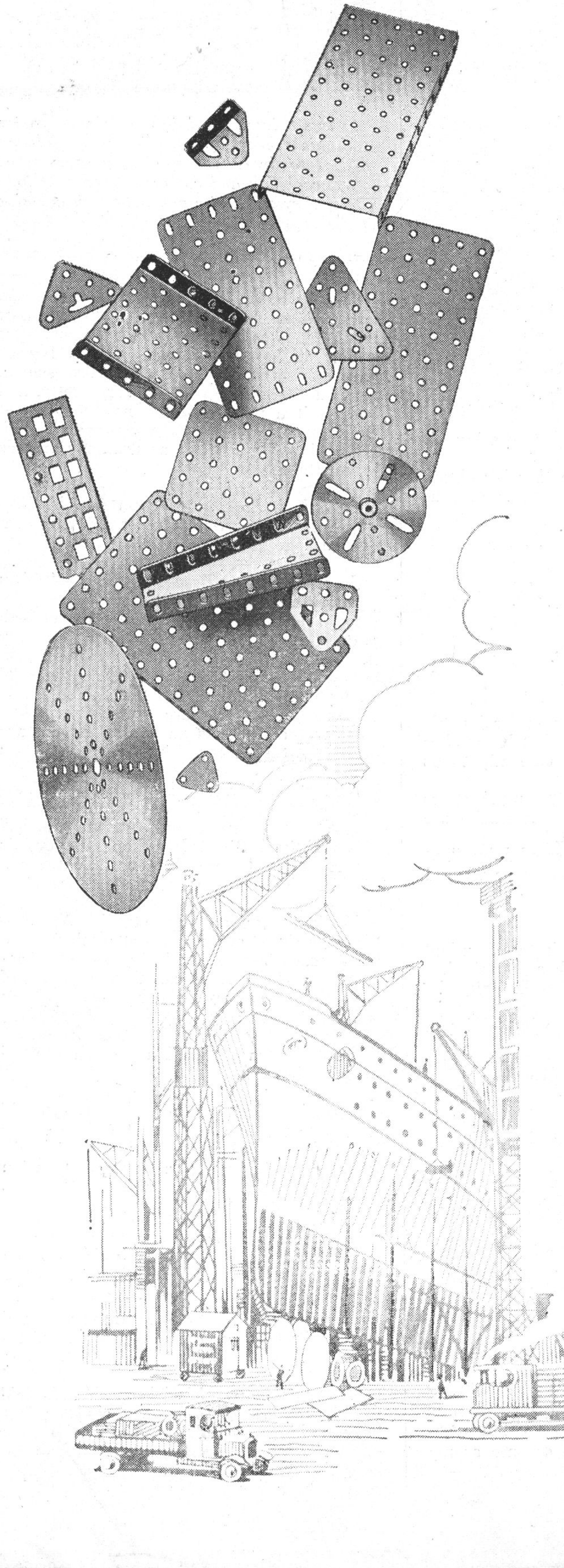
William Steiner, Spotswood, N. J.—"Your articles are fine. Better than most boys' magazines. Small models, etc., are just what I like. Enclosed find a list of more than 30 of my Brooklyn pals. If you will send them a sample of the *M.M.* some of them will subscribe." You are an enthusiast, William, and I am much obliged for your interest.

Donald Schwartz, Easton, Pa.—Donald writes to say how well the *M.M.* fits in with his studies in school and that he has built 75 models including a new Suspension Bridge. See page 156 Donald, and enter the Prize Contest.

Harry Schefers, Campgaw, N. J.—"I have a Meccano No. 2 and it is the best toy I ever had. I expect to get a larger set for my birthday. The *M.M.* articles are very interesting." Glad to hear from you and hope you are not disappointed on your birthday.

Winston Hamm, Wolfeboro, N. H.—We were very pleased to know that your first business letter was addressed to us. A copy of the *M.M.* has been sent to you and we hope that you enjoyed it.

Meccano Accessory Parts



Plates

The manufacture of steel plates in actual practice has been brought to a wonderful pitch of perfection. This is due chiefly to the fact that the amazing evolution of armaments—which reached its climax during the Great War—necessitated the constant production of plates of sufficient toughness to afford some measure of protection for warships, forts, tanks, etc., against the terrible and ever-increasing power of enemy armor-piercing projectiles and high-explosive shells. New inventions and improved methods of preparing and rolling the metal followed each other in quick succession, until today it is possible to produce steel plates of huge dimensions and strength.

Now that more peaceful times prevail, the improvements in steel plate manufacture are showing their merits in the construction of engines, boilers, ships, bridges, and similar structures.

Meccano plates, like their prototypes in real engineering, are made of the finest steel only, and are highly polished, with smooth rounded edges and corners. The holes are punched cleanly and accurately and arranged according to the Meccano equidistant system, which enables the plates to be incorporated in any kind of model and used for a thousand and one different purposes.

52.	Perforated Flanged Plates, 5½" x 2½"	each	.25
52a.	Flat Plates, 5½" x 3½"	"	.15
53.	Perforated Flanged Plates, 3½" x 2½"	"	.20
53a.	Flat Plates, 4½" x 2½"	"	.12
54.	Perforated Flanged Sector Plates	"	.20
61.	Windmill Sails	"	.10
70.	Flat Plates, 5½" x 2½"	"	.15
72.	Flat Plates, 2½" x 2½"	"	.10
76.	Triangular Plates, 2½"	"	.05
77.	Triangular Plates, 1"	"	.04
109.	Face Plates, 2½" diam	"	.20
118.	Hub Discs, 5½" diam	"	.50
126.	Trunnions	"	.10
126a.	Flat Trunnions	"	.06
133.	Corner Brackets	"	.10
145.	Circular Strip, 7" diam. over all	"	.50
146.	Circular Plates, 6" diam. over all	"	.60

Your dealer will be pleased to show you all the Meccano Parts.

Ask him for a complete list.

MECCANO COMPANY, INC. ELIZABETH, N. J.