MECCANO MAGAZINE

for Boys

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Grand Model Building Contest

$50 in Prizes

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The Editors Own Page

Lindbergh

We cannot go to press with this issue without first presenting our tribute to Colonel Charles A. Lindbergh, the hero of the air, whose story has appeared in practically every newspaper in every land. Every Meccano boy has doubtless read with enthusiasm the details of his marvelous feat, and been thrilled by the thought of the "Lone Eagle" gallantly winging his way across the Atlantic in his plane "The Spirit of St. Louis." He has blazed the trail which others will follow and performed a courageous act, but more than this, he has displayed the qualities of a true hero. His skill as an aviator coupled with his grit and determination would have won him fame, but his modesty and unassuming friendliness have won for him the admiration of the whole world.

Meccano boys everywhere should endeavor to emulate these qualities for themselves, thinking not of the reward, for this has a way of seeking out those who deserve it, like America's "Lindy."

Television

On page 131 we commence a simple explanation of television, the most recent miracle of science, whereby a man is enabled to hear and see another speaking to him from a distance of over 200 miles. Probably no other single thing in the wonderful development of science today has so fired the imagination as this: and yet, so simple is the explanation given that every reader of the "*M.M.*" will have a good understanding of the principles of television after he has read this article. School is now closed for the summer vacation, otherwise I would suggest to my readers that they take this article to class for discussion under the guidance of a teacher.

The Story of Lead

Following up our series of articles on the stories of metals, we commence this month the Story of Lead, and I do not doubt that this will prove as popular with our readers as did the earlier stories in the series.

Smaller Models

It has been evident for some little time that there has been a demand for models made from smaller outfits. Of course, everyone likes the big models but not all boys are so fortunate as to have the larger sets with which to build them. On pages 136 and 137 we show some interesting small models, and I have made arrangements for a number of new and fascinating models, made from the cheaper outfits, to appear in future issues.

Photographic Contest

Now that summer is reported to be near, although around this part of the world there has not been much sign of it yet, my readers will be planning their holiday activities which should form excellent subjects for photography. There is no greater pleasure than to look back on happy vacations long afterwards, especially when incidents and scenes have been recorded on the kodak. On page 140 we announce a new Photographic Contest and I hope to be able to publish some of the entries in the "*M.M.*"

You Can Help

My readers may help me very considerably in obtaining new subscribers by telling their friends about the "*M.M.*" There are over a million Meccano boys in this country who would all enjoy the "*M.M.*" if only they knew there was such a magazine. Our circulation is growing steadily, but I wish to see it grow even more rapidly, so that I shall be able to still further increase the size of the "*M.M.*" Then I shall be able to print more and more of these hundreds of interesting subjects, for which competitors in our recent competition have made definite requests. If every reader of the "*M.M.*" obtained only one new subscriber we should double our circulation and could then add several more pages. Now, boys, will you try and find at least one new subscriber and so help me to make the "*M.M.*" even better, bigger, and brighter than it is at present? If you know of a Meccano boy who is not a regular reader of the "*M.M.*" and will send me his name and address, I will see that he has a free copy mailed to him.

Radio and Wire Television

Viewing Action Hundreds of Miles Away

TELEVISION, or "far-vision," has been confidently awaited by scientists, and its general underlying principles have been known for a long time. The development of these principles, however, into practical equipment required years of research work, which was carried on in the Bell Telephone Laboratories under the supervision of Dr. Herbrt E. Ives. Aided by the knowledge obtained in transoceanic telephony and telephotography, television was developed to a point where simultaneous sight and sound could be obtained both by telephone and radio. The demonstration given on April 7th proved beyond doubt that practical television had been obtained.

In this demonstration the features of Secretary of Commerce Hoover were thrown on a small screen, two by three inches, in New York, and the expression on his face as well as the movement of his lips could be plainly distinguished, although he was telephoning from Washington, more than two hundred miles away. Then the screen was enlarged to two by three feet and a loud speaker reproduced the conversation, but the results were not as favorable as with the small screen.

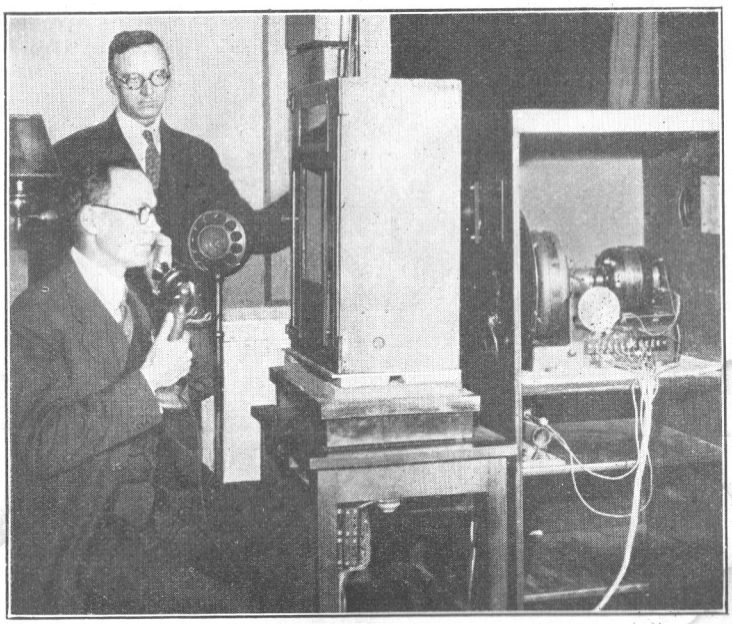


Photo A. T. & T. Co.

At the transmitting end, showing the motor-driven scanning disc.

In the second part of the demonstration, the telephone was replaced by radio from the studio of the American Telephone and Telegraph Company at Whippany, New Jersey, and the pictures coming through the air were just as plain as those over the wire. After a technical description of television, a vaudeville act was put on as a talking picture, the comedian's antics being portrayed on the screen at the same time that his voice was heard from the loud speaker.

How Television is Accomplished

Before we can understand the method of television we must first of all know two scientific phenomena. The first is that a film of potassium metal in a vacuum, called a photoelectric cell, will give an electrical current when light shines on it and the stronger the light the stronger will be the current. The second is the opposite. A tube from which the air has been excluded, containing neon gas, will give off light when a current is applied to it and the stronger the current the stronger will be the light.

In addition we must remember that sight is a reflection of light. The act of seeing does not go from the eye to the object but when the light from an object has been reflected back to the eye, then it registers on the brain. An object looks white because it gives off a great amount of light and so the shades vary until we reach black which reflects no light.

Optical Illusions

Let us take finally two optical illusions and then we shall be ready to grasp the method of television. Most illustrations in the newspapers are what are known as half-tones. If you look at one through a strong magnifying glass you will see that the picture is not really a solid picture but is composed of a large number of dots which are not discernable to the naked eye and in their grouping together they give the appearance of a solid picture. It is important to bear this in mind when considering television and it is interesting to note that this method of reproducing pictures by means of dots was the invention of Frederick E. Ives, the father of the Dr. Ives mentioned earlier.

The second optical illusion has to do with the movies. When you look at a moving picture you see what appears to be one complete photograph of people in action but in reality you are looking at hundreds of separate photographs. The film is made up of a large number of photographs, each one separate, but we cannot distinguish them when they are put through the projector because the speed with which they pass in front of the lens is too quick for the eye, and so we have the illusion that it is one photograph.

Scanning Disk

In television the light from a carbon arc lamp is thrown on the face. Immediately in front of this lamp there is a revolving disc in which are punched fifty holes starting from the edge and running inwards spirally, each hole being a little nearer to the center than the one before. This disc revolves so rapidly that the dots pass over the face seventeen and one-half times per second. Now as the holes pass over the strongly lit parts of the face, such as the nose and forehead, a strong light will be reflected, whereas the pupil of the eye will reflect no light. These

(*Continued on page* 138)

MECCANO STANDARD MECHANISMS

EXAMPLES OF THE LEVER AS ADAPTED TO MECCANO MODELS

Levers in Model of Drawbridge

The properties of the lever, which were explained in the April issue of the "*M.M.*", have been known and appreciated by man since the earliest times. Indeed, the fundamental laws of mechanics probably all trace their origin from deductions arrived at from the first observations of its characteristics.

An interesting example of the use of levers in bridges is furnished in the Meccano Drawbridge. As will be seen from Fig. 19, there are two kinds of levers included in this model. A lever of the first order is shown at ABC, the fulcrum being at B, the load at A, and the power at C. DEF represents a lever of the third order, in which F is the fulcrum, E the power, and the load is represented by the weight of the arm DE. It will be noticed that with this arrangement of levers the bridge DF moves through a much greater distance from that traversed by the power C. The lever ABC merely transposes the force from C to A.

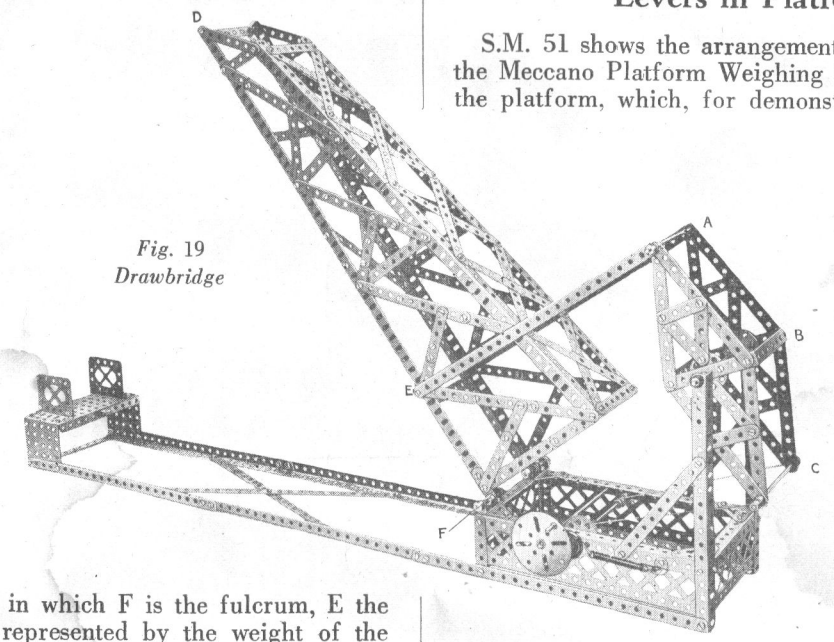


Fig. 19
Drawbridge

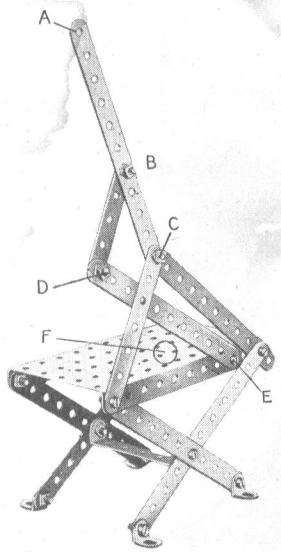


Fig. 20—Cutting Machine.

Cutting Machine

Two levers of the second order ABC, DE, are included in the Cutting Machine (Model No. 251 in the Instruction Manual). In the first lever ABC (Fig. 20) the power is applied at A, the fulcrum is at C, and the load lies between the two at B. In the second lever DE, the power is applied at D, while the fulcrum is at E. The load in this case is represented by the pressure of the lever arm against the material to be cut, which is placed in position at F.

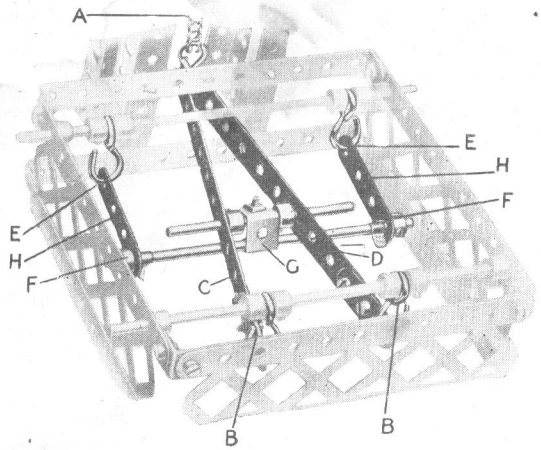
A large increase in power is obtained from this combination of levers, and the model illustrated resembles the type of apparatus used in many workshops for the purpose of cutting through solid bars of metal by hand power.

Levers in Platform Scales

S.M. 51 shows the arrangement of levers in the base of the Meccano Platform Weighing Machine. The weight of the platform, which, for demonstration purposes, we will call the power, bears upon the first levers at C and D, between the load—represented by the force required to pull down the Sprocket Chain at A—and the fulcrum on a Hook B. In the smaller levers the fulcrum E is at one end, the load (or force required to pull down the center link G) is at the other end F, and the power—i. e., the weight of the platform—bears upon H.

From this it will be seen that all these levers are of the third order and therefore the power must be greater than the load before they can be operated, as explained in the April issue of the "*M.M.*" (see "lever of the Third Order," page 122). Hence the Hook A must move through a greater distance than the power, and the pull upon the Hook (which we have taken as representing the load) must always be less than the weight, or power, imposed upon the platform of the scales.

The use of the apparatus therefore enables us to weigh with accuracy by merely moving a small counterpoise along the steel-yard until the pull upon the Hook A is counterbalanced.



S.M. 51—Levers in platform scales.

Our Modern Elevators

High Speed Electric Skyscraper Equipment

TO say just when elevators came into existence would be practically impossible, for some old records have it that as far back as 236 B. C. Archimedes constructed one, while other claims are put forward that the palace of Nero contained three separate lifts.

Though we cannot trace the development from periods so remote, it is not difficult to see how a gradual transition could result from the windlass or capstan to the highly efficient elevator of today.

Water Balance Elevator

Tracing the history of elevators in the United States from the beginning we find that one of the earliest devices used was a water-balance elevator. This consisted of cables passing over a grooved wheel, fastened at one end to the car and at the other end to an iron bucket lighter than the car. By means of a hand cable connected with a water-supply valve the bucket could be filled with water or emptied, as the operator chose. As the bucket was filled it became heavier than the car, which was consequently made to ascend, and by thus varying the contents of the bucket the movement of the car could be controlled. There is quite a difference between this elementary example and the modern equipment shown in our illustration.

The type of the modern car depends upon the use for which it is intended and the amount of traffic it is to carry, although nearly all American elevators are of the steel-frame construction. All frames are essentially the same, consisting of a top beam to which the suspension ropes are attached, a simple bottom cross-beam, and two vertical steel posts connecting the two. Across the bottom beam of this rectangular framework is laid the platform, securely bolted and reinforced by steel strips from each corner to the vertical posts. On this platform is constructed the car.

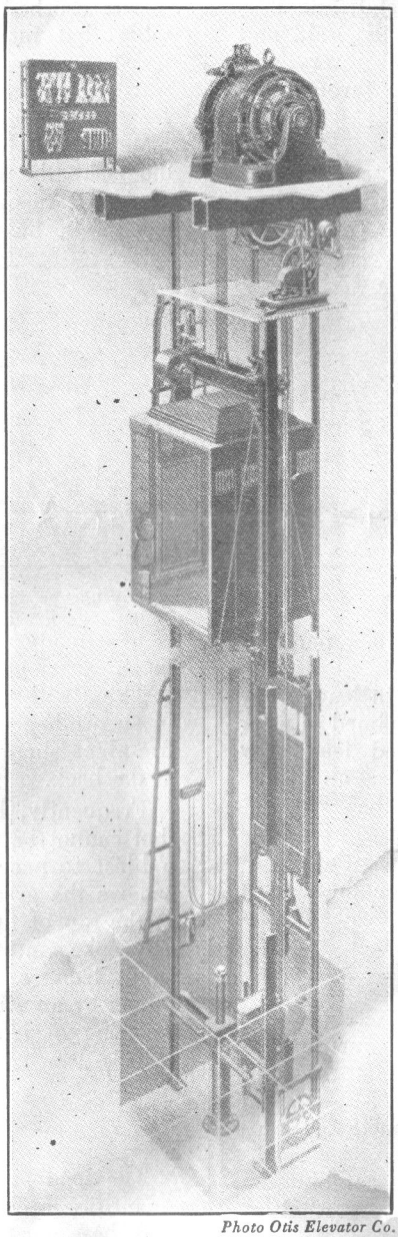


Photo Otis Elevator Co.

Complete installation of a gearless traction passenger elevator.

Guide Rails

As the car goes up and down in the shaftway, there is a natural tendency for it to sway, especially when the weight in the car is unevenly distributed. To prevent this rocking, guide rails are employed consisting usually of a "T" section steel bar, fastened to the wall on two opposite sides or corners of the shaftway. Then on the top and bottom of the car are fastened guide rail shoes, which are merely pieces of metal with a slot that slide along the guide rail and keep the car from swaying. The guide rail and shoes may be of practically any shape, as long as the rails are perfectly parallel and smooth, and are kept well lubricated.

A more important detail is the selection of cables or pulleys by which the car is raised. These cables are run over a wheel at the top of the shaft, and go through a severe twisting and bending, so that besides being very durable they must also possess great flexibility. This flexibility is secured by a combination of strands of wire woven around hemp cord, the latter in the center forming a cushion for the steel or iron strands as they pass over the drum. Each strand, to increase its strength, is itself a composite of several wires; and several ropes or pulleys are used on a car.

Purpose of Counter Weights

In the old water-balance lift, the elevator was propelled by the balancing of weight, a principle that is still used in the motor-driven elevator. The suspension rope is run from the top of the car over the wheel or sheave, to which the motor is attached at the top of the shaft, and then fastened to a load of sliding weights. These weights, held in a frame similar to the car frame but very narrow, with guide rails and guide-rail shoes, balance the weight of the car. The force required to lift it, therefore, is only a fraction of what would otherwise be required. This system of balance has been worked out so thoroughly that in tall buildings even the weight of the shifting cables is balanced by attaching similar cables from the bottom of the weights to the bottom of the car.

Methods of Drive

Unlike the bucket in the water-balance elevators, counterweights only balance the weight of the car, so that power is required to furnish the drive. The drum drive was one of the earliest methods employed in lifting the car and consists of a motor-driven drum to which cables are attached, both from the counterweights and from the car itself. When the drum turns, the cables from the car wind up, while the cables from the counterweights unwind, or vice versa.

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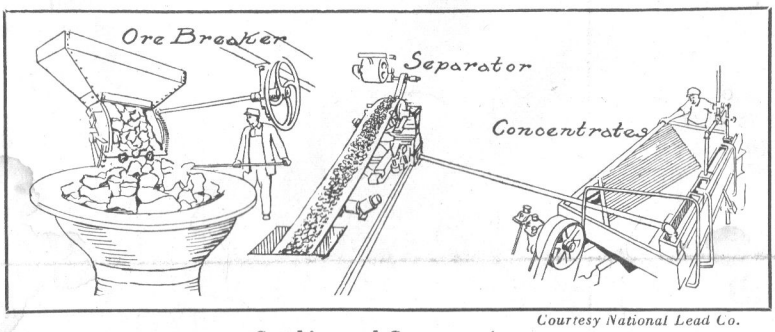
The Story of Lead

1—History, Mining and Refining of Metal

AS in the case of most of the other metals, the early history of lead is wrapped in mystery. The metal has certainly been in use from a very remote period, but it is probable that its discovery occurred some time after that of copper. There is evidence that the Assyrians, Egyptians, and other ancient peoples used the metal, and it is referred to in the Bible by Moses:—"Only the gold and silver, the brass, the iron, the tin and the lead—everything that may abide the fire ye shall make it go through the fire and it shall be clean."

Mined in Ancient Times

Lead was mined in large quantities by the Greeks and Romans. The mines of Laurium in Attica, which were reopened by a French Company in 1863, were flourishing in the fifth century B. C. Large amounts of ore were taken by the Romans from mines in the southeast of Spain which were opened in the third century B. C. by Hannibal. We also know that the Romans carried on extensive mining operations along the Rhine and in various parts of England.



Courtesy National Lead Co.

Crushing and Concentrating.

The old alchemists were keenly interested in lead. They regarded it as the oldest of all metals and named it after Saturn, the father of the gods. They used lead very largely as the basis of their efforts to bring about the transmutation of metals, hoping to discover the "Philosopher's Stone" which, by a touch should transform the base metal into gold. Unfortunately for their hopes the "Philosopher's Stone" was never discovered, although modern chemical investigations show that these ancient experimenters were nearer success than they realized.

Lead Ores

Lead is found in various parts of the world. The United States produces about a third of the total output, and next in importance come Spain, Germany, Mexico, and Australia. A considerable amount of the metal is produced also in Burmah.

The most important lead ore is "galena," a combination of lead and sulphur, crystals of which are very familiar today as used in detectors for wireless sets. The only other lead ore of real commercial importance is "cerussite" or natural lead carbonate.

In the United States the largest amount of lead is mined in Missouri. The ore was discovered about 1700 and first worked some twenty years later. In present-day operations a vein of the metal is sought for by boring into the earth and bringing up samples of the rock. When the vein is struck, shafts are sunk from which tunnels are driven in various directions, following the course of the vein.

The ore-bearing rock is brought to the surface in big lumps which are passed through a series of revolving crushers, emerging as fine as sand.

The crushed material is then spread out on a sort of table that moves backward and forward with a quick jerking motion, causing the material to be impelled forward. The table has a slight tilt downward and is fitted lengthwise with a series of low ledges or "riffles." The material is fed along the table with water, and on reaching the riffles the lighter particles, which contain practically no lead, are pushed over and so pass off the table at the side. The heavier lead bearing particles are not able to surmount the riffles and so they work gradually down the table to the end. This process, which is called "concentrating," removes the greater part of the worthless material, and the material that remains contains a very high percentage of metal.

Smelting

The concentrated ore is now ready for the smelter. In some cases the sulphur in galena can be separated from the lead by causing it to combine with oxygen. This is affected by treating the ore in an ore-hearth, which consists essentially of a small low fire-place surrounded by three walls, and having a tuyere at the back.

Frequently, however, the ore contains other impurities that cannot be eliminated in this manner, and smelting in a blast furnace is necessary. The ore is first roasted to remove the greater part of the sulphur and is then fed in at the top of the blast furnace along with the fuel, generally coke, and the "fluxing" materials, which are usually sand, iron, ore and limestone. An intense heat is obtained by an air blast in exactly the same manner as in the smelting of iron. When the proper moment arrives the lead is drawn off at the bottom of the furnace.

Refining

The lead produced in the blast furnace contains small quantities of silver, copper, antimony and other metals, and these must be removed by some process of refining.

The most important impurity in lead is silver, and most lead ores contain sufficient silver to make its recovery profitable. The removal of the silver is known as "desilverization," and it is most often effected by what is known as the "Parkes" process.

The first step is to remove the copper by a process called "liquation." This process depends upon the fact that cop-

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The Spirit of Saint Louis

The Plane That Crossed the Atlantic

OUR readers have doubtless read with the keenest zest about Colonel Lindbergh's famous flight from New York to Paris. It was a magnificent feat of pluck, endurance and courage. The highest honors of foreign nations have been heaped upon him, and they were richly deserved. The splendid manner in which the Colonel, a young man of 25, has borne himself during the period of celebrations is one that all Meccano boys can emulate with profit.

It is not our intention to talk about the flight, for that has been thoroughly dealt with in the press. However, our readers will probably be interested in the wonderful instruments that helped Colonel Lindbergh in his flight and we are reproducing the instrument board from his plane.

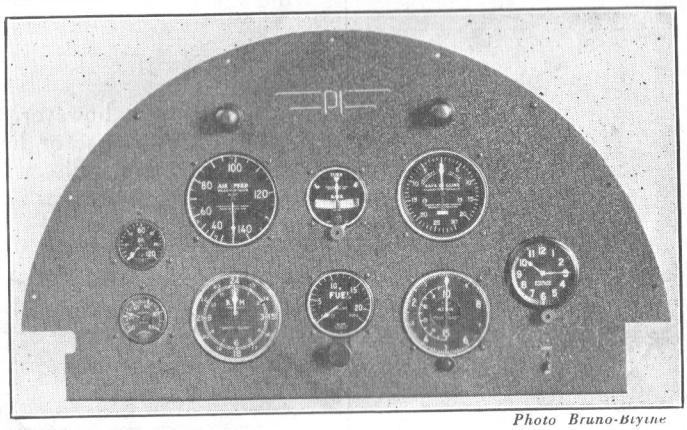


Photo Bruno-Blythe

Instruments Used in Lindbergh's Plane.

In the top row from left to right:
(1) oil-pressure gauge;
(2) air speed indicator, showing the speed of the aeroplane through the air in miles per hour;
(3) turn and bank indicator;
(4) rate-of-climb indicator.

In the bottom row from left to right:
(1) temperature indicator;
(2) tachometer, showing speed of engine;
(3) fuel level gauge;
(4) altimeter showing the height of the aeroplane from the ground;
(5) electric clock.

Bank Indicator

The third instrument from the left in the top row, is the Bank and Turn Indicator. In clouds or fog, the aviator is unable to see the ground, and, the beginner especially, finds it difficult to keep the wings of the plane level. With the Bank Indicator this is greatly simplified, for it tells him when he is flying straight, and when he is turning it tells him when the plane is banked at the correct angle.

The next instrument is the Rate-of-Climb Indicator which shows how quickly the plane is climbing or descending in hundreds of feet per minute. The remainder of the instruments shown are self-explanatory.

The most wonderful instrument of all is one that is not shown in the illustration, the Pioneer Earth Inductor Compass. This compass, which has been adopted for practically all long distance flights and was used by Chamberlin and Levine in their transatlantic voyage, depends upon electro-magnetic reactions with the earth's field. Directions are indicated with reference to magnetic North.

The compass is quite unlike an ordinary compass, having no fluctuating needle to find true North. In the ordinary mariners' compass, a needle is used which revolves freely, the point always being drawn toward the North Pole, thus pointing out true North. This needle, however, is not very stable.

There is no such needle in the earth inductor compass, which consists of three major units, a Generator, a Controller, and an Indicator.

The Generator is the same in principle as any electric generator. It has an armature, a commutator and a pair of brushes. This armature unit is supported on gimbals so that its position will be undisturbed by ordinary rolling and pitching of the airplane. Connected to the armature and commutator through a universal joint is a small windmill which sticks up through the fuselage and provides the drive for the Generator. Electrical connections are made to the brushes, which are movable and so mounted that they can be pivoted in any direction. Due to the fact that the Generator is mounted on gimbals, however, this direction is always in a horizontal plane.

Brushes Rotated

The controller is a purely mechanical device, connected to the Generator through a shaft and casing. When this Controller is rotated, the brushes of the generator are rotated correspondingly, and by means of dials upon the face of the Controller, the exact angle is shown that the brushes make with the course of the aeroplane.

The Indicator is a galvanometer which is electrically connected, by means of a cable, to the brushes of the Generator, and the position of the needle of the indicator is indicative of the amount of potential being produced by the Generator.

The whole secret of the operation lies in the Generator, the armature of which revolves, cuts lines of flux of the earth's field, and generates electricity. The potential, or the amount of electricity generated, depends upon the angular relation between the brushes and the direction of the earth's field. That is, the output of the Generator is a function of the angles between the position of the brushes and magnetic North. Due to this peculiarity more current is generated when the brushes are in one position than in another. The way the Pioneer Compass Indicator is assembled the maximum current is produced when the brushes are in a north-south position, and the least, which is none at all, when they are in an east-west position. The par-

(*Continued on page* 143)

Mining Engineering

By Dic

NOT very long ago my cousin Frank was visiting me. I had not met him before his visit for he lives out West in a mining district and I had been wondering before his arrival what sort of a boy he would turn out to be and how we would get along together. I had planned to take him fishing for I had heard he was a keen fisherman but, just my luck, the very first day he was here it poured with rain and we had to stay at home. After breakfast Frank and I

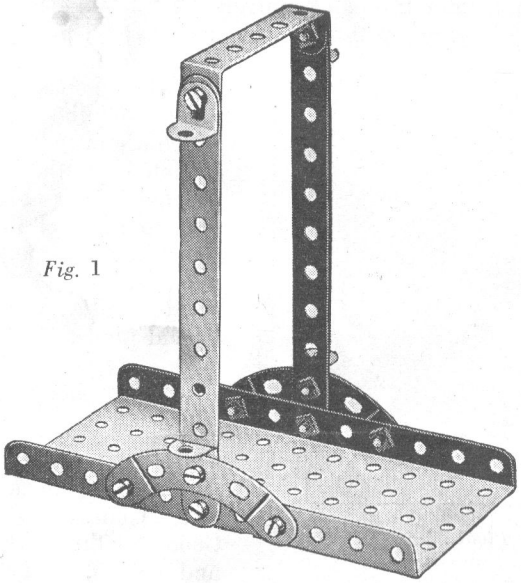


Fig. 1

sat talking, or rather Frank was talking and I was an interested listener, as he told me something of the work of mining out where he lived. I was tremendously fascinated and suddenly the thought occurred to me, could we not make some models of mining equipment with my Meccano outfit? I made the suggestion to Frank, and he, strange to relate, had never seen a set of Meccano. My outfit is only a No. 0 and when I produced it he turned to me with an amused smile.

"Say," he asked, "how can we ever build much with that?"

I must admit that I was not very hopeful myself of being able to accomplish much with my No. 0 set but I wasn't going to admit that to Frank.

"Never mind," I replied, "just wait and see."

First We Build an Elevator

And then commenced one of the most enjoyable days I have ever spent. As for Frank, I never saw a fellow become so enthusiastic in such a short time. He caught the hang of building with Meccano in no time and he kept me hustling to keep up with him.

"Now, the first thing we'll have to fix," said Frank, "is a way of getting in and out of the mine. You know mines are down in the earth and it takes a pretty long ladder to get down. I don't suppose we can build an elevator, can we?"

"Let's try," I replied.

After looking over the parts we decided that the perforated flanged plate was just the thing for the bottom of the car, and the rest was simple. In no time we had an elevator car (Fig. 1) that Frank said was exactly like the ones they used in real mines.

The next step was to have some sort of shaft or pulley over which the car could be suspended. I remembered a model from the manual, the Well Windlass, that was the very thing we needed, and I proceeded to show my cousin how it was made. He thought I was awfully clever to be able to think up such a model so easily and I'm afraid I did not tell him that I had seen it in the manual!

Frank Builds the Prize Model

I must admit, however, that Frank really deserved the prize for cleverness for he made up a model that was a wonder. We were disscusing the operation of the car by the Windlass, when Frank suggested building an engine for it.

"I am afraid that is too much," I said ruefully, "I guess we will have to wait until I get a larger outfit."

Frank did not answer; he is a quiet sort of fellow anyway, and just sat there apparently lost in thought.

"Let's see now," he said half to himself, "we need a fly wheel and a piston and a cylinder to drive the wheel."

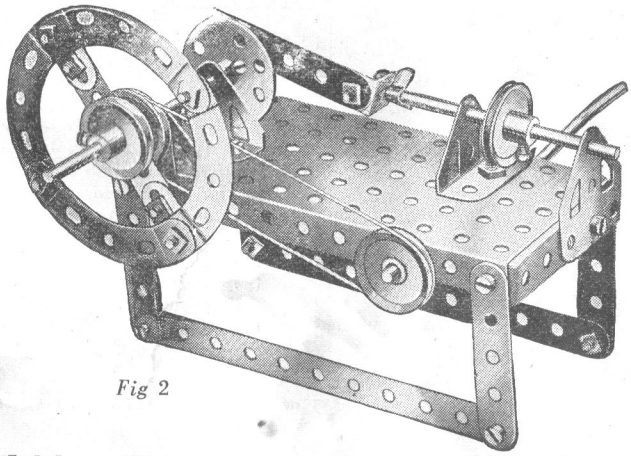


Fig 2

I did not think there was much chance of his making an engine out of my No. 0 outfit but he was so deep in thought and looked so in earnest I didn't like to tell him so. Suddenly he leaned forward and picked up four curved strips and with a couple of turns of the screw driver constructed a wheel which he proceeded to mount on a flanged plate.

From his eagerness and air of suppressed excitement, it was quite evident that he had hit on some definite plan and I was astounded to see how quickly he had caught the idea of building with Meccano. Then he placed a bush wheel at the other end of the rod on which the fly wheel was mounted and attached to it a 2½" perforated strip. I could hardly believe my eyes for there was a regular horizontal engine slowly taking shape. Then he inserted a crank handle, and fastened it to the pulley wheel connected to the fly wheel.

with a No. 0 Meccano

k Newman

"There you are!" cried Frank, and turning the crank handle quickly the perforated strip was driven back and forth, working with the piston, and the engine was in full operation.

I was as fascinated as Frank was proud and I was impressed with the fact that this young cousin of mine was showing me possibilities in my Meccano that I had little dreamed of. To think of an engine that would really work built from a No. 0 outfit—and by a beginner! Well, there it was, and it is illustrated in Fig. 2.

Electrically Driven Ore Cars

Then Frank went on to tell me that there are a number of roads at the bottom of the mines, branching out in all directions and following the course of the veins of ore. Sometimes these roads penetrate into the earth for a long distance and it is quite an undertaking to get the ore back to the elevator and bring it up to the surface. For this purpose an ore car is used which is similar to a railroad dump car but smaller. After building the horizontal engine we knew we could construct an ore car without any trouble and we were both so eager that we were bumping into each other, reaching for the parts. And it is lots more fun when you are actually working in competition

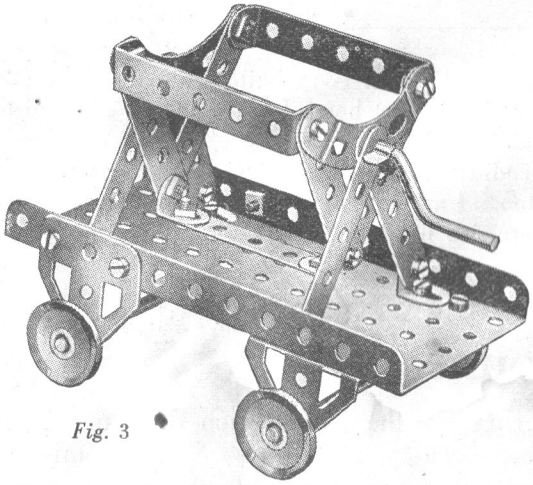


Fig. 3

one against the other, seeing who can get his part done first. Well, Frank grabbed the flanged plate and started the bottom of the car, so I had to figure out some way to make the upper part of the car and also a means of making it tip. It was not quite as simple as I thought it would be but I got it at last, using the cradle arrangement shown in Fig. 3.

"Good for you!" cried Frank, "that is a regular dump car, only of course the real cars are mostly driven electrically now, although, not long ago they used to use mules and wagons. It was so difficult to get the mules in and out of the mine that in most cases the poor animals were left down there day and night. Dad told me that not seeing any light at all blinded them, but by the time they became blind, they knew the roads so well that they did not have to see."

I did not like to think of this, it seemed so cruel.

Then Frank suggested that we make an ore-crusher. Some ore-crushers, he told me, were like huge coffee mills, so large that you could put in pieces of rock as big as a table, and the crusher would grind it all up into small pieces. Several of these crushers are used, each one grinding the

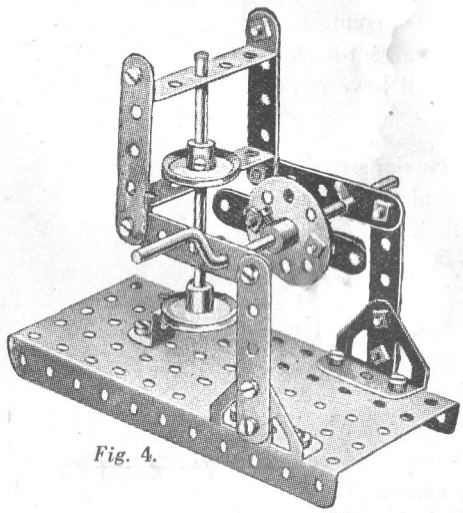


Fig. 4.

pieces smaller and smaller, until they are just like sand. After figuring for some time, I decided the ore-crusher was too much for us, but once again Frank came to the rescue and with his help we built the model in Fig. 4. He helped a lot more than I did, but remember he had the advantage over me for he knew what the models looked like and I was trying to build something like a coffee mill.

"You know," he explained, "these crushers are above the ground and the ore is carried up to them. The car is run right on to the elevator which takes it up to the crusher. Down in the mine it is dark and damp. They use dynamite to loosen the ore from the ground, too, and the fumes from the charges along with the natural gas in the ground make it pretty dangerous. Can you picture being down there all day long? I'll bet it is not very nice to have to inhale that gas all the time."

As you can readily imagine I was quite enthusiastic over my new cousin by this time. He certainly was a regular fellow and described everything so vividly that I felt as if I was down in a mine myself.

"Say," I broke in suddenly, "talk of imagination, you have described everything so plainly that I imagine I can almost smell the gas."

"That's funny," said Frank, "a moment ago I thought the same thing."

Just then the kitchen door opened and Mother called up to us excitedly, "What's the matter with you children, haven't either of you a nose in your head? I just stepped next door for a few minutes and when I get back the light is out under the kettle and the kitchen is full of gas. It's a wonder you're not asphyxiated."

We looked at each other, and burst out laughing. It

(*Continued on page* 138)

Wire and Radio Television

(*Continued from page* 131)

varying intensities of light are reflected on to photo-electric cells placed in front of the subject causing them, as we already know, to give off varying degrees of current which are transmitted along wires or into space. Now we have taken the different lights of a subject and turned them into electric current. If we can turn the current back into light we shall have our picture.

When these currents reach the receiving end they have lost some of their power, so amplifiers are used to increase them, just as amplifiers are used to increase the power of the voice in radio. They then pass to the tube containing neon gas, which we already know gives off light when a current is applied. The light passes through a disc which is an exact duplicate of the one at the sending end, and this disc is caused to revolve at exactly the same speed as the one at the sending end. For this work two motors are used at the transmitting end. In each case there is a main motor which operates at the desired frequency, corresponding to eighteen cycles per second, and a subsidiary or smaller motor that assists the drive. The smaller motor prevents the first one from even small variations in speed and insures that the two discs at either end of the system shall revolve at exactly the same speed. The light passes through the disc on to a screen, and the revolutions of the disc are so rapid that the picture appears as one whole, just as in the movies.

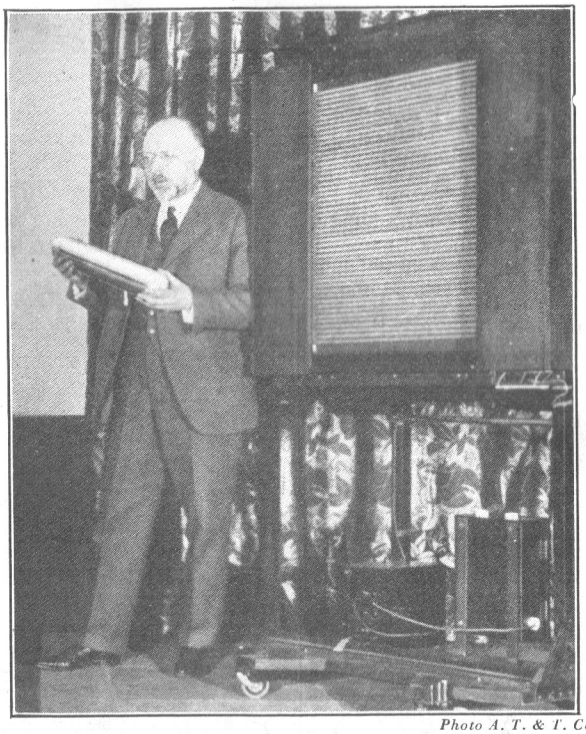


Photo A. T. & T. Co.

Dr. Ives holding a photo electric cell. On his right is the large neon tube which recreates the action.

Mining Engineering

(*Continued from page* 137)

was some time before we could control ourselves sufficiently to explain to my mother, but when we did she enjoyed it as much as we did.

It was now dinner time and we had to stop.

"I have enjoyed this," said Frank, "and you have shown me what good fun it is to build with Meccano. Believe me, as soon as I get home I am going to ask Dad to buy me a set."

"Splendid!" I replied, "and you have shown me something, too. I am not going to keep my Meccano to myself any more, it's heaps more fun when there are two building."

An Important Announcement

For a long time we have been busily engaged in preparing for the introduction of a new and superior type of mechanical trains and sufficient progress has been made so that we can promise a complete announcement in our next issue. There is a tremendous fascination about railroads, one that is shared by most readers of the "*M.M.*", I imagine, and Mr. Hornby, the inventor of Meccano, has developed some very remarkable improvements in mechanical trains. It is no exaggeration to say that the new trains will surpass in beauty, finish, and mechanical efficiency any that have been seen before, and their high quality is guaranteed by the fact that they will be manufactured in the Meccano factory by Meccano workers.

The new trains will be known as Hornby Trains and they will be for sale in the stores in the fall. Many boys have written in the past to say how much pleasure they derive from using Meccano in conjunction with their trains. This pleasure will be doubled when the new Hornby trains are available.

Watch for the announcement in our next issue.

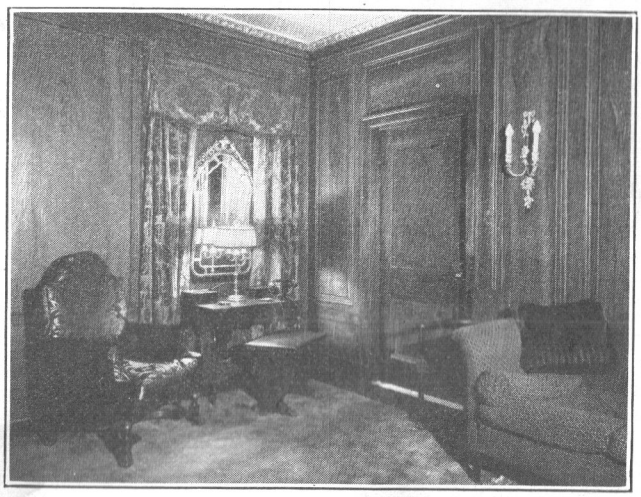
The Editor

An Inside View of Radio Stations

By a Meccano Boy

MANY readers of the "*M.M.*" are doubtless radio fans like myself but as probably only a few have had the advantage of an inside view of a radio station, a brief account should be interesting.

A broadcasting station may be divided into six parts and not infrequently these parts are housed in as many rooms. The first room you enter is the reception room and here the artists rest while waiting for their turn to broadcast. There is sometimes more than one reception room, depending on the size of the station, and most of these have one thing in common. They are handsomely appointed with comfortable chairs and magnificent decorations. The illustration on this page is a corner of a reception room at WABC; notice the beautifully wrought wall fixtures and mirror, the heavy draperies, and writing desk with the cradle-type telephone. The whole atmosphere of the room is decidedly one of luxury and this is not an unusual one but just representative.



A corner of the reception room at WABC.

The studio, from which the programs are broadcast, comes next, and for the sake of convenience this usually adjoins the reception room. On entering the studio, the first thing that will attract your attention is the small round microphone that is so familiar to most of us from pictures of public men delivering addresses.

The Microphone

The microphone is a transmitter that passes on all the sound vibrations occurring within several feet of it. Outside of this radius, however, the transmitted voice seems to fade away, and when the speaker forgets the microphone, as he often does, and moves around, the voice at the receiving end varies accordingly. To obviate this, the microphone is placed on a portable stand that can be moved about to the most suitable position for receiving the program.

After the program has been transmitted by the microphone and amplified, it proceeds to the radio transmitter. Here, after passing through oscillating and modulating circuits it is amplified further and goes to the tuning unit, which transmits the output to the antenna. This is all taken care of in the remaining four rooms where the mechanical and electrical work of broadcasting is carried on, and which is divided into control, radio, power and radiator sections. But this article is not concerned with the technical part of broadcasting, so we will pass on to the antenna.

When looking over the antenna towers of a modern broadcasting station, we are struck with what seems to be a regular labyrinth of wires. On closer inspection, however, we find these towers to be very sound and properly constructed engineering structures composed of steel girders braced and counterbraced. At Station WJZ there are two of these towers, each 300 feet high and 700 feet apart. Between them, however, the antenna only measures 300 feet, for 200 feet from each end of the antenna proper to the tower is insulated. Each tower is built on a concrete base and is thoroughly insulated from its foundation.

You will be able to realize something of the popularity of radio when you learn that there are over 5,000,000 radio receiving sets in the United States alone, and it is estimated that something like 27,000,000 persons are daily enjoying entertainment and instruction from them. The number of broadcasting stations has grown proportionately and has already become so great that the radio commission found it necessary in many cases to allot the same wave length to different stations, apportioning to each the time for operation.

Broadcasting from the Theatre

Sometimes the broadcasting station is not large enough for the purpose for which it is required. For instance, an opera performance on a big scale can only be held in a properly appointed theatre. In such a case the ordinary land telephone line is used.

Suppose it is decided to broadcast an opera from the Metropolitan Opera House. Sensitive microphones are fitted at various points in the theatre, so as to catch every sound from the stage. These microphones are connected by a land line to WJZ, amplified, and then broadcast by wireless just as if the performance were taking place in the ordinary studio. In this way music lovers all over the country are able to hear operatic performances by the finest artists, and similarly concerts and speeches can be broadcast from the actual hall in which they are taking place.

COMPETITION PAGE

Doublet Word Puzzles

The boys seemed to like this new kind of game and we received many entries, many of which were very good. The two prizes have been awarded as follows:

First Prize.....John Hopkins, Marysville, Montana
Second Prize.....Allen S. Nace, Cleveland, Ohio

Third Grand Photographic Contest

This is to be a special Summer Vacation Contest and will be of particular interest now. All entries should depict a vacation view, and they should be accompanied by a brief description of the scene, not to exceed one hundred words. Photographs will be judged on the basis of general interest to readers.

This contest is open to all readers of the *"M.M."* and there is no entry fee. Any make or type of camera may be used and prints may be of any size or finish, although a minimum size of 2 x 3 inches and a "glossy" finish are preferred. They may be mounted or not, at the discretion of the competitor.

Photographs of any vacation subject may be entered in this contest but competitors should bear in mind that subjects most likely to interest readers of the *"M.M."* will be preferred to those of merely local or personal interest.

The photographs must be taken by the competitor, but the developing and printing may be done by others. Each entry should, however, state whether the photograph is the competitor's sole work throughout—that is, taken, developed and printed by him—as this will be taken into consideration when the awards are made.

The Contest will be in two sections, one for boys under ten years of age, and the other for boys over ten years of age. In each section the prizes will be awarded as follows:

First Prize.....Meccano goods, value $5.00
Second Prize.....Meccano goods, value $3.00

The competitor's full name, address and age should be written on the back of each entry, which should be carefully packed to avoid damage in the mails, and addressed: Photographic Contest, Meccano Magazine, Elizabeth, N. J.

The contest closes on September 15 and the winning photographs will be published in the *"M.M."* as soon thereafter as possible.

Ask Me Another

We do not know what started the present craze for question contests but we do know that it has swept the country. Hardly a paper or popular magazine appears now without a question contest in one form or another (popularly known as Ask Me Another Contests) and so great has the popularity become that special books of Questions and Answers for such contests have been published.

Our readers will now have an opportunity of testing their skill and ingenuity in a combination Meccano and allied enginering question contest. The answers to practically all the questions below have appeared in past issues of the *"M.M."*

A Prize of Meccano goods amounting to $2.00 will be given for the best set of answers to these questions. Answers should be addressed to "Questions Contest," Meccano Magazine, Elizabeth, N. J. Contest closes August 5.

1. Who invented the Torque Converter?
2. What is the Bessemer Converter?
3. Who originated the idea of using steam in a cylinder?
4. In 1801 a man by the name of Revere founded Revere's Copper Company." Was there any relationship between him and the hero of "Paul Revere's Ride?"
5. What is commonly termed the "Langley Folly?"
6. How accurately are Meccano parts measured?
7. When did Jackie Coogan make his first stage appearance?
8. At what university did Dr. Alexander Bell, the inventor of the telephone, teach?
9. Why do Meccano parts have equidistant holes?
10. Why are Meccano nuts and bolts brassed?
11. Why are Meccano gear teeth cut instead of stamped?
12. What's the purpose of the pierced side plates on the Meccano Electric Motor?
13. What is the best construction toy and why is it?

The 1927 Model Building Contest

The announcement of this competition was made in our last issue and already it is evident that the rivalry will be keen. Many entries have been received and for the benefit of new readers, we repeat that 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 .....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.

The Story of Lead

(*Continued from page* 134)

per solidifies at a higher temperature than lead. The molten lead is gradually reduced in temperature until the point is reached at which the copper compounds solidify, and these are then skimmed out. The lead, still molten, is now drawn off into a reverberatory furnace to undergo the process known as "softening." It still contains a certain amount of copper, but what is more important, it contains also arsenic and antimony, which are very harmful, even in small quantities. In the reverberatory furnace the lead is raised to a very high temperature and is thoroughly stirred. The arsenic and antimony present thus come in contact with the current of air in the furnace and are oxidized and skimmed off as dross.

In Our Next Issue
"How Lead Is Used"

Recovery of Silver and Gold

At this stage the lead still contains its silver and also certain quantities of gold and copper, and in order to separate the metal from these impurities it is run off into cast-iron vessels known as "kettles." Small quantities of zinc are now thoroughly stirred into the molten lead, the exact amount of zinc added being determined by the amount of silver and gold in the lead. The zinc unites with the silver and gold to form an alloy which, being lighter than the lead, comes to the surface. The temperature of the molten mass is then lowered and as the alloy solidifies before the lead, it is easily removed. This alloy contains practically all the silver, gold and copper and some of the zinc, and the lead is now pure except for a small quantity of zinc which is removed by further treatment in a reverberatory furnace. The refined lead is then cast into "pigs" weighing from 70 lbs. to 100 lbs. each.

Pattinson Process

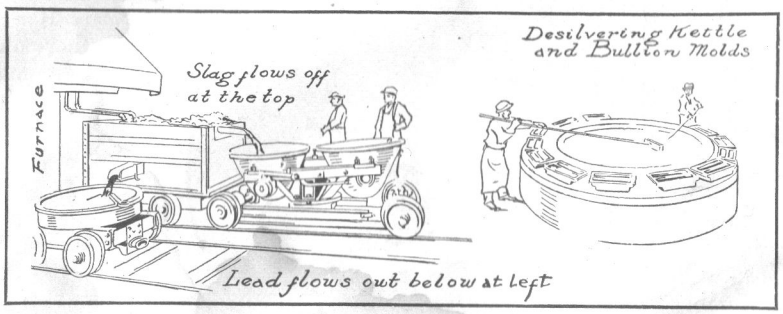
Another method of desilverization, formerly in extensive use, is the "Pattinson" process. This process is based upon the fact that if the lead is melted and then slowly cooled, the crystals that separate out are much poorer in silver than the original lead, while the liquid remainder is correspondingly richer in silver.

In its original form the Pattinson process is carried out in a set of from eight to fifteen cast iron spherical "kettles," each holding from six to fifteen tons of lead. The kettles are built close together in a row and each has a separate fire-place. The lead to be treated is placed in the central kettle and melted down, and then the fire below is withdrawn and transferred to a neighboring kettle, the molten mass being continuously stirred while it slowly cools. Crystals separate out and are removed by means of a long-handled skimmer and transferred to the next kettle on the right. This process is continued until two-thirds of the whole contents of the central kettle have been removed in the form of crystals. The liquid remainder is then ladled into the next kettle on the left.

The kettle on the *right* is now two-thirds full of crystals, and to it is added one-third of lead containing the same proportion of silver. The kettle on the *left* is one-third full of molten lead, and to it is added two-thirds of lead containing a corresponding amount of silver. These two kettles are now heated, and then cooling, crystallizing and ladling out are carried on just as in the case of the original kettle. The latter thus receives crystals from the kettle on the left and liquid lead from the kettle on the right. The process is continued, with the final result that the amount of silver decreases in the kettles to the right up to the last one, while it increases correspondingly in the kettles to the left. In this manner a large amount of lead low in silver is produced, together with a small amount of lead very rich in silver.

There is also a variation of the Pattinson process in which only two melting pots and a crystallizer are used. The stirring is done by means of a jet of steam, and instead of ladling out the crystals the liquid lead is drawn off.

In some cases an electrolytic method of desilverizing is employed. The anodes consist of the lead to be refined, while the cathodes are made of pure lead. A special lead solution is used as the electrolyte, and as the current passes, pure lead is taken from the anodes and deposited upon the already pure cathodes.



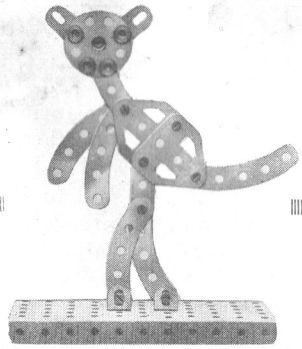
Separating and Desilvering Courtesy National Lead Co.

Cupellation

The amount of gold and silver in lead may be determined by an interesting process known as "cupellation." The sample of lead to be tested is placed in a small cup or "cupel" made of bone-ash, which is a very porous substance. The cup is then heated to a very high temperature, which has the effect of oxidizing the lead, but not the silver and gold. The oxidized lead either sinks into the pores of the cup or passes away as fumes, while the silver and gold remain in the form of a tiny button. This button is weighed, and its two metals are then separated by treating it with nitric acid so as to change the metallic silver into silver nitrate. The gold remaining is then weighed, and the difference between its weight and that of the whole button gives the weight of the silver.

Lead is bluish-grey in color, and a freshly cut surface shows a bright lustre which quickly tarnishes on exposure to air. It is so soft that it can be easily scratched with the finger nail and it readily marks paper with a grey streak. It is the heaviest of all the common metals. It is very malleable, being easily rolled into thin foil but on the other hand it cannot be drawn out into fine wire in the same way as copper.

A Page of Fun



Puzzle No. 76—James is 24 years old and he is twice as old as John was when James was John's present age. How old is John?

* * * *

Puzzle No. 77—By placing the letter A at the proper points in the following diagram a sentence can be made. The end of a line does not necessarily mean the end of a word:

T H T M
N S Y S
T H T M
R Y N D
J C K S
W M N Y
S M L L
B G S T
N R T B
Z R T M
N D L Y

* * * *

Professor: "What is the quickest way to produce sawdust."

Nervous Student: "Why—er—er—"

Professor: "Come, my lad, use your head!"

* * * *

Poor Dad

A teacher in the East side of New York received the following letter from the mother of one of the pupils:

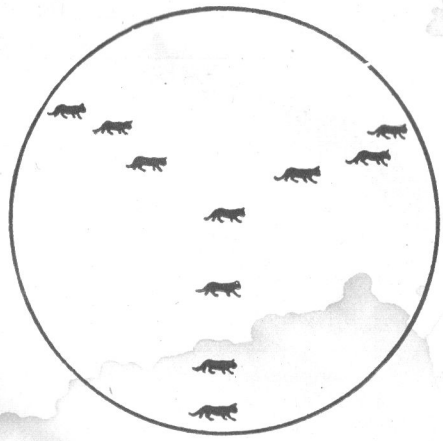
Dear sir: Please do not give Charlie any more homework. That sum about how long would it take a man to walk two hundred times around Columbus Circle caused his father to lose a whole days work; then after he walked it you marked the sum "wrong."

Puzzle No. 78—My seas have never held water, my rivers are dry and my fields are barren. I possess large cities, and yet not a single house. I am irregular in shape without either grace or beauty and yet in your eyes I represent the whole world. "What am I?"

* * * *

A Cat Puzzle

Puzzle No. 79—A certain old man kept ten black cats as pets. He found that these cats were always quarrelling and fighting among themselves and he determined to separate them. He therefore drew a circle and placed the ten cats in it as shown in the diagram below. He then drew three other circles inside the large one in such a manner that no cat could reach another cat without crossing one of the circles. How did he do it?



Puzzle No. 80—Rearrange the following letters so that each horizontal line will give a complete word and so that the first and last columns read downward will form the names of two well-known poets:

A A A A A C
D D D E E E
G G I I L L
L L L N N N
O O O P R R
S T T T W Y

* * * *

Rules for Hotel Guests

1—Guests are requested not to speak to the dumb waiter.

2—Guests wishing to get up in the morning without being called should take self-raising flour.

3—Guests wishing to do a little driving will find a hammer and nails in the cupboard.

4—If the room gets too warm, open a window and watch the fire escape.

5—If you are fond of jumping, lift the mattress and watch the bed spring.

6—If your lamp goes out, take a feather out of the pillow. That's light enough for any room.

7—Don't worry about paying your bill as this house is supported by the foundation.

* * * *

Lodger (to landlady) — "There hasn't been any soap in my room for over a week."

Landlady: "Well, you've a tongue in your head, sir."

Lodger: "Yes, but I'm not a cat."

Answers to Puzzles in Last Issue

No. 69—The old lady originally had $33.80.

No. 70—"Beneath this stone reposeth Claude Coster tripe seller of Impington as doth his consort Jane."

No. 71—Loco A with 13 cars moves forward and then shunts back into the siding, clear of the single line. 2—The train B then proceeds past the siding, taking A's remaining cars and itself clear of the siding. 3—Loco A and the 13 cars then come out of the siding and advance far enough to allow train B to deposit the remaining cars of Train A in the siding. Train B then proceeds to its destination, while Loco A and its 13 cars return to the siding, pick up their remaining trucks, and proceed on their journey.

No. 72—79 apples.

No. 73—Turn the square so that each of the four corners of the pond are centered between two trees. In this position th size of the pond can be doubled.

No. 74—Beginning with the lower left-hand compartment and travelling clockwise the numbers are: 18-6-15-9-17-19-8-12-11-14-20-7-13-10-16.

No. 75—Postman.

Modern Elevators

(*Continued from page* 133)

Though this method is still used in some elevators, it has several disadvantages; if the brake does not hold the weights are liable to be dragged through the roof of the shaft, or in case the car stops in the shaft and the cable continues to unwind, the car might descend suddenly and snap the cable. Moreover, in tall buildings the amount of cable to be wound up is too great to be wound up on a drum of reasonable size.

A better method of drive is the vee-sheave or traction drive, shown in our illustration. In this method, the drum is done away with and a sheave or wide wheel with grooves for the cables takes its place. The two cables which were formerly fastened to the drum, are replaced by a single continuous cable which is passed over the sheave and has each end fastened to the car and weights, respectively. Friction holds the cable securely in the groove of the sheave so that when it turns, the cable turns also and hoists or lowers the car. And when the car is to be stopped a brake similar to an automobile brake, is automatically applied to the drum shaft on the motor, as soon as the current is switched off.

Control

With the motor at the top of the shaft you will probably wonder how the car can be started and stopped. There are several methods employed. The Hand-rope Control, the oldest method, consists of a rope stretched from top to bottom of the shaft, and attached to a switch at the top. By pulling, the switch may be turned to stop, start or reverse.

The Car-Switch Control is more satisfactory and is now mostly used. In this method when the handle of the control is released, the car is brought to a stop by the lever returning to the center while upward or downward motion is produced by moving the handle to either side. This control is connected to the main switch by a flexible cable which functions in the same manner as the old hand-rope.

The third way is the Push-button Control, a method that dispenses with the services of an attendant. It consists of a series of buttons inside the car, one for each floor, with a similar button, the "call-push" on every landing. Whenever the car is not being used it can be summoned to any floor by merely pushing the button at that landing. Upon reaching here, the lock on the door is automatically released and may be opened by the passenger who enters the car, closes the door and pushes the numbered button corresponding to the floor he wishes to go to. This is registered on the main control panel at the top of the shaft and the car automatically stops at the floor desired.

So much for the basic method of operating elevators. The furnishing of elevator supplies, safety devices, lighting systems, type of motors, etc., is a very large and interesting department of the elevator industry and it is one that we shall have to leave for another time.

The Spirit of St. Louis

(*Continued from page* 135)

ticular position which gives zero potential is not of any importance, for it is simply necessary that the direction which corresponds to that position of zero potential, be set on the dials of the Controller.

Now suppose it is desired to follow a North-Easterly course. The exact number of degrees is set by turning the hand of the Controller until this is registered on the Controller dial. By turning the Controller, the brushes of the Generator are turned also, and when the airplane is pointed in the direction set, the angle between the airplane or the course it pursues, and the brushes, will be such that no current is produced. The Indicator needle will point to zero, therefore, as long as the plane maintains its course. As soon as it changes its direction, however a current is generated and the needle will point to right or left, corresponding to the direction the plane takes. To get back on the course it is merely necessary to fly so that the needle once more points to zero.

George Price, of White Plains, N. Y.

Although only three years old, George is an enthusiastic Meccano boy and has built many models. Our photograph shows him with an excellent model Scooter. No wonder he has such a happy smile!

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.

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.

Richard Duenas, New York, N. Y.—"I have a good many things to tell you: I agree with the suggestion of a monthly *M.M.*; if it were a weekly it would be better still. I subscribe to six magazines besides the *M.M.* and I think as much of the *M.M.* as any. Three years ago I had a 1x Meccano and now I have a multicolor set, and want to congratulate you on the improvement with colors. I suggest a column for questions and answers." I am afraid we cannot look forward to a weekly publication for some little time. As for your suggested question and answer column, we are at all times glad to answer any questions submitted.

Arthur Merryman, Corvallis, Oregon.—Arthur commends the stories in the *M.M.* and writes that he has had more fun with his 1x Meccano than with any other toy he ever had. Splendid, Arthur; and when you get a 1a outfit, you will be surprised to find how much more you can build.

Jack Dunning, Palms, Calif.—"I own a 3x Meccano set and I made these Flying Airplanes with it. I like the set very much and expect to get a larger one next Christmas. I send you these drawings because in the book you didn't have any models like it." Thank you, Jack, we were very pleased to receive the drawing.

William Steiner, Brooklyn, N. Y.—William suggests the formation of a Meccano Club in Brooklyn, and we think the suggestion an excellent one. Are there other boys in Brooklyn who would like to form such a club? If so, write to William—his address is 239 East 26th St.

Harlan Smith, Johnstown, Penna.—writes that he likes the *M.M.* but thinks it would be much better if we had some more models in it, especially smaller models. Several others have asked us to publish some small models, Harlan, and the suggestion has been carried out on pages 136 and 137.

Donald Wolfe, Independence, Iowa—has sent a description of what appears to be a very interesting automobile that has "head lights, spot lights, two parking lights, motometer, top and a little window in the back. It has also a double mirror." We are sure other readers would like to know more of this model, which is made from a No. 3x. Won't you send us a picture or a drawing, Donald?

MECCANO ACCESSORY PARTS

Girders

Their Importance in Engineering

The greatest works of engineering depend for their strength and durability upon the massive girders of steel which, though sometimes hidden by an outer casing of masonry, bind them together and hold them rigid. A single rolled steel girder, if properly constructed, proves as strong as a wall of masonry.

The Forth Bridge, a steel highway 1½ miles in length, suspended high above the Forth; the Eiffel Tower, extending almost to the height of a mountain; the Woolworth Building, the tallest skyscraper in New York—these are three of the world's greatest structures that stand like monuments to man's constructive skill. The last named disguises its steel skeleton in a cloak of masonry, but the others tower into the sky like huge Meccano models. It is plain to see how even the smallest strut or tie is carefully planned and placed into position so that it may bear its allotted portion of strain or thrust.

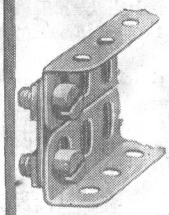
Meccano Girders fulfill the same important duty in Meccano engineering. They are fitted into models and braced by Strips or Rods until the finished structure would support a man's weight without the slightest disruption. Meccano Girders are made of the finest steel. The edges and corners are rounded and smoothed off, while the perfect accuracy of their manufacture makes them invaluable in the construction of even the most intricate mechanisms.

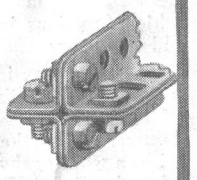
No.			Price
1	Perforated Strips, 12½" long	½ doz.	.45
1a	" " 9½" "	"	.35
1b	" " 7½" "	"	.30
2	" " 5½" "	"	.25
2a	" " 4½" "	"	.20
3	" " 3½" "	"	.20
4	" " 3" "	"	.20
5	" " 2½" "	"	.15
6	" " 2" "	"	.15
6a	" " 1½" "	"	.15
7	Angle Girders, 24½" long	each	.25
7a	" " 18½" "	"	.20
8	" " 12½" "	½ doz.	.60
8a	" " 9½" "	"	.55
8b	" " 7½" "	"	.50
9	" " 5½" "	"	.45
9a	" " 4½" "	"	.40
9b	" " 3½" "	"	.35
9c	" " 3" "	"	.35
9d	" " 2½" "	"	.30

No.			Price
9e	Angle Girders, 2" long	½ doz.	.25
9f	" " 1½" "	"	.25
97	Braced Girders 3½" long	"	.20
98	" " 2½" "	"	.15
99	" " 12½" "	"	.75
99a	" " 9½" "	"	.60
100a	" " 5½" "	"	.50
103	Flat Girders 5½" long	each	.10
103a	" " 9½" "	"	.12
103b	" " 12½" "	"	.15
103c	" " 4½" "	"	.10
103d	" " 3½" "	"	.10
103e	" " 3" "	"	.08
103f	" " 2½" "	"	.03
103g	" " 2" "	"	.06
103h	" " 1½" "	"	.05
103k	" " 7½" "	"	.12
113	Girder Frames	"	.10
143	Circular Girders, 5½" diam.	"	.55

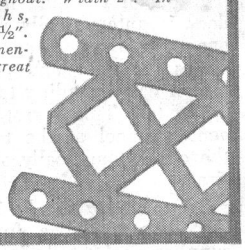
("L" section, Angle Girders ½"x⅝"). In 12 lengths, ranging from 1½" to 24½".

Below are two examples of Meccano construction: Channel Section (left) and Cross Section Girders. The latter consists of a pair of "T" girders butted together.





Braced Girders. Stout latticework throughout. Width 2". In 5 lengths, 2½" to 12½". Very ornamental and of great utility.



YOUR DEALER WILL BE PLEASED TO SHOW YOU ALL THE MECCANO PARTS. ASK HIM FOR A COMPLETE PRICE LIST.

MECCANO COMPANY, INC., ELIZABETH, N. J.

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Mining Engineering with a No. 0 Meccano

By Dick Newman

NOT very long ago my cousin Frank was visiting me. I had not met him before his visit for he lives out West in a mining district and I had been wondering before his arrival what sort of a boy he would turn out to be and how we would get along together. I had planned to take him fishing for I had heard he was a keen fisherman but, just my luck, the very first day he was here it poured with rain and we had to stay at home. After breakfast Frank and I

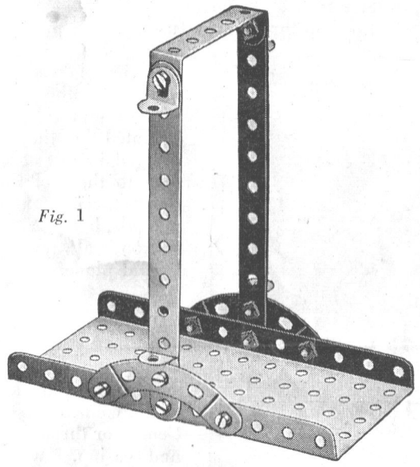

Fig. 1

sat talking, or rather Frank was talking and I was an interested listener, as he told me something of the work of mining out where he lived. I was tremendously fascinated and suddenly the thought occurred to me, could we not make some models of mining equipment with my Meccano outfit? I made the suggestion to Frank, and he, strange to relate, had never seen a set of Meccano. My outfit is only a No. 0 and when I produced it he turned to me with an amused smile.

"Say," he asked, "how can we ever build much with that?"

I must admit that I was not very hopeful myself of being able to accomplish much with my No. 0 set but I wasn't going to admit that to Frank.

"Never mind," I replied, "just wait and see."

First We Build an Elevator

And then commenced one of the most enjoyable days I have ever spent. As for Frank, I never saw a fellow become so enthusiastic in such a short time. He caught the hang of building with Meccano in no time and he kept me hustling to keep up with him.

"Now, the first thing we'll have to fix," said Frank, "is a way of getting in and out of the mine. You know mines are down in the earth and it takes a pretty long ladder to get down. I don't suppose we can build an elevator, can we?"

"Let's try," I replied.

After looking over the parts we decided that the perforated flanged plate was just the thing for the bottom of the car, and the rest was simple. In no time we had an elevator car (Fig. 1) that Frank said was exactly like the ones they used in real mines.

The next step was to have some sort of shaft or pulley over which the car could be suspended. I remembered a model from the manual, the Well Windlass, that was the very thing we needed, and I proceeded to show my cousin how it was made. He thought I was awfully clever to be able to think up such a model so easily and I'm afraid I did not tell him that I had seen it in the manual!

Frank Builds the Prize Model

I must admit, however, that Frank really deserved the prize for cleverness for he made up a model that was a wonder. We were disscusing the operation of the car by the Windlass, when Frank suggested building an engine for it.

"I am afraid that is too much," I said ruefully, "I guess we will have to wait until I get a larger outfit."

Frank did not answer; he is a quiet sort of fellow anyway, and just sat there apparently lost in thought.

"Let's see now," he said half to himself, "we need a fly wheel and a piston and a cylinder to drive the wheel."

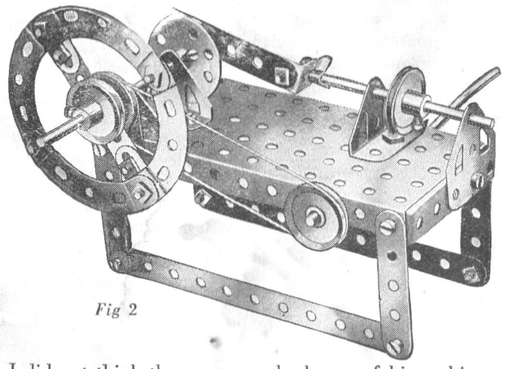

Fig 2

I did not think there was much chance of his making an engine out of my No. 0 outfit but he was so deep in thought and looked so in earnest I didn't like to tell him so. Suddenly he leaned forward and picked up four curved strips and with a couple of turns of the screw driver constructed a wheel which he proceeded to mount on a flanged plate.

From his eagerness and air of suppressed excitement, it was quite evident that he had hit on some definite plan and I was astounded to see how quickly he had caught the idea of building with Meccano. Then he placed a bush wheel at the other end of the rod on which the fly wheel was mounted and attached to it a 2½" perforated strip. I could hardly believe my eyes for there was a regular horizontal engine slowly taking shape. Then he inserted a crank handle, and fastened it to the pulley wheel connected to the fly wheel.

"There you are!" cried Frank, and turning the crank handle quickly the perforated strip was driven back and forth, working with the piston, and the engine was in full operation.

I was as fascinated as Frank was proud and I was impressed with the fact that this young cousin of mine was showing me possibilities in my Meccano that I had little dreamed of. To think of an engine that would really work built from a No. 0 outfit—and by a beginner! Well, there it was, and it is illustrated in Fig. 2.

Electrically Driven Ore Cars

Then Frank went on to tell me that there are a number of roads at the bottom of the mines, branching out in all directions and following the course of the veins of ore. Sometimes these roads penetrate into the earth for a long distance and it is quite an undertaking to get the ore back to the elevator and bring it up to the surface. For this purpose an ore car is used which is similar to a railroad dump car but smaller. After building the horizontal engine we knew we could construct an ore car without any trouble and we were both so eager that we were bumping into each other, reaching for the parts. And it is lots more fun when you are actually working in competition

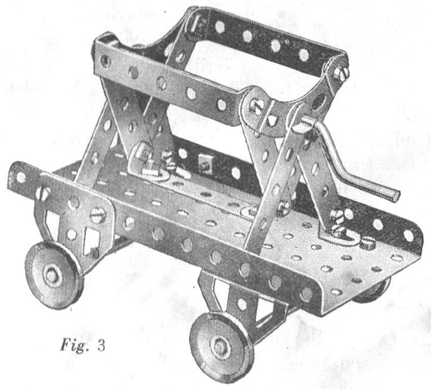

Fig. 3

one against the other, seeing who can get his part done first. Well, Frank grabbed the flanged plate and started the bottom of the car, so I had to figure out some way to make the upper part of the car and also a means of making it tip. It was not quite as simple as I thought it would be but I got it at last, using the cradle arrangement shown in Fig. 3.

"Good for you!" cried Frank, "that is a regular dump car, only of course the real cars are mostly driven electrically now, although, not long ago they used to use mules and wagons. It was so difficult to get the mules in and out of the mine that in most cases the poor animals were left down there day and night. Dad told me that not seeing any light at all blinded them, but by the time they became blind, they knew the roads so well that they did not have to see."

I did not like to think of this, it seemed so cruel.

Then Frank suggested that we make an ore-crusher. Some ore-crushers, he told me, were like huge coffee mills, so large that you could put in pieces of rock as big as a table, and the crusher would grind it all up into small pieces. Several of these crushers are used, each one grinding the

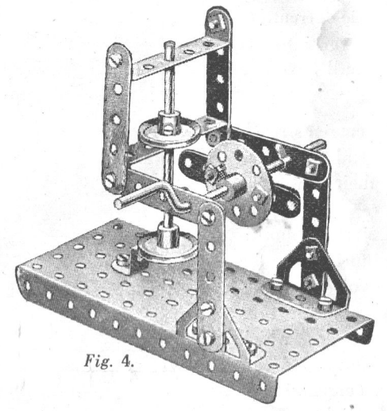

Fig. 4.

pieces smaller and smaller, until they are just like sand. After figuring for some time, I decided the ore-crusher was too much for us, but once again Frank came to the rescue and with his help we built the model in Fig. 4. He helped a lot more than I did, but remember he had the advantage over me for he knew what the models looked like and I was trying to build something like a coffee mill.

"You know," he explained, "these crushers are above the ground and the ore is carried up to them. The car is run right on to the elevator which takes it up to the crusher. Down in the mine it is dark and damp. They use dynamite to loosen the ore from the ground, too, and the fumes from the charges along with the natural gas in the ground make it pretty dangerous. Can you picture being down there all day long? I'll bet it is not very nice to have to inhale that gas all the time."

As you can readily imagine I was quite enthusiastic over my new cousin by this time. He certainly was a regular fellow and described everything so vividly that I felt as if I was down in a mine myself.

"Say," I broke in suddenly, "talk of imagination, you have described everything so plainly that I imagine I can almost smell the gas."

"That's funny," said Frank, "a moment ago I thought the same thing."

Just then the kitchen door opened and Mother called up to us excitedly, "What's the matter with you children, haven't either of you a nose in your head? I just stepped next door for a few minutes and when I get back the light is out under the kettle and the kitchen is full of gas. It's a wonder you're not asphyxiated."

We looked at each other, and burst out laughing. It

(*Continued on page* 138)