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A HUGE CASTING

EDITORIAL OFFICE
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LIVERPOOL

MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

Our Cover

OUR cover this month shows a huge Steel Casting for a Rolling Mill for steel. The photograph, kindly supplied by the makers of the Mill, Messrs. Davy Bros. Ltd., of Sheffield, has been coloured by our artist in a most realistic manner. The Casting is shown standing on the bed-plate of what is called a "Side Planing Machine." This is provided with the usual vertical and horizontal movements, the portion of the machine shown on the left-hand side of the Casting being the vertical slide. The Casting was produced from a Siemens-Martin Open-Hearth Furnace, and it forms one of a pair of Castings in which are housed the rolls of a "three-high" Rolling Mill. In these mills there are three rolls 9 ft. in length, the top and bottom being 3 ft. in diameter and the middle roll 2 ft. in diameter. The Mill is used for rolling pieces of steel weighing from four to six tons, the steel being passed through the rolls time after time until it is reduced from a thickness of 14 in. to plates varying from $\frac{1}{8}$ in. to $1\frac{1}{4}$ in. in thickness. I have given these details in the endeavour to give some idea of the great size and strength of these rolling mills, which will be dealt with in greater detail in a subsequent instalment of our article "*The Story of Iron and Steel.*" Although the methods used in the treatment of steel are very wonderful, we must not overlook the ingenuity displayed in the construction of such huge macnines as these Rolling Mills, without which the manipulation of great masses of metal would not be possible.

The "M.M" in France

I do not know whether all my readers know that the "*M.M.*" has been published in France for a number of years. It has a wide circulation and the French Meccano boys are keenly interested in their "*M.M.*", which follows the lines of our own publication. Readers who wish to improve their French should become subscribers to the French Magazine, as they will no doubt find it interesting to follow the "*M.M.*" articles in the French language. I imagine, too, that they would find it considerably more interesting to improve their French by reading about Meccano boys than in translating from school-books! I shall be pleased to send particulars and subscription rates to any boy interested.

Our Correspondence Club

This reminds me that the Correspondence Club, which is organised in connection with the Guild, is doing very excellent work. No charge is made for enrolment in this club, this being one of the privileges of Guild members. The Correspondence Club offers a wonderful opportunity for every boy to have a friend in any country abroad, or in any town or city in England. Stamps, post-cards, and photographs may be exchanged, and correspondence arranged in English or in the language of the country in which the correspondent lives. Here again is a splendid opportunity for my readers to improve any foreign language that they are studying, and correspondents will find it very interesting to exchange views and ideas about Meccano with their friends overseas. If they like to do so, they may ask for letters to be returned corrected by their correspondents, a procedure that is often very helpful. Any boy who desires to become a member of the Correspondence Club, and to be placed in touch with a suitable correspondent, should write to the Guild Secretary for full particulars and enrolment form.

Some Queer Questions

Since the *Meccano Magazine* was first published, eight years ago, I have received tens of thousands of enquiries on all manner of subjects. As a rule I welcome these enquiries, and am pleased to be able to give my readers information and to clear up their difficulties. At one time the enquiries bore a distinct relation to engineering and other similar subjects with which Meccano is more closely associated, but during the last year or two the questions I have received have covered a much wider field. I have been asked for information on all manner of subjects, the nature of which would, no doubt, surprise most of the readers of the "*M.M.*" One morning recently I opened a letter from a young friend asking for information as to what to feed tadpoles on, while the the next letter asked me to "recommend something for a baby's cough," as my correspondent's baby-brother was very ill! I have also been asked many posers, such as: What causes a shell to drift sideways when it is fired? What book would you recommend for an elementary study of Hydraulics? Does sand conduct sound? Which is the longest single-span bridge in the world? How much heat and light do we receive from Jupiter? How can I bore holes in glass without breaking it? How is horse-power calculated, and what is the difference between the several formulæ? Another poser was contained in a letter which said: "I am very interested in the Forth Bridge, but please will you tell me what keeps it up?"

Help Yourself

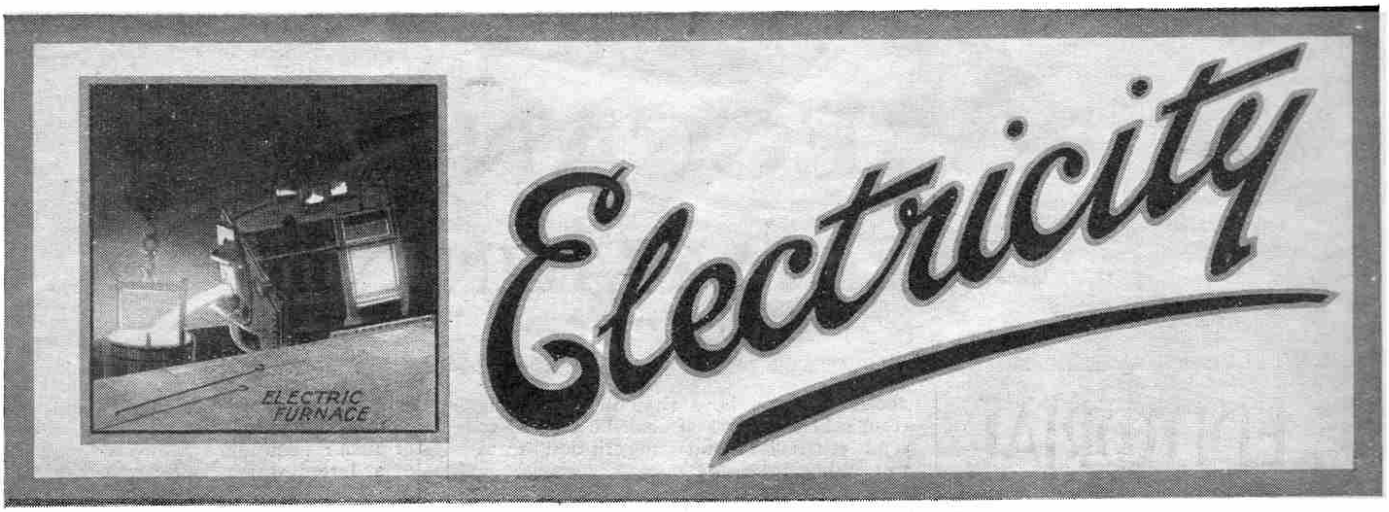
To such questions as these I do not take exception, as most of them are more or less connected with Engineering and Mechanics, and I feel that my correspondents are really in search of information. Questions were made to be answered, and difficulties to be overcome, and information on any point can nearly always be obtained from a Reference Library, a Lending Library or some other similar source to be found in almost every town. A good Encyclopædia will often give the desired information; and whilst I am always ready to give assistance in these matters, I hope that readers will first endeavour to "help themselves" by discovering answers to their questions before they invite my assistance.

Posers for the Editor

Whilst on this subject I will mention another class of readers who often ask trifling questions on trifling subjects, and seem to take a real delight trying to cause the Editor a great deal of trouble. These include such questions as: How do you explain the cutting up of a draught board measuring 8 inches square into pieces that fit together in two rectangles with an apparent area of 65 square inches, when $8 \times 8 = 64$? Did the "*Titanic*" reach the bottom of the ocean, or does she hang suspended half-way to the bottom? If a bullet is shot from the back of a moving train, at a speed equal to that of the train, what happens to it? If an explosion occurs when there is no one within ear-shot can there be said to be any sound? Some of these questions I recognise at once as "chestnuts," which I suppose have been sent to Editors of other papers for many years by different people, apparently with the idea of "setting the Editor a poser." It is surprising how quickly an Editor is able to tell whether questions are asked "just for the fun of the thing" or in real earnest, however, and those in the former category generally find their way into the waste-paper basket!

IMPORTANT

We are constantly asked to supply back numbers of the "*M.M.*" We print only sufficient copies to fill our regular orders, and as a rule back numbers cannot be supplied. In order to prevent disappointment our readers are advised to place a regular order with a Meccano dealer, a newsagent, or direct with us.
(Subscription rates on page 276).



VII. ELECTRIC POWER STATIONS

FEW things are more impressive and fascinating than a large electric power station. There is an element of mystery about the huge machines working incessantly at enormous speeds and yet producing no visible result. We know that electric current of tremendous power is being produced, but that current is silent and invisible, and only makes its presence known when it lights tens of thousands of lamps and drives innumerable motors in all parts of a great city.

In this country steam is used almost exclusively as the motive force to drive the generators of a large power station. Until recent years the reciprocating engine was in general use, but now the steam turbine has taken its place in up-to-date stations. The turbines are coupled directly to the generators so that the two machines look like one. The advantages of the steam turbine are that it is capable of higher speeds than the reciprocating engine, is more silent in running, occupies less space and requires less attention.

From Coal to Steam

A large central power station consumes vast quantities of coal and requires a plentiful supply of water. For this reason it is built whenever possible on the banks of a river or canal, so that supplies of coal can be brought to its doors cheaply and easily and an ample water supply is at hand. The coal arrives in barges and is unloaded by huge mechanical grabs and deposited in a big receiving hopper. From this hopper it is taken by some form of conveyor to other hoppers close to the furnaces, and is fed into the furnaces by mechanical stokers.

After combustion the ash and clinker fall down great funnel-like chutes directly into trucks below, and are taken away and sold to be made into building and other materials. Even the gases resulting from the combustion of the coal are made to do work before they are allowed to escape through the chimney. These gases are led into an economiser chamber through which pass pipes bringing fresh water to the boilers. Here the gases part with a great deal of their heat, with the result that the water flowing through the pipes is raised to a very high temperature before it reaches the boilers, so that a comparatively small amount of heat is required to turn it into steam.

The heat produced in the furnaces is used to generate steam in a number of great boilers, from which the steam is collected in large pipes and led to the engine-room, where it is distributed to the turbines as required. Having exerted its energy in the turbines it might be thought that the steam would be allowed to escape, but no—a great deal more work is yet required of it. It passes from the turbines to a condenser in which it is cooled and condensed to water, freed from oil and grease, and then sent back to the boilers to be re-converted into steam. This condensed water is quite warm, and therefore less heat is required to turn it into steam than would be the case if the boilers were constantly fed with fresh cold water.

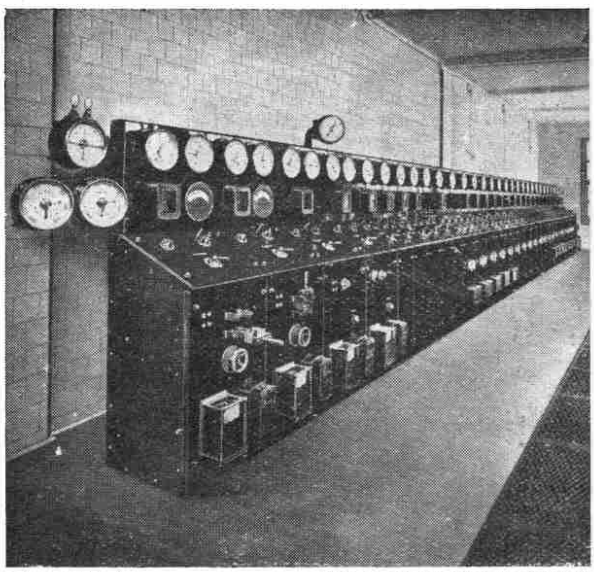


Photo courtesy [*Messrs. Metropolitan-Vickers Ltd.*

The Switchboard at a Power Station

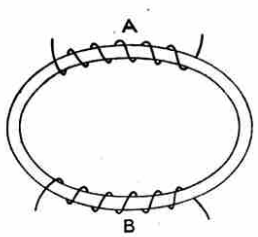


Diagram showing principle of Transformer

Silent Giants at Work

Perhaps the most striking feature of a large power station engine-room where the generators are turbine-driven is the silence. There is none of the clash and clatter one usually associates with rapidly moving machines. The giant turbines, turning at the rate of perhaps 1,000 revolutions per minute, are uncannily quiet, and as one listens to their purring hum it is difficult to realise their enormous power. The generators, too, run very quietly, although they may be developing current capable of supplying the whole of the electrical requirements of a great city.

The current generated is conveyed by heavy copper cables to what are called "bus bars," two of which run along the entire length of a large main switchboard. One receives the positive cable from the generators and the other the negative cable.

The kind of current to be generated at a power station—continuous or alternating—is largely determined by the size of the area supplied. Generally speaking, continuous current is generated for small supply areas and alternating current for larger ones, but there are exceptions, and in many cases both kinds of current are generated at one station.

Continuous Current : Three-Wire System

If continuous current is generated it is usually at a pressure of from 400 to 500 volts, the average being about 440 volts. The distribution is generally on what is known as the three-wire system, which employs two parallel circuits with a common return. Three separate wires are used. The two outer wires are connected respectively to the positive and negative bus bars and carry current at the full voltage of the system. Between these wires is a third and smaller wire connected to a third bar, smaller than the main bars, and not connected to the generators but to earth by way of a large copper plate buried in the ground. The mid-wire is

connected to the positive and negative outer wires respectively by two machines called "balancers." If we suppose the pressure between the outer wires of the system to be 440 volts, then the pressure between the third wire and either of the outer wires will be 220 volts—that is exactly half.

Balancers

Board of Trade regulations prohibit the use of current at a pressure exceeding 250 volts for electric appliances of all kinds intended for ordinary domestic purposes. In a three-wire system such as we are describing, all such appliances would be connected between the mid-wire and one of the outer wires, thus receiving current at 220 volts. It is clearly impossible to ensure that the appliances connected with the positive side of the system shall always take the same amount of current as those connected with the negative side. There is always liable to be a greater load on one side than on the other, and the function of the balancers to which we have just referred is to adjust these differences.

The balancers are machines capable of acting either as dynamos or motors. So long as the current demands on each side of the system exactly equal one another, the balancers have nothing to do and they run light as motors. Let us suppose, however, that a heavy load is thrown on the negative side. The voltage on that side accordingly drops and the voltage on the positive side rises. The balancer on the positive side then runs as a motor and drives the negative side balancer as a dynamo, and thus the excess demand on the negative side is immediately supplied. There are other methods of balancing, but the one we have described gives a sufficiently good idea of the principle involved.

The half-pressure of 220 volts in such a three-wire system is confined to appliances for domestic use, and electric motors for driving trams or machinery of any kind are connected across the outer wires, thus receiving the full voltage of the system.

Batteries of Accumulators

One of the many problems with which central power stations have to contend is that of a constantly fluctuating demand for current. In a system supplying power and light, for instance, the current demand increases very rapidly at a certain time on winter afternoons, because, as the daylight fades, vast numbers of electric lamps are switched on within a very brief period, while the motors driving machinery in factories and workshops are still running at the full. The same thing happens when a fog descends on a city, or in summer when an approaching thunderstorm quickly darkens the sky and lights are switched on accordingly. A sudden and heavy demand for current may also arise in a system supplying power for tramways. If one of the cars has a serious breakdown it holds up all the cars behind it and a long string of cars quickly forms. As soon as the breakdown is repaired all these cars start practically at the same time, and consequently the current demand is momentarily far in excess of the normal.

If a power station is to deal successfully with situations of this kind it obviously must have a reserve of current beyond that normally required. In the case of power stations generating continuous current such a reserve may be provided by means of a large battery of accumulators. The battery is charged during periods of small demand and then, when an abnormally heavy load comes on, the current from the battery is available to take a share of the load and so relieve the generators. Of course, such a battery of accumulators cannot be used where alternating current is generated unless that current, or part of it, is converted to continuous current. In our June issue we gave an illustration of a large power station battery.

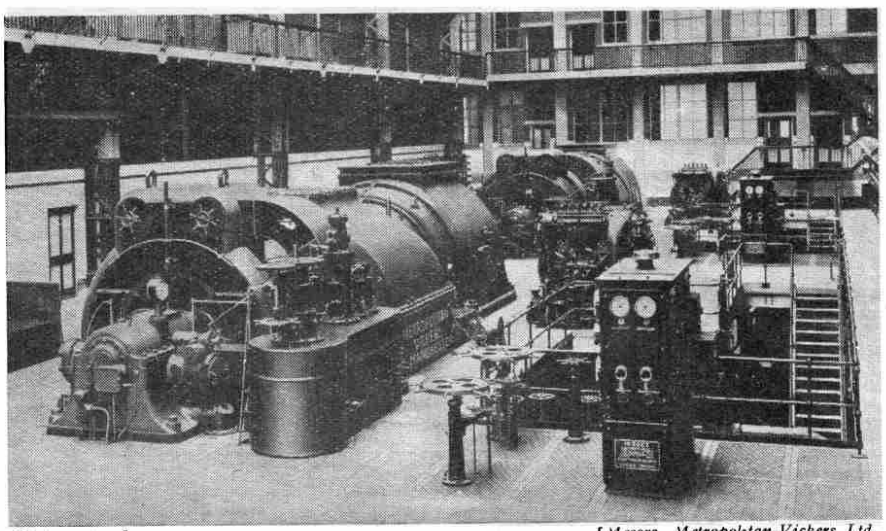


Photo courtesy] [*Messrs. Metropolitan-Vickers Ltd.*

Turbo-Generators at a Typical Power Station

Alternating Current

We have already said that alternating current is generated at stations supplying very large areas. This current is generated at pressures of from 2,000 volts upwards. The highest pressure at present employed in this country is about 11,000 volts, but in the United States and in other countries where current has to be transmitted very long distances pressures more than ten times as great are in regular use. Pressures such as this are, of course, very much too high for lamps or motors, and the object of using them is to secure economy in transmitting current through very long cables.

Electrical power is measured in watts. In the case of continuous current the number of watts is obtained by multiplying together the pressure or voltage of the current and its rate of flow or amperage. Therefore, so long as the product of voltage and amperage remains the same, it makes no difference so far as electrical power is concerned whether the current is of low voltage and high amperage or high voltage and low amperage.

In transmitting a current through a long cable a considerable amount of loss occurs through the heating of the cable. This heating is due to the current flow, not to the pressure, and therefore the heavier the current the greater the loss. From this it will be seen that by decreasing the current flow and increasing the pressure by a corresponding amount, the electrical power will remain the same, yet at the same time the loss in transmission will be greatly reduced. It also follows that the use of current at high pressure and low amperage allows of the use of cables of smaller cross-section, and thus a great saving in copper is effected.

In the case of alternating current the calculation of the watts is not quite so simple, but the same principle holds good.

Work of Transformers

Alternating current at pressures of from 2,000 to about 11,000 volts is produced without any difficulty direct from the generators, but where pressures of 100,000 volts and upwards are necessary, direct production is not practicable owing to the great liability of the insulation to break down. In such cases the alternating current is generated at a moderate pressure and raised to the required pressure by means of transformers.

The principle of the transformer was discovered by Faraday in the course of his long series of electrical experiments. He wound upon an iron ring two insulated coils of wire, as shown in the accompanying diagram. Coil A was connected to a battery and Coil B to a galvanometer. When the current was switched on or off in Coil A secondary currents were generated in Coil B. Similarly, if Coil B was used as the primary, then secondary currents were generated in Coil A.

In all transformers the electro-motive forces set up in the secondary coil are nearly proportionate to the relative number of turns of wire in the two coils. If the primary coil has 100 turns and the secondary coil 2,500 turns, then the electromotive force in the secondary circuit will be nearly 25 times as great as that used in the primary circuit. A transformer wound in this manner thus raises or steps-up the voltage of the current supplied to it, and it is called a "step-up" transformer. By reversing the arrangement and having more turns of wire on the primary than on the secondary, we are able to lower the voltage of the original current, and a transformer that does this is called a "step-down" transformer.

Transformers thus enable us to raise or lower the voltage of an alternating current as required, but it should be clearly borne in mind that this does not alter the total power of the current. If the voltage is increased the amperage is correspondingly reduced, and *vice versa*, so that the power of the current is not changed, except for certain inevitable losses of energy that occur in the transformer itself.

The step-down transformer plays an important part in reducing the high transmission voltage of an alternating current to a voltage suitable for industrial and

(*Continued on page* 270

V. STAINLESS STEEL

THE most outstanding feature in the production of special steels during recent times is the discovery and development of stainless steel. The liability to rust in the case of ordinary steel articles is a very serious matter, and the general corrosion in steel structures and articles is always the cause of much trouble and expense. For many years scientists have endeavoured to solve the problem of steel corrosion, the solution of which has now been discovered to be that if the metal chromium is alloyed with steel, the steel becomes immune from many of the more important corroding influences.

With this article we conclude the series that has dealt with the story of iron and steel, considered as raw materials. As space permits we shall print other articles under this heading dealing with the further processes involved in the manufacture of rails, armour-plate, big guns and similar articles. Thereafter we shall tell the story of other minerals, such as coal, copper, aluminium, gold, silver, etc., and we can promise many interesting features under these headings.

The Effect of Chromium

By adding from 12 to 14 per cent. of chromium to steel when it is in the melting furnace, a perfectly uniform steel is prepared with some characteristics so different from those of ordinary steel that it might indeed be considered to be a different metal. For instance, we may take drillings of ordinary steel and drillings of stainless steel, and placing them in separate glass vessels, pour nitric acid on them. The ordinary steel drillings dissolve with the production of great heat and dense brown fumes, whereas the stainless steel drillings are not affected. Nitric acid is one of the strongest oxidising agents known, and such an experiment as this shows what an enormous advance has been made in solving the problem of preventing corrosion.

There is only one drawback to this great development in metallurgy—unfortunately the metal chromium does not exist in sufficient abundance for 12 to 14 per cent. to be added to all the steel made. Nevertheless there are sufficient supplies of the chromium ores in existence to make the process practicable for the production of non-rusting steel for special purposes.

Although stainless steel is one of the special steels that have been newly developed, it is already less than half the price of the best high-speed tool steels, which fact brings it at once into a practicable field of application.

Twenty Million Stainless Knives a Year

The application of stainless steel to cutlery is, of course, known to everybody, but it will probably surprise most people to know that already from 12,000,000 to 20,000,000 stainless knives are produced in Sheffield every year! So satisfactory are the stainless properties of this cutlery that one Sheffield cutlery firm, who make something like a million stainless knives a year, had only one complaint last year of a knife staining. Such a record is a tribute not only to the excellence of the stainless steel, but also to the skill and care of the cutlery manufacturers.

While we are on the subject of stainless cutlery it may be useful to contradict one or two strange ideas that are abroad in regard to such cutlery. We frequently hear it said that stainless knives will not cut, that they must not be sharpened, and that their stainless properties are only a surface effect. All these ideas are entirely wrong. Stainless knives, like any other knives must be sharpened if the cutting edge is to be maintained, and there need be no hesitation about sharpening them properly on a steel. The scratches produced by sharpening will not in any way affect a knife's stainless properties. In producing the knife the steel is hardened and tempered, and exactly the same temper is given to the blade as in the case of ordinary cutlery. A stainless knife, therefore, is fully equal in temper and cutting properties to ordinary cutlery.

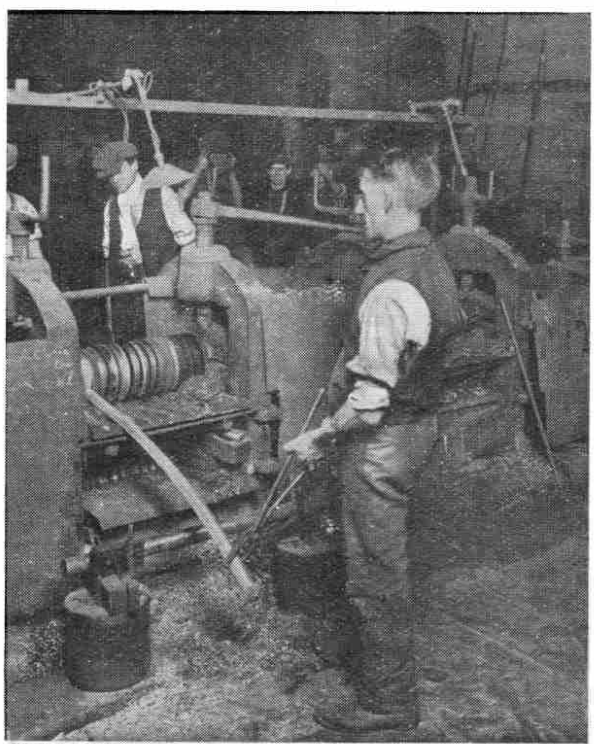


Photo courtesy [*Messrs. Thos. Firth & Sons Ltd.*

Rolling Stainless Steel Bars for Turbine Blades

Strength and Toughness

The great success of stainless knives has caused metallurgists to consider the application of the steel to many other purposes, particularly in the realm of engineering, and Messrs. Thos. Firth & Sons Ltd., the original makers of the steel, began some years ago to develop stainless steel for such work.

Stainless steel is now being used in large quantities. The metal is obtained in such a condition that it can be machined easily and does not require a further hardening and tempering before being put into service. Such steel has a strength and toughness equal to special alloy steels such as are used for back axles and transmission shafts in motor cars, and therefore it will be appreciated that such characteristics, accompanied by non-rusting properties, cannot fail to ensure steady expansion of its use. Further modifications of the steel have also been introduced, and stainless steel is now available in the form of sheet, wire, tubes and so on—indeed in all forms in which ordinary steel is available.

Resistance to Corrosion

It is not claimed that stainless steel will resist corrosion of every kind, but neither will even such metals as gold and platinum, for the chemist, if he wishes, can dissolve even the latter. But the addition of chromium to the steel so increases its resistance to the corroding influences with which it is likely to be brought into contact that the metal may really be considered rustless. The entirely satisfactory service given by millions of stainless steel knives clearly proves that these knives are impervious to the effects produced on knives of ordinary steel by the juices of the orange, lemon, apple, tomato, various sauces, etc.

The most common corrosive

influences, weathering agents, have little effect on stainless steel. Samples have been exposed to the weather, wet and dry, frost and snow, for many months, and at the end of the time they have been perfectly bright and unaffected in any way. Samples have been placed in streams, and after twelve months have still maintained their original brightness. Knives have been lost for many months in drains, and after washing have been found still bright and unoxidised. The atmosphere of large towns has a superficial effect on stainless steel, but this is due to the products of combustion and industry in the atmosphere, and surface effects of this kind are easily removed. A pump shaft of stainless steel which had been in service in the water of the River Don, a notoriously dirty river, was found to be covered with the usual accumulations from the water, but when the deposit was cleaned off the steel was found to be quite bright and with no sign of corrosion. It has also been found that total immersion in sea water does not affect stainless steel.

In addition to stainless steel there is another material known as stainless iron. The difference between stainless steel and stainless iron lies in the fact that the iron contains a lower percentage of carbon, and in reality it is not iron at all, but mild steel.

Photo courtesy] [*Messrs. Thos. Firth & Sons Ltd.*

Moulding Small Castings of Stainless Steel

Optical Uses

The capability of stainless steel of being worked up to a geometrically perfect surface having a perfect polish renders it eminently suitable for use as mirrors of various kinds. For this purpose it is superior to silvered glass, not only on account of its high reflecting efficiency, but also because of the absence of "multiple" reflection which glass mirrors give owing to reflection from both front and rear surfaces of the glass. In addition the surface keeps its reflecting properties indefinitely, and does not suffer from deposited moisture as glass readily does, while, of course, the question of loosening or destruction of the "silvering" does not arise. The steel is readily formed and finished either as a plane surface or as a concave or convex surface, and lends itself much better than glass to grinding and polishing operations. For oblique mirrors, inverting mirrors, right-angle mirrors and similar combinations such as are found necessary in optical appliances, stainless steel is finding an extended use.

Stainless steel is a direct result of the application of science to industry, and it is very gratifying that it should have been an English discovery. Its manufacture is being conducted under the best technical conditions and, as the steel rightly merits, the demand for it is increasing from month to month.

New Process of Iron Making

Serious Rival to Blast Furnace

The announcement of a new process by which pig iron may be produced at a low temperature has aroused a great deal of interest.

The inventor of the process is Mr. John W. Hornsey, an American consulting engineer, of English descent. Some years ago Mr. Hornsey became interested in the problem of low-temperature production of iron, and by 1922 had evolved a practical scheme. In that year, while on holiday in this country, he submitted his plans to certain British ironmasters, who were so greatly impressed that they built special works at Sheepbridge, near Sheffield, for demonstration purposes. Work commenced in March 1922, and the first operation of the plant was carried out in January of last year.

In this process the iron is produced in a rotary kiln something like that used in the cement industry. Low-grade slack is used instead of the expensive metallurgical coke required for the blast furnace, and no limestone or other flux is needed. The process is said to result in a saving, as compared with the blast-furnace process, of £1 per ton of iron produced. Other advantages of the process are that, as the plant is not subjected to great heat, the cost of repairs and renewals is less than in the blast furnace, and that, unlike the blast furnace, the kiln plant can be stopped and started as required, the cost of restarting being only the price of two or three hours' fuel. Further, the process lends itself to the use of English low-grade ores without any admixture of high-grade qualities.

In regard to quality, no difficulty has been found in making iron sufficiently low in sulphur and phosphorus for all practical purposes. In the blast-furnace process the various contents of the furnace are melted together and the iron is tapped off. The reduction of the iron oxide, however, takes place at a temperature greatly below the melting point of the iron, and thus a useless expenditure of heat is involved. In the new process the iron is not melted at all, and in addition to the saving in heat there is the advantage that the iron does not absorb impurities from the other materials in the ore, as is the case when the iron and these materials are all molten together.

Finally, the iron produced by the low-temperature process, even when low-grade iron is used, has given the most satisfactory results when used in steel-making, the steel being of very high quality.

A Bicycle for a Snap

An interesting photographic competition for purchasers of Messrs. Butcher's "Little Nipper" Cameras is announced on page 266. The first prize is a B.S.A. Bicycle, the second a Tennis Racket or Cricket Bat and the third a Silver Watch. In addition there are 100 consolation prizes. Competitors must be under the age of 17 and the photographs must be taken with a "Little Nipper." There are no other restrictions, and each competitor may enter as many pictures as he likes. Those who intend to enter for this competition should lose no time, as the closing date is the 30th of this month.

New Meccano Part

No. 143. Circular Girder ... each **1/-**

Further Adventures in Meccanoland

BRAINS AND INGENUITY IN THE CHAMPIONSHIP CONTEST

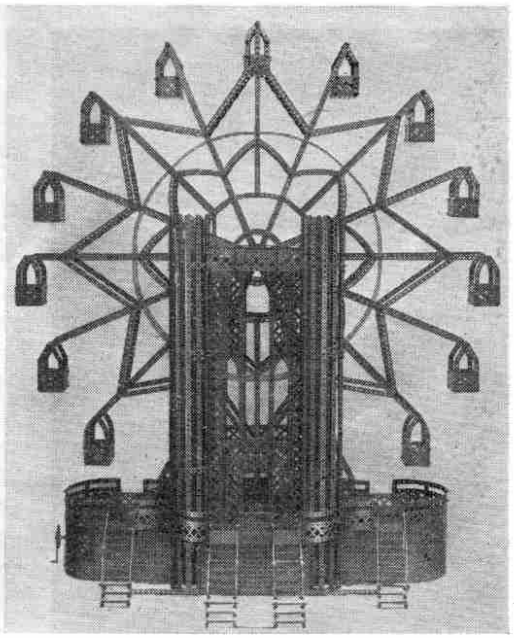
by "Spanner"

I HAVE just returned to London after a visit to the north of England, and on my way up I had an interesting experience about which I want to tell you boys. Before I started I made up my mind to pay a visit to the Meccano headquarters in order to see some of the new models in which I was specially interested, and I had written to Mr. Hornby telling him that I should arrive on a certain day.

When I reached the offices I was told that Mr. Hornby was in the model room, and I was taken over to see him. I found him with two other gentlemen, absorbed in the study of a vast number of photographs and drawings which, they told me, were the entries in the Meccano Championship Competition.

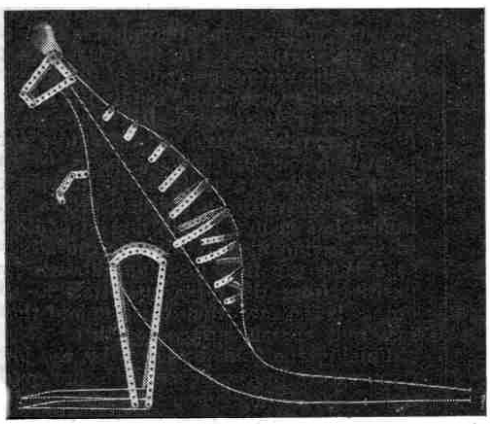
The adjudication had almost been completed at the time of my arrival, and Mr. Hornby told me what a difficult but fascinating task it had been.

"The keenest interest has been taken in this contest," he said, "and I have been amazed by the number of entries and by the ingenuity and inventiveness shown by the competitors. Another feature that is very gratifying to me is the increased interest taken in Meccano by boys in remote parts of the world."



Big Wheel

(Entered by H. Woodman, Melksham, Wilts.)



Kangaroo

(Entered by E. Hayward, Perth, West Australia)

Thousands of Entries

Mr. Hornby asked me if I would care to look through some of the entries, and you may be sure that I jumped at the opportunity. In fact, I told him that nothing would give me greater pleasure than to examine every single entry as he had done, and I observed an amused twinkle in his eye as he told me to "go ahead."

It was with great enthusiasm that I attacked the first classified section, which happened to be Section B containing all the entries from Great Britain, but at the end of two hours I found I had scarcely made any impression on the mass of entries! It became evident that either I should have to devote as many weeks to the examination as the judges had already done, or I should have to go through the entries much more quickly. I decided on the latter course, and made a selection of those entries from all countries that seemed to me to be worthy of attention and comment, and I hope that what I found of interest in them will also prove of interest to readers of the "*M.M.*"

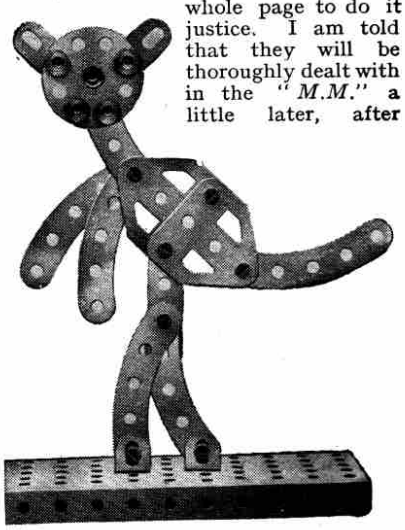
A Million Friends

It seemed to me to be a wonderful thing to have the work of all these vigorous young brains brought together in this way. There were entries—thousands of them—from every country, each entrant striving to create something new and to invent something worthy of commendation, and which would give an added pleasure to dwellers in the great Meccano World.

A large number of the competitors had sent photographs of themselves, either standing by their models or separately, and as I looked at their smiling faces I envied Mr. Hornby his million boy friends. There were smiles and greetings in all languages, and I saw that most of the boys were wearing the little triangular Meccano Guild Badge on their coats. This made me think what a glorious meeting we should have if only we could all get together! As a matter of fact, the competitors in this great Championship Contest had really come together in spirit at that moment, and there they were all smiling at each other and at me. I just yearned to be able to take each one in a quiet corner and talk over his model with him and discuss his difficulties.

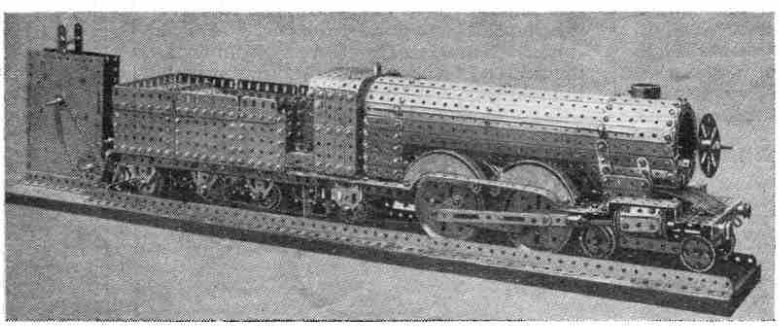
Better Photographs Wanted

I examined the entries that had secured the Championship Cups, but you will all realise that I cannot describe these, for each one would require a whole page to do it justice. I am told that they will be thoroughly dealt with in the "*M.M.*" a little later, after models have been built up from the details and photographs submitted by the entrants. I must say how excellent they all were, however, and how much I admired the ingenuity and inventiveness shown in them. My purpose in this article is rather to deal with Competition entries as a whole, and to tell you of one or two features of them that seemed to be both interesting and curious.



Felix

(Entered by K. G. Boggis, Beccles)

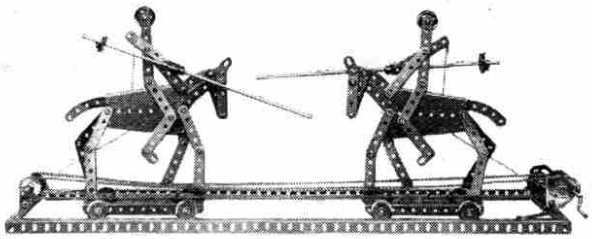


G.W. Locomotive and Tender

(Entered by W. Kendrick, Warrington)

Let me here remark on some of the reasons that

entries failed to attract the attention of the judges. Quite a number of competitors had sent in what were undoubtedly interesting models, but the photographs they sent did them anything but justice. In several instances the models in the photographs measured less than one inch in diameter! You may imagine that it was quite impossible for the judges to form any idea of the details of construction of the models in photographs so small. Other photographs had been sent in "un-fixed," and by the time they reached the judges they had blackened all over and the image had disappeared completely. In such instances the boys had to be written to for new photographs and further particulars, all of which added to the delays and difficulties of adjudication. A perfectly clear photograph or drawing helps the judges considerably, and naturally increases the competitor's chances of gaining honours.



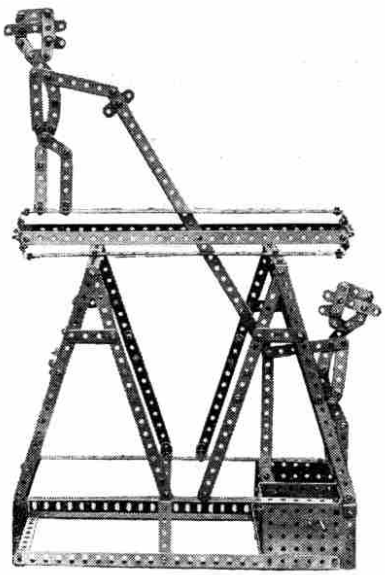
Knights Jousting

(Entered by R. Rousseau, Le Mans, Sarthe)

A Scale Model Locomotive

I observed that quite a number of competitors had designed very excellent models of locomotives, and much ingenuity had been shown in adapting Meccano parts to this somewhat trying type of structure. The drawback to models of this kind, of course, is that, on account of their weight and size, they cannot be used on the ordinary toy railway track. Although many boys may get an immense amount of pleasure in designing and constructing locos, these can never be classed as completely satisfactory Meccano models because they cannot be utilised for real work as in the case of a model of a Crane, Wagon, Clock or Chassis, etc.

For those boys who take an interest in designing locos, I am illustrating a very excellent model, sent in by W. Kendrick, of Warrington. Here the approved lines of loco construction have been followed with remarkable faithfulness, the special feature of the model being that it is on a scale of ½" to the foot. The model is founded on the general principles and construction of this type and is correct in proportion throughout. It is evident that much careful thought has been used in the design of the model, and I recommend my readers to have a shot at a similar construction and endeavour to improve on this fine effort.



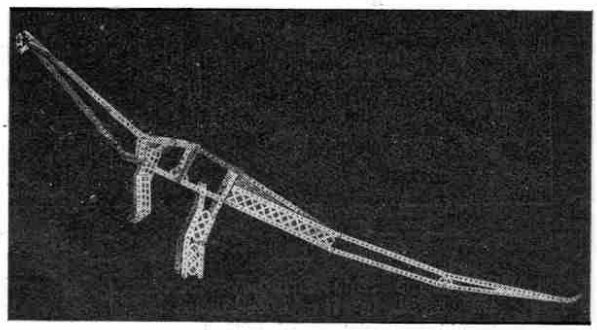
Sawing a Log

(Entered by R. Wijffels, St. Kruis, Zeeland, Holland)

Curved and Straight Lines

I have often thought that my young friends do not make quite sufficient use of the various curved parts that have been added to the Meccano system in recent years. Curved lines are often much more pleasing and artistic than straight lines, especially in constructional — as distinguished from mechanical —models. Thus the new Curved Strips, Architraves, Large Wheel Segments, etc., may often be used with pleasing effect.

I was pleased to notice that some of the competitors had recognised this, and the illustration on the previous page is a good example of what I mean. This Big Wheel was designed by H. Woodman, of Melksham, Wilts., and incidentally, in the letter that accompanied his entry, he made a very happy reference to the many delightful evenings that Meccano had provided. Note the pleasing curves that this competitor has so successfully introduced. This is undoubtedly a good model, but in some of its details I believe it could even now be improved. I should be glad to know that some of my readers have conceived a liking for Mr. Woodman's impressive structure, and that they intend to try and go one better!



Extinct Diplodocus

(Entered by W. Harvey, Thornton Heath)

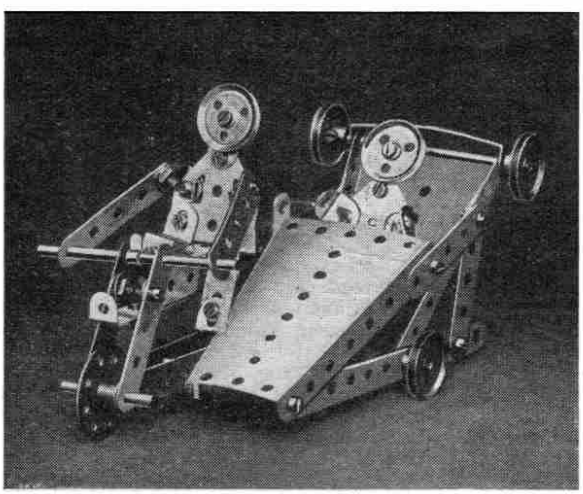
"Felix" and other Humorous Models

I was anxious to see how the younger boys had fared in this competition, and as I scanned the entries I experienced some pleasant thrills and incidentally had one or two unexpected laughs. Here for instance is a model sent in by K. G. Boggis, of Geldeston, which he calls "Felix." He states that Felix can sit down or run and perform all kinds of antics. He certainly cuts a comical figure!

Another humorous effort was that of R. Rousseau, of Le Mans, Sarthe, who sent in a model of jousting knights which he called the "Tournament." Both knights in armour and their fiery steeds are very life-like, and by turning a handle they may be made to tilt at each other in a very realistic manner.

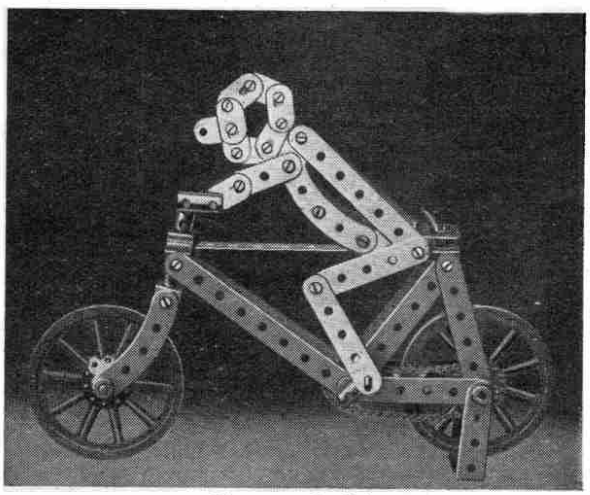
R. Wijffels, of St. Kruis, Zeeland, Holland, demonstrated that he has an

(Continued on page 245)



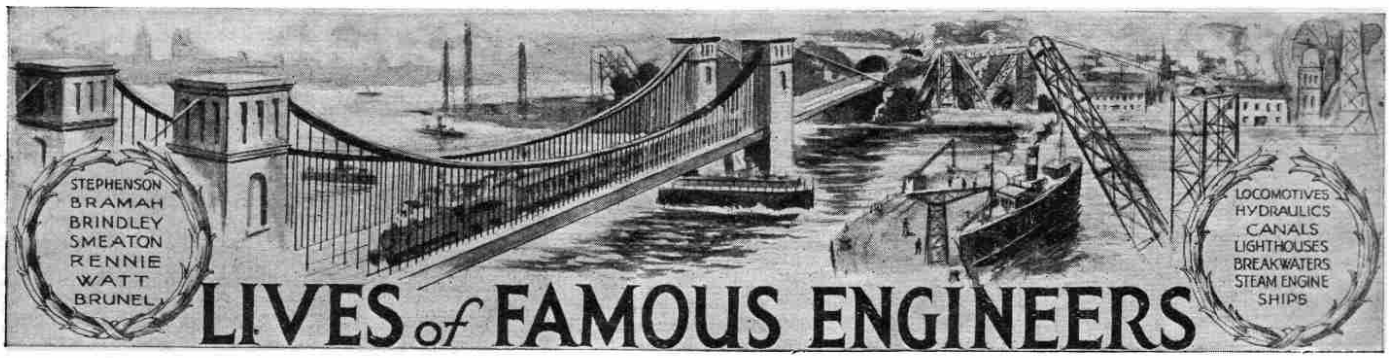
"A Meccano Boy's First Ride"

(Entered by M. Manning, Bristol)



Meccano Cyclist

(Entered by J. Bouchenoir, Drancy, France)



VIII. JAMES BRINDLEY: The First English Canal Engineer

Last month we saw how Brindley, the millwright's apprentice, steadily advanced in his trade, and in spite of the jeers of his fellows gained so much mechanical knowledge as to become his master's trusted servant. He was in great demand in the district where he worked, and it was predicted that he had a great future. In this article is described his first great undertaking, the construction of the Bridgewater Canal.

ABOUT this time Brindley became interested in the possibilities of steam as a source of power. One of Newcomen's engines was proving very successful in drawing water from a coal mine near Wolverhampton, and Brindley made a special journey to examine it. He was greatly struck with it, but he saw at once that it consumed far too much coal, and realised that it could only be an economic success where coal was unusually abundant and cheap.

Effects Economy in Fuel-Consumption

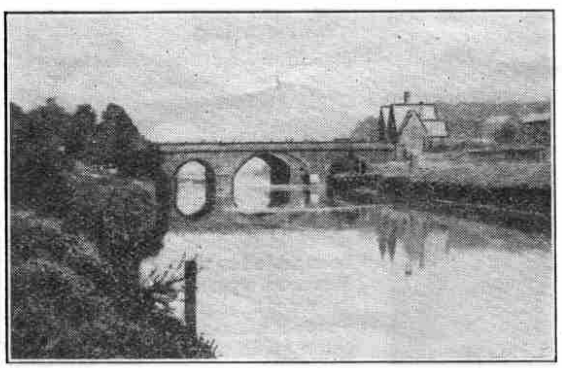
He at once attacked this problem of fuel economy, and in 1756 commenced the erection of an improved engine at Fenton Vivian, in Staffordshire. In this engine he adopted the plan—afterwards tried by Watt—of making the cylinders of wood instead of iron, and he also substituted wood for iron in the chains that worked at the end of the beam. Like Watt, he had to abandon his wooden cylinders, but as an alternative he surrounded the iron cylinders with a wooden case, filling the intervening space with wood ashes. By this means, and by cutting down to the minimum the quantity of water injected for condensation purposes, he succeeded in reducing the waste of steam by nearly half.

The quaint entries in Brindley's note-book regarding this engine show that it gave him a lot of trouble. It took a year to construct, and when it was finished it appears to have taken a great deal to persuade it to work. Brindley's notes are brief but very much to the point. We read: "Bad louk (luck) five days"; then "Bad louk" for three more days. Then matters seem to have improved a little, for we find "Midlin' louk" for some days! From the succeeding entries it is clear that he had a long struggle to get his "engon at woork." He writes: "Engon at woork 3 days," and then there was a stoppage of four days, after which the engine worked for seven days and Brindley was so excited about it that he wrote "Driv-a-Heyd" ("Drive-ahead.") Later, however, more trouble seems to have occurred, and the entries come to a sudden close with the words: "At woork good ordor 3 days." The subsequent career of that "engon" is shrouded in mystery.

During the next few years Brindley built a number of other engines on improved lines, but his work had little influence upon the development of the steam engine, and his mind was already turning to canal construction, in which his remarkable ability found its fullest scope.

Beginning of the Bridgewater Canal

Up to this time very little had been done in England to develop inland waterways, although attempts had been made to open up the navigation of the Mersey and the Irwell from Liverpool to Manchester. Schemes had also been started in Yorkshire to open up the navigation of the Aire and Calder to Leeds and Wakefield, and of the Don from Doncaster to near Sheffield. In 1737 an Act was passed by Parliament to make navigable the Worsley Brook to the point where it joins the River Irwell near Manchester, and a couple of years later another Act was passed for making the Sankey Brook navigable from the Mersey about two miles below Warrington to St. Helens, Gerrard Bridge, and Penny Bridge. In the latter scheme a canal was constructed alongside the brook, and locks were made to adapt the canal to the level of the country through which it passed.



Photograph courtesy [*Manchester Ship Canal Co.*

Brindley's Aqueduct at Barton

About the same time the Corporation of Liverpool were considering a much more ambitious scheme, consisting of a canal to unite the Trent and the Mersey so as to open up a waterway between Liverpool and Hull. Two surveys were made for this canal, the second one by Brindley at the instance of Earl Gower. This scheme apparently fell through, however, but it was not long before Brindley was engaged on another canal scheme proposed by the Duke of Bridgewater.

The Duke's Scheme

While travelling in France, the Duke of Bridgewater was greatly impressed by the Grand Canal of Languedoc. This important waterway was begun in 1666 and completed in 1681. It crossed the isthmus connecting France and Spain and extended for a distance of nearly 160 miles from the River Garonne at Toulouse to Cette on the Mediterranean, thus providing a waterway from that sea to the Atlantic. After his return to England the Duke settled on his Lancashire estate at Worsley, on the borders of Chat Moss, and the idea occurred to him that it might be possible to cut a canal by which the coal found on his estate could be readily conveyed to Manchester. At that time Manchester, although only a small town, was steadily increasing in size and importance. Owing to the terribly bad state of the roads it was very difficult at times to provide food and coal for the large population, especially in winter when road traffic was almost entirely at a standstill. The Duke became convinced that his idea was sound, and in 1759 he obtained from Parliament powers to cut a canal from Worsley Mill eastward to Salford, and westward to Hollin Ferry on the Mersey.

The Duke's land agent, John Gilbert, knew of Brindley's skill through his brother, Thomas Gilbert, who was at that time agent to Earl Gower. Neither the Duke nor his agent had any practical knowledge of engineering, and Brindley was called in to advise them as to the best method of constructing the canal.

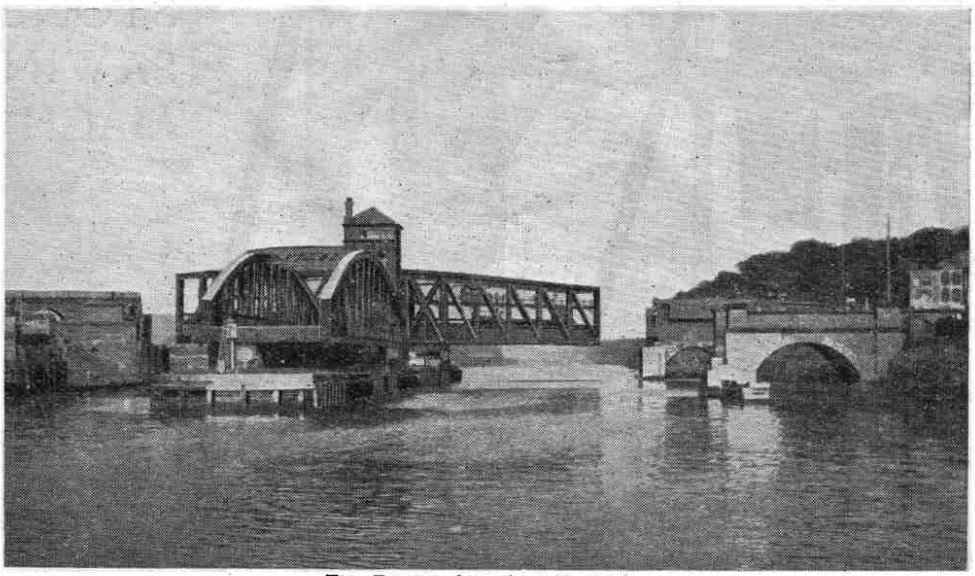
Brindley's Proposal Ridiculed

The original idea had been to carry the canal by means of a series of locks down from the level of the coal mine into the River Irwell, and so up again on the other side to the proposed level. Brindley, however, recommended that the canal should be carried right over the river and maintained at one level throughout. This was a bold proposition involving works that had not been attempted in England before, but Brindley succeeded in convincing the Duke that his scheme was the best for the purpose. It was now necessary to obtain the sanction of Parliament to the proposed new scheme of

operations, and plans were prepared and the application was put in. In the meantime work proceeded on such portions of the canal as could be carried out under the powers already obtained.

The necessary Parliamentary sanction was obtained in 1760, and now the Duke was free to carry his canal over the Irwell near Barton Bridge, about five miles west of Manchester, by means of a series of arches, and he was further authorised to extend a short branch to Longford Bridge near Stretford, the branch to Hollin Ferry being abandoned.

The aqueduct was, of course, the most difficult part of the undertaking. The proposal to carry barges on a bridge over the top of other barges navigating the river below was ridiculed by the general public as the idea of a lunatic. Even the Duke himself was rather uneasy about the project, and he called in another engineer to give his opinion. To the dismay of Brindley, this engineer said the aqueduct scheme was sheer folly, and wound up his report to the Duke with the words: "I have often heard of castles in the air, but never before saw where any of them were to be erected." Brindley was still confident as to the ultimate success of his scheme, however, and finally the Duke authorised him to carry it out.



The Barton Aqueduct To-day

Brindley's Remarkable Ingenuity

The Barton aqueduct built by Brindley was about 200 yards in length and 12 yards in width, the middle portion being supported by a bridge of three arches. It carried the canal over the river at a height of 39 ft., and so allowed the largest barges to pass beneath without lowering their masts. The canal passed over the arches in a channel carefully "puddled," that is, lined with a carefully-prepared mixture of well-tempered clay and sand, through which the water could not penetrate.

Brindley's remarkable ingenuity and resource are well illustrated by the way in which he dealt with the streams that flowed across the course of the canal. It was one of his fixed principles never to allow a stream or river to flow into a canal except for the purpose of supply, because he realised that in times of flood the rush of water into the canal would be dangerous to navigation. The plan he adopted in dealing with the River Medlock is an excellent example of his methods. He constructed a weir 366 yards in circumference, over which the river flowed into a well, from which it was conveyed along a subterranean passage into the River Irwell, which is close at hand.

An Underground Canal

In addition to cutting the canal itself, Brindley excavated a large basin at Worsley Mill, the starting point of the canal. The idea of this was to provide accommodation for a number of barges, and thus serve as a head for the navigation. He also cut a subterranean channel from the basin to connect the chief workings of the mine, so that the coal could be readily transferred in boats to the place of sale. In Brindley's time this underground canal was about a mile in length, but later it was enlarged until it extended for nearly 40 miles in all directions. The tunnel was arched with brickwork where it passed through coal or earth, but in passing through solid rock it was simply hewn out. The barges when loaded were drawn along by means of staples fixed in the sides of the tunnel, but when empty, and therefore higher in the water, they were so close to the roof that it was necessary for the bargemen to lie on their backs and propel the boats by pushing with their feet against the roof. This method was known as "legging."

The canal was successfully completed, and on 17th July, 1761, the first boatload of the Duke's coal passed over the Barton aqueduct on its way to Manchester.

The result of Brindley's "castle in the air" was that the people of Manchester received regular supplies of coal at a much cheaper rate than ever before. For a long time the aqueduct remained the wonder of the neighbourhood, crowds of people coming daily from all parts to see it.

Brindley in London

The canal between Worsley and Manchester had opened up a regular supply of coal, but there remained the difficulty of transporting the raw materials of trade from Liverpool to Manchester. The Duke of Bridgewater was determined to overcome this difficulty, and in less than two months from the opening of the Worsley canal Brindley was engaged in a survey for a proposed canal to join it with the Mersey near Runcorn, from where there was a natural tideway to Liverpool.

At the same time the Duke made arrangements to present a Bill before Parliament, and early in 1762 Brindley went to London as chief witness before a Parliamentary Committee. He was naturally a very thrifty man, spending as little as possible on clothes, but on this occasion he apparently thought it necessary to be well dressed. His note-books tell us that he spent one guinea —an entire week's pay—on a pair of new breeches, two guineas on a coat and waistcoat of broadcloth, and six shillings on a pair of new shoes!

It was during this stay in London that Brindley paid his first and last visit to a theatre. His friend, Gilbert, the Duke's agent, persuaded him to go to see the famous actor Garrick in the play of "*Richard III.*" but the result was unfortunate. The play excited Brindley so much and so completely disturbed his ideas that he was unable to do any business at all for some days! He declared that nothing should ever tempt him again to enter a theatre, and he kept steadfastly to his resolution.

NEXT MONTH:—

THE GRAND TRUNK CANAL

Further Adventures in Meccanoland—

(*Continued from page* 243)

eye for the grotesque as well as the humorous by entering his model of the "Log Sawers." Very complete instructions were attached to the entry, and I am quite sure that the model works in a most realistic manner.

A very realistic model of a Kangaroo was submitted by Eric Hayward, of Perth, Western Australia. Eric calls his model a "Dinkum Aussie," which certainly sounds a good description of this interesting animal —a purely Australian product I believe!

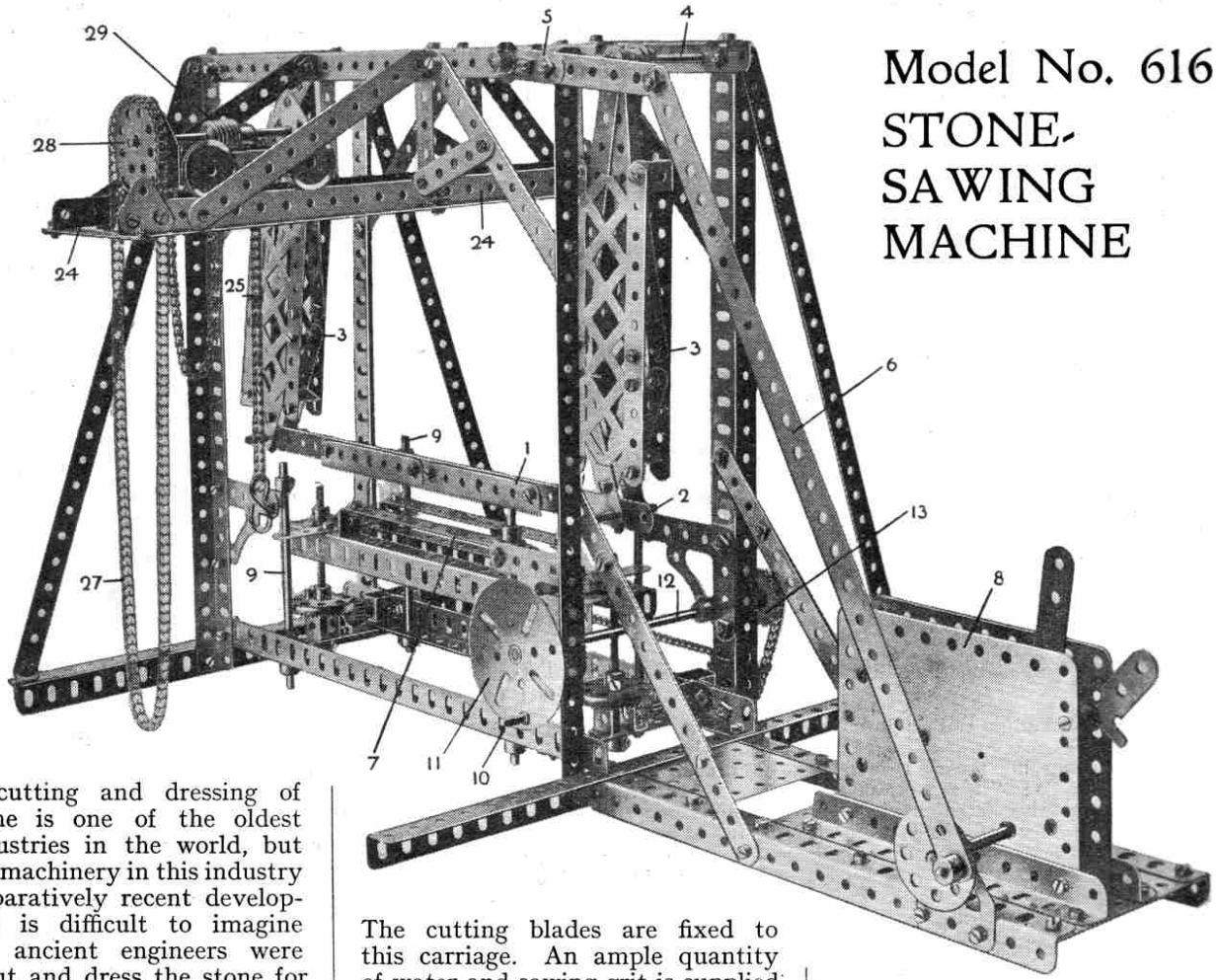
An interesting Meccano "Cyclist," was sent in by Jack Bouchenoir, of Drancy, France; "A Meccano Boy's First Ride" by M. Manning, of Bristol, and "Diplodocus" by Wallace Harvey, of Thornton Heath. There were entries of a similar kind from France, Italy and Spain—indeed almost every country in the world was represented in this class of model, all of them showing a lively imagination and a keen sense of humour.

There is ample evidence here that, apart from the purely mechanical and engineering side of the Meccano hobby, the regular parts of the system may be cleverly used in designing all kinds of novel and unexpected objects. I and my young friends must certainly try our hands at this kind of thing, and the Editor tells me that he will encourage the suggestion by a special competition later in the year.

(*To be continued*)

A NEW MECCANO MODEL

Model No. 616 STONE-SAWING MACHINE



THE cutting and dressing of stone is one of the oldest industries in the world, but the use of machinery in this industry is a comparatively recent development. It is difficult to imagine how the ancient engineers were able to cut and dress the stone for their great buildings and monuments. Indeed, this subject presents many interesting problems, and some of the achievements of the ancient craftsmen are remarkable. Some day we hope to publish a series of articles on Ancient Engineering, when the subject of stone-cutting and stone-dressing in early days will be dealt with in greater detail.

Frame Saws

In modern stone-yards the most important work done by machinery is the actual cutting or sawing of the stone, and for this purpose two main types of saws are used. These are the Diamond Saw and Frame Saw.

The new Meccano model illustrated on this page demonstrates the working of the frame type of saw. This consists of an upright frame supporting a swinging carriage, which is given an oscillating motion from a driving crankshaft. The cutting blades are fixed to this carriage. An ample quantity of water and sawing grit is supplied to the blades, and by driving this grit backward and forward the blades cut their way into the stone.

Diamond Saws

The diamond saw is an entirely different machine, and is of more recent origin.* It operates by means of a circular blade consisting of a steel disc having diamonds mounted in sockets on its periphery. The diamond saw cuts very much faster than the frame saw, and this gives it great commercial value where large output is required.

For some purposes the steel disc and its diamonds are replaced by a wheel having a steel centre and a rim of carborundum. The carborundum wheel gives a very smooth cut with sharp edges, and is largely used in working marble. It takes more power, however, and its cutting rate is slower. In the case of very soft stone—such as Bath stone, for example—a steel-toothed wheel is often used.

Preliminary rough sawing of large blocks of marble or stone is frequently performed in quarries or yards by a wire running over the surface of the stone. This wire cuts in a similar manner to the frame saw, by means of an abrasive such as sand and water.

The Meccano Model

The construction of this model is not difficult to follow from the illustrations, and there is little to be said to supplement them.

The sawing strip (1) consists of two Rack Strips bolted to a 12½" Strip (2) connected by 1" Rods to the ends of the swinging frames (3). One of these is loosely pivoted on one of the Rods carried in the frame, the other being secured by a Crank to the Rod (4). The swinging frames (3) are oscillated

* The first diamond stone saw was made by Geo. Anderson & Co. about 27 years ago. We are indebted for our information on stone saws to Messrs. The Anderson-Grice Co. Ltd., of Carnoustie.

A New Meccano Model—(*continued*)

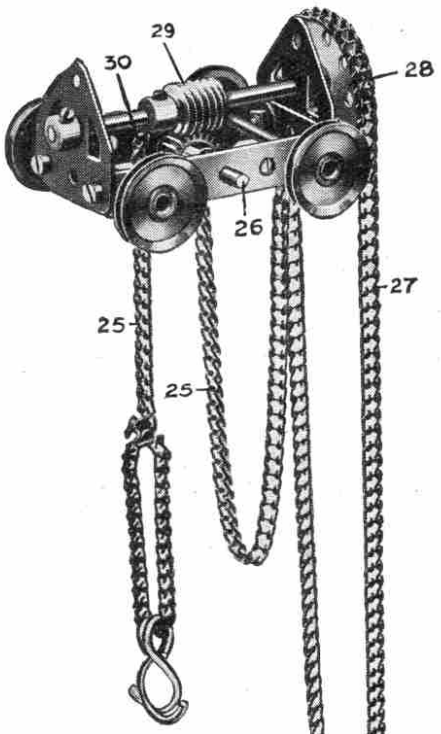


Fig. A

from the Crank (5) and connecting rod (6) driven by the Clockwork Motor (8).

The support frame (7), on which the stone blocks to be sawn are raised and lowered, is guided on the vertical Rods (9) and raised and lowered by the operation of the Threaded Pin (10) forming a handle on the Face Plate (11). This Face Plate is mounted on a Rod (12) carrying a 1″ Sprocket Wheel (13) connected by a chain to another 1″ Sprocket Wheel (14 Fig. B) on a Rod (15). A third 1″ Sprocket (16) on the same rod is coupled to a fourth 1″ Sprocket Wheel (17) at the other end of the machine.

The Rods (15 and 18) carry ½″ Pinions (19) driving Contrate Wheels (20) secured on Screwed Rod (21) and engaging Threaded Cranks (22) secured to the frame (7) by 1½″ Strips (23).

The trolley (Fig. A) runs on gantry rails (24) and the load chain (25) passes over a ¾″ Sprocket Wheel on the Rod (26), to be secured at one end to the trolley frame.

The chain (25) is raised or lowered by the operation of a Sprocket Chain (27) passing over a 1½″ Sprocket Wheel (28). This is mounted on a Rod carrying a Worm (29) which engages a ½″ Pinion on another Rod (26) carrying a Sprocket Wheel (30) over which the load chain (25) passes.

Parts required :

5	of	No.	1	12	of	No.	35
19	„	„	2	4	„	„	37
1	„	„	2A	181	„	„	37A
11	„	„	3	32	„	„	38
4	„	„	4	6	„	„	45
8	„	„	5	1	„	„	47
2	„	„	6A	5	„	„	48A
12	„	„	7	3	„	„	53
4	„	„	8A	2	„	„	57
2	„	„	9	15	„	„	59
1	„	„	10	2	„	„	62
8	„	„	11	2	„	„	62A
15	„	„	12	2	„	„	76
1	„	„	14	2	„	„	80A
1	„	„	15	40″	„	„	94
5	„	„	15A	1	„	„	95A
3	„	„	16	1	„	„	96A
2	„	„	16A	4	„	„	100
1	„	„	17	4	„	„	108
2	„	„	18A	1	„	„	109
4	„	„	22	2	„	„	110
1	„	„	24	180	„	„	111B
3	„	„	26	2	„	„	115
2	„	„	28	4	„	„	125
1	„	„	32	3	„	„	126A

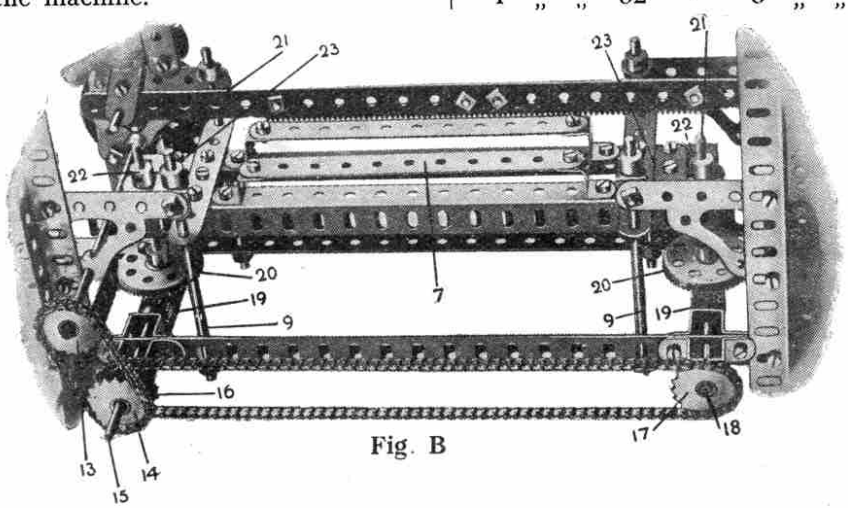


Fig. B

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

T. Wray (Peckham).—"If six snakes in a circle began to eat each other's tails, how much would be left of each when they had finished eating? I have been trying to solve this problem for many weeks past but have been unlucky." So have we, Thomas; in fact, we have had no luck at all with it!

J. Wadham (Seascale).—We have many girl members of the Meccano Guild and shall be glad to enrol you. We are pleased that you enjoy model-building so much.

D. Armstrong (Sydney, N.S.W.).—You write an excellent letter for one so young. We gave your congratulations to Mr. Hornby, and he asks us to thank you for your nice wishes.

I. M. H. Etherington (Mill Hill).—"I have placed a regular order now with a newsagent for the '*M.M.*,' so I can sleep in peace at night without fear of missing it." That's a fine feeling to have, Ivor, and you share it with about 50,000 other boys. Thanks for your riddle, which is good, and for your kind wishes, which are acceptable.

A. E. Fletcher (Berwick-on-Tweed).—"The '*M.M.*' seems to inspire me with feelings that somehow make Meccano a dearer (not in price) thing to me. When I read about all the fine things that other Meccano boys do I feel that I, too, must do something." Many thanks for all the kind things that your letter contains, and which are much appreciated. We hope that all Meccano boys will wear their Guild Badges when they visit Wembley. They will find there many kindred spirits and thoroughly good fellows.

E. L. West (Taumaranui).—"I live in the heart of the North Island of New Zealand, amidst the wonderful race of Maoris. Around are lonely bush-clad hills." We envy you, Eric! There is no such glorious scenery as you describe near us, but we have lots of nice rainy days! We hope your forecast of a happy Meccano winter is being realised.

G. R. Thomas (Dewsbury).—We greatly appreciate your keenness in recruiting for the Guild, but you make us shudder when you write: "If my chum doesn't join soon I know of a way to make him!" What dreadful tortures are you preparing, G. R.? Surely peaceful persuasion will have its reward.

C. L. Arms (Macclesfield).—Your numerous suggestions are very interesting. We have already given consideration to the publication of photographs of British locos on "cigarette cards," and some day may be able to add these to the attractions of the "*M.M.*," but not at present. Your short story about "Burglar Bill" is very pathetic, and we may be able to find a corner for it some time.

L. R. Stockdale (Thirsk).—We assure you that we share your anxiety to see the "*M.M.*" increase in size, and we will just whisper in your ear that it is already feeling growing pains, so look out for developments before long! We were pleased to hear that you have found the "*Story of Iron and Steel*" useful in your school work.

A. Watson (Melbourne, Australia).—One sentence in your letter appealed to us very much: "Although I am thousands of miles away from you I feel that my Guild membership forms an invisible but real bridge between us." You are quite right, Arthur, the Guild is a world-wide brotherhood of boys, and the Guild President and Secretary are just as much interested in members who live in far-off countries as they are in boys living next door, as one might say.

D. C. Young (Sheffield).—If your father is able to take you to one of the big Sheffield steel works you will be a very lucky boy, and you must write and tell us about your visit. Your story about the Scotsman is a "chestnut" that we heard years ago, even before the story of the Scotsman who went to Woolworth's 6d. Stores and asked for the piano department!

G. Plowright (Lower Benefield).—You seem to have had a real "wamble" at Wembley. We agree that the Palace of Engineering is the most interesting part of the Exhibition, with the Palace of Industry a good second. Editors are supposed to be very serious-minded people, quite above such things as the Amusement Park, but we confess that we also spent a good deal of time there and enjoyed every minute of it!

A. R. Burnicombe (Lincoln).—Many thanks for your good wishes. We are glad to know that you have enjoyed the "*Electricity*" and "*Iron and Steel*" articles so much. We are afraid that your suggestion for a page about pets would not meet with the approval of the majority of our readers. We have an illustration of "Felix the Cat" in this issue.

Many of the letters that I receive every day contain at least one point of general interest, which, if written out in the form of a short article, would appeal to my readers. I invite my readers to submit such articles for this page, and if of general interest they will be published as opportunity permits. The articles may deal with such subjects as new ideas for making something; new methods of doing things; accounts of some unusual occurrences or incidents, etc., and should not exceed 500 words. They should be written as neatly as possible and on one side of the paper only. Those articles that are published will be paid for at our usual rates. If desired, illustrations may be sent—either drawings, photographs, or rough sketches. No reader should hesitate to send in an article because he may not be very good at composition or cannot sketch any diagrams necessary to illustrate it. If he states the facts clearly and sends rough drawings I will have his article put into shape, if necessary, and finished drawings made by our artists ready for publication.—EDITOR.

"Into the Land of Fun" at Wembley

My chum and I recently spent a day at Wembley, and after we had explored the Palace of Engineering, the Temple of Venus, and the Canadian and Australian buildings, we made our way to the gigantic Fun Park, determined to have as thrilling a time as possible before we regretfully turned our steps homeward. At the Fun Park all was Noise. [Please put a capital "N" Mr. Editor, because it deserves it!] Here was a roundabout, blaring out the latest ragtime as its nodding horses swept round at a terrific speed. There was the jolting machinery of a cake-walk reminding one of Model 434 in the Meccano Manual! At intervals there was an ominous rumbling sound, and looking up we could see, coming tearing down one of the slopes, the cars of the "Racer," a kind of giant switchback. Clear above the noise of their approach we could hear the screams of the women and girls on board!

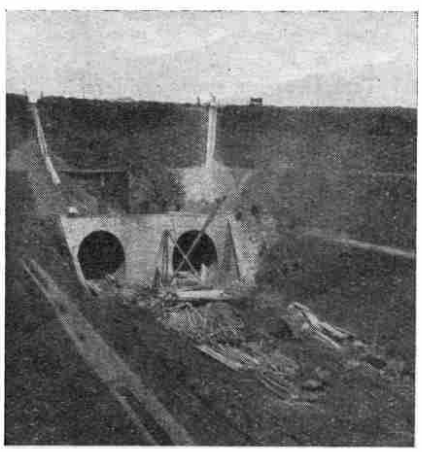
The first thing we ventured on was "The Dodg'em," a most exciting affair. We sat in a small electric car like a big arm-chair, with a steering-wheel and a small knob by our feet. On the outside of the car were steel buffers, the purpose of which we quickly discovered! When the knob was pressed we moved forward and endeavoured to steer our vehicle round the arena, but we seemed able to do nothing but bump into other people! These collisions were not at all dangerous, as each car was well protected by its buffers, and every bump produced shrieks of laughter from the spectators as well as from those immediately concerned. Our Meccano training here stood us in good stead, and we soon hit upon the correct method of steering, so that whenever we wanted to go to the right, we turned the wheel slightly to the left, and *vice versa*. By this method we succeeded in going for a fairly long ride round the enclosure at top speed before the attendant blew his whistle to indicate that time was up.

Next we went on the "Racer." We got in the front compartment of the car, and then began the most thrilling five minutes of our lives! When we got to the top of the first steep slope, up which we were pulled by cable, our car ran along the level until we saw a tremendous drop before us, and down it we went at 50 miles an hour, with the air rushing past like a gale. Mounting the next slope by our momentum, we rounded a curve and shot down another tremendous dip, longer than the previous one. That ride was a glorious sensation, and we felt that we should like to spend an infinite number of shillings on it.

I have not space here to tell of the other marvels we sampled—"Jack and Jill," "Over the Falls," "The Whip," "The Witching Waves"—and I only wish that all readers of the "*M.M.*" could have been with us to enjoy "one crowded hour of glorious life" at the Amusement Park at Wembley.

(R. DUFF, Taplow).

A Double Tunnel in South Africa



"I am sending a photograph of the cutting and mouths of the twin tunnels on the new railroad through Natal, from Durban to Johannesburg. The size of the cutting may be judged from the tunnels side by side, upon which the engineers have been engaged for over two years. The whole of this line will be electrified, the power station being situated in the midlands of Natal."

(C. L. JONSSON, Durban).

A Visit to the British Museum

I HAVE always had a great longing to explore the wonders of the British Museum, and when the opportunity came a few days ago I lost no time in visiting this imposing building. I am a very enthusiastic philatelist, and naturally I first sought out the room containing the stamp collection. Here I found a very remarkable assortment of valuable stamps containing many rarities of all nations, and, needless to say, there were quite a number that I haven't got! My interest was specially aroused by the Hawaiian Missionary stamps, Cape Triangular (4d. red and 1d. blue), and two blocks of twelve of the 1d. black Mauritius.

From the stamps I next went to see the old books. It seemed to me very wonderful to be looking at volumes printed by Caxton and Gutenberg. These books are so well done that it seems scarcely possible that they are the very first printed books. From the old books I turned to the beautiful illuminated manuscripts, the work of the monks of bygone days. These men must have had an enormous amount of patience to carry out such detailed work so perfectly. Many of the capital letters are coloured in blue and gold, and there are hand-painted pictures on each page. Several ancient Greek letters written on papyrus are shown here, and an especially interesting feature is the log book of Nelson's ship "Victory."

An adjoining room, the entrance to which is guarded by a large bronze figure of Buddha, contains a wonderful collection of Hindu antiquities. As soon as I stepped inside, I saw in imagination Indian princes in dazzling costumes, with glittering scimitars and daggers hanging at their sides. In glass-topped cases are many of these daggers, most of them curved, and all jewel-hilted and with jewelled scabbards. In cases against the walls are many statuettes of Vishnu and other Hindu gods and goddesses. An interesting model in another room close by shows a Vishnu "Juggernaut" car perfect in every detail.

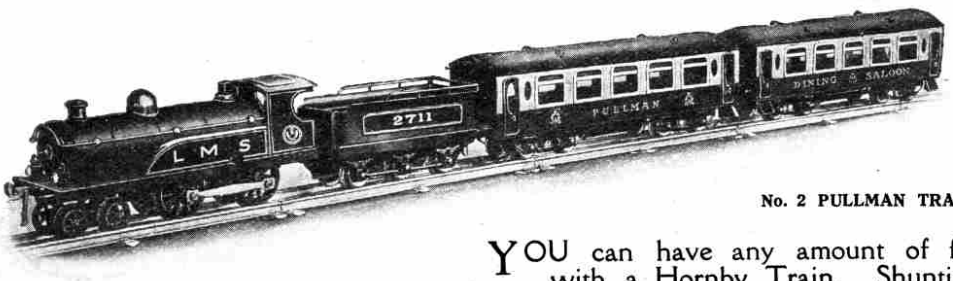
I had only time to give a passing glance to the other rooms containing antiquities from China, Africa, Australia and South America. Among these I noticed cases containing national costumes of the Tibetan people, taken from Lhassa in 1905. A little further on are other cases of great interest to all boys who are fond of stories of Red Indians, for they include among other things, some remarkable Indian costumes, one of which must have belonged to a great chief, as the feathered head-dress sweeps nearly to the ground.

It was now nearing the time for closing the Museum, and very reluctantly I had to drag myself away. When I emerged from the Museum I felt that, although I had only been able to get a hurried glance at a small proportion of the exhibits, I had learned a great deal, and I made up my mind to pay another visit on the first opportunity.

ARNOLD MILLER.

REDUCTION IN PRICES OF

HORNBY CLOCK WORK TRAINS



No. 2 PULLMAN TRAIN

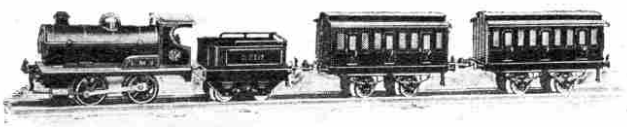
Guarantee

Hornby and Zulu Trains are tested and their efficiency is guaranteed. A form of guarantee is furnished with each loco, and we undertake to repair, or replace at our option any loco that fails to run satisfactorily from any cause, other than misuse, within 60 days of purchase.

YOU can have any amount of fun with a Hornby Train. Shunting, coupling-up the rolling stock and making up trains will give you hours of pleasure. Hornby Trains are beautifully finished, strongly made, and will last for ever. One of their most valuable features is that all the parts are standardised, and any lost or damaged part may be replaced with a new one.

Every train is guaranteed, in accordance with the terms shown above, and you are therefore sure of satisfaction if you buy a Hornby.

A series of articles will shortly be published in these pages telling you how to get the most fun out of your Hornby Train set. You will enjoy reading them, and if you are not yet the proud possessor of a Hornby Train choose one for your next Birthday present — you will never regret it!



No. 1 PASSENGER TRAIN (new type coaches with opening doors)

HORNBY TRAIN PRICES

No. 1

Goods Set	22/6	Wagons	each 2/6
Passenger Set	30/-	Tenders	,, 2/6
Locos	each 15/-	Passenger Coaches	,, 5/-

No. 2

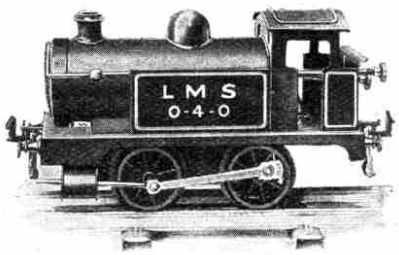
Goods Set	37/6	Wagons	each 3/6
No. 2 Pullman Set ...	60/-	Tenders	,, 3/6
Locos	each 22/6	Pullman Cars ...	,, 15/-

ZULU CLOCK WORK TRAINS

Zulu Passenger Set ...	22/6	Zulu Tenders ...	each 2/-
,, Goods ,, ...	17/6	,, Coaches ...	,, 4/-
,, Locos	each 10/6	,, Wagons ...	,, 2/6

Full particulars of these splendid trains will be sent post free on request.

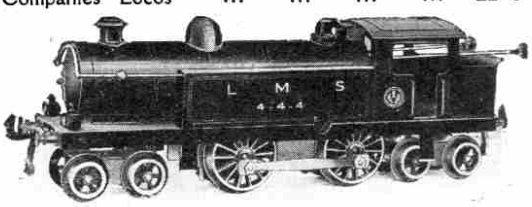
HORNBY TANK LOCOS



No. 1

The Hornby No. 1 Tank Loco is a strong and durable loco capable of any amount of hard work; richly enamelled and highly finished; fitted with reversing gear, brake and governor.

Gauge 0, in colours to represent L.M.S. or L.N.E.R. Companies' Locos 12/6



No. 2

The Hornby No. 2 Tank Loco is a powerful model embodying all the characteristics of the Hornby series. It is 11½" in length and is fitted at both ends with a four-wheeled bogey. Beautifully finished in colours; lettered L.M.S. or L.N.E.R., with reversing gear, brake and governor. Suitable for 2 ft. radius rails only.

Price 30/-

OBTAINABLE FROM ALL MECCANO DEALERS

(Continued)

WHEN I came to Mr. Constantinesco's stand in the Palace of Engineering I felt I had at least one friend in this great building, for I remembered the articles on Mr. Constantinesco and his inventions that have appeared recently in the "*M.M.*" On this stand was the chassis of a full-sized Beardmore locomotive fitted with the Torque Converter, also a motor-car and several very interesting models. A machine-gun fitted with the invention for firing through the propeller of an aeroplane was also on view.

On the next stand was a combined shunting and crane locomotive which lifts seven tons. It is chiefly used for rapidly unloading the wagons in dockyards and shipyards, and it struck me as being a very interesting subject to build in Meccano. On the opposite side of the avenue was a wonderful model of the Manchester Ship Canal and Docks, measuring over 40 ft. in length and 20 ft. in breadth, and also showing a model of a grain-elevator and discharging plant. In Bay 55 there was some fine Spinning Machinery, but what interested me more was the stand where Vickers Ltd., the famous Sheffield steel-makers, showed a huge naval gun that would throw a shell weighing over 2,000 lbs. a distance of 20 miles. This shell would pierce hard-faced steel armour 2½ ft. thick at a range of 10 miles! They also showed special gearing for turbines, some fine models of battleships and cruisers, and a heap of other interesting things.

I felt as though I could spend many days in this wonderful building, but I realised that, if I were to complete my tour in the time allotted, I must hurry on. I therefore left the Engineering section behind me with regrets and entered the Palace of Industry, a building equally vast.

Spinning and Weaving

Here there was a great noise—the hum of many machines at work making all manner of things, with attendants in different coloured uniforms moving about attending to the various mechanisms. I was almost bewildered by the wonderful sights before me, but I could not help feeling a thrill of pride as I looked down the long avenues and realised that here were shown some of the finest and most wonderful machines that British engineers have produced.

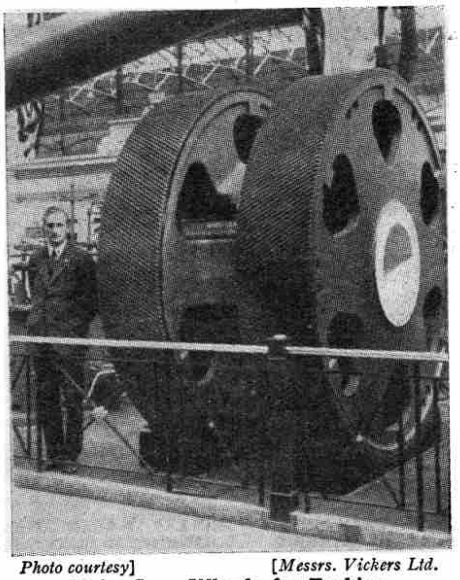


Photo courtesy] [*Messrs. Vickers Ltd.*

Main Gear Wheels for Turbines

Directly in front of me was the Textile section with machines at work showing the numerous processes of the cotton industry. These machines, which run from 11-30 to 12-30 a.m. and 2-30 to 4-30 p.m. each day, include a Self-Acting Mule and Roving, Slubbing and Drawing Machines.

There were also in this section Jacquard and Dobby Looms, and a wonderful loom that makes Turkish towels. I found these looms all very interesting and quite easy to understand, for the working principles are the same as in the famous Meccano Model Loom. I confess I was puzzled by the intricacies of a Tapestry Loom exhibited by Messrs. Hattersley & Sons Ltd., on Stand 301a. This machine is a real marvel, and weaves wonderful tapestry pictures similar to those seen on the walls of ancient castles and in museums. I noticed it stated that in the pattern being woven there were 10,250 warp threads and 30 colours of weft passing through the warp. There are 2,680 needles and 11,600 Jacquard cards, and on the occasion of my visit the loom was weaving a picture of "Bolton Abbey in the Olden Time."

I stood for a long time watching some more looms weaving suit lengths, and it amazed me to see how quickly the shuttle was sent flying through the warp threads by a terrific blow from the picking stick. Backwards and forwards the shuttle flew, so quickly that it was almost impossible to follow it with the eye.

Slate-Splitting Extraordinary

Quite a change was seen in the next section, where the Festiniog Quarries showed exhibits of slate-splitting. An amusing rhyme, painted on a slate, stated:—

"Tiles may come and tiles may go
But slates go on for ever."

Slates are split by chisel and mallet, and from a block one inch thick sixteen separate sheets of slate are obtained, each without a flaw! Of course, only highly-skilled workmen can do this, and I could not help noticing their delicate hands, quite in keeping with the class of work on which they are employed. The slate in the Festiniog

Photo courtesy] [*Messrs. Vickers Ltd.*

Naval Gun, Turbine-Gears and Models of Battleship

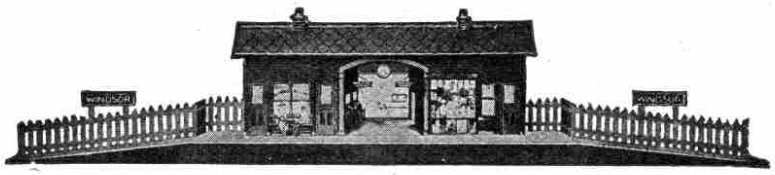
New Rolling Stock and Accessories

(HORNBY SERIES)

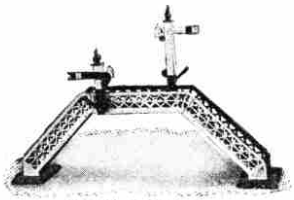
WE announce below several new train accessories, including Level Crossing, Signal Cabin, Snow Plough, Tunnel, New Wagons, Junction Signals and Platform Accessories. All are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains. Most important of all they have the uniformly beautiful finish which is the great feature of the Hornby System. To use cheap-looking rolling stock or a foreign-looking station with a Hornby Train completely spoils the effect.

THE WINDSOR STATION is a thing of beauty—the only really British station obtainable. Its bright colouring and realistic appearance will bring joy to the heart of every boy who sees it.

TUNNEL
Price **7/6**

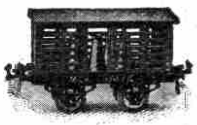


WINDSOR STATION
Excellent model, beautifully designed and finished
Dimensions: Length 2 ft. 9 in., breadth 6 in., height 7 in. Price **12/6**

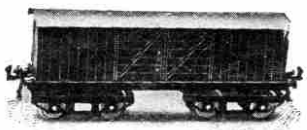


FOOT BRIDGE
With detachable signals. Price **6/-**
Without signals. Price **3/6**
Signals, per pair **2/9**

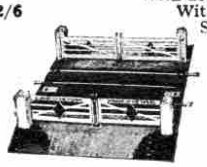
CARR'S BISCUIT VAN
Price **4/-**



MILK TRAFFIC VAN
Fitted with sliding door, complete with milk cans. Price **4/6**

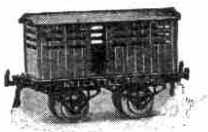


No. 2 LUGGAGE VAN
Finished in colour. Fitted with double doors. Suitable for 2 ft. radius rails only. **Price 6/6**

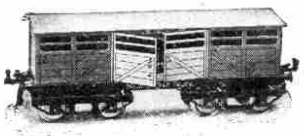


LEVEL CROSSING
Beautifully designed in colour. Measures 11½ in. × 7½ in., with Gauge 0 Rails in position.
Price **6/6**

SNOW PLOUGH
Finished in grey, with revolving cutter driven from front axle.
Price **5/6**



No. 1 CATTLE TRUCK
Fitted with sliding door, Very realistic design.
Price **4/-**



No. 2 CATTLE TRUCK
Splendid model, fitted with double doors. Suitable for 2 ft. radius rails only. Price **6/6**

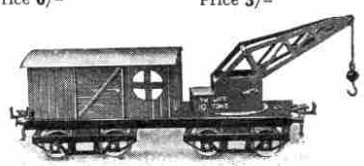
TROLLEY WAGON. Finished in colour. Suitable for 2 ft. radius rails only. Price **6/-**

GAS CYLINDER WAGON
Finished in red, lettered gold.
Price **3/-**

No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2 ft. radius rails only. Price **5/-**

No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **2/-**

SPRING BUFFER STOP Price **1/6**

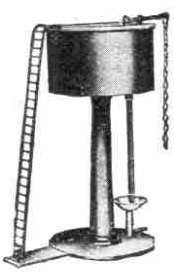


BREAKDOWN VAN AND CRANE
Excellent finish. Beautifully coloured. Suitable for 2 ft. radius rails only. Price **7/-**

PLATFORM ACCESSORIES No. 1
Price (per set) **2/-**

PLATFORM ACCESSORIES No. 2
Price (per set) **2/-**

PLATFORM ACCESSORIES No.
Price (per set) **2/-**



WATER TANK
Brightly coloured in red, yellow and black, 8½ in. in height, with flexible tube and pump lever.
Price **6/6**

LOADING GAUGE
Price **1/9**

SIGNAL CABIN
Dimensions: height 6¼ in., width 3½ in., length 6½ in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired. Price **6/6**

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

JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14 in. in height. Price **5/6**

ASK YOUR DEALER TO SHOW YOU SAMPLES

quarries is sixteen million years old. Slate is really nothing less than the solidified mud of our prehistoric seas, and it seems marvellous that these ancient deposits should be made to serve innumerable uses in our day.

Baffling the Burglar

A little further on was a splendid exhibit of Chubb's safes, which looked strong enough to defy the attempts of the most expert safe-breakers. Some of the safes had combination-locks, the operating dials of which reminded me of the condenser knobs on my radio set. A very ingenious type, called the "Lighthouse Safe," is a huge steel globe, fitted with a small door and mounted on a pedestal. When all is locked up, the globe revolves continuously and a light shines from the top. It is impossible for this safe to be tampered with, because of its constant movement, for if this be stopped the light goes out and an alarm bell rings! I wonder if any safe-breaker will ever manage to "crack" one of these safes—he will certainly have a dizzy time following the safe round as it revolves!

A large section of this building is devoted to musical instruments, but I had only time to notice the piano part. I had no idea that there was so much work in a piano until the man in charge of the exhibit told me there were over 5,000 parts in an ordinary piano and 6,000 parts in a grand piano! These parts are all displayed mounted in cases, so that even the most minute details of the piano-action are shown.

From Pulp to Paper

A huge paper-making machine performs the whole process by which pulp and water are converted into paper, from 11-30 a.m. to 5-0 p.m. every day. At one end of the machine there is a stream of pulp and water flowing on to a travelling band of fine mesh wire something like wire cloth. As this stream of pulp is carried forward the water drains off, passing through the wire mesh. The pulp is then left on the travelling band in the form of a thin skin, called the "web," which is passed through huge rollers to squeeze out the water. Then it is dried by being passed over steam-heated cylinders, and it comes out at the end of the machine to be wound off on huge rollers, ready for despatch to the newspaper office. It all looked so delightfully simple, but I remembered that the machine was perfected only as the result of many years of experience.

The Exhibition Post Office is near here, and I spent some time at the door examining the interesting exhibits of foreign stamps in glass cases. I particularly noticed some fine Triangular Capes, which I should very much have liked to take home with me, but the cases were securely screwed to the wall!

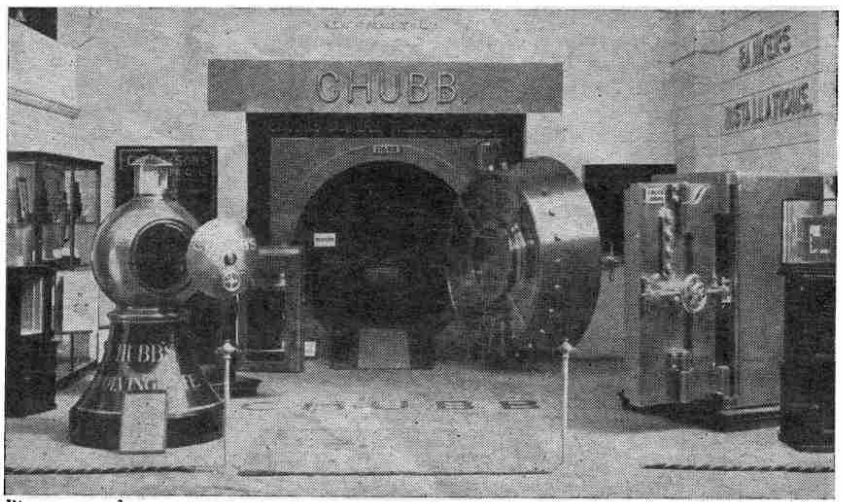


Photo courtesy] [*Messrs. Chubb & Sons Ltd.*

Safes and Strong-Rooms

(Chubb's Lighthouse Safe is seen on the left. Notice the thickness of the huge door of the Treasury Vault)

Biscuits and Chocolates

It was quite a pleasing change, after seeing cloth and paper in the making, to come to something even more interesting—the exhibits dealing with the manufacture of things in the eatable line. At one stand they were making very appetising-looking biscuits by machines that handled the whole business from weighing out the flour to packing the biscuits in tins. The biscuits were baked in long ovens through which they passed on a travelling band, and thousands upon thousands of them were made every hour. The machines used in making these biscuits were about 30 yards in length and the biscuits went through all the processes without being removed from the wide band on which they travelled. Instead of looking like a biscuit machine I am sure it could easily be mistaken for a coal conveyor!

On the next stand (Carson's Chocolates) toffee was being made at the rate of 200 lbs. an hour and a giant machine was mixing chocolate in four huge buckets. The machine mixes 2½ tons of chocolate at a time, using cocoa nibs that have been ground to powder by machines with two big grinding wheels revolving over pans. Indeed, all the machinery on this stand looked more suitable for mixing concrete or mortar than for mixing chocolate, but one of the attendants explained to me that the firm's output is such that huge machinery of this nature is necessary for them to keep up with the demand. He told me also that Carson's had supplied the chocolate for most of the famous expeditions in recent times, including those of Shackleton in 1914 and 1921 to the Antarctic, and the recent Everest expedition.

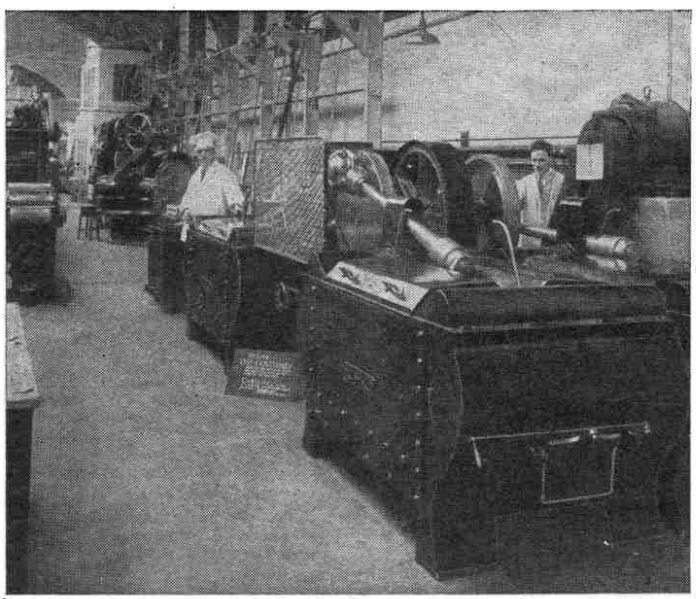


Photo courtesy] [*Baker, Perkins Ltd.*

Huge Chocolate-mixing Machine at Messrs. Carson's Stand

12,000 Loaves an Hour

Bread-making is a very interesting industry and one that we do not often hear about. Huge machines mix the dough, knead it, and weigh it out into loaves in a very different manner from that in which bread is made at home.

The unbaked loaves are carried by a kind of endless rack into a huge oven which looks about the size of an ordinary house. When they are baked, the loaves come from the oven on an endless belt, tumbling and jostling each other down an incline, like the people on the Helter-Skelter in the Amusement Park! Then they are caught by steel hands, placed in a piece of paper, wrapped up, labelled and passed along to be stacked ready for sale. A single machine of this kind can deal with 12,000 loaves an hour, and from flour to wrapped loaf the bread is never touched by a human being!

For Mothers and Sisters

Leaving the bread-making I passed through the Central Hall, with its gold columns 24 ft. in height and surmounted by heraldic designs, and came to a kind of arcade filled with show-cases of beautiful shoes of all kinds—kid, satin, brocade and skin. Some had jewelled heels and flashing buckles, but shoes don't interest me very much so I only stayed long enough to

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