MARCH 1924

MECCANO MAGAZINE

PRICE 2D

VOL. IX

No. 3

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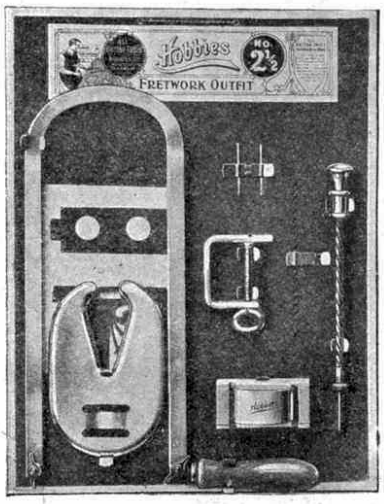

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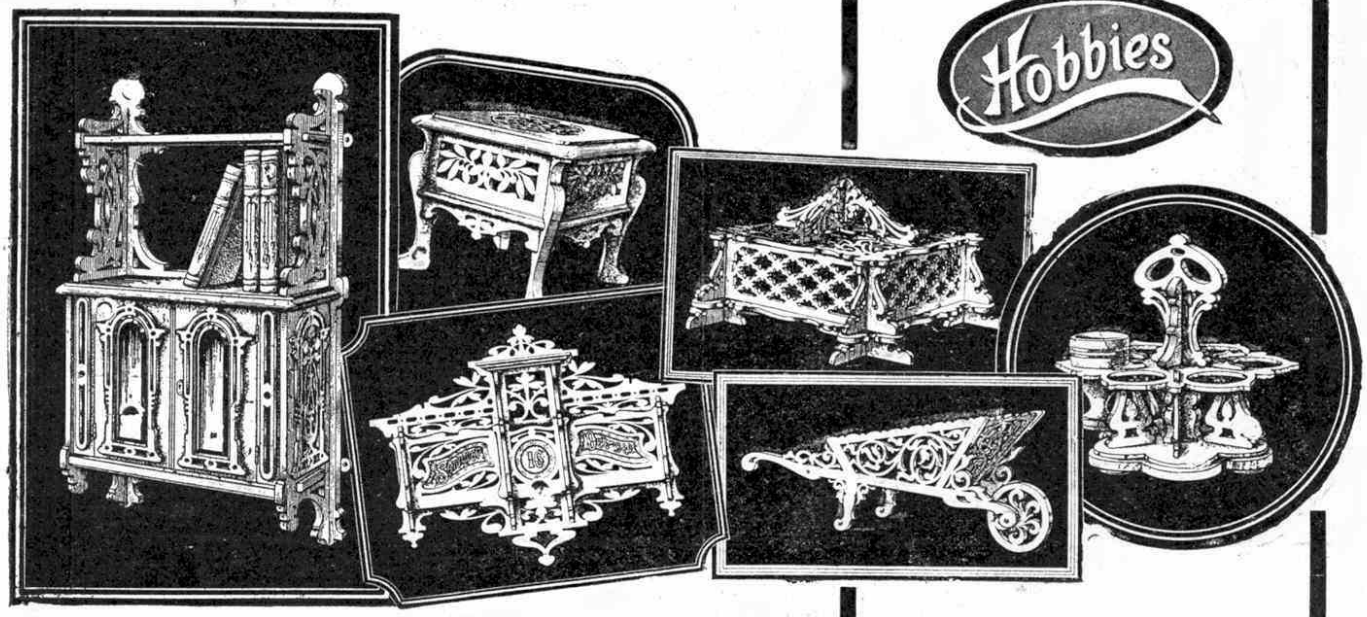


THE "M.M." IS PUBLISHED ON THE 1st EACH MONTH. ORDER YOUR APRIL COPY NOW! PRICE 2d

EDITORIAL OFFICE
Binns Road,
LIVERPOOL

MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

ONLY six weeks more in which to try to win one of the many valuable trophies offered in the £250 Championship Contest! For some time past Meccano boys the world over have been busily engaged in perfecting, improving, and finishing-off their models before finally sending in their entries for the great competition. For some years past I have followed the results of the Model-Building Competitions and have each year closely inspected the winning entries. One thing has been very forcibly impressed on me, and that is that the whole secret of success in these competitions is contained in the one word "originality."

The Great Championship Contest

To win a prize don't copy or improve on a model already in the Meccano Instruction Manuals. You should remember that the judges are all experienced model builders themselves, and that they know the models in the Manuals as well as you know how often the "*M.M.*" is published! What the judges look for is some movement or some original model they have never seen made in Meccano before. They look for some model that will attract their attention. Your model need not be a complicated piece of mechanism, but it should be attractive because of its originality. It should be so attractive indeed, as to make the judges feel they must just drop every other job and set to work "this very minute" to build your model for themselves. You will never make them do this if you submit some model that has been copied from the Instruction Manuals.

How to Win

This year the Competition is being run on new and original lines. Championship Cups and Medals are being awarded to boys in seven different countries or groups of countries. These countries are divided into sections, depending on the age of the competitor, so that every one is treated fairly and the models of boys of the same ages are judged together. The winner of each Championship Cup will hold the title of "Meccano Champion" for his particular group for twelve months. The award of these cups will be closely followed by all Meccano boys and everyone will be interested to learn who are the lucky recipients.

Meccano Champions

Every year entries for this great competition come in thousands from all parts of the world. In one sense, therefore, the establishment of the competition on the new lines makes it of a distinctly international character. More especially is this the case, however, with the special gold medal that is to be awarded for the best model in the entire competition. I cannot help wondering to which country this medal will be awarded. I sincerely hope that it will be won by a British boy, although I know that if this is the case British Meccano boys will require to "put on their thinking caps," for they have very serious rivals in the boys of France and America, not to mention Italy and Spain! So now "get busy" boys and see that your entries are despatched well before 15th April. (Full particulars of this contest on page 79).

Next Month:

FAMOUS ENGINEERS :—
George Stephenson (Part III.)
WONDERFUL NEW COALER
ELECTRICITY : More Experiments with Static Electricity
STAMP COLLECTING :—
Papers and How to Identify Them
INTO THE LAND OF FUN :—
New Parts and their Uses
MILLIONS OF UNDERGROUND TRAVELLERS :—
Wonders of London's Tube Railways
WHAT BROADCASTING MEANS :—
How a Transmitting Station "Works"
COMPETITIONS, GUILD NEWS, CLUB NOTES, PUZZLES, and other regular features

The suggestion has been made hundreds of times that we should supply a Meccano jersey, and I am now able to say that the necessary arrangements to make this practicable have been made with the Jaegar Company. I have seen samples of these jerseys and must say they are of very pleasing appearance. They are supplied in a range of colours, and the design has been approved by Mr. Hornby himself. The name of the Jaeger Co. is a sufficient guarantee of their quality. Meccano boys will now be more easily recognised than ever, and I shall keep my eyes open during my travels for any boy wearing these jerseys! Full details will be found in our advertisement pages. (See page 70).

Meccano Jerseys

I think I have previously mentioned in this column that I am always pleased to receive suggestions for articles or special features for the "*M.M.*" Our circulation has been increasing by leaps and bounds, and if this is any guide it would seem that my ideas as to what Meccano boys want in their paper are on right lines. Of course, it is difficult to please everyone, and out of 40,000 regular readers there are sure to be a few complaints, but I welcome complaints as well as suggestions, for they indicate what readers do *not* want! Among the many suggestions made recently have been insistent demands for pages dealing with Nature Study, Cycling, Photography, and Railway topics, and I should very much like to hear from those readers who are in favour (or against) such features. A postcard will serve the purpose, and if you are able to suggest any other articles that you think will be of interest during the summer months, mention them at the same time. Our Puzzles have been well received, and we shall continue these, and also the stamp page, as a large number of readers have expressed their satisfaction of this feature. We hope shortly to commence a serial stamp article of a novel character. This will take the form of a tour round the world, as illustrated by postage stamps. Special attention will be given to the great engineering structures as depicted on stamps. Many other interesting articles are being prepared and will be announced in due course. Articles on "Electricity" have been promised for some time, and I am pleased to be able to print the first of the series this month. The article describes how readers may experiment without danger with this great and mysterious force.

Improving the "M.M."

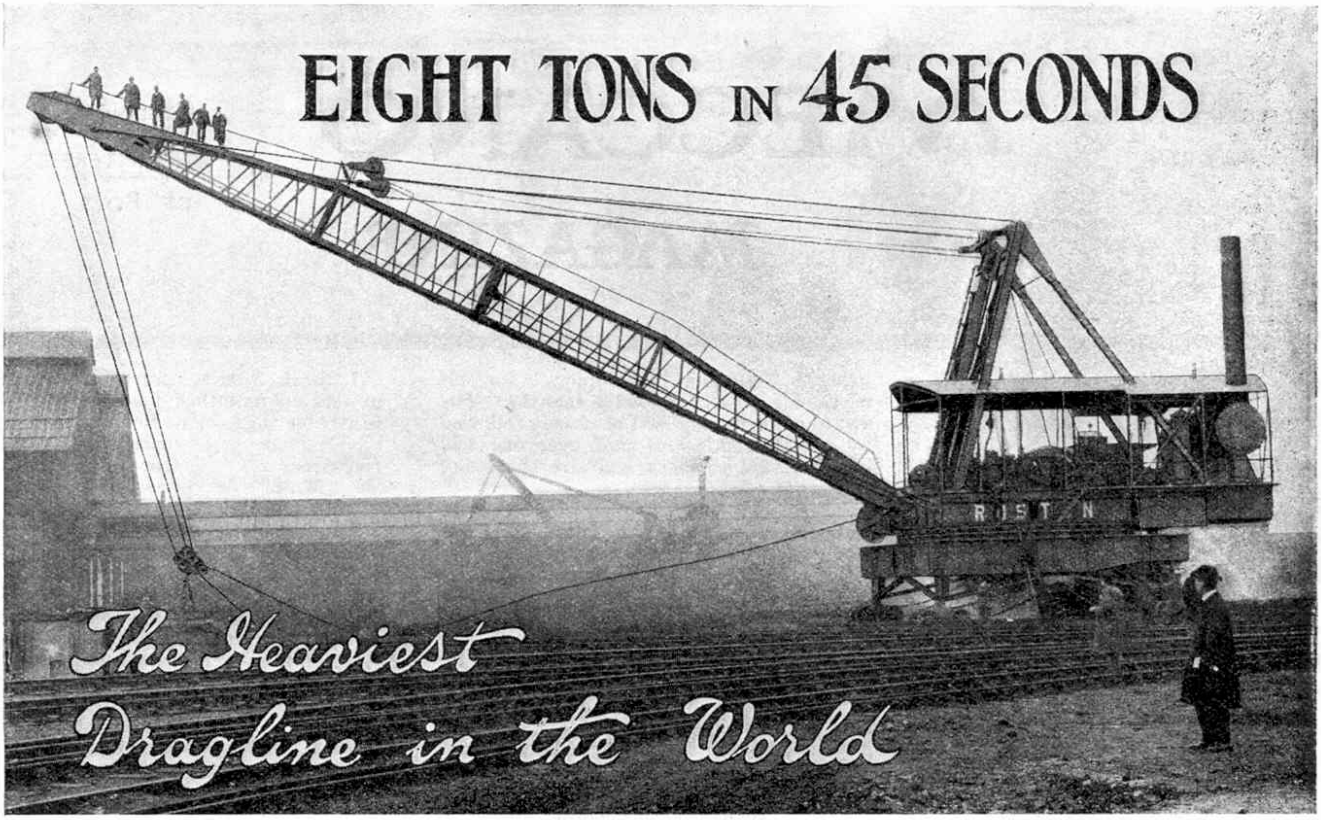
How to Obtain the "*M.M.*"

The "*Meccano Magazine*" may be ordered from your Meccano dealer, or from any newsagent or bookseller, price 2d. If you are not able to obtain the "*M.M.*" from these sources it may be obtained direct from this office, post free, 6 issues 1/6, 12 issues 3/-.

The next number of the "*M.M.*" will be ready on 1st April. As we print only sufficient copies to supply orders received, you should place a regular order with your dealer or newsagent, or direct with this office, to avoid disappointment.

"*Meccano Magazine*,"
Binns Road, Liverpool

EIGHT TONS IN 45 SECONDS



The Heaviest Dragline in the World

In our last number we gave an account of steam navvies—mechanical appliances that have made possible many engineering feats. We are now able to print an article describing another type of these same remarkable machines that has played its part in the advancement of civilisation.

IN our article last month we described the construction and purpose of steam navvies. In these columns we deal with another type of excavator, called the Dragline.

The Dragline obtains its name from the fact that the bucket is dragged towards the machine on a flexible rope, instead of being mounted on an arm that pivots on a jib.

Steam Navvies and Draglines

The single-bucket excavators previously described have three special features by which they may be classified. (1) They excavate *above* the level on which they stand (2) they *dig away* from the machine, and (3) they advance *into* the excavation as the work proceeds.

Draglines work in an exactly opposite manner, for they excavate *below* the level on which they stand; they work *towards* themselves, and they travel *backwards* when they have excavated all material within reach.

Draglines are used principally for drainage work, or where the ground is too wet to allow a steam navvy to stand. In certain parts of the Panama Canal Draglines were extensively used, and in conjunction with steam navvies they did the work of thousands of labourers, at a fraction of the cost.

A Great Engineering Feat

In such circumstances these mechanical devices are of inestimable value to the engineer. Apart altogether from the fact that their upkeep is nothing like the amount that would be required in wages if men were employed, they eliminate the difficult question of housing and feeding.

The zone of the country through which the Panama Canal passes is uninhabited, and the cutting of the canal necessitated the erection of large numbers of shelters and temporary houses for the workmen. Even when every conceivable form of labour-saving device was used, it was still necessary to employ over 60,000 men. These men, with their wives and families, had to be housed and fed in what was practically a desert area. This itself was a very big task, but if it had not been for the employment of mechanical devices such as steam navvies and Draglines, the number of labourers required would have been so enormous as to have made it impossible to accommodate them. It is more than probable that without these mechanical devices the Canal would never have been constructed at all—at any rate it is certain that the completion of this great work would have been delayed for very many years.

Details of the Dragline

A Dragline is very similar in construction to a steam navvy. Indeed, the latter may be so designed that it may be converted into a Dragline if desired, simply by fitting a different jib and special bucket, and adding another winding-drum to the machinery.

There are two drums—one for the digging rope and the other for lifting the bucket out of the excavation, regulating the depth of cut, and allowing the bucket to swing back for discharging and for another cut. In the steam navvy the digging rope passes over a pulley at the top of the jib, but in the Dragline the digging rope passes out at the front of the machine, close to the foot of the jib, and is connected to the bucket. A hoisting rope, which takes the weight of the bucket and its load, runs over the head of the jib and is attached to the bucket.

The Lattice-Girder Jib

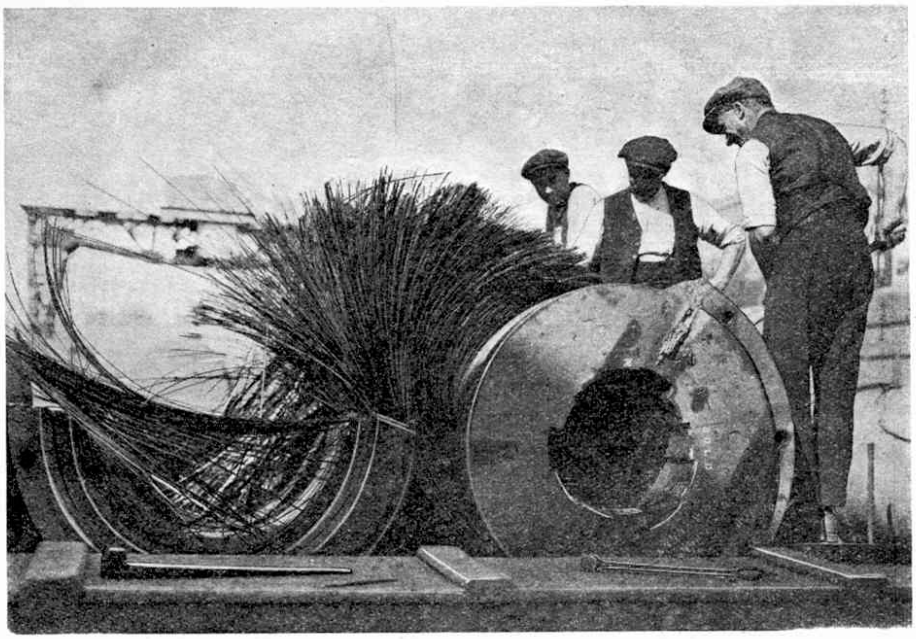
The jib of a Dragline is a lattice-girder and is of lighter design than the jib of the steam navvy. This is made possible by the fact that in a Dragline the jib takes only the load due to the lifting rope, and this with the slewing motion, is its only stress. In the steam navvy, however, the jib takes the stress not only from the digging rope but also bears the whole of the excavating stresses from the bucket arms, with their attendant slewing and digging stresses. In the Dragline the stresses at the head of the jib are

Where Do Old Guns Go?

HOW many people know what happens to discarded naval guns? And why should we discard them? Every nation with a Navy strives to build guns of greater power than those of its neighbours, and in this age of continual progress naval guns soon become obsolete. The result is that when a new gun is designed, the older guns become useless and are consequently demolished. This process is commonly known as "scrapping," and the term is also applied to ships, buildings, etc., as well as to guns.

When a gun is condemned it is sold to some firm of scrap-metal dealers, who offer the highest price for it. The name of the firm is painted on the gun, together with the word "Sold." The gun shown in our illustration was purchased by a firm in Wales whose name appears in white near the rifling of the barrel.

The gun is then removed to the scrap-yard by the large gantry crane (seen in the distance in our photograph) and electric drills or powerful hydraulic tools split open the outer steel jacket along the length of the barrel. As this outer covering is released and lifted clear, thousands of lengths of steel wire fly out. In the case illustrated these have assumed the curious appearance of a sheaf of corn. This wire is wound around the barrel to take the heavy shock of the gun when it is fired, and to prevent the barrel from splitting up. The wire also is treated as scrap, and every part of the gun is melted down and the metal is, perhaps, used again in guns of a later type.



Photograph by] [*G. Knapman*

Cutting the Wire wound around a Naval Gun

In some future number of the "*M.M.*" we hope to describe how large guns are made, and also to tell something of the making of armour plate and of the great machines used in the processes.

The Heaviest Dragline in the World—(*cont.*)

considerably less than in the case of the steam navvy and so the jib may be made longer. This also is an advantage in this class of work, for it enables the bucket to be thrown out further and to take a deeper and wider cut.

The angle at which a Dragline jib is inclined is much flatter than that of the steam navvy, because a large working radius is very useful and working height is not a necessary consideration. Draglines are usually fitted with derricking gear for altering the working radius. The variations possible in the angle of the jib are generally from 25° to 40° from the horizontal in the case of a Dragline, and from 45° to 60° in a steam navvy.

£5 for a Meccano Model

Messrs. Ruston & Hornsby Ltd., of Lincoln, who are famous as builders of Draglines and steam navvies, have recently built a very large Dragline, which is the subject of the illustration at the head of page 58. We shall continue this descriptive article in our next issue, and we advise all our readers to follow the details very closely, for Messrs. Ruston & Hornsby Ltd. are anxious to see whether any Meccano boy is sufficiently clever to build a working model of this great Dragline. In this connection we are arranging a competition, full particulars of which will be announced in our next issue. Messrs. Ruston & Hornsby Ltd. are offering a prize of £5, and there will also be other prizes to be won in this connection.

(*To be continued*)

OUR MAIL BAG

In these columns 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.

J. Rayburn (Royton).—
"Now for the start—we're off again,
Nothing so safe as a Hornby Train.
Round the bend—oh! isn't it grand?
Now we've arrived in Meccanoland."

Your complete poem is very good, and we are sorry we can only print one verse. Many thanks for your kind criticisms.

A. Banister (Stoke Poges).—It was good to hear from you again, and to know that you are following the Meccano hobby and the "*M.M.*" so closely. We sincerely trust that the necessary sum will be raised to restore the Stoke Poges Church Spire, made immortal in Gray's *Elegy*.

G. Harding (Highgate, N. 19).—We are pleased to know that our Stamp Column appeals to you so strongly. We will gladly reply to any queries on stamps.

J. Cooper (Glasgow).—Our Meccano boys are growing up into Meccano men all the time. We are glad to hear that your interest in the hobby is still keen. We wish you all success in your business career.

A. Knight (Chichester).—We are glad to welcome you back to the Editorial fold and to be able to send you the back numbers of the "*M.M.*" that you missed. We strongly counsel you not to miss any of the coming issues, and as we now print only as many copies as are actually ordered, it is unlikely that we shall be able to supply back numbers in the future.

H. Thompson (Scotstoun).—The increase in size of the "*M.M.*" is not intended to make you suffer from "fits of joy," Henry! Thanks for your congratulations and for print of the proposed new road-bridge across the Forth. The Stamp Editor will reply to your last query.

R. Gay (Christchurch, N.Z.).—Many thanks for your interesting description of the Hydro-Electric Power Station at Lake Coleridge. We are always glad to hear from you and we wish you success in the "Star" competition.

A. F. Battersby (Mitcham).—It is always a pleasure to hear from older Meccano enthusiasts, and we gather from your letter that you derive as much pleasure from model building as your boys. Your criticisms are all sound and have been noted. We shall be glad to see you on your next visit to Liverpool.

L. H. W. Wright (South Shields).—Of course we know that it is dangerous to go to church when the organist is drowning the choir, and when the canon fires away at the congregation from the pulpit, but no Meccano boy would seriously make this an excuse for staying away from church.

W. H. Robson (Backworth).—We think that stories "to make the hair stand on end" would be out of place in the "*M.M.*" Your suggestion for a nature column is on much sounder lines, and we have this under careful consideration. When we do decide to introduce this feature it will be on distinctly novel and attractive lines.

Aubrey Nairn (Perth, W. Australia).—We quite agree with the sentiments expressed in your verses, Aubrey, but we think you must improve your rhyming if your efforts are to see print. We do not think your suggestion re circular strip is practicable.

A. Bentley (Padiham).—The verses you have written to illustrate the humorous sketch on the "Fireside Fun" page in our Christmas number are quite good. We were sorry to hear that you have been ill in bed, and we hope that you are now well on the way to recovery.

G. H. Mawson (Leeds).—We were glad you told us that the answer to your riddle "Can you spell 'hungry horse' in four letters?" is "M.T.G.G." as otherwise this issue of the "*M.M.*" might never have been published! Thank you for your good wishes, which we heartily reciprocate.

C. Roberts (Liverpool).—The interest expressed in our new puzzle feature has been very considerable, and we shall certainly continue this page. You should have no great difficulty in solving most of the puzzles in view of your thorough acquaintance with Algebra. You evidently find this subject useful, and we feel sure that if you maintain your interest you will find Algebra even more useful in later life.

II. GEORGE STEPHENSON, the Man Who Gave Railways to the World.

IN the first instalment of this article, which appeared in our January issue, we described Stephenson's early days when he was employed at Killingworth Colliery. We also told how he came to build his first locomotive and how it was proposed to construct a railway between Stockton and Darlington.

Stephenson persuaded the directors of the new railway to use locomotives instead of employing horses to draw the wagons or hauling them by fixed engines, as had also been suggested. His confidence in the future of the locomotive was unbounded and on one occasion at this time he said, speaking to his son Robert, "I think you will live to see the day when railways will come to supersede almost all other methods of conveyance in this country—when mail coaches will go by railway, and railroads will become the great highway for the King and all his subjects. The time is coming when it will be cheaper for a working man to travel on a railway than to walk on foot. There are great and almost insurmountable difficulties that will have to be encountered, but what I have said will come to pass, as sure as you live." What a remarkable prophecy this was! To-day the complicated and extensive railway systems of the world far outdistance even these intelligent anticipations of Stephenson.

Photograph by] ["*Newcastle Chronicle*"

"High Street House," Wylam-on-Tyne, the humble cottage in which George Stephenson, one of the world's greatest engineers, was born

An Important Discovery

In 1823 the construction of the Stockton and Darlington Railway commenced, and Stephenson was appointed the Company's Engineer at a salary of £300 per annum. He established a locomotive works at Newcastle at the same time, and here three locomotives were built for the Stockton and Darlington Railway, embodying Stephenson's latest discovery, the steam-blast. This was one of the famous engineer's greatest triumphs, and to it he owed a considerable measure of his ultimate success. It is of such importance that we shall stop to consider it in detail.

First let us explain that the cost of running Stephenson's original engines was about the same as if horses had been used. Their speed also was about that of the walking pace of a horse, so that really there had been little in favour of the colliery adopting the steam engine instead of horses for haulage purposes. It has been said, indeed, that the fate of the locomotive was at this stage trembling in the balance, and it is quite possible that it might have been condemned as useless had it not been for the invention of the steam-blast.

In the early engines the exhaust steam from the cylinders had been allowed to escape directly into the air. It issued from the exhaust ports with a hissing blast and frightened all horses and cattle within earshot—not to mention pedestrians! In fact, so much annoyance had been caused by the exhaust steam that a neighbouring squire threatened to commence an action against the colliery on which Stephenson's locos were used, if the nuisance did not cease!

The Steam-Blast

Stephenson had already noticed that the steam issued from the exhaust with a greater velocity than that with which smoke issued from the chimney of the loco. It occurred to him that if the exhaust steam were conducted to the chimney by a pipe and allowed to escape in a vertical direction, it would cause the smoke from the furnace to travel at an increased velocity. This in turn would cause a greater draught in the furnace and so enable it to burn more coal and give greater heat. This had been desired for some time, for it had been found difficult to produce steam in sufficient quantity to keep the engine constantly working. The only method of overcoming this difficulty was to increase the intensity of the fire in the furnace.

In 1815 Trevethick, another inventor, had taken out a patent for a method of urging the fire by fanners, similar to those used on a winnowing machine, but this solution to the difficulty had not been wholly satisfactory, apart from the fact that additional mechanism was required to work the appliance. On the other hand, Stephenson's blast was entirely successful—so much so, indeed, that it more than doubled the power of the engine. This was a splendid achievement, for it must be remembered that it was attained without any increase in weight, which Trevethick's invention necessitated.

The addition of the steam-blast marked the turning-point of a critical stage in the history of the locomotive, and consequently in Stephenson's life. Even had the locomotive survived this critical period without the blast, the high speeds obtained later and the multi-tube boiler could not have been developed without it. The steam-blast is used extensively to-day, as anyone may see, when a loco is getting up steam or running at high speed. We have all noticed the steam coming from the smoke stack and the force with which the smoke is expelled—just as it was in Stephenson's time.

A Famous Loco

Having developed the steam-blast on his Killingworth engines, Stephenson rightly decided to fit it to the locos he made for the Stockton and Darlington Railway. These locos each weighed about eight tons, and they were capable of speeds of up to 16 miles per hour. The first was named the "*Locomotion*" and is now to be seen on the platform of Darlington Railway Station. In this engine a tube through the boiler served as a large flue, by which heated air passed directly from the fire-brick furnace at one end, to the chimney at the other. The steam-blast entered the chimney and quickened combustion so that the heat was sometimes so great as to cause the chimney to become almost red-hot!

From an old] [*engraving*

The Opening of the Stockton and Darlington Railway

After many months of work the Stockton and Darlington Railway was at last ready to be opened. The ceremony was performed on the 27th September, 1825, and we may easily imagine how anxious Stephenson was as to what would be the issue of his great experiment. As the great day approached the excitement grew more and more intense, but it seems that Stephenson's confidence in the success of the railway was unshaken.

A Notable Ceremony

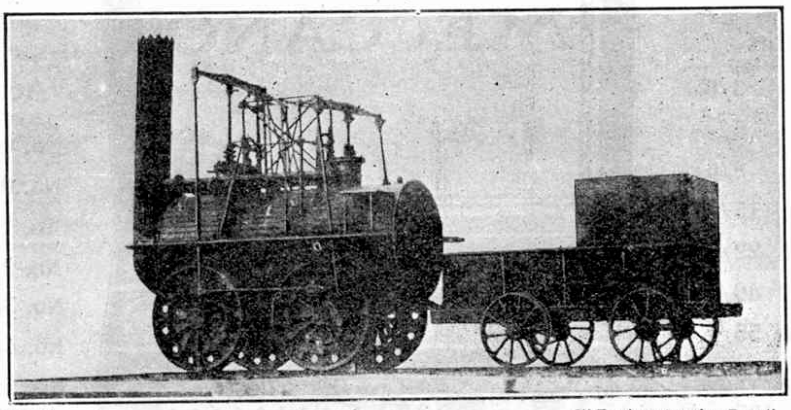
There had been considerable opposition to the construction of the Stockton and Darlington Railway, and when the line was opened great crowds of people came from all parts of the country to witness the ceremony. Many threats had been uttered against the Company by various people, who declared they would prevent the line from being worked. Probably quite as many people attended the opening ceremony in the hope of seeing the new invention fail, or the engine blow up, as those who went to cheer.

Those who anticipated a great disaster were disappointed, however, for nothing of the kind happened. Instead, the opening was a great success. Stephenson himself drove the engine of the first train, consisting of six wagons loaded with coals and flour. After these came a passenger coach filled with directors and their friends, and twenty-one wagons fitted with seats. Lastly there were six wagons loaded with coals, making a train of thirty-five vehicles in all.

A witness of the scene quaintly described how "the signal being given, the engine started off with this immense train of coaches, and such was its velocity that in some parts the speed was frequently twelve miles an hour." When the train reached Stockton there were about 600 persons either in the train or hanging on to the wagons, each anxious to be amongst those able to claim having ridden in the first train!

The regular working of the line commenced immediately after the opening, and an enormous amount of coal was shipped from Stockton and Middlesbrough by means of the railway. At that time Middlesbrough as a town was unknown, for where this large and prosperous town now stands there were only a few cottages. The railway soon changed this, however, and it may be truly said that the town of Middlesbrough and the prosperity of the surrounding district were the direct outcome of the invention of the steam-blast!

It is interesting to find that although the Stockton and Darlington Railway was originally constructed for the carriage of coals from the Durham mines for sale at the stations along the line, this work proved to be only a small portion of the traffic that came to the railway. Even the projectors of the railway were themselves surprised at the amount of new traffic that came to them, principally the haulage of coals to the seaports for export to London and elsewhere. When the bill for the establishment of the railway was before Parliament, the Earl of Durham had succeeded in having a clause inserted limiting the railway company's charge for carrying coal to one half-penny per ton per mile. The object of this was to protect the Earl's own trade for coal that he himself exported from other ports. Everyone—including the directors of the railway—believed that this very low rate would make it impossible for the company to carry coals to the ports, but when the railway opened, the shipment of coal to the ports at the half-penny rate was enormous. Instead of there being no traffic as the railway company had anticipated, this did, in fact, form the main traffic of the railway.



From] ["*Engineering for Boys*"

The famous "Locomotion," now to be seen on the platform at Darlington (Bank Top) Railway Station

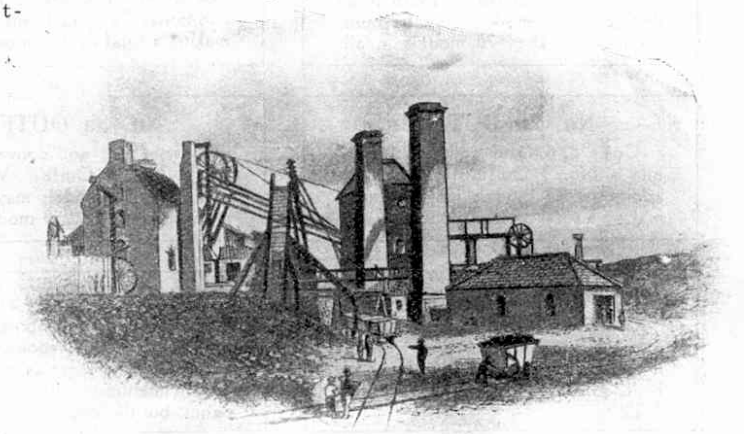
In a similar manner, passenger traffic, which had not been thought of seriously in the original estimates, became considerable. The running of the trains between Stockton and Darlington brought many new businesses into existence and an increasing traffic in passengers sprang up.

Shortly before the railway was opened, Stephenson was requested to build a railway coach. This was the first railway carriage in existence, and it was not unlike a bathing machine or hut on wheels! There was a row of seats on each side, with a long deal table in the centre and a door at the back. This coach, which Stephenson appropriately named the "*Experiment*," was the forerunner of our splendid Pullman coaches of to-day. At first the "*Experiment*" was drawn by a horse and performed the journey between the two towns—a distance of 12 miles—in about two hours. Soon, however, this coach was found to be too heavy and uncomfortable, and its place was taken by better carriages which were, in fact, made from old stage coach bodies mounted on under-frames and fitted with flanged wheels! In the "*Experiment*" the fare was 1/- and there was no distinction of class, but in the new carriages there were inside and outside passengers who were charged different fares, and so first and second-class distinction commenced.

NEXT INSTALMENT:—

Stephenson's Greatest Triumph:

The Conquest of Chat Moss



From an old] [*engraving*

The Westmoor Colliery, Killingworth, Northumberland, where Stephenson was at one time employed as brakesman

MECCANO

ACCESSORY OUTFITS

Make Your Outfit Bigger and Better

Once a boy has commenced to build with Meccano, he desires to build larger and more ambitious models. He may do so by adding an Accessory Outfit to his existing set, thereby greatly increasing its scope. The particulars below show how a boy who commences with one of the earlier Outfits may build up his equipment by easy stages, until he is the proud owner of a No. 7 Outfit.

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Complete Outfits

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PRICE LIST
Accessory Outfits

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No. 4a	... ...	15/-
No. 5a	(carton) ...	50/-
No. 5a	(wood) ...	80/-
No. 6a	... ...	210/-

This illustration shows a No. 3a Outfit which converts a No. 3 into a No. 4 Outfit.

No. 00a OUTFIT
Costs 1/6, and converts No. 00 into a No. 0 Outfit. With it an additional 27 models may be built, making a total of 70 models in all.

No. 0a OUTFIT
Costs 4/-, and converts No. 0 into a No. 1 Outfit. With it an additional 36 models may be built, making a total of 106 models in all.

No. 1a OUTFIT
Costs 7/6, and converts No. 1 into a No. 2 Outfit. With it an additional 57 models may be built, making a total of 163 models in all.

No. 2a OUTFIT
Costs 8/6, and converts No. 2 into a No. 3 Outfit. With it an additional 43 models may be built, making a total of 206 models in all.

No. 3a OUTFIT
Costs 18/6, and converts No. 3 into a No. 4 Outfit. With it an additional 53 models may be built, making a total of 259 models in all.

No. 4a OUTFIT
Costs 15/-, and converts No. 4 into a No. 5 Outfit (carton). With it an additional 43 models may be built, making a total of 302 models in all.

No. 5a OUTFIT (Carton)
Costs 50/-, and converts No. 5 into a No. 6 Outfit (carton). With it an additional 51 models may be built, making a total of 353 models in all.

No. 5a OUTFIT (Wood)
Costs 80/-, and converts No. 5 into a No. 6 Outfit (wood). The parts are exactly the same as in the carton Outfit mentioned in the preceding panel, but the cabinet is in wood.

No. 6a OUTFIT
Costs 210/-, and converts No. 6 Outfit into a No. 7 Outfit (oak cabinet). This Outfit builds every one of the 393 models illustrated in the Complete Manual.

FROM ALL MECCANO DEALERS

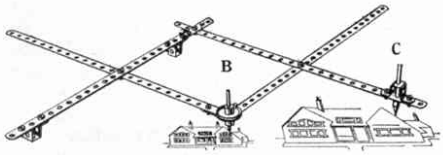
Into the Land of Fun

by

"SPANNER"

I HAVE sometimes heard boys say "I can't think of anything new to build." Finding ideas for new models should not be a difficult matter for any bright boy, however, and after all, it is this inventive power—this touch of originality—that Meccano is able to cultivate in boys.

I remember that in my early Meccano days I was never particularly interested in copying models from the Manuals, after I had once learned how to build and how to use the parts correctly. I have always preferred to build in detail new movements for various mechanisms, and from these I have obtained any amount of enjoyment and satisfaction. When short of an idea my usual procedure was to go for a walk with the sole intention of finding something new to reproduce in Meccano. The first time I went out on one of these hunting expeditions I got no further than the garden gate. Regarding it critically it seemed to be quite a cumbersome arrangement. I thought I could improve upon it, so I went indoors and proceeded to make a new gate in Meccano. It was quite a success and I was very proud of the special self-closing and locking device, which I exhibited to my parents and friends. I was never disappointed in my later rambles and always managed to find something new. Some of my happiest memories are of the days when I used to copy the bridges, carts, railway-stations, trams, 'buses and even top-hatted old gentlemen that I saw!

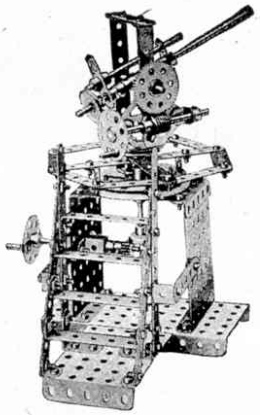


Model No. 446. Pantograph

And now for our monthly chat on the interesting models illustrated on this page. No. 434 (Cakewalk) is an old favourite of mine. Even though my dog "Lady" has grown into quite a big dog now, she will never forget her first (and only!) experience as a puppy on those treacherous platforms on which she was an unwilling passenger!

The model here illustrated is worked by hand, but I substituted a pulley wheel for the handle and drove the Cakewalk by a belt from an electric motor. In either case the results are equally good, however, and the model has the added charm of being very simple to construct.

The rocking platforms are built of braced girders, connected by 2½″ end strips and pivotally bolted and lock-nutted to the other 2½″ strips which form the rocking-links or mounting. These latter are bolted and lock-nutted to the angle girders beneath. The platforms themselves are made of stout cardboard and are secured to the 2½″ end strips. They are rocked by means of the two 6″ strips, each of which is connected to one rocking platform (only one is to be seen in the illustration). The other end of the strip is connected to a Triple-Throw Eccentric, fixed on a rod, to which is also secured a contrate wheel, driven by a pinion from the hand-wheel. As the handle is turned, the platforms rock up and down on the supporting strips. The Eccentrics should be so arranged that the platforms rock in opposite directions.

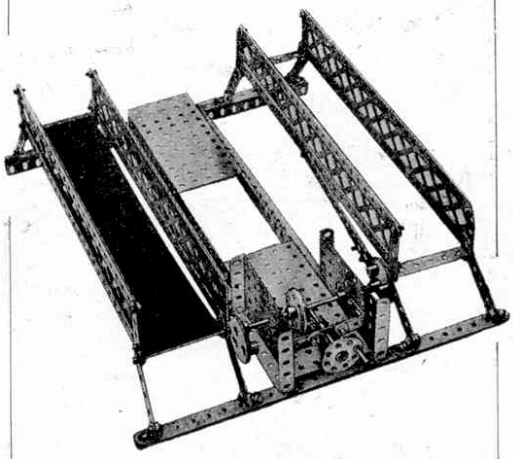


Model No. 452. Anti-Aircraft Gun

By the way, the Triple-Throw Eccentric (No. 130) is not very well known to Meccano boys and the Editor tells me that he often has letters from readers enquiring how the part is to be used. I hope next month to describe some of the uses to which this and other recently-introduced parts may be applied.

A model of an entirely different character to the Cakewalk is No. 446, which goes by the high-sounding name of "Pantograph." In actual practice this is a device used by draughtsmen and artists for copying plans and designs, either on a reduced or an enlarged scale.

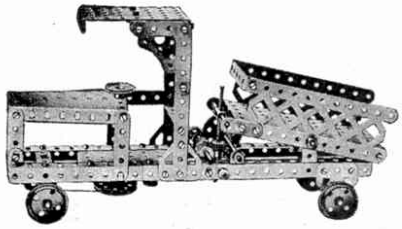
When constructed, the apparatus is fixed with a wood screw by the left hand corner to the table or board. The drawing to be copied is laid flat on the table as shown in the centre of the accompanying illustration. To make an enlarged reproduction of the original the point is traced around the outlines of the drawing. At the right-hand corner there is a pencil or fountain pen, which exactly reproduces the original sketch, but on a larger scale. With a little practice, and by taking the pencil in the fingers, very good results may be obtained. If a drawing reduced in size is desired, then the outline is traced with the pencil and point reversed—that is to say the pencil is placed in the central holder and the tracing point in the holder on the right. This arrangement reproduces the sketch on a smaller scale, the size of which depends on the position of the tracing point on the perforated strip.



Model No. 434. Cakewalk

A great deal of fun may be obtained from Model No. 452, Anti-Aircraft Gun, if used in conjunction with Model No. 423 Searchlight Tower (illustrated in the January "*M.M.*") These two models may be placed side by side or they may be mounted on a common base. Then when the electric lamp of the Searchlight is switched on, and the beam directed on to various objects in the room, the "man behind the gun" should endeavour to follow the beam by manipulating the controls of the gun. These are ingeniously contrived to give almost any desired movement, as is the case in real anti-aircraft gunnery.

A 57-toothed wheel mounted on a pivot rod engages a worm, which is operated from the small hand-wheel. By turning this wheel the gun-barrel is raised or lowered. Two vertical strips form the framework for the pivot rod and are bolted to a 1½″ pulley wheel, secured on a vertical rod. A 3″ pulley wheel is also bolted to the rod and from the pulley wheel a framework is carried by reversed angle brackets. The rod with the framework is rotated by a hand-wheel, a pinion on the spindle of which engages a ¾″ contrate wheel on the rod. By turning this hand-wheel the gun may be swivelled round.

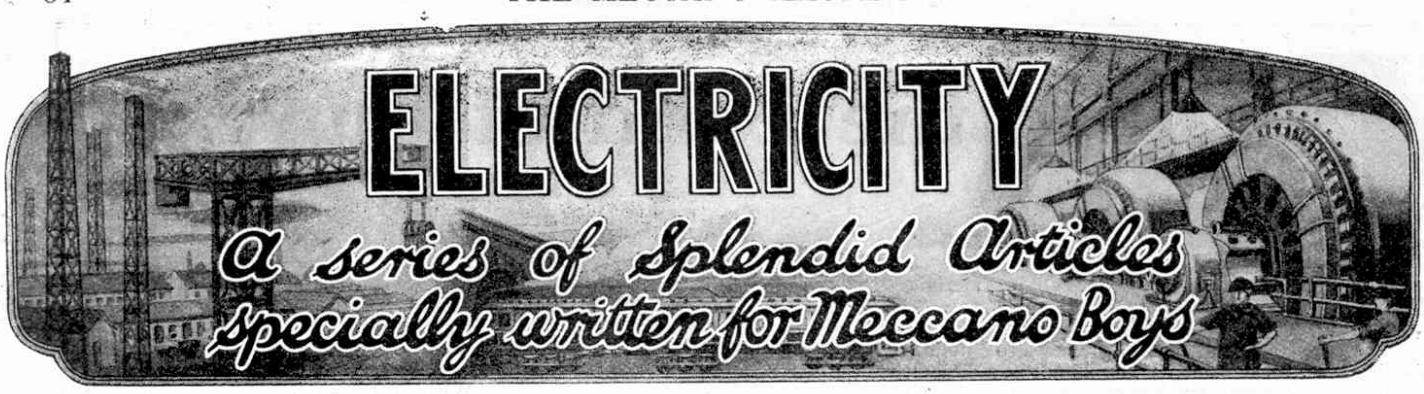


Model No. 453. Tip Wagon

A Motor Wagon that is capable of tipping its load is the subject of Model 453. These wagons may be seen any day in every town or city in use for various forms of transport where the load is to be quickly discharged. Coal merchants, road contractors and building firms generally possess a number of these useful wagons.

The model is easy to construct, and even the tipping arrangement is clearly shown in the illustration. Tipping is effected by a handle secured on a 57-toothed wheel, which engages a ½″ pinion mounted on a rod. A worm is also secured on this rod and engages another ½″ pinion, which is secured to an upright screwed rod, revolving freely in a coupling, being retained in position by a collar. The wagon is tipped or restored to its original position by respectively turning the handle in one

(*Continued on page* 84)



I. SOME INTERESTING EXPERIMENTS WITH STATIC ELECTRICITY

This article deals with the discovery and development of electricity and illustrates its principles, as far as possible, by means of interesting experiments within the reach of every Meccano boy. These experiments will give many hours of fascinating fun and are quite free from danger.

ELECTRICITY has a fascination for almost every Meccano boy. There are few boys who do not, at one time or another, wish to take up electrical engineering as a profession. An electrical engineer finds it easy to conjure light, heat and power out of the most ordinary materials. Truly he may be described as a modern wizard, whose achievements far exceed even the most fantastic dreams of the wizards of olden days.

Electricity was known over 2,000 years ago, but the form in which it was known ("static" electricity) did not enable it to be employed for any useful purposes. As we shall shortly learn, there are two kinds of electricity—"static" and "current," the former being at rest and the latter in motion, as the different names imply.

We may easily experiment with static electricity by briskly rubbing a pipe-mouthpiece, fountain pen, or stick of sealing wax on our coat sleeve. It then becomes charged with static electricity and in this condition we find that it will attract small pieces of paper, tobacco-ash and similar light objects, just as a magnet attracts pins and certain metal objects. (Fig. 1).

This power of attraction was known to the ancient Greeks, who demonstrated it by rubbing amber with fur. It is believed that this discovery was first made some 600 years B.C. by Thales of Miletus, an eminent Greek philosopher.

An Ancient Greek Legend

Although they did not know it, the Greeks had taken the first step towards the foundation of the science of electricity in thus demonstrating the attractive power of amber. They regarded the phenomenon as a curiosity, believing that attractive power had been given to amber by the gods. Their legend tells how Phæton, the son of the sun-god, supposing—as do many boys to-day!—that he could do things better than his elders, decided to drive his father's chariot across the sky. He lost control, however, and came too near the Earth, with the result that the oceans were dried up and the land scorched. Jupiter, the lord of the heavens, seeing what was taking place, hurled a thunderbolt at Phæton and brought him to Earth. As a further punishment his sorrowing sisters, the Heliades, were at the same time changed into poplar trees, and their tears to amber.

This story is of more than passing interest, for the sun-god's name was Alector, "the shining one." Because of this, amber became known as *elektron*, or "the shining thing," from which is derived the word "electricity."

To-day the Greek legend is set aside and the secret of the attractive power of amber is explained in a more scientific manner. For our present purpose we may say that the curious power is due to a charge of static electricity imparted to the amber as a result of rubbing. We shall consider this matter again, however, and will then explain in great detail exactly what takes place when the amber is rubbed.

A Famous Elizabethan: Dr. Gilbert

Having once found that they were able to summon this wonderful attractive force at will, the Greeks made no further study of it. In fact, as far as we know, the subject seems to have been almost entirely forgotten until the 17th century, when Dr. Gilbert, of Colchester, a medical attendant of Queen Elizabeth, experimented with magnets.

Dr. Gilbert, of Colchester

The magnet has been known from olden days, and was regarded as an object of curiosity by the people of many nations. An iron ore possessing the peculiar property of attracting iron, and called the "lodestone," is mentioned in ancient Chinese records. The lodestone is also referred to by ancient Greek and Roman writers.

Dr. Gilbert was interested in the lodestone and studied its curious properties. He discovered among other things that when suspended by a thread a magnet always points north and south. To-day this principle is used as a basis of the magnetic compass, which enables our ships to sail across the ocean and to steer a course to any point that may be determined. Although we know that magnetism and electricity are closely connected, it did not occur to Gilbert to suggest that the excited amber of the ancient Greeks could in any way be connected to his lodestone and magnets.

Experiments with Static Electricity

Nothing further was done in this wonderful field of research until 1737. In that year Dufay, a celebrated French scientist, discovered that when excited by rubbing, substances other than amber have the same power of attraction for other bodies. We have already proved this by our experiment with the pipe stem. We may now perform some further interesting experiments with this form of electricity, by rubbing a glass rod (a piece of glass tubing or even a glass bottle will serve the purpose equally well) with flannel.

First of all make sure that the flannel and the glass rod are perfectly dry by warming them. Then hold the glass rod in one hand and rub it briskly with the flannel, held in the other hand. Hold the charged rod near some tiny pieces of paper, or some other light substance, such as tobacco ash or feathers. These objects will immediately be attracted, and will fly up to the glass rod and remain

Electricity *(continued)*

adhering to it for a short space of time. This is, of course, a repetition of the experiment with the pipe-mouthpiece.

Attraction and Repulsion

Our glass rod enables us to carry out further experiments, however, for which the only additional "apparatus" required are some pith balls, which are simply pieces of pith from a branch of an elderberry tree. Slit a branch open with your pen-knife and you will find inside a white leathery lining. Cut out

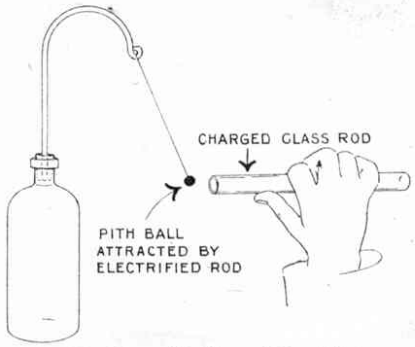


Fig. 3. "Unlikes Attract"

a small piece about the size of a pea, dry it, and hang it on the end of a suspended silk thread, so that it hangs clear of the table. If pith is not obtainable a small feather or similar light object will serve the purpose almost equally as well. A suitable holder may be made by piercing a piece of wire through the cork of a bottle, as shown in Fig. 2.

Charge the glass rod, by briskly rubbing it as before, and bring it near the suspended pith ball. It will then be found

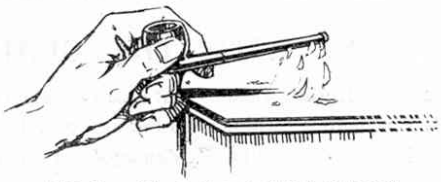


Fig. 1. Pipe attracts light objects*

to attract the pith ball towards it (Fig. 3). Notice that the glass rod acts as a magnet and that as soon as it touches the pith ball, the latter falls away and is repelled by the rod (Fig. 4).

"Like Repels Like"

Now suspend a second pith ball alongside the first, by a second silk thread, fastened to the same support. Charge the rod as before and bring it near the pith balls. They are both attracted by the rod, but when the rod is taken away the balls immediately fly apart.

In our first experiment, when the electrified glass rod was brought near the pith, the latter was attracted by the charged rod because it (the pith) was uncharged. When the pith came into contact with the rod, however, it became electrified; here again, as "like repels like," it was at once driven away. For the same reason, the two pith balls repel each other, because they have both received from the glass rod a charge of a similar kind.

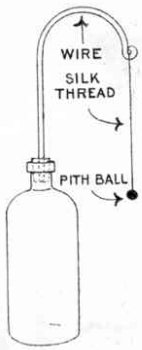


Fig. 2

Positive and Negative Charges

Dufay showed that there are two kinds of static electricity, which he called "vitreous" and "resinous." These to-day are known as "positive" and "negative," represented by the signs + and —. In static electricity a positive or a negative charge depends on the substance used for the experiment, and also on the material with which it is rubbed. Glass rubbed with silk takes a positive charge and sealing-wax rubbed with flannel takes a negative charge.

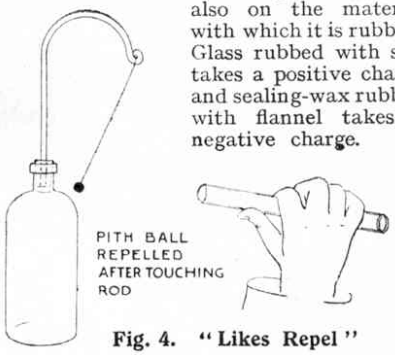


Fig. 4. "Likes Repel"

In the next instalment of this series we shall demonstrate this more clearly by further experiments with the charged glass rod. We shall also describe how you may obtain sparks from your cat, and other equally interesting phenomena.

NEXT MONTH

Further Experiments in Static Electricity

*This figure is reproduced from "*The Romance and Reality of Radio*," by permission of Messrs. T. C. & E. C. Jack Ltd.

BRIGHT IDEAS

These columns are reserved for dealing with suggestions sent in by Meccano users for new parts, new models and new ways of making Meccano model-building attractive. We are always pleased to hear from any Meccano boy who has an idea which he considers will be useful in the Meccano system.

James Stevens (Kingston).—We have in mind further new types of rolling stock for Hornby trains. It is our intention to make the series as comprehensive as possible.

H. Oddie (Carranballac, Victoria).—(1) Regret, but we are not able to follow your suggestion for a cup with a boss and cone plate. (2) Circular sections are having our attention.

Neil Shimmin (Leeds).—Meccano strips and girders do not make satisfactory rails for a train system. We already list a signal for Hornby trains.

G. D. D. (Windermere).—We are exploring various suggestions for a sliding gear. Squared rods offer some obstacle in the matter of bearings.

R. Manger (Guernsey).—We are afraid a hook such as you suggest would not overcome the twisting trouble. Moreover, it would be very costly to manufacture.

Leonard Lumb (Golcar).—We do not stock rubber "tyres" on account of their perishable nature.

Trevor Eden (Nelson).—We are interested in your photograph showing the addition of lamps to your model chassis. No doubt the fitting of this lighting installation has afforded you a considerable amount of entertainment.

Leslie King (Hyde).—We think that the present range of wheels offers a fairly good selection. In support of your suggestion we have already introduced a flanged disc and pulley wheel of approximately 5½" diam., and also rim segments to form a wheel with a diameter of 11½".

W. Womersley (Sheffield).—Your suggested rod with flatted ends and pierced is alright to a certain extent, but in no two instances would the same size be required.

H. Guerrier (Ealing, N.)—An internal combustion engine on so small a scale as you suggest is quite impracticable.

A. Nairn (Perth, W. Australia).—The subject of circular elements is constantly being dealt with in these columns.

F. Spencer (Thurcroft).—We have designed a ball race element for use as a swivelling base for cranes, etc. This is illustrated in Model 401 in the No. 3 Complete Manual.

T. Tasker (Barnsley).—We list a special shoe for picking up the current from a centre rail. Thanks for suggested switch contact piece. We shall keep this before us when we make revision of the Electrical Manual.

R. P. Jones (Dulwich, S.E.).—A longer threaded pin commends itself and we shall keep the idea in mind. We do not see much advantage in single flanged plates and single angle strips. Smaller springs have already been suggested.

C. H. Wise (Grantham).—We have several good electrical models for inclusion in the Electrical Manual, when it comes under revision. 3½ × 2½ flat plates have many advantages, and we shall consider them. We hope to publish shortly an illustration of a Meccano electric loco designed to pick up the current from a third rail.

L. Herdman (Birmingham).—We do not think that a rack rod would be of general use, and its inclusion would not be justified for the one purpose you mention.

Arthur Price (Warrington).—We do not recommend the use of Meccano strips and girders in the formation of train track. Curves offer a very serious difficulty.

Norman Ward (Kings Langley).—Our present milk van would serve equally well as a fruit van. They are almost identical in design.

C. G. Read (Guildford).—For what do you consider a perforated rod would be useful? A wider pitch worm wheel has already been suggested. We are exploring the possibilities of helical gears and propose increasing the variety of bevel gears shortly.

Fred Poultney (St. Helens).—An H-girder may be constructed from existing parts by bolting four angle girders to a flat girder.

J. Brackett (Upper Tooting, S.W.).—Rails with wooden sleepers are scale model equipment which we do not list. Thanks for criticisms of our rails, we are making considerable improvements in the method of manufacture.

Ronald Stansfield (Southampton).—Corner brackets No. 133 and architraves serve the purpose of bracing pieces.

R. J. Mellan Amersfoort, Holland).—We have recently introduced a flanged disc of about 5" diameter which we think would serve the purpose of your suggestion.

W. F. Coates (London, S.W.).—(1) The small flanged disc attached to the face plate forms a flanged wheel of 2½" dia. (2) We have the matter of single angle strips already before us.

W. G. Roberts (Hove, Sussex).—(1) Wrap the cord two or three times around the crank handle and tie with two ordinary half hitches. This will make a secure fastening. (2) We are afraid we cannot follow your ideas for eye-pieces of the same sizes as the perforated strips. (3) A station for use with Hornby trains is already on the market. Tunnels, Water Tanks, Level Crossings and Signal Boxes will probably be available this year.

C. W. Cubitt (Ipswich).—We are at the moment engaged on a suitable sliding action.

Edgar Plunkett (Dublin).—We shall consider the addition of a flange to the clockwork motor.

R. Stimson (Lowestoft).—Boat equipment such as you suggest would have no general use.

Ewart Clee (London, N.W.).—We are bringing out a variety of signals this year.

E. Robertshaw (Nelson).—We are already giving the matter of a double crank shaft close attention.

L. R. Stockdale (Thirsk, Yorks.).—The increased perforation of the sector plate is under consideration.

Will Kidston (London, N.).—We are preparing a further variety of train accessories this year, and shall announce full particulars in the "*M.M.*" in due course.

J. Denis (Keighley, Melbourne).—(1) We have not yet found any uses for cams in Meccano construction. (2) Compression springs may easily be made from the expansion springs by simply extending the coils.

A. H. Miskin (E. Warwick, Queensland).—Your list of suggestions is interesting, but most of them duplicate existing parts. Under your heading marked 4 instead of using a bolt as a bearing for a wheel, we recommend the employment of a threaded pin.

D. J. Davies (Tottenham, N.).—Nearly all the train accessories you mention are already in course of preparation. Announcements concerning them will be made shortly.

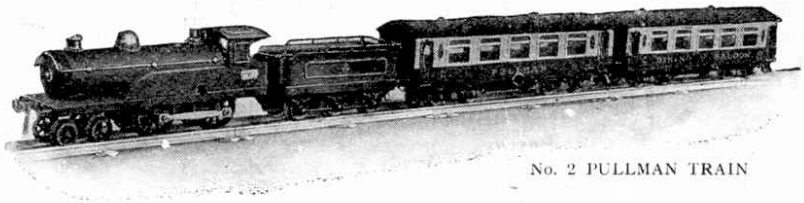
J. Aighton (Clayton-le-Moors).—Such a part as you suggest could not be made from one piece of metal. Since you admit that this formation may be obtained from existing parts, there would be no object in introducing a set piece to carry out the same functions.

B. Condon (Chiddingstone).—The difficulty about curved sections is determining the most useful diameters.

HORNBY CLOCK WORK TRAINS

THE TRAINS WITH THE GUARANTEE

A most valuable and remarkable feature of the Hornby Train is that it can be taken to pieces and rebuilt just like a Meccano model. All the parts are standardised, and there is as much fun taking Loco, Tender, Wagon, and Coaches to pieces and rebuilding them as there is in playing with them. Any lost or damaged parts may be replaced with new ones.



No. 2 PULLMAN TRAIN

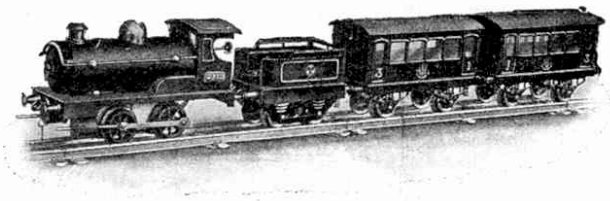
HORNBY TRAIN PRICES

No. 1

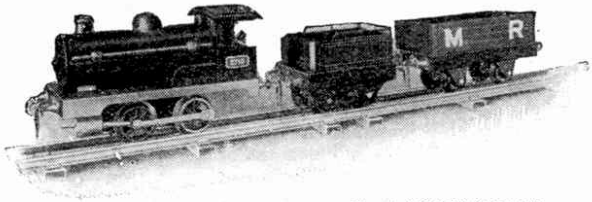
Goods Set	25/6	Wagons ... ... each	3/9
Passenger Set	35/-	Tenders ... ... ,,	3/6
Locos ... ... each	16/-	Passenger Coaches ,,	6/6

No. 2

Goods Set	45/-	Wagons ... ... each	3/9
No. 2 Pullman Set	70/-	Tenders	4/-
Locos ... ... each	30/-	Pullman Cars ...	16/-



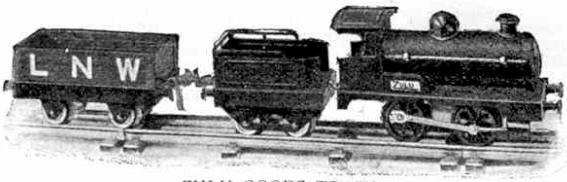
No. 1 PASSENGER TRAIN



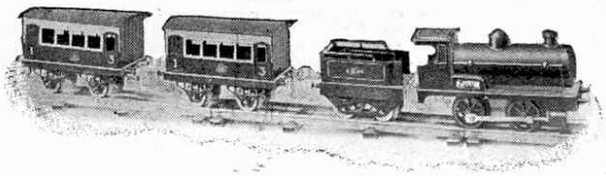
No. 1 GOODS TRAIN

ZULU CLOCK WORK TRAINS

The Zulu Clockwork Train is a cheaper type of mechanical train, the chief characteristics of which are fine and durable mechanism and immense strength of construction in all parts. The Zulu Loco is well designed and efficient, and will give long and excellent service. Richly enamelled and highly finished ; fitted with brake and governor ; non-reversing.



ZULU GOODS TRAIN



ZULU PASSENGER TRAIN

Zulu Train Prices

Goods Set	18/6
Passenger Set	25/
Locos ... ... each	10/6

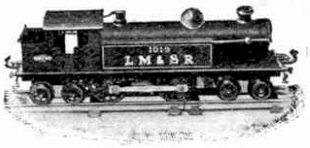
GUARANTEE

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.

Zulu Train Prices

Tenders ... ... each	2/6
Wagons ... ... ,,	3/-
Passenger Coaches ,,	5/-

TANK LOCOS



Hornby Tank Loco

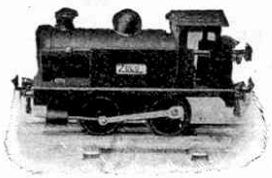
The Hornby Tank Loco is a powerful model embodying all the characteristics of the Hornby Train. It is 11½" in length and is fitted at both ends with a special bogey.

Price 32/6

Zulu Tank Loco

A strong and durable loco capable of any amount of hard work ; richly enamelled and highly finished ; fitted with reversing gear, brake and governor.

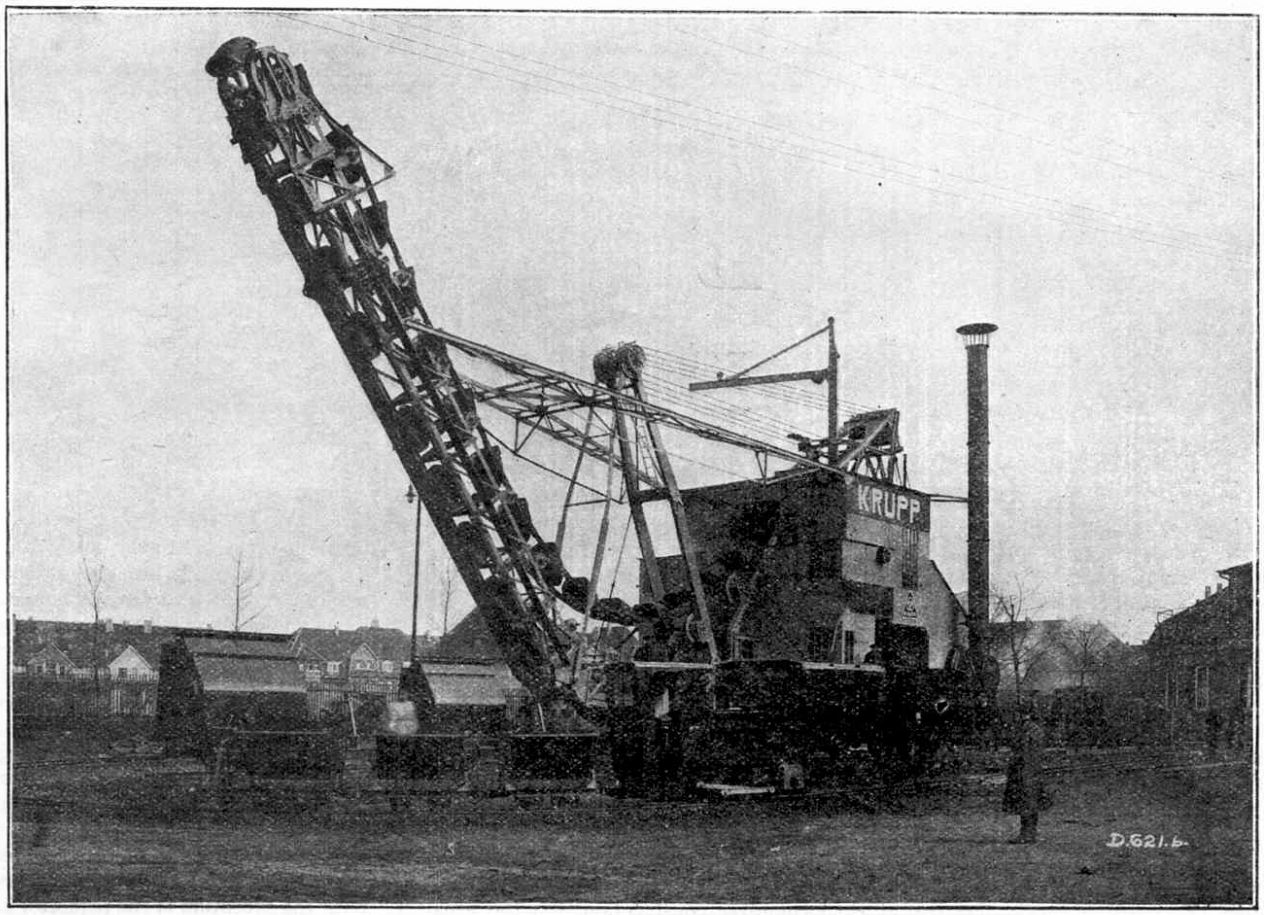
Gauge 0, in black only ... 12/6



FROM ALL MECCANO DEALERS

Stronger Than A Thousand Men

A GIANT BUCKET CHAIN EXCAVATOR



Monster appliances, such as this Bucket Excavator, have made possible many great engineering achievements

THE attention of all Meccano boys has recently been drawn to the Ruhr Valley by the activities of the French, who have occupied this district in the hope of exacting reparations from Germany that were not previously forthcoming. One of the principal towns of the Ruhr is Essen, now occupied by the French troops. Essen is a large manufacturing town situated in the heart of the German coal mining district of the Ruhr. The town itself is particularly noted for the fact that Messrs. Krupps' works are situated there.

At these great engineering works all manner of appliances are manufactured. During the war the works were the centre of feverish industry, day and night, supplying the German army with munitions and war materials of every description. It was here that the "Big Berthas"—the long range guns that shelled Paris—were made, as also were most of the giant howitzers that are now familiar objects in parks and public places in this country.

Now that arms and other war-like materials are no longer in demand, Krupps' works are engaged in the manufacture of agricultural implements and similar machines of a more peaceful nature.

We are able to illustrate one of these machines—a giant dredger. These dredgers are used for levelling surfaces in canal work, and for clearing farm-land by removing surface rock and other materials in order to lay bare the soil beneath. They are also used to obtain lignite or brown coal, which generally lies near the surface, and in connection with the mining of all kinds of minerals.

This remarkable dredger runs on rails. The frame arm that carries the bucket chain may be lowered or elevated to any required position in which to work. If lowered to the ground, or beneath the level of the ground, it may be used for subterranean excavation.

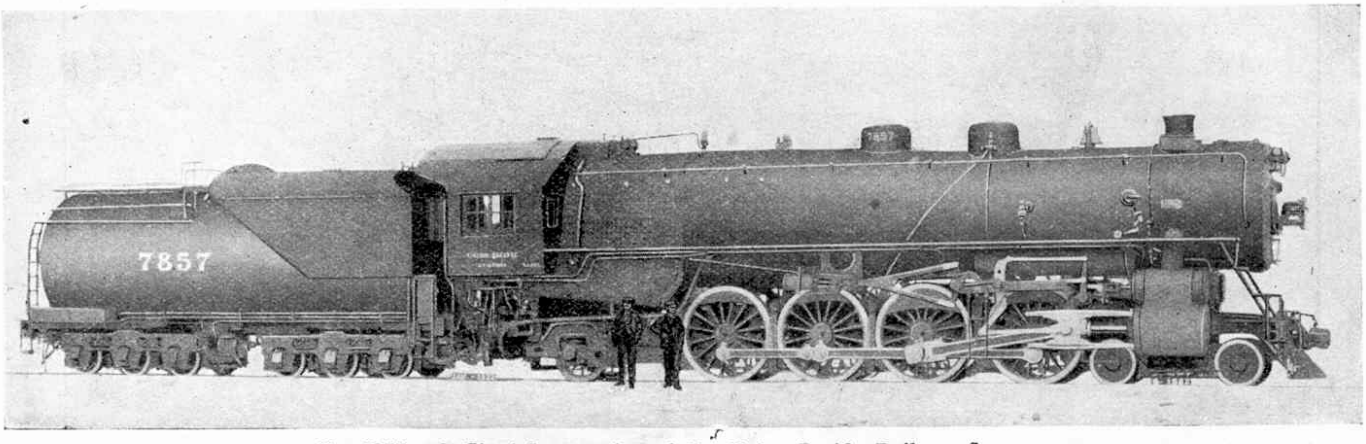
It was appliances of this type that made possible such wonderful achievements as the cutting of the Panama Canal and other similar great engineering works, that have so greatly benefited mankind.

It is of interest to note that in principle these machines are very similar to their "sailor brothers"—the sea-going bucket-dredgers. In both cases the buckets which scoop up the material are on an endless belt. When in a river the bucket-dredger lowers the arm carrying the buckets down to the river bed and scoops up the material. The mud or sand is then loaded into a lighter or "hopper" alongside, which is towed out to sea and discharged.

The story of dredgers and dredging is a very fascinating one indeed, including as it does the remarkable ships that discharge their loads by dropping the vessel's bottom out while at sea, and dredgers that can fill themselves with 10,000 tons of material in less than an hour. An interesting article giving illustrations and full particulars of these wonderful machines, which are convincing examples of the marine engineer's skill, will be published in a future number of the "*M.M.*"

GIANTS OF THE RAILROAD

American and British Locomotives Compared



No. 7857. A Giant Locomotive of the Union Pacific Railway Company

THOSE of our readers who are interested in railways—and judging by the continual flow of queries on railway subjects, there must be many tens of thousands of such—are all familiar with the fact that the giants of the locomotive world are to be found in America. In that country the cry for more speed and power has been developed to such an extent that some American locomotives are built on proportions so gigantic as to make us pause with wonder and awe.

Look, for instance, at the huge monster illustrated above! Note its gigantic proportions as compared with the two men standing alongside. Note its eight coupled-driving wheels, its enormous boiler, the height of the cab, and lastly its great length. Then by way of contrast compare the photograph with that of Stephenson's early locomotive on page 61 of this issue and you will realise what is meant by the "triumph of engineering"—more especially so when we remember that there is an interval of barely a hundred years between the date of these two locos.

The amazing engineering progress of the past hundred years is nowhere better shown than in the evolution of the locomotive. In this article the writer shows how the locomotives of America exceed the size of those in Britain, although the home of the locomotive was in England. He shows also that the reason for this is governed largely by local conditions. A comparison of American and European locomotives is always interesting—more particularly so at the present time, after the recent introduction of the new and powerful "Castle" type of the G.W. Railway.

Why America Builds Giant Locos

Although American locomotives may lead in point of size, the locos of British railways make quite a good show, and in this article we shall compare one type with the other. In doing this we may remember that American locomotives are built for a different gauge and are designed for a more varied class of work than those used in our own country.

America will probably always lead the way in this respect, for it is not necessary for us to have such powerful locomotives. The "*Caerphilly Castle*" is the most powerful express passenger loco in the British Isles. It is the first of a new class of ten, each of which will be named after some famous castle, with numbers running from 4073 to 4082.

Belonging to the 4–6–0 class, these new locos incorporate several important departures from previous designs. In the first place larger cylinders have been fitted, and steam is supplied from a new type of boiler. This type of boiler, which is now becoming increasingly popular in locomotive construction, has the usual standard features, but the dimensions have been considerably increased.

New Type of Cab

The tractive power of the ordinary four-cylinder engine now in general use is 27,800 lbs., but this new type of engine increases the effort to 31,625 lbs. This increase has been effected by giving an additional inch to the cylinders, making them 16 in. in diameter, the piston stroke of 26 in. remaining as before.

The valves are of the inside admission type and are connected by horizontal rocking-arms and driven by two sets of Walschaerts' motion between the frames. Steam is conveyed to the outside cylinders by external pipes brought through the smoke-box sides and directly connected to the steam-chests, the inside cylinders being supplied through passages in the saddle.

The coupled wheels retain the standard diameter of 6 ft. 8½ in. and the bogie wheels the diameter of 3 ft. 2 in., and no change has been made in the total length of the wheel base, except to increase by 1 ft. the overhang of the rear end. This has made it possible to fit a new type of cab, the roof of which has been extended and the sides fitted with larger windows. With the exception of the regulator handle, no fittings project into the cab, thus giving more room for both driver and fireman, for whom tip-up seats have also been provided.

An American Giant

Having gained some idea of the improvements in this new British loco, let us now compare them with one of the giants of America.

No. 7857 is one of several locos that were recently built to the order of the Union Pacific Railway. These have proved highly satisfactory for hauling heavy goods trains over the very hilly country traversed by this railroad. They embody all the latest engineering improvements, and may be said to be representative of the latest phase of American locomotive construction.

Perhaps their most interesting features are to be found in the boiler and superheater, together with their various accessory apparatus. The boiler is of the usual straight-top type with an inside diameter of 82½ in. and a pressure of 200 lbs.

The grate is of the table type, is equipped with a power-operated shaker, and has an area of 84 sq. ft. It is fed by an Elvin mechanical stoker, driven—as are the other auxiliaries—by superheated steam. This mechanical stoker does away with the necessity for manual labour on the part of the fireman and is both compact and light—important considerations in the construction of locomotives of this type.

The inner firebox, which is made of steel, is 10 ft. 6 in. in length and 8 ft. in width. A double firebrick arch is used instead of the usual combustion chamber. It consists of two sets of refractory bricks, supported on rows of four arch tubes, which greatly increase the heating surface and materialy promote water circulation.

Large Tubes Fitted

The tubes contained in the boiler barrel are of a relatively large size on account of the fact that a number of them are coupled by the elements of the superheater. This superheater is of a greatly-improved design and imparts a higher temperature to the steam than that given by the ordinary pattern. It allows a greater steam area through the element tubes, besides permitting the passage of a larger volume of gas, which in turn ensures a better transference of heat. Heat losses at the stack, too, are greatly reduced by this new arrangement. There are no dampers, as in British locos, and as the regulator is between the superheater and the cylinders, protection against excessive heating when the engine is shut off is afforded by the flow of steam to the blower, pumps and other auxiliary apparatus.

The total superheating surface is 1,331 sq. ft. and including arch tubes, flues, firebox, heating surface and tubes, the total heating surface, inclusive of superheater, is 6,302 sq. ft. Consuming bituminous coal at the rate of 138 lbs. per hour per square foot of grate area (or a total of 9,180 lbs. per hour) the boiler shows an hourly evaporation of 56,900 lbs. of water, which according to the Cole method of calculation (a system in general use among railway constructors and engineers) corresponds to over 2,735 boiler horse-power.

There is a great interest amongst our readers in railway matters. We shall endeavour to include more articles on this subject in our future issues, if space permits. The Editor will be pleased to consider any articles, photographs, or sketches dealing with railways, locomotives and kindred subjects. Payment for those published will be made at our usual rate.

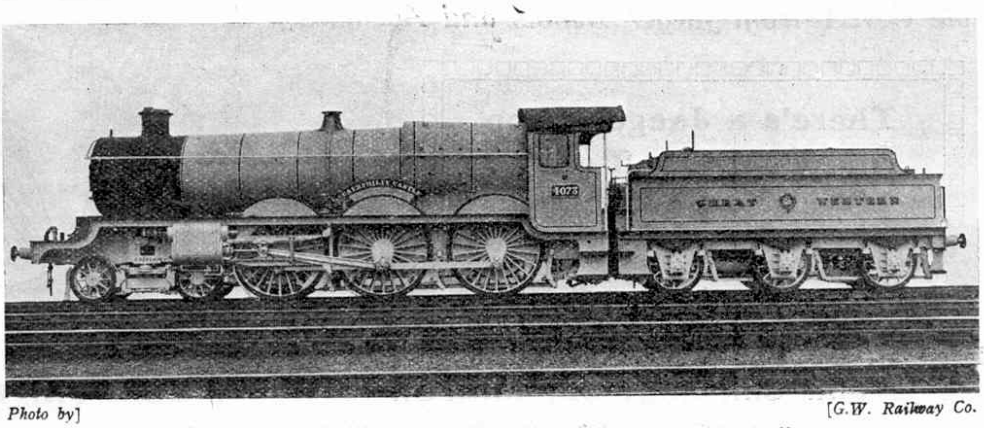


Photo by] [*G.W. Railway Co.*

The New Four-cylinder "Caerphilly Castle" of the G.W. Railway

Power-operated Accessories

The firebox door, reversing gear and sanders are all operated by compressed air. The usual electric head, cab and rear lights are provided, and steam-operated grate shakers for clearing or dumping the fire are additional improvements. When not delayed by any obstructions, these engines cover the entire railway division in 5 to 6 hours drawing a full load. They steam well, and keep the pointer on the 180 mark easily against the injector at a full capacity of 5,000 gallons per hour.

The cab is of the Canadian Pacific Railway type and the fittings, in addition to power reversing gear, include a pyrometer and two reflex water gauges of the Ashcroft type. The right side gauge is tapped into a water column which is in turn tapped into the back head of the boiler, while the left gauge is tapped directly into the boiler head.

The Latest in Tenders

A novel departure has been made in the shape of the tender, which somewhat resembles a petrol tank wagon. Nearly circular in shape, it is built on the usual frame and runs upon two six-wheel bogies. It is fitted with an up-to-date and improved water scoop and has a capacity of 12,000 gallons and 20 tons of coal. In working order this tender weighs 242,100 lbs., which added to the weight of the engine, i.e., 348,000 lbs., gives a total for both of 690,100 lbs.

In spite of its huge weight and apparently complicated arrangements, however, the engine is exceedingly easy to handle in practice, special attention having been given to this point in both the design and construction. Manual labour is practically eliminated and all controls are grouped conveniently on either the driver's or the fireman's side. The whistle, cylinder-cocks and bell (the latter device being a feature never seen on our English locomotives) are all actuated pneumatically.

Specification	Caerphilly Castle	Union Pacific 7857
Gauge of track	4 ft. 8½ in.	6 ft. 8½ in.
Length of engine and tender	65 ft. 1¾ in.	79 ft. 11½ in.
Cylinders, diameter	16 in.	29 in.
,, stroke	26 in.	28 in.
Boiler diameter	61-15/16 in. (outside front)	82½ in. (inside)
No. of fire tubes	201 2 in.	239 2¼ in.
,, ,, flues	14 5⅛ in.	48 5½ in.
Grate area	30.28 sq. ft.	84 sq. ft.
Heating surface (firebox)	163.76 sq. ft.	345 sq. ft.
,, ,, (tubes)	1,885.62 sq. ft.	3,084 sq. ft.
Total heating surface	2,312 sq. ft.	4,971 sq. ft.
Water capacity of tender	3,500 gallons	12,000 gallons
Maximum tractive effort	31,625 lbs.	54,838 lbs.

Comparative Details

From our description it will be seen that the Union Pacific locos are very different in construction to the G.W.R.'S "Castle" class, or, indeed, to any of our British locos. The classified comparison of heating surfaces, grate areas, boiler diameters, etc., given will make the contrast even more clear.

Interesting Paragraphs

The late Sir James Dewar, the discoverer of liquid air and inventor of the Thermos Flask, was known as a scientist throughout the world. He had received honours and distinction at the hands of nearly every scientific body in existence.

The Old Colwall Tunnel, which takes the Great Western Railway through the Malvern Hills and has done service for more than fifty years, is to be replaced by a new tunnel. This will run parallel with the old tunnel at a distance of 45 ft. from it. It will be 1,600 yards in length, will cost about £200,000, and will take about two years to construct.

Another most important discovery has been made in one of the Sheffield laboratories. This is a tarnish-resisting alloy, which is in reality "stainless silver." The new product is called "Silanca," and owing to the small percentage of other metals that it contains, it is entitled to carry the silver hall-mark.

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Motoring in Shakespeare's Country

By Master Brian Bentley

(This Essay won the First Prize in our recent Holiday Essay Competition).

MOTORING is a delightful method of spending a holiday, and I do not think that I enjoyed any tour as much as the one we had last summer, when we went through the country where Shakespeare lived. We started out from Bridgend for Uppingham at about half-past five on a Sunday morning in July. We had two objects in view—one to have a short holiday, and the other to see Uppingham School, where I was to go next term. Morning and evening seem to me to be by far the best times for motoring in the summer, for the air is so beautifully fresh and cool. As you rush through it it makes you feel that you would like to go on and on for ever! That particular Sunday morning was perfect. Not a soul was to be seen, except some farm-labourers going to attend to the cattle, and a lonely wayfarer trudging along the deserted lanes.

Shakespeare's Birthplace

We first passed through Caerlon, that romantic old place which was the scene of many of the exploits of King Arthur and the Knights of the Round Table. Having passed Monmouth and the River Usk, we reached the Valley of the Wye, where the scenery became more and more beautiful. It was here that we came across a relic of the past—a toll-gate. Outside the little lodge was a notice stating the various charges, and beginning with the quaint "toll for an ass laden." Further down came the "toll for a motor vehicle," so that the ancient beast of burden was placed side by side with the modern vehicle of transport.

The next place we came to was Ross, where there is an old red Market Hall. It was here that I took out my camera to put in a new film and take a photograph. But alas! I found I had no empty spool on which to wind the film, and I was forced to pass the old Market Hall without taking a photo of it. However, I was able to take it on my way home, but it was heart-rending to have to leave all the beautiful views until the return journey because I had no film!

A rather amusing incident happened while we were in Ross. Looking round for somewhere to get a spool, I noticed a shop open. We enquired for a V.P.K. spool and the man said he thought he had one. After a search under the counter he returned with a *spoon!* I am sure I do not know what he thought a "V.P.K. spoon" was!

Our next place of call was Gloucester, where there is a beautiful cathedral. We did not stop, however, because of the small-pox epidemic, and also because we desired to get to Tewkesbury as quickly as possible for some breakfast! Tewkesbury is the "Nortonbury" of that famous book "*John Halifax, Gentleman.*" There again, ancient and modern lay side by side, for in the old coffee room of the "Bell Inn" was a notice that "Marconiphones are sold here!"

The Abbey Church is in a wonderful state of preservation and looks very grand from outside, but the interior is even more lovely with its stained-glass windows. Its 800th anniversary was celebrated last year, and there are few buildings in all England that have so many historical associations. It escaped the destruction of abbeys and churches in the reign of Henry VIII, and stands to-day almost exactly as it was built in the early part of the twelfth century.

Memorial Theatre, Stratford-on-Avon

From Tewkesbury we travelled through the heart of the apple-growing country to Evesham, where there is a glorious view from the river-bank. Boats and punts were moving up and down the river, and a church surrounded by trees added beauty to the scene. Between Evesham and Stratford-on-Avon we passed many fine old cottages with white fronts lined with black wooden beams, and surrounded by pretty little gardens. These quaint little houses became more and more numerous as we neared Shakespeare's native town.

Stratford itself is a picturesque old place. One thing I noticed particularly was the way in which the atmosphere of old England seemed still to be preserved. Even the modern houses are built after the style of the old ones, in order not to spoil the old-fashioned appearance of the place. I was disappointed on the way home that I had no time to take a photograph of Anne Hathaway's cottage, which is some distance out of the town. However, I took a photograph of the house in which Shakespeare was born, and another of the Memorial Theatre, which, of course, is known all over the world. The view from the grounds of the latter was nearly as lovely as that at Evesham, being also of a river with a church on the bank.

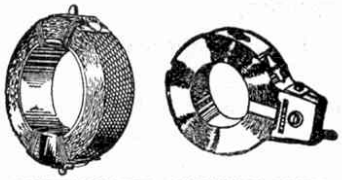
From Stratford we went to Warwick, eight miles away, and here I got a photograph of one of the corners of the Castle. Seen from the street, the tower with the sunlight shining on it made a very pretty picture indeed. After passing through Warwick we did not come to many places of interest, but the country was still as beautiful as ever. Near Leamington the trees often met overhead, forming a natural archway of foliage, broken now and then by a patch of sunlight. At Leamington I felt like stopping to see the famous Meccano Club, but remembered in time that it was Sunday! Between Leamington and Market Harborough there seem to be multitudes of small villages, but a most confusing medley of villages came between Market Harborough and Uppingham.

According to our guide book we had to go through Rockingham and Coltingham. Here and there we found sign-posts directing us to these places, but, although we followed the road along which they pointed we never found either of the places. At last, however, we got to Uppingham by another route. We *were* tired, which is not surprising, for we had travelled about 190 miles that day. We went to see the school that night, and started for home at eleven o'clock next morning, where we arrived without a mishap after a most enjoyable trip through glorious country.

The Avon at Stratford

FOR DEPENDABILITY OF OPERATION USE

"IGRANIC" RADIO DEVICES



HONEYCOMB INDUCTANCES

(De Forest Patent No. 141344).

These world-famous coils are renowned for their high efficiency, low self-capacity, small absorption factor and minimum high frequency resistance. No dead-end losses. Each turn surrounded by air pocket. Made in two types, gimbal and plug mounted. Wave lengths approximately 100 to 25,000 metres. The only coils that uphold their claim for negligible losses. Prices vary with sizes.

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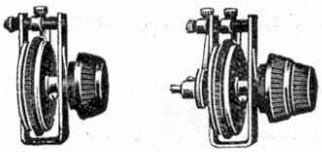
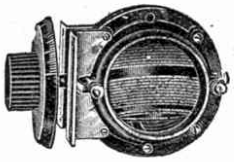


FILAMENT RHEOSTATS

(Patent No. 195903).

A splendid instrument for filament control under all conditions. Novel method of construction ensures smooth and silent operation. Designed for individual valve control. Adjustable contact finger permits of resistance values from zero to four ohms by fine variation. Supplied in two types, plain and vernier. Prices : Plain, 4/6. Vernier, 7/-.



TYPE "H" VARIOMETER

Recommended for use in the aerial circuit of crystal and valve sets. Wave length range approximately 150-600 metres, with P.M.G. standard aerial. Stator and rotor best quality mouldings, windings self-supporting and impregnated solid. Price, with knob, dial and fixing bracket, 15/-.

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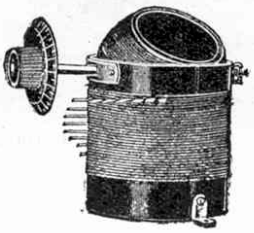

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Splendid Essay Competition *for boys under 14*

WHAT YOU HAVE TO DO.

Write an Essay of not more than 500 words on "Why I should like an AUTO-SCOOTER for my next present." Then send it to the Editor of the "*Meccano Magazine.*" Closing date for entries from the United Kingdom 31st March, Overseas 30th April next. The Editor of the "*M.M.*" has kindly consented to act as judge, and for the two best essays we will give the following—

First Prize : Our Model-de-Luxe Scooter, as illustrated.
Second Prize : Our Popular Model with Solid Tyres.

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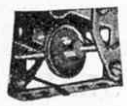
Competition Corner

Competitions are now a strong and popular feature of the "M.M." Some splendid new ones are being prepared and will be announced in our future issues. On page 79, particulars are given of the £250 Championship Contest for the best models, which every reader of the "M.M." should enter.

For Lynx-Eyed Readers

FINAL SET OF PUZZLE PICTURES



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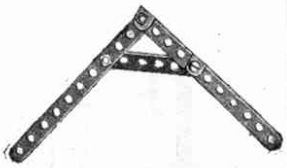

No. 15 .....

No. 16 .....

No. 17 .....

No. 18 .....

WHAT YOU HAVE TO DO

Above is the third and last set of Puzzle Pictures in this novel competition. Each picture represents part of some model in the current 0-3 Meccano Manual of Instructions.

Readers of the "*M.M.*" who know their Manuals well, should have no great difficulty in finding out from which models the Puzzle Pictures have been taken. As each one is identified, write the number of the model beneath the Puzzle Picture, until all six pictures are solved. Then turn to the other two sets, which appeared in the January and February issues, and write on a postcard the numbers of the pictures, and against these write what you think are the numbers of the models from which they are taken. When all eighteen numbers have been set down, write your name, address and age on the postcard and send it to "Puzzle Pictures," *Meccano Magazine*, Binns Road, Liverpool. No other matter should be written on the postcard, except the solution to the puzzles and the competitor's name, age, and address. Entries should reach this office by March 31st (Overseas, June 30th).

Competitors should remember to write neatly, as in the event of a tie, neatness will be taken into consideration. If no competitor succeeds in numbering all the models correctly, the prize will be awarded to the competitor who sends in the best effort. Other prizes will be awarded in order of merit.

FIRST PRIZE :—Hornby No. 2 Passenger Set.
SECOND PRIZE :—Zulu Goods Set.
THIRD PRIZE :—Electric Motor.
CONSOLATION PRIZES :—12 Meccano Writing Pads and 12 Complete Manuals.

Remember that this contest closes on March 31st, and on June 30th for Overseas readers. Make sure of being in time and send in your attempt to-day. The results will be published in the May number of the "*M.M.*"

Competition Closing Dates

1924	25 Mar.	Puzzles (see p. 83).
	31 Mar.	Puzzle Pictures.
	"	Stamp Essay.
	15 April	£250 Championship.

Overseas Closing Dates

1924	31 Mar.	Essay.
	30 April	Drawing.
	30 May	£250 Championship.
	30 June	Puzzle Pictures.
	"	Stamp Essay.

Seventh Photographic Competition

Our photographic competitions continue to attract large numbers of entries, and we have pleasure in announcing another competition. This is the Seventh Photographic Competition, and, as before, there will be no restrictions except that the photographs entered must have been taken (i.e., exposed) by the entrant. The plates or films may have been developed or the prints made by others. This fact must be stated on each entry, however, as naturally if two photographs tie for first place, preference will be given to the one that is the sole work of the competitor.

The subject of the present competition is :—

AN OUTDOOR SCENE

and the contest will be divided into two sections: (A) For those of 16 years of age and under, and (B) for those over 16 years of age.

The Prize will be goods to the value of 10/6, to be chosen from our catalogue by the winner. Closing date 30th April next. (For Overseas Readers 30th July).

FOR OVERSEAS READERS
Drawing Competition

As already announced, a drawing competition has been arranged in response to numerous requests, the subject to be : "*The Editor of the 'M.M.' as I imagine him to be.*" In this competition the drawings may be of any size and the subject may be treated in any manner desired, i.e., it may be either in black and white, pencil, crayon or wash.

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

(A) Boys under 12 years of age.
(B) Boys of 12 years of age and over.

A prize of a Hawk-Eye camera, manufactured by the Kodak Company, will be awarded in each section. The closing date for entries Overseas is 30th April, 1924.

Essay Competition for Stamp Collectors

Our last essay contest (the result of which will be announced next month) clearly showed that there are many thousands of keen stamp collectors among readers of the "*M.M.*" It has been decided to hold another essay competition, this time the subject is "My Favourite Stamps and Why I Like Them." Some special set, or stamps of a certain colony or even stamps of a country should be chosen and described, and the reasons for your choice given. The essay must not exceed 500 words and is to be written neatly on one side of the paper only. Envelopes containing the entries should be marked "Stamp Contest" in the top left hand corner and sent to the Editor of the "*M.M.*," Binns Road, Liverpool.

The first prize will be stamps to the value of 10/6, to be chosen by the winner himself from any firm advertising in the pages of the "*M.M.*" Make your choice when you send in your essay, and give full particulars of the stamps required, so that the prize may be sent direct to you in the event of your success. Closing date March 31st (Overseas Readers : June 30th, 1924).

"Why We Should Buy British Toys"

Results of Interesting Essay Competition

There is little doubt of the correctness of the New Auto-Scooter Company's claim that their scooter is "the Sporty Toy for the Sporty Boy." Hundreds of sporty Meccano boys all over the British Isles made valiant efforts to secure one of the splendid prizes awarded by this enterprising company, and the essays on "Why We Should Buy British Toys" showed considerable care and thought. The winner of the Competition was Master G. S. Marsh, of Thornton-le-Fylde, Preston, and the first prize of a Model de-Luxe Scooter fitted with pneumatic tyres, has been despatched to him. The essay entered by Master R. Shearer (age 8), of Bradley, Keighley, was adjudged second, and he has been awarded the second prize of a Popular Model Auto-Scooter.

So great has been the interest taken in the Competition that the New Auto-Scooter Company have decided to conduct another contest, so that our many thousands of Overseas readers will have an opportunity of competing. Full particulars of this second competition are given on page 72, and although the closing date for the United Kingdom is not until March 31st, readers are advised to send in their entries as soon as possible.

Mark your envelopes "*Auto-Scooter*" in the top left hand corner and address to the Editor, the *Meccano Magazine*, Binns Road, Liverpool, who has been asked to act as judge.

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