A Novel Excavating Machine

The "Henderson" Cable Drag-Scraper

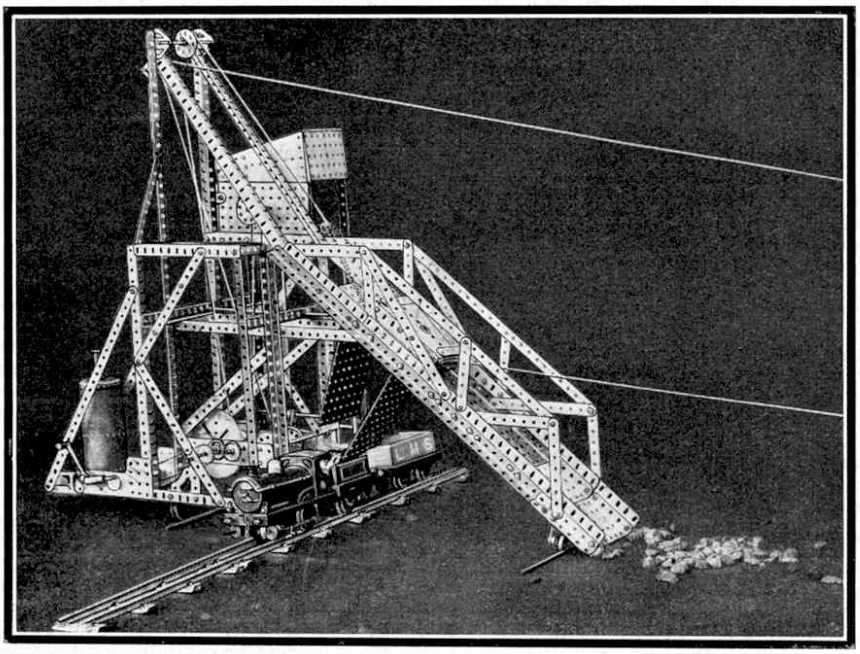
THE most remarkable feature of Meccano is the manner in which it enables actual machines and mechanisms of all kinds to be reproduced with every important detail of the original. There is thus no limit to its possibilities, and this is the reason for its ever-growing popularity with model-builders in all parts of the world.

One of the most interesting models that have come to our notice recently is a workable reproduction of a new type of excavating machine, known as a cable drag-scraper. The actual machine, which is illustrated on the next page, is a product of John M. Henderson & Co. Ltd., Aberdeen, and the model was built by D. L. Medd, also of Aberdeen.

After examining the model we came to the conclusion that other Meccano model-builders would be interested in it, and in this article we give details of its construction, together with a description of the real machine and the manner in which it works.

The cable drag-scraper is a simple and effective machine for certain kinds of excavation work, and also for storing and reclaiming coal and other bulk materials. The particular drag-scraper with which we are concerned in this article is really an experimental machine of a new type, and was designed specially for the purpose of carrying out a big excavation job in order to construct a new water outlet and sluice gate for draining the agricultural area surrounding King's Lynn, Norfolk. For this work the machine has proved entirely satisfactory.

The task is one of peculiar difficulty. The original channel was constructed many years ago, and in course of time has become gradually filled up with silt and enormous quantities of clayey mud. In order to clear the channel it was necessary to remove over 135,000 cu. yd. of this material and to convey it to a neighbouring dumping ground.



A close-up view of D. L. Medd's fine model, showing details of the mechanism and head pulleys. Note the bucket about to discharge its load down the chute to the wagons beneath.

The channel to be excavated was about 300 ft. across at the widest point, near the outlet sluice, and had to be excavated to a depth of 35 ft. below the bank, the depth of silt being from 20 to 30 ft. Owing to the fact that a large percentage of clay was present in the silt, pumping operations, which normally might have been employed on a job of this kind, could not be resorted to. Further, the fen-like nature of the ground banned the use of ordinary heavy dragline excavators for even when mats and caterpillar tracks were tried the ground would not sustain the weight of a dragline. It was therefore finally decided to employ a drag-scraper.

One of the principal advantages of this machine is that its use obviates the necessity of second handling of the excavated material, for the drag bucket excavates, conveys and deposits its load direct into waiting tipping wagons.

The machine consists of a bucket or scoop of special form without a bottom. This is hauled backward and forward by means of wire ropes. When travelling forward the bucket digs into the material and fills itself, after which it travels forward holding the same material till it is stopped. When the hauling machine is reversed, the bucket travels backward and leaves its load behind.

On one side of the ground to be excavated there is a head carriage, built of steel sections and plates and arranged to travel on a rail track of 22 ft. centres, laid parallel to the channel to be dug. An electrically-driven double drum winch is mounted on this carriage, and operates the in-haul and out-haul ropes, which drag the bucket backward and forward. The front of the head carriage is in the form of a steep ramp built of steel plates fitted with removable wearing strips. The bucket is fitted at its front with skids, and when the full bucket reaches the carriage it travels up the ramp and is allowed to come to rest on a horizontal grid, through which its contents are discharged into trucks passing underneath. When the bucket has discharged its contents it is travelled back for another load.

A small ballasted tail carriage runs on a double narrow gauge track on the other bank of the channel, and carries the return pulley for the out-haul rope. Hand travelling gear is fitted for moving the head carriage along the rails, while the tail carriage is moved along by a pinch bar. The in-haul and out-haul drums of the winch are driven by an electric motor of 50 b.h.p., which runs continuously. The drums are engaged by friction band clutches, and each is fitted with a brake applied automatically by a weight and so adjusted as to maintain at a suitable tension the rope that is being overhauled, thus preventing the ropes getting entangled or rubbing the material.

The machine is operated from an elevated cabin by one man who, in addition to the electric switch and motor starter, has only two clutch control levers, which he simply moves backward and forward one with each hand. The levers are interlocked in such a manner that it is impossible for both clutches to be engaged at the same time.

The capacity of the bucket is 1 cu. yd., and as the train wagons also hold 1 cu. yd. each bucket load fills a wagon. A train of wagons hauled by a petrol-driven locomotive is run under the head carriage and moved forward as each bucketful is discharged through the grill. A second narrow gauge track runs behind the head carriage, so that a regular circulation of wagons can be maintained between the drag-scraper and the tip. The in-haul speed is approximately 225 ft. per minute, and the out-haul speed 450 ft. per minute, the same power being expended in each direction.

Although the machine is of an unusual type, no trouble has been experienced with it, and apart from one or two minor adjustments to the bucket skids and the grill, no repairs have been carried out. The usefulness of the machine will be realised from the fact that it is capable of handling 2,500 to 3,000 cu. yd. of material per week of 60 hours, or an average of 42 to 50 cu. yd. per hour.

John M. Henderson & Co. Ltd. make other types of drag-scraper machines in some of which the tail-mast is arranged to travel radially on a circular track. Various forms of power plant are fitted according to the requirements of the work to be done.

The drag-scraper is a particularly good subject for the attention of Meccano model-builders, as will be apparent from the accompanying photographs of D. L. Medd's fine model. There is little

need to dwell in detail on the construction of the model, for its most important features are shown clearly in the illustrations.

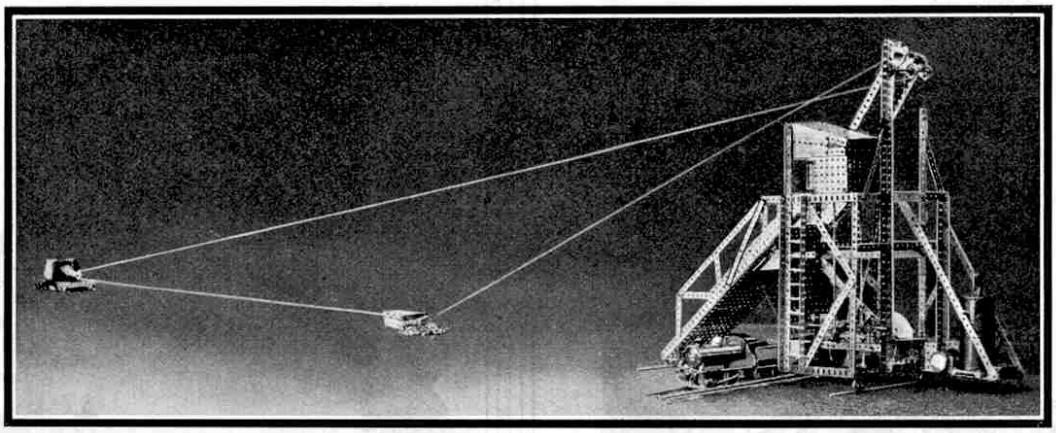
So far as the working of the model is concerned, it follows very closely the operation of the actual machine. It is driven by a Meccano Steam Engine, and will actually collect, convey and deliver material to the miniature wagons of a Hornby model railway system. It is fitted with reversing gear operated from the elevated operator's cabin, and is equipped also with brakes that are arranged so as to be applied automatically when the machine is reversed, in order to keep under suitable tension the rope that is being overhauled.

The bucket is pulled backward and forward by means of a double drum winch built up from Pulleys, and when the pulling-in drum is in gear the automatic brake is applied to the out-haul drum, so that it slips just sufficiently to allow the bucket to slide smoothly over the ground. When the bucket is being pulled outward the brake is applied automatically on the pulling-in drum.

The head carriage of the Henderson Cable Drag-Scraper, with the bucket about to ascend the ramp. The tall structure in the background is a ile-driver. For this photograph we are indebted to the courtesy of John M. Henderson & Co. Ltd.

It will be noticed from the illustration of the model that Strips and Plates form the major part of the construction which, considering the unusual working of the model, is remarkably simple. Details of the ramp, and the chute down which the excavated material descends to the waiting railway wagons, are clearly shown in the photographs.

Meccano model-builders who are also Hornby Train enthusiasts will find the model doubly interesting. Not only will they be able to apply their constructional abilities, but also when the model is completed they will be able to spend many happy hours in operating it in conjunction with their Hornby Train system. If a suitable layout is arranged many exciting and interesting manœuvres can be carried out in conveying "excavated" material to the dumping grounds.



A general view of the model, showing the method of attaching the in-haul and out-haul ropes to the tail carriage.

A NEW COMPETITION

When submitting details of his fine model Medd enclosed also a photograph and a leaflet describing the actual machine. The advantage of being able to compare a model with the machine or mechanism that it reproduces will be obvious to all readers; and it occurred to us that it would be a good idea to organise a model-building competition in which each entry must be accompanied by an illustration of the actual machine it represents.

We have therefore decided to award prizes of £2/2/-, £1/1/- and 10/6 respectively for the three best models sent in by competitors living in the British Isles, and a separate and similar set of prizes for the three best models sent in by competitors living overseas. To enter the contest it is only necessary to send a photograph of the model, together with an illustration of the actual machine it reproduces. A written description of the model must accompany each entry, and the sender's age, name and address must be written clearly on the back of each photograph.

Envelopes containing entries must be addressed "Actual Machines" Contest, Meccano Ltd., Binns Road, Old Swan, Liverpool. The closing date for the competition is 31st March, 1932.

Competitors should have no difficulty in obtaining illustrations of suitable subjects. A magazine cutting or a picture taken from a newspaper will usually answer the purpose, but of course it will be better still if, as in the case of the drag-scraper model, a competitor can obtain an illustration from the makers of the original machine.

In entering this contest competitors should note that whatever subject may be chosen for a model it must be a definite make of machine. For example, suitable subjects would be Collis or Lister trucks, Stothert & Pitt cranes, or a "Sentinel" steam wagon. A model of a truck, crane, wagon or any other machine that does not reproduce a definite original will not be eligible.

Readers will remember the remarkable model of the Garner six-wheeled motor chassis which was illustrated and described, together with the actual vehicle, in the issue of the "*M.M.*" for March, 1931. This is another example of the kind of models required in this competition.

A selection of the successful entries will be illustrated in future issues of the "*M.M.*"

It will greatly assist the competition judges if competitors will try to obtain photographs that show the details of their models as clearly as possible. This is not a difficult matter provided that certain simple precautions are taken. One of the most important points is the choice of a suitable background. For models constructed from coloured parts a plain sheet of white paper makes an admirable background and throws the main constructional details into sharp relief. After the background is arranged, the model should be studied carefully from various angles in order to find the viewpoint that shows the most important details clearly. In the case of complicated models two or even three photographs taken from different angles may be necessary to show all the essential features.

Another good plan is to suspend the model over a mirror, at such an angle that the underside of the model is reflected in the mirror. Then by careful choice of the angle at which the camera is placed, a really interesting and informative photograph will be obtained.

We hope competitors will pay particular attention to these points as in many recent competitions it has been impossible to illustrate the prize-winning models owing to the unsuitability of the photographs.