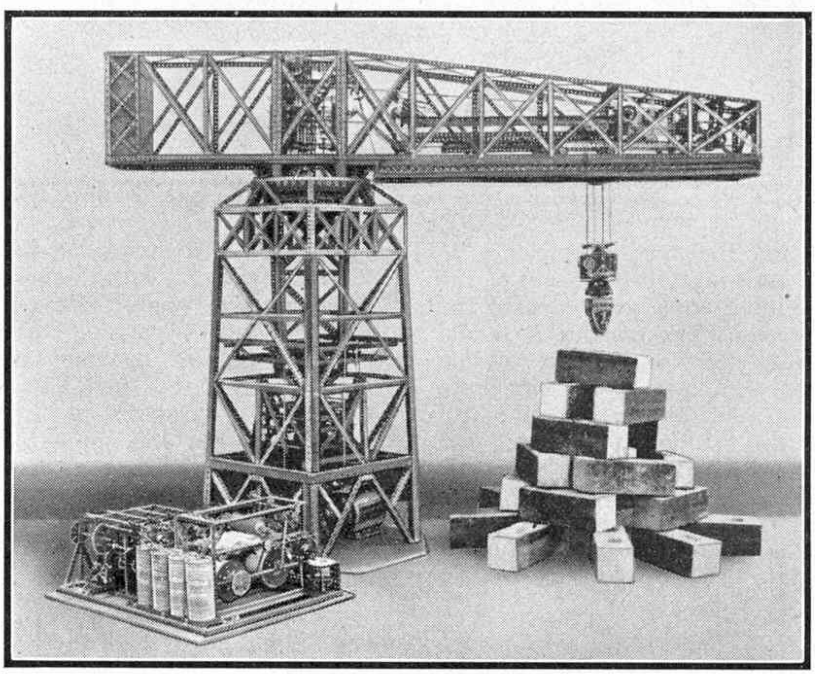
An Automatic Block-Setting Crane

Meccano Model Controlled by a Robot Unit

THE model illustrated on this page is a blocksetting crane of splendid design, but unlike other examples of this popular type it actually builds walls, simple dams or breakwaters automatically. Without any aid from its designer, it lifts up miniature blocks from piles arranged near it and places each in position with such uncanny certainty that anyone watching it at work might almost think it capable of thinking.

The builder of this astonishing model is Mr. Griffith P. Taylor, Toronto, who appears to have had a Wellsian vision of "Things To Come" in a world in which human labour will not be necessary for building up the creations of engineers and architects. He has named his model "Robot Gargantua." Its "brain centre," as it may be called, is the unit shown on the left in the illustration. This controls every movement and carries out each in its turn.



A remarkable model block-setting crane that automatically builds simple structures. Its movements are controlled by an ingenious robot mechanism, which is seen at the base of the tower on the left of the illustration. The model is the work of Mr. Griffith P. Taylor, Toronto.

Although the chief interest lies in the robot mechanism, the crane itself incorporates many ingenious and novel constructional features. For example, the boom swivels on a vertical pillar, inside the main tower, that is provided with two roller bearings, one fixed to the underside of the boom and the other to a point on the pillar itself and near its lower end. This arrangement is sometimes used in the construction of actual cranes of this kind, but is seldom adopted by model-builders. Another feature of the crane is that all the levers by which its various operations are controlled are grouped together at the base. The chief purpose of this is to enable them to be connected easily to the robot mechanism. The block-lifting gear and hoisting trolley are operated through a gear-box placed at the top of the boom pillar, and slewing of the boom is carried out through separate gearing situated at the base of the tower. All the movements are driven by a single motor mounted in the base.

The robot unit is designed so that it can be used to control automatically, not only the crane illustrated here, but also any other type of machine, such as an excavator or a dragline, that incorporates not more than five different operations. It works by moving the control levers of the crane in their proper order.

The robot is driven by the same motor that operates the crane. Its central feature is a roll of paper punched with holes set out on a pre-arranged system. The roll resembles on a miniature scale those used for operating player pianos. It is drawn slowly over a brass drum and there passes under a row of spring brushes, which are connected in separate electric circuits and press lightly on the paper. When a hole passes beneath one of the brushes, this makes contact with the drum, and so completes the electric circuit through it. This current operates a solenoid that is used to move one of the control levers of the crane by means of a special differential drive operated by the crane motor.

A revolution counter gives the number of revolutions of the shaft of the robot and also of that driving the crane. The counter is used in preparing the paper roll, which is done in the robot itself.

The method by which the exact positions of the holes is determined is very complicated, but an outline of the process will make it clear. A simple structure is first designed and a plan drawing made, after which the layout of blocks from which the structure is to be built is considered. The number of revolutions of the robot and crane driving shafts required to transfer each block to its allotted position is then determined. In a similar manner the movements of the trolleys and of the grabbing and hoisting tackles required for the positioning of each block are calculated. These calculations are then tabulated, and the machine set accordingly.

Suppose the hoisting of a block is found to require 150 revolutions of the driving shaft. The lever that controls this operation then must first be moved to start the crane working, and after 150 revolutions have been made the position of the lever must be reversed to stop the operation. The roll of paper is placed on the rollers and set in motion. As the counter registers each required number of revolutions, as set out on the tabulated list, the mechanism is stopped and a hole is punched in the paper in such a position that the appropriate brush makes contact with the drum. In a similar manner holes are punched to control other movements, and thus the complete sequence of movements required to build the structure is recorded on the paper roll. The time taken to erect the brick structure shown in the illustration was 50 minutes.