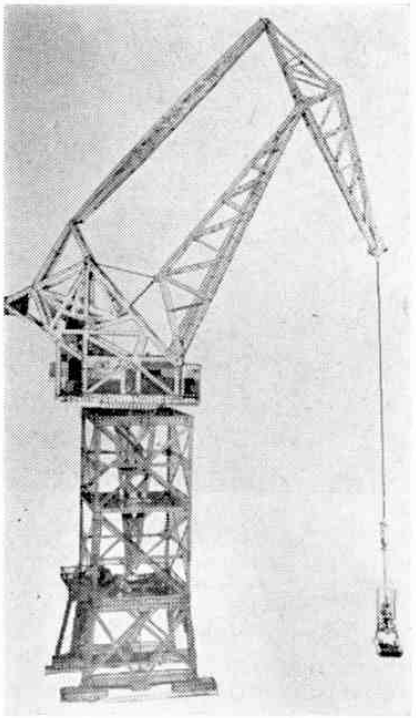


This shows just what can be done with Meccano—a scale model of a Giant Level-luffing Crane built by M.M. reader Eric Taylor of Nuneaton, Warwickshire. The prototype is found in dockyards all over the world.

GIANT LEVEL LUFFING CRANE

An outstanding model by Eric Taylor for advanced Meccano model constructors.

See "Workbench" for details of full building notes.

ILLUSTRATED IN the accompanying photographs is a Meccano Model of a Giant Level Luffing Crane which was built by Mr. E. K. Taylor of Nuneaton. This model reproduces all the movements of the prototype and was voted to be the most outstanding presentation at the Inaugural Meeting of the Midlands Meccano Guild, an independent Meccano 'Club' made up from enthusiastic adult followers of the Meccano Hobby. The type of crane represented by the model may be seen in many leading ports of the world and is probably one of the most popular types in existence due to the fact that luffing is by jib linkage so that rope replacement is required only for the main hoist.

As in the prototype, the crane illustrated is fitted with an automatic chain-operated discharge bucket but this may be replaced by a cargo hook when necessary. The model stands approximately 7 ft. 8 in. high when the main jib is fully retracted and at maximum radius the jib luffs out to a distance of 4 ft. 6 in. from the centre of the tower. Throughout this movement the load remains at the same height without any adjustment of the hoisting mechanism and this is why such cranes are known as level-luffing types. The grab bucket is of the single suspension variety, meaning that it requires one hoisting rope only. Operation of the discharge is carried out by an ingenious system of trip levers mounted in the bucket head which trigger themselves against a 'chandelier' ring suspended on a very light hoist just above the bucket.

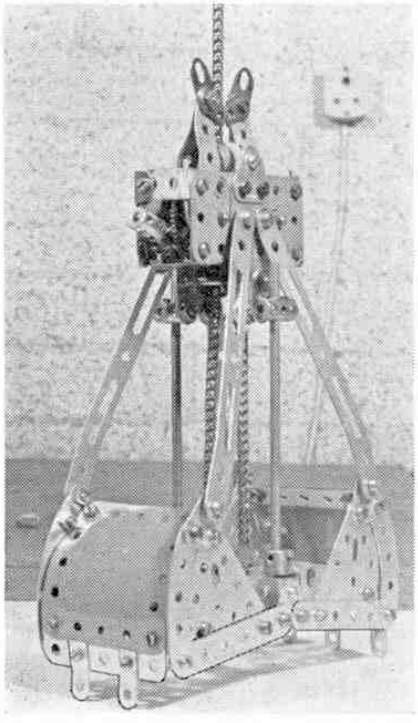
Five movements are carried out by the crane, namely luffing, hoisting, bucket discharge, slewing and travelling which it does with great realism and smoothness. All operations are remotely controlled from a control box fitted with push buttons made from Elektrikit parts. The secret of the remote operation lies in the judicious use of no less than five Meccano Motors, and the versatility of the different types is exploited to great effect in the model. One E15R, three Power Drive Units and one Emebo Motor are incorporated and each Motor is wired on a two-wire system to give forward and reverse directions. The Power Drive and Emebo units are D.C. motors and two-wire reversing circuits are easily applied to them. In the case of the E15R, which is a Universal motor normally requiring four connections for reversing, the 'fourth wire' constitutes the framework of the model, the mechanical reversing lever being removed and the terminals wired directly to the remote controller.

The jib linkage of the type of crane in question requires careful design to maintain correct geometrical motion for level-luffing purposes. The particular real-life version of this model employed toothed rack quadrants operated by pinion drive, and Mr. Taylor was able to simulate the original quadrant by operating its movement with Sprocket Chain. This was kept in tension by the forward weight of the jib system but was relieved by a sliding counterweight on a second set of chains situated at the rear of the control cab. The careful balance then places a fairly light load on the E15R Motor used for the luffing operation.

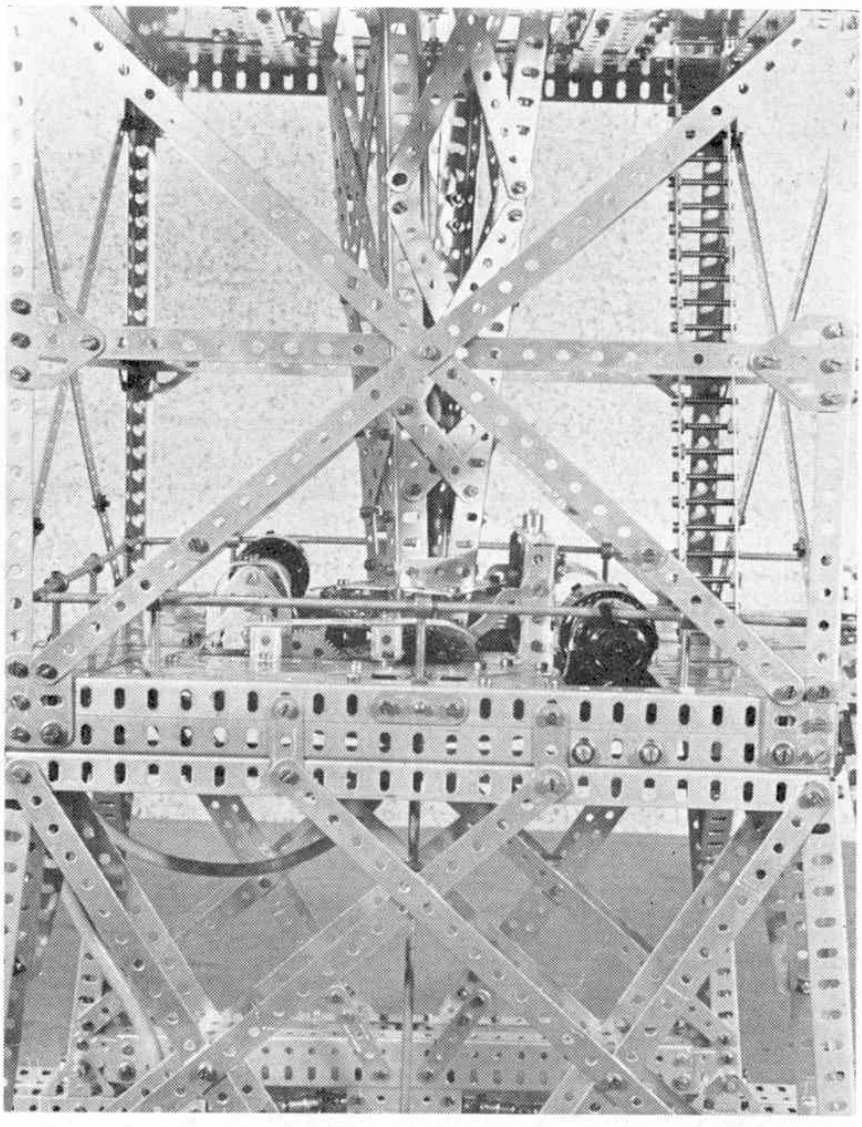
A Power Drive Unit is employed for the main hoist and an Emebo Motor for the 'chandelier' hoist. Speed of bucket hoist is set by the internal gearbox of the Power Drive Unit. Both hoisting barrels are simple, being Axle Rods fitted with Bush Wheels for end cheeks. These narrow-diameter Rods result in fine control of the bucket or 'chandelier' levels for discharge operations.

It can be seen from one of the accompanying photographs that the control cab is mounted on what appears to be a sturdy roller bearing, but, in actual fact, this is of very simple construction and its only job is to take up the tilting thrust. Hence, its rollers act only in a radial direction. The entire weight of the revolving superstructure is carried by a thrust bearing situated at the base of the long pivot which pass down through the centre of the main tower. The thrust bearing is even simpler, being a pair of wheel flanges running on a roller race of ½ in. Pulleys, the grooves of which make the whole bearing self-centring. This arrangement allows a multi-core control cable to pass up through the central pivot post to the control cab,

The single suspension bucket grab in the open position to show the trip gear.



In this detail shot of the main tower, the lower machinery platform is clearly shown.



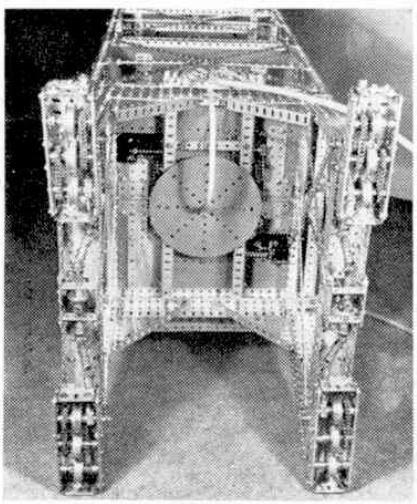
while the flexibility of the cable in turn allows the super-structure to rotate at least two revolutions in either direction without damage to the cable.

The pivot post carries a 3½ in. Gear Ring just above the lower bearing and this is used to slew the superstructure. The Gear Ring is Pinion driven, the drive coming, via a reduction ratio, from another Power Drive Unit, mounted on the machine platform at the base of the pivot. The third Power Drive Unit is connected through reduction gearing and Chain drive to bevel gearing which transmits the drive to the travelling bogies by means of vertical shafts in the portal structures at the sides of the tower base and then by further Bevels. Universal Couplings and Worm drives to the bogie wheels. Each bogie is pivoted at the foot of each 'leg' to accommodate uneven rails or dock surfaces, as in the prototype.

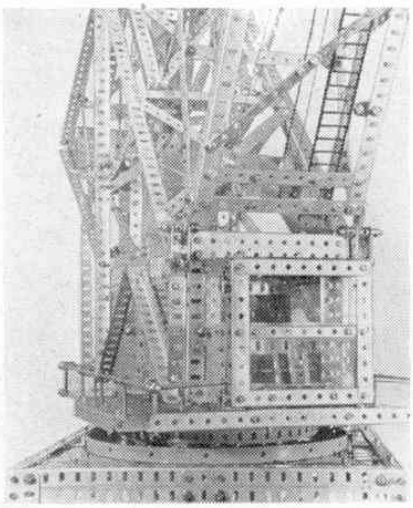
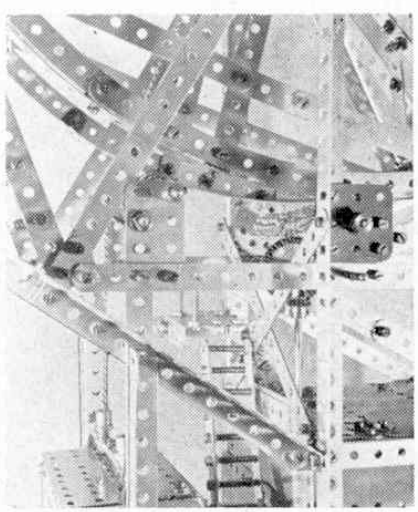
Great care has been taken throughout the construction of the model to reproduce the original outlines as faithfully as possible with a light, but rigid construction. The well-known principle of triangle construction for maximum strength is exploited to the full in the tower, superstructure and jib constructions. All bearings are reinforced by additional Strips to improve the running qualities of the machinery and to ensure accurate gear meshing.

An important requirement of the main hoist rope in any real-life crane is that it be of a non-spinning type. This lets out the common flexible wire rope as this is normally twisted up from strands of wire with a uniform right hand 'lay' and such a wire tends to untwist slightly resulting in an appreciable spin over a long length, when loaded. The normal cargo hook is fitted with a spinning swivel to allow for this, but special non-spin hoisting ropes are woven for single-hoist buckets. In the model, this rope was simulated by a platted cord, patiently made by Mrs. Taylor with a crotchet hook from strong linen thread. It gave a nice chunky appearance to the joisting rope and proved very satisfactory in practice.

The travelling bogies of Mr. Taylor's Crane use fairly complex drive systems as this photograph shows.



A close-up view of the cab front showing the hoisting compartment. All movements are controlled remotely from an external unit built from Elektrikit Parts.



A view of the rear of the control cab showing the luffing gear and sliding counterweight.