

Quayside Unloader in Meccano

An Interesting H Outfit Model

THE loading and unloading at the quayside of coarse loose materials such as coal and iron ore has always presented a difficult problem. Until comparatively recent times it was carried out by hand, the usual unloading scheme being to fill a number of tubs in the hold of the ship and hoist them up to elevated wooden platforms on the quayside by means of the vessel's own derricks. As the volume of freight of this nature increased, some quicker and cheaper method of handling became urgently necessary. In 1880 a move in this direction was made by the invention in America of the Industrial Brownhoist tramway type of unloader, and it is from this early machine that present-day bridge cranes have been developed. Unlike modern machines of this type the early unloaders resembled short cable railways on which ran small self-emptying tubs. These tubs were filled by men stationed in the hold of the ship that was being unloaded, and when full were hoisted out and their contents discharged on to the ground between the two end columns of the unloader.

An interesting working model of an up-to-date Brownhoist bridge crane is shown in Fig. 1. Its prototype, which is stationed at the port of Rotterdam, Holland, is a little over 150 ft. in length and is fitted with a grab capable of lifting 10

tons at a time. The model is built to a scale of $\frac{1}{3}$ in. to 1 ft., and its overall measurements are length 4 ft., and height 2 ft. 3 in. It is fitted with crane hooks in place of a grab, owing to lack of the necessary parts in the H Outfit with which it is designed to be built. A suitable grab could easily be constructed with a few extra parts, however. Further realism would be secured by mounting the model on $\frac{3}{4}$ " Flanged Wheels and arranging it to run on rails built up from Angle Girders. These girders might be screwed down to a baseboard painted to represent a quayside.

The model is commenced by building up the four main girders 1, each of these being composed of two $12\frac{1}{2}$ " Angle Girders connected together by means of two $2\frac{1}{2}$ " Strips as shown in Fig. 1. When the four girders are complete they are secured together in pairs, each pair having two $5\frac{1}{2}$ " Angle Girders 2 and 3, and five $5\frac{1}{2}$ " Strips. The two pairs of long girders, when secured together in this manner, form the side members of the bridge section of the machine, and they are both

connected together to form a long box girder by a series of Angle Girders and Strips.

At the rear end is fitted a $7\frac{1}{2}$ " Angle Girder 4, and at the front end a $5\frac{1}{2}$ " Strip 5 is used together with a second $7\frac{1}{2}$ " Angle Girder 6. The Girder 6 forms part of the gear-box, as will be described later.

The top edges of the side members of the bridge are connected by four $4\frac{1}{2}$ " Strips, one of which consists of two $2\frac{1}{2}$ " Strips bolted together and overlapped one hole each. This section of the model is completed by the addition of four $12\frac{1}{2}$ " Strips, two of which are shown at 7. These compound strips represent the handrails that are fitted along the entire length of the prototype.

At this point the gear-box should be built and fitted, as this will be more difficult when the remainder of the model is built. Before fitting the complete gear-box, however, the two $5\frac{1}{2}$ " Strips 8 and 9 must be temporarily re-

moved, so that the unit can be secured in place without difficulty.

The $7\frac{1}{2}$ " Angle Girder 6 carries a $5\frac{1}{2}" \times 3\frac{1}{2}"$ Flat Plate to which is secured, by means of $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets, two $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates. An E6 or E20b Electric Motor is also bolted in place as shown in Fig. 2. One of the $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates is fixed to the Motor side plate by means of a $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip 10, and this part forms a bearing for one of the shafts in the gear-box.

A Worm on the armature shaft of the Electric Motor engages with a 57-teeth Gear 11 that is locked on a vertical 2" Rod journaled in the Double Angle Strip and one of the holes in the $5\frac{1}{2}" \times 3\frac{1}{2}"$ Flat Plate. The 2" Rod carries at its upper end a $1\frac{1}{2}"$ Contrate that drives a sliding 4" Rod by means of a $\frac{1}{2}"$ Pinion 12. Two Washers are placed on the Rod, between the $\frac{1}{2}"$ Pinion and end plate, for spacing purposes.

Two Collars, one of which is shown at 13, are secured on the end of the sliding Rod, and these accommodate the shank of a bolt 14, between them. This bolt is carried in the centre of a $3\frac{1}{2}"$ Strip, fitted with a Threaded Pin, forming the gear change lever.

The sliding Rod carries a second $\frac{1}{2}"$ Pinion 15 and $\frac{3}{4}"$

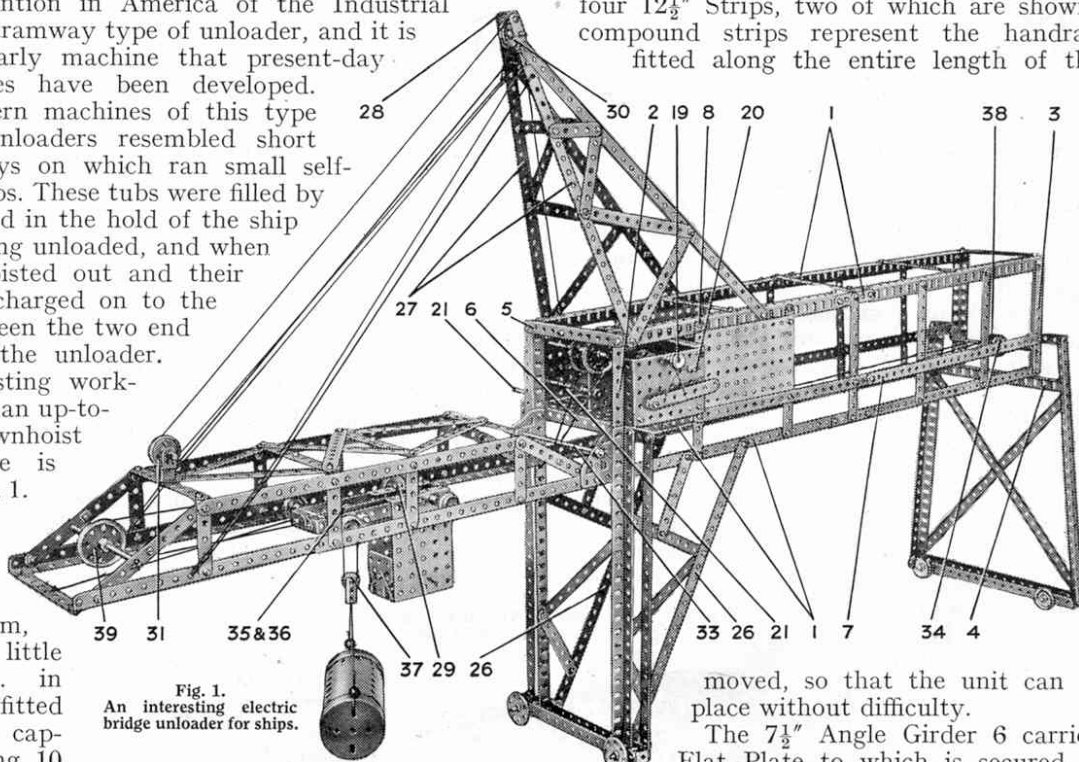


Fig. 1.
An interesting electric
bridge unloader for ships.

Contrate 16, the Pinion being in engagement with a 57-teeth Gear when the gear lever is in its outer position. The 57-teeth Gear rotates a $1\frac{1}{2}$ " Pulley 17, the purpose of which will be described later. When the gear lever is at its inner position the $\frac{3}{4}$ " Contrate 16 engages with a second similar part mounted on the hoisting barrel 18. A length of cord is shown wound on this Rod in Fig. 2. The $\frac{1}{2}$ " Pulley 19 forms a brake drum, the arrangement of which is shown in Fig. 1. The $\frac{3}{8}$ " Bolt 20 forms a stop for the brake lever.

The Crank Handle 21, Figs. 1 and 2, carries the hoisting cord for raising and lowering the bridge extension. As will be seen from Fig. 1, the Crank Handle is journaled in one of the side Flanged Plates and one side plate of the Electric Motor. On the outside of the side Flanged Plate, the Crank Handle carries a 1" fast Pulley 22, Fig. 3, and round this is passed a brake cord. The cord is secured at one end to the frame of the model and at the other end to one arm of a Boss Bell Crank 23. This Crank, which is mounted pivotally on a Pivot Bolt 24, carries on its horizontal arm a $3\frac{1}{2}$ " Strip fitted with the weight 25, a Coupling.

The gear-box can now be fitted in position as shown in Fig. 1, and the construction of the model continued. The complete bridge and gear-box are elevated on four $12\frac{1}{2}$ " Angle Girders, the rear two being bolted, five holes from their upper ends, to the Girder 4. At the lower end the $12\frac{1}{2}$ " Angle Girders are joined together by means of two $9\frac{1}{2}$ " Angle Girders that are bolted together to form a channel section girder. This girder carries two $1\frac{1}{2}$ " Rods on which are secured two travelling wheels. For bracing members, 2" and $12\frac{1}{2}$ " Strips are used as shown.

At the front end of the bridge the two $12\frac{1}{2}$ " Angle Girders are bolted to the end $5\frac{1}{2}$ " Angle Girders 2 and are overlapped four holes. The end of the Girder 6 is fitted with two $12\frac{1}{2}$ " Strips, and the lower ends of these, together with the ends of the $12\frac{1}{2}$ " Angle Girders, are secured together by means of two $7\frac{1}{2}$ " Strips. The next-to-end holes of these two Strips form bearings for the axles of the remaining pair of travelling wheels.

Two $12\frac{1}{2}$ " Strips 26 are now fitted to the lower set of girders 1, and these Strips are attached at their lower ends to $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets bolted to the $7\frac{1}{2}$ " Strips of the front legs. These $12\frac{1}{2}$ " Strips are braced as shown in Figs. 1 and 3.

The structure surmounting the bridge can now be fitted. This consists of two $12\frac{1}{2}$ " Strips 27 connected together at their upper ends by a Double Bracket 28.

The two rear members of the structure are each built up from a $12\frac{1}{2}$ " Strip and a $3\frac{1}{2}$ " Strip, each overlapping the other two holes. Bracing is fitted as shown.

The construction of the trolley for carrying the load, that runs along the bridge and bridge extension, can now be proceeded with. The frame is composed of two $5\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips secured together at one end by two Flat Brackets. At the other end the Double Angle Strips carry two $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates fitted with a $1\frac{1}{2}"$ Strip 29 and a $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plate at the bottom, not shown in the illustrations. At the bottom the trolley also carries a Trunnion and Flat Trunnion as shown.

The operating cords are fitted in the following manner. One end of a cord is secured to the Crank Handle 21, and from here it is taken over

the Pulley 30, round the Pulley 31, and then secured to the top of the superstructure.

A second cord is secured to the Collar 32 and passed round the pivot Rod 33, round the Pulleys 34, 35, 36 and 37, and finally tied to the Strip at the end of the bridge extension. A third cord passes round the $1\frac{1}{2}"$ Pulley 17, and both ends pass in opposite directions round the Rod 33. One end is then taken round the Pulley 38 and secured to one end of the trolley. The other end of the cord passes over the Pulley 39 and is fastened to the opposite end of the trolley.

The construction of the bridge extension should not present any great difficulties. Each main side girder consists of two $12\frac{1}{2}"$ Angle Girders overlapping nine holes, and when complete these two compound girders are connected together by means of two $2\frac{1}{2}"$ Strips at one end, and by two Flat Trunnions carrying the Rod 33 at the other end. Four vertical $2\frac{1}{2}"$ Strips are bolted to each side girder and these are connected together at their upper ends by means of a $12\frac{1}{2}"$ Strip. These are braced by means of $4\frac{1}{2}"$ Strips at each end, each of which is composed of a number of $2\frac{1}{2}"$ Strips. Eight $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets are secured to the $12\frac{1}{2}"$ Strips and these carry the ends of the upper bracing members as shown in Figs. 1 and 3.

List of parts required to build the model:

16 of No. 1; 2 of No. 1b; 25 of No. 2; 4 of No. 2a; 12 of No. 3; 2 of No. 4; 36 of No. 5; 2 of No. 6; 3 of No. 6a; 14 of No. 8; 4 of No. 8a; 2 of No. 8b; 4 of No. 9; 2 of No. 10; 3 of No. 11; 19 of No. 12; 1 of No. 12a; 5 of No. 15; 1 of No. 15b; 3 of No. 16; 2 of No. 16a; 5 of No. 17; 3 of No. 18a; 1 of No. 19s; 4 of No. 20b; 2 of No. 21; 4 of No. 22; 3 of No. 22a; 3 of No. 23; 1 of No. 23a; 2 of No. 24; 1 of No. 26; 2 of No. 27a; 1 of No. 28; 2 of No. 29; 1 of No. 32; 10 of No. 35; 200 of No. 37; 6 of No. 37a; 24 of No. 38; 1 of No. 43; 1 of No. 48a; 3 of No. 48d; 3 of No. 52a; 4 of No. 53; 2 of No. 57c; 18 of No. 59; 3 of No. 63; 1 of No. 73; 6 of No. 111c; 1 of No. 115; 1 of No. 126; 5 of No. 126a; 1 of No. 128; 1 of No. 147b; 1 of No. 162; 1 of No. 176; Electric Motor (not included in Outfit).

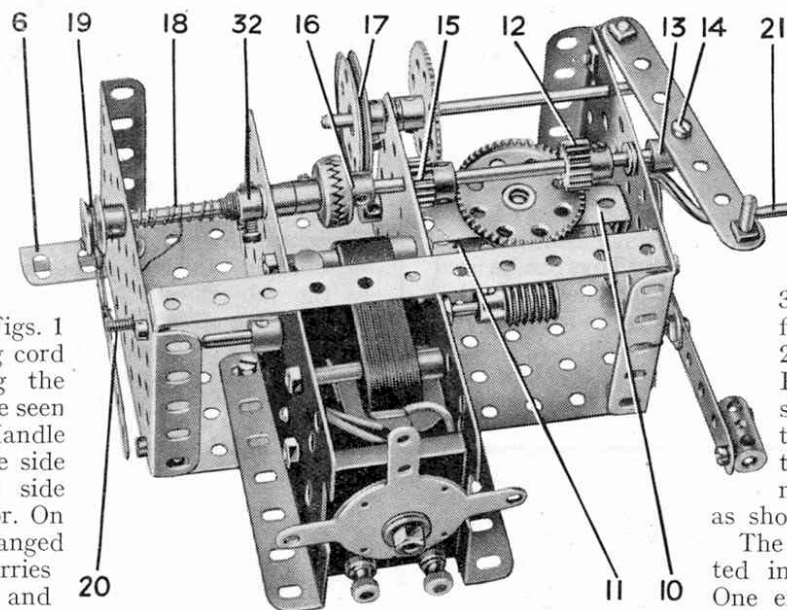


Fig. 2. The motor and gear-box, showing the hoisting drums and racking pulley.

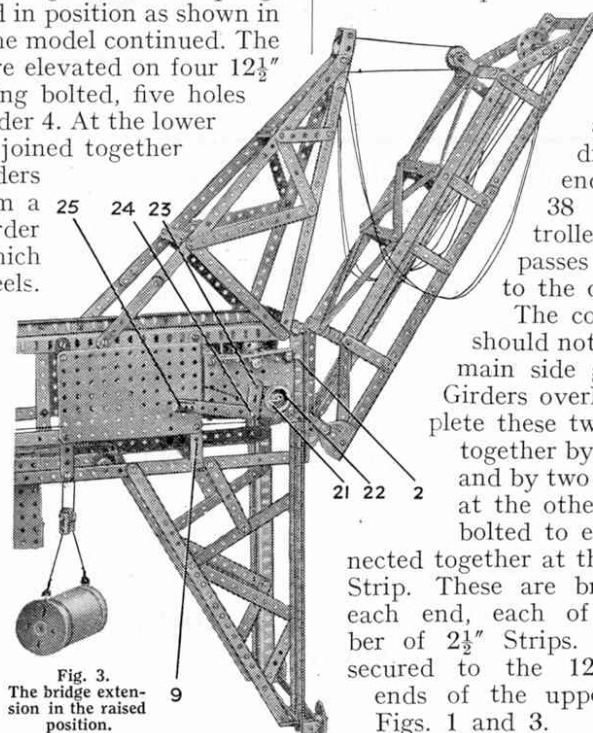


Fig. 3. The bridge extension in the raised position.