

# Grabs and Hoists for Cranes

## Equipment That Will Improve Your Models

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THE fun of building and playing with a model crane is greatly increased by providing it with alternative types of grabs and hoisting tackle, so that loads of different kinds can be lifted. Actual cranes have to handle loads varying from sand and rock to giant concrete blocks and heavy metal castings, and many different types of grabs and lifting gear have been devised to enable them to tackle their work in an efficient and rapid manner. In this article I am showing how some of the more commonly used types of lifting gear can be modelled in Meccano.

All the examples mentioned are easy to build and among them are grabs suitable for building from both large and small Outfits. One of the most simple and generally used grabs is the bucket type employed in actual practice for lifting loose materials such as mud, sand and gravel. A model of this kind is shown in Fig. 1. It has two scoop-like pivoted jaws, which are controlled by ropes from the driving cab and can be opened and closed as desired. The grab is operated by opening the jaws and then lowering it swiftly on to the heap of sand or other material to be moved. The jaws are then closed, an action that causes them to bite into the material and scoop up a full load, and the grab is then hoisted.

The model grab has jaws made of  $2\frac{1}{2}$ " Triangular Plates 1 extended at their bases by  $2\frac{1}{2}$ " Curved Strips 2. It is raised or lowered by means of cords 3, while another cord 4 passes round a 1" Pulley carried on the cross-piece 5. All the cords pass around winding barrels in the crane mechanism. If the cords 3 and 4 are hauled in or paid out at the same speed, the grab travels up or down without the jaws moving, but if one cord is stopped, the grab opens or closes according to the direction of movement of the other cord.

The joints "A" are all pivoted by means of bolts and lock-nuts, and real sand or other loose material can be lifted if the outer sides of the grab are filled in with Flexible Plates. The model crane or excavator to which the grab is fitted must have two hoisting drums that are geared so that they may be operated either independently or together.

Although bucket type grabs are used extensively for handling sand, gravel, earth and similar materials, large blocks and stones cannot be dealt with in this manner and sometimes slings are used. This is a rather slow method, however, and it is now more general to use a grab of the kind shown in model form in Fig. 2. The chief part of the grab mechanism is a suspension block made from two 2" Strips and 1" Corner Brackets, spaced  $\frac{1}{2}$ " apart by means of  $\frac{3}{4}$ " securing Bolts. The hoisting Cord is tied to one of these Bolts and the other Bolt carries a  $\frac{1}{2}$ " loose Pulley and two washers. The Rod 1,

passed through the 2" Strips and Corner Brackets, serves as a pivot for curved arms to which the gripping jaws are attached. Each arm is made from two  $2\frac{1}{2}$ " small radius Curved Strips to which  $4\frac{1}{2}$ " Strips are bolted, and Collars are used as shown to space the Strips apart and make the arms rigid.

Each of the jaws that grip the block or stone consists of six  $2\frac{1}{2}$ " large radius Curved Strips and is pivoted on a  $\frac{1}{2}$ " Bolt 2. Each of the latter carries also two 3" Strips, and a further pair of 3" Strips is rigidly bolted in the centre hole of each jaw. The two pairs of Strips on each jaw are pivoted on the  $\frac{3}{4}$ " Bolt 3, which carries also two  $1\frac{1}{2}$ " Strips. A  $\frac{3}{4}$ " Bolt passed through the upper ends of the  $1\frac{1}{2}$ " Strips carries two 1" loose Pulleys, between which a washer is placed for spacing purposes. The 2" Strips of the suspension block carry a 1" loose Pulley and a Flat Bracket, both on a  $\frac{3}{4}$ " Bolt secured in the lower holes of the Strips. The closing "rope" 5 is tied at one end to the Flat Bracket and passes around one of the lower 1" Pulleys. It then passes around the upper 1" Pulley and around the second lower Pulley, finally being pushed through the Strips of the frame and over a Pulley at the head of the crane jib. The  $\frac{1}{2}$ " loose Pulley serves as a guide for the cord.

To open the grab the weight is taken by the hoisting cord 4, and the cord 5 is paid out. Thus the jaws are opened, and by hoisting on the cord 5 they can be closed to grip the article that is to be raised. The weight of the load increases the pull on the cord, and consequently the upper and lower Pulleys are pulled together. It will be seen therefore that the greater the weight of the load the stronger is the grip of the jaws upon it. It is important that the hoisting cord 4 should remain slack when the grab is lifting a load. To release the load the cord 4 is hauled in and the cord 5 paid out.

The outstanding feature of the skip illustrated in Fig. 3 is that it automatically unloads as soon as it touches the ground. The model may be used in connection with cranes or aerial ropeways. Each side consists of two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates, each of which has two  $2\frac{1}{2}$ " Triangular Plates secured to it, and to the ends of these Plates  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates are attached by means of Angle Brackets at the inner edges of the Triangular Plates as shown. Each of the Plates 6, which form the discharge doors, turn on two Hinges each, and they carry  $4\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips along their lower edges.

To each end of the Double Angle Strips are pivoted 3" Strips, and one pair of these is pivoted also to the lower ends of  $2\frac{1}{2}$ " Curved Strips, one on each side of the skip. The

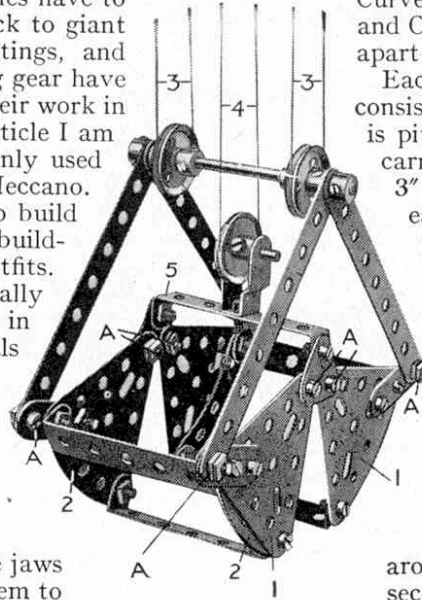


Fig. 1. A model bucket grab used for handling loose material.

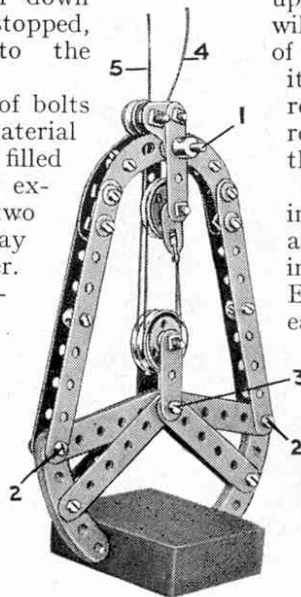


Fig. 2. A novel pincer grab suitable for gripping small blocks and stones.

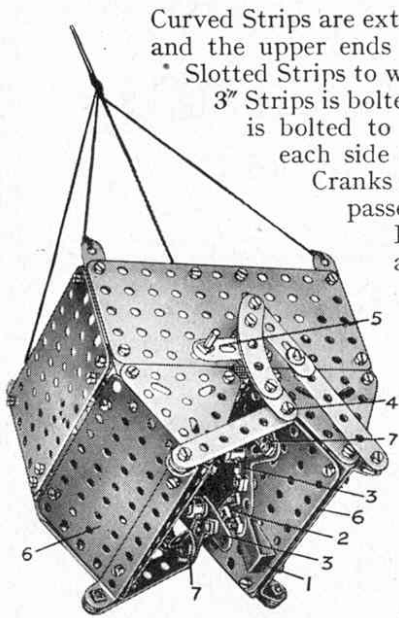


Fig. 3. This twin-chute skip automatically discharges its contents when lowered to the ground.

Curved Strips are extended by similar parts, and the upper ends of the latter carry 2" Slotted Strips to which the second pair of 3" Strips is bolted. A Boss Bell Crank 5 is bolted to the Curved Strips on each side of the skip, and both Cranks are mounted on a Rod passed through the side Plates. The Bell Cranks are provided with Threaded Pins for handles.

Two simple Bell Cranks 3 are pivoted on 3/8" Bolts gripped in Collars carried on 1" Screwed Rods secured to a 4 1/2" Strip fitted across the centre of the skip. Angle Brackets 7 are fitted at the outer ends of the Bell Cranks, and a 2" Strip 2 is pivoted between the inner arms. The pivots are passed through the elongated holes of the Cranks. A 25 gramme Weight 1 is attached to the Strip 2 by means of a 1" Triangular Plate.

When the skip is suspended from the crane, the Weight 1 causes the Angle Brackets 7 on the Bell Cranks to move upwards. By depressing the handle 5 the doors 6 are closed, and the 3/4" Bolts 4 force down the Angle Brackets on the Cranks 3. As soon as they have passed the Brackets, the Weight 1 causes the Brackets to move up again, thus retaining the Bolts in position. The Weight protrudes below the skip, so that it touches the ground first and then releases the Bolts 4. The Weight of the material in the skip causes the doors to open and the load is discharged without external handling. The doors must be closed by hand.

In Fig. 4 is shown another very useful form of grab that is suitable for handling materials of many kinds. It is constructed on what is known as the single-suspension system, one rope only being used for raising and lowering the grab and operating the jaws. As will be seen from the illustration, the model has eight finger-like jaws, each of which is pivotally connected to the rings 1 and 2. The single-suspension operating gear is a compact unit and may be built separately, its design being such as to permit its use on several other types of grab.

The side plates 3 are 3" Flat Girders connected at their lower edges by 1" x 1/2" and 1/2" x 1/2" Angle Brackets. The hooks 4 and 5 each comprise two 2 1/2" Strips carrying between them a Pawl and Flat Bracket. One of each pair of Strips is fixed to a 57-teeth Gear mounted on a 1 1/2" Rod. These two Gears mesh with each other, and the hooks are held together under light tension by a piece of Spring Cord bolted to hook 5. The right-hand Gear is fitted with a 3/8" Bolt, on which is a Collar that forms the stop for the catch 7. The latter comprises a Coupling pivotally mounted on the shaft of hook 5 by a Handrail Support, and it

carries in its longitudinal bore a Centre Fork and a 1" Rod fitted with a Collar.

At 6 is a 1" x 1/2" Angle Bracket bolted to a 1" Triangular Plate, a similar assembly being fixed to the lower edge of Girder 3. The angular travel of the hooks is limited to approximately 45 degrees by suitable stops. The hoisting cord passes through the 1" x 1/2" Angle Brackets and then through the central hole of the 1 1/4" Disc of the ring 1, and is fitted with a Collar at its end. It is important to note that a bulky knot is tied in the Cord as shown at 9.

When the grab is raised under load the hooks 4 and 5 make contact with the suspender ring 8, which is hung from the jib and through which the hoist cord passes. The hooks are forced apart, and are then drawn together again by the Spring Cord so that they hook over the 1 1/2" Pulley 8. When the hoist cord is paid out the ring 2 remains stationary but ring 1 falls and the grab jaws open. As the catch 7 is weighted with a Collar, the Centre Fork bears against the hoist rope, so that when this is wound in the knot 9 engages with the Centre Fork and raises the hooks clear of the ring 8. The grab is then held suspended in the open position by knot 9.

Cranes working in metal stockyards and foundries usually are fitted with electro-magnetic lifting tackle in place of a grab or hook. This gear can be reproduced quite easily with Meccano parts and one example is shown in Fig. 5.

Two Bobbins (part No. 181) are wound to capacity with No. 26 S.W.G. wire and attached to the yoke 1, which is composed of three 1 1/2" Strips, by the Screwed Rods. The inner leads of the coils are then joined and the outer leads are connected to a Transformer or a battery. The crane hoisting cord passes around the 1" Pulley 3, which turns on a 1" Axle Rod journalled in a Cranked Bent Strip 4 bolted to the yoke 1.

Electro-magnetic lifting tackle of a more powerful type suitable for large model cranes, was described on page 715 of the "M.M." for December 1938. In that case Elektron Magnet Coils were used, and model-builders who do not wish to wind their own coils can also make good use of these in the magnet shown in Fig. 5.

Provision should be made for switching the current on and off, and it is quite easy to make a simple switch by using Meccano parts in conjunction with Elektron parts. One example is a Flat Bracket pivoted on an insulated Bolt and arranged to make contact with a second insulated Bolt.

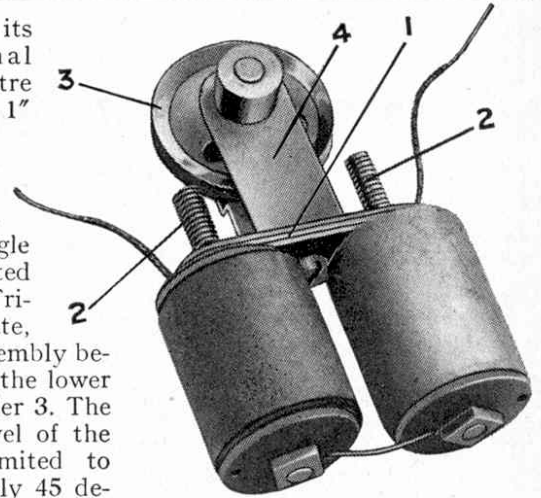


Fig. 5. An electro-magnet forms an interesting alternative to a hook or grab.

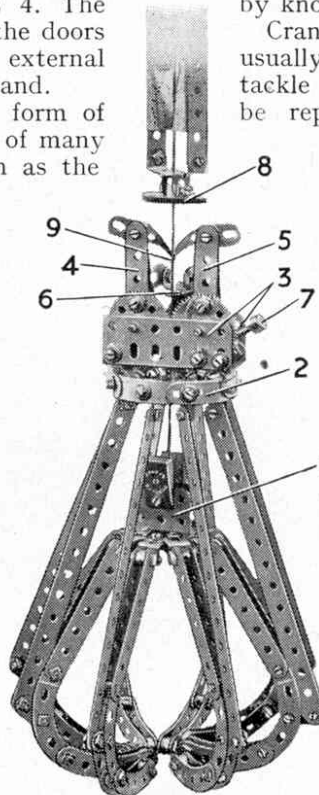


Fig. 4. A multi-jawed grab of the single-suspension type.