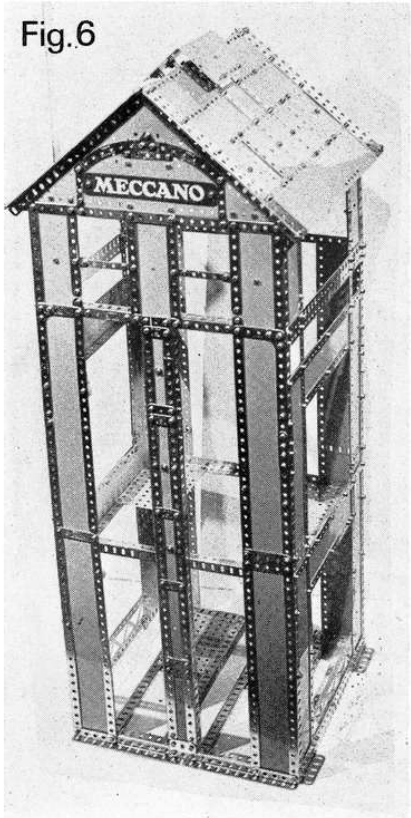
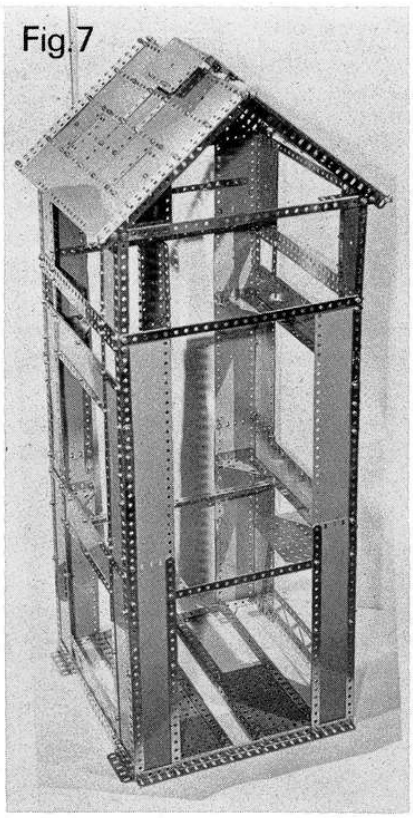
GOODS WAREHOUSE with ELECTRIC ELEVATORS

Past Masters
NUMBER FIVE
(PART 2)



Above and below, two views of the modified Warehouse building assembled from a current No. 10 Meccano Set. Front view above; rear below.



IN PART 1 of this feature, published in the last issue of the MMQ, we dealt with the general construction of the Elevator building. In this, the second and final part of the feature, we will be covering the mechanisms, but, before doing so, a brief mention of building construction for the current No.10 Set – with which this model, slightly modified, may be built – is in order.

Continuing the photograph Figure Numbers from last issue, in Fig.6 here we show what can be done with the No.10 Set and a striking improvement is achieved in the sample illustrated. This by no means limits the scope and is merely given as a guide, construction being self-evident from the illustration. Only four 12½" Strip Plates are actually used for the roof, 'fill-in' being achieved quite neatly with smaller Flexible Plates, plus the Hinged Plate to make an attractive roof ventilator. Fig. 7 shows the partially completed rear view, No.10 Set style, and shows the triangular internal bracing of the two floor levels. Adequate parts exist in the outfit to embelish the rear aspect with loading balconies and simple derrick hoists attached externally for each floor.

CAGES AND SAFETY DEVICES

But to return to the original pre-war model, we continue with construction of the cages and safety devices, *remembering that, in the following description the illustrations referred to by Figure Numbers 1 to 5 appear in the January MMQ.* One of the two similar cages is shown in Fig. 10, which is a reproduction of an illustration in the original Super Model Leaflet. The cage consists of two 3½" x 2½" Flanged Plates 20, to the flanges of which are bolted 2½" x 2½" Flat Plates 22. Single Bent Strips 21 are bolted to the sides of each cage in such positions that, when the cages are placed between the guides 7 (Fig.1 last issue) the Single Bent Strips will slide in the channels of the Guides and so form guide blocks for the cages.

The safety devices employed in the model are of a simple, yet very interesting type. They are fitted to the top of each cage and one is clearly shown in the Figs. 9 and 10. A Coupling 25 is secured to the roof of the cage by a 3/8" Bolt that is locked in position by a Nut 25a. Secured centrally in the upper transverse bore of this Coupling is a 1½" Rod that carries two Fork Pieces 24, secured one on each side of the Coupling. Two Pawls 23 are pivotally held on Bolts lock-nutted in the Fork Pieces as shown, and each Pawl has a 3/8" Bolt 23a instead of the usual Grub Screw, the Bolt being held firmly by means of a Nut screwed against the boss of the Pawl. Bolts 23a must not grip the pivots on which the Pawls are mounted.

A piece of Meccano Cord is attached to each of the Bolts 23a and the ends of the cord are brought through the Fork Pieces behind the Pawl bosses in the manner shown in the illustrations. (The two pieces of Cord are later to be attached to the

lifting Cord 27). The ends of a length of Spring Cord 26 are also attached to Bolts 23a.

When the lift cord 27 is in tension, i.e., as soon as the cage is raised from the ground, Pawls 23 are rotated slightly on their pivots and the projecting ends pulled downward clear of the lift guides. This movement bends the Spring Cord 26 so that one side of it is in tension. Now, should Cord 27 break or fail for any reason, the Pawls are no longer held down and, owing to the action of the Spring Cord, the ends of the Pawls rise and engage with the elongated holes of the Guides 7. The cage is consequently locked safely in position in the shaft and cannot be moved until the Pawls are pulled downward and clear of the Guides.

This most interesting feature of the model is closely allied in principle to the safety device usually employed on the actual lift. A demonstration of its action on the Meccano Lift should enable even the most timid old lady to overcome any fears that she may entertain as to the safety of travelling in lifts!

OPERATING MECHANISM

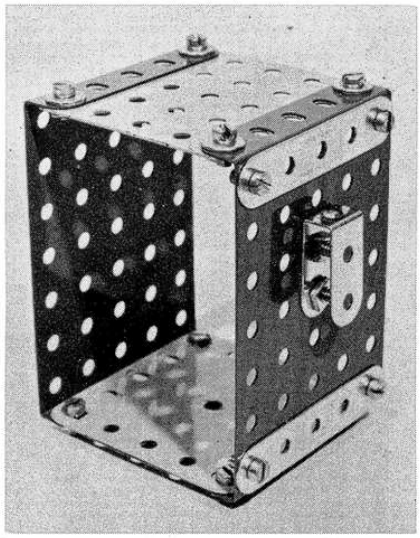
The mechanism incorporated in a model for lifting and lowering the two cages is of special interest as it enables the model to be worked for an indefinite period without attention. It is entirely automatic in action, and the arrangement is such that one cage is raised while the other is being lowered.

In operation, as soon as the motor is set in motion, one of the cages ascends and the other descends until both cages have reached the top or bottom positions of their respective guides, when they come to rest as though to allow for loading and unloading. Then, after a short pause, the upper cage descends while the lower ascends, and the process is repeated each time the limit of travel is reached.

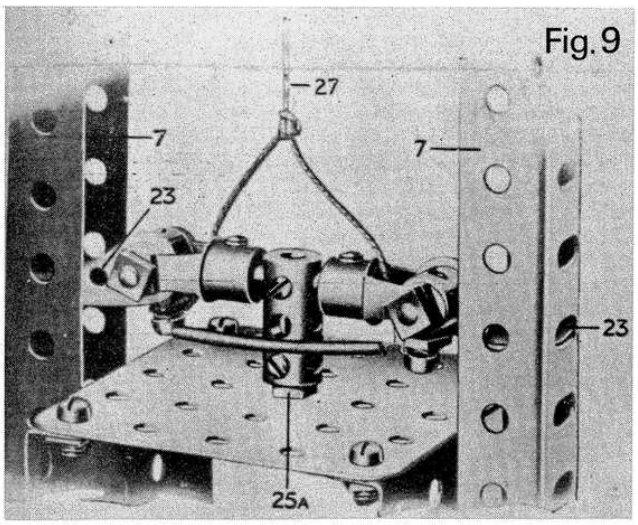
The motor is secured in position by bolting its flanges to the transverse Angle Girders 47 (Fig.5). The drive is taken from the motor armature via a ½" Pinion 29, a 57-teeth Gear Wheel 30 and a ½" Pinion 30a on the opposite end of the Rod carrying Gear 30. This Pinion meshes with another 57-teeth Gear Wheel 31 on a 2" Rod which also carries a Worm 32. This Worm meshes with a ½" Pinion secured to a vertical 3" Rod 33, which is journalled in bearings consisting of a 2½" Strip 43 bolted across Girder 47 beneath the motor (Figs.5 and 11) and a 1½" x ½" Double Angle Strip 33a secured between the motor sideplates. Rod 33 carries at its upper end a second Worm 34 meshing with a ½" Pinion on a 3½" Rod 35. This Rod is journalled in Corner Brackets, as shown, and carries at its end the device whereby the automatic reversing hoist motion is obtained.

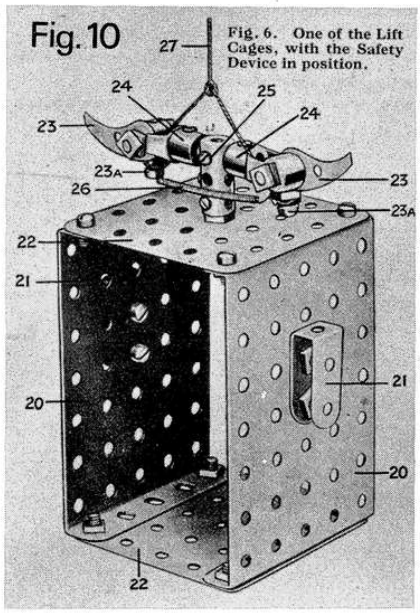
It will be seen that this device consists essentially of two rotating arms, each of which is built up from 5½" Strips – secured rigidly to Rod 35 by means of Bush Wheels 38 – and a system of 1" loose Pulleys 40 and 42. Pulleys 40 are free to run on a 2" Rod 39 journalled in each arm and Pulleys 42 are mounted on a 4½" Rod attached to the motor. A Washer is placed between the Pulleys to minimise friction and allow freedom of movement.

The spindle of Pulleys 40 follows the circular path traced out by the end of the arm, while the spindle of Pulleys 42 is fixed. The Cord 27, which is attached to the cage, passes over Pulleys 51 at the top of the lift shaft. From there it is led under one Pulley 42, round one Pulley 40, back to the remaining Pulley 42 and then to the second Pulley 40. After passing round the latter, it is secured to Fishplate 42c. The system is similar in effect to a two-sheave pulley block, in which the free end of the Cord, where the power is applied, moves through four inches for every inch the load is raised. In the model, however, the load (i.e., the lift cage) is attached to the Cord at a point corresponding to the free end in the ordinary pulley block, and the power is applied to the movable pulley block. Consequently, the reverse effect is obtained, the lift cage moving through four inches for every inch of movement of Pulleys 40 relative to Pulleys 42. →



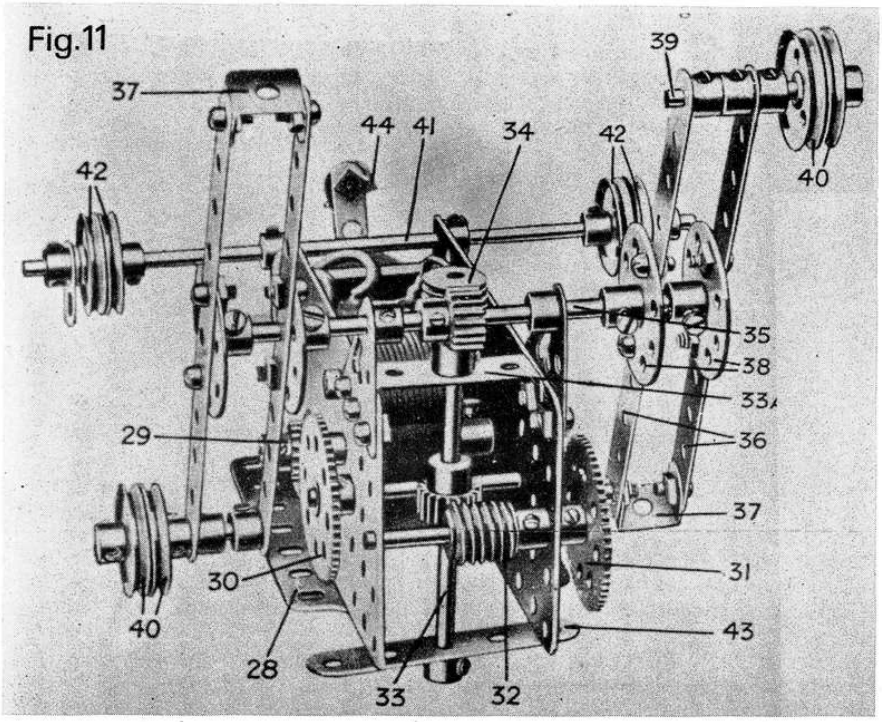
Lift cage slightly modified for No. 10 Set construction.





Left, an illustration reproduced from the original pre-war Super Model Leaflet of the Goods Warehouse with electric Elevators showing the automatic safety device fixed to the roof of one of the lift cages

Right, another original illustration showing the complete lift.



The motor and lifting mechanism for the Goods Warehouse with Electric Elevators as originally illustrated in the pre-war Super Model Leaflet.

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When Pulleys 40 advance towards Pulleys 42, the hoisting rope is paid out, but, as the distance between the two sets of Pulleys decreases, the relative motion between them also decreases, with the result that the movement of the cage becomes gradually slower until finally, when Pulleys 40 and 42 and the moving arm are all directly in line, all movement of the cord ceases. At this point the cage is at rest at the ground floor.

The rotating arm, continuing its motion, now begins to withdraw Pulleys 40, with the result that the hoisting Cord is hauled in and the cage begins to rise, gradually gathering speed as the increasing angle of the rotating arm increases the relative movement between Pulleys 40 and 42. In view of the fact that a slight movement of the rotating arm results in a greatly magnified movement of the cages, it will be apparent that the arms must rotate very slowly. This explains the use of the double Worm drive from the motor. Owing to the considerable strains imposed upon the mechanism, the Pinion and Bush Wheels mounted on Rod 35 should be secured very rigidly in place, using two Grub Screws in each case.

The extent of the travel of the cages may be varied considerably by altering the length of the rotating arms – adding to the length to increase the travel, and vice versa – or by using a larger number of Pulleys. Such alteration will be necessary, for example, if it is decided to add further floors to the model, thus increasing the length of the lift shafts.

MOTOR CONTROL GEAR

In the model, as in an actual lift, means are provided by which it is possible to start or stop the motor and thus control the movement of the cages from any of the landing floors. This is accomplished by means of the Control Handles 10 (Fig.1) which are secured to a compound rod 9 built up from one 5½" and two 11½" Rods connected together by Couplings. At its lower end, the rod is journalled in a Double Arm Crank 11 (Fig.2) that is bolted to one of the Transverse Angle Girders in the base, as shown. Rod 9 extends from top to bottom of the Warehouse and, at its upper end, is journalled in a 1½" Strip (bolted to Angle Girder 47a), where it is held in place by means of a Collar mounted on the rod against the face of the Strip. A Crank 46 secured to the end of the rod is pivotally connected to one end of a 4½" Strip 45, the other end of this Strip being attached to an Angle Bracket that, in turn, is pivotted to the central arm of the motor switch. The Control Handles 10 are simply provided by Threaded Pins screwed into Collars.

After the mechanism has been finally adjusted, the roof may be placed in position and bolted to Angle Girders 14 to complete the model.

No.10 SET MODIFICATIONS

As mentioned in Part 1 of this feature, although the Goods Warehouse was originally presented as a pre-war Super Model, it can be built with a current No.10 Set, provided some modifications are made. Several of these have already been mentioned, but there are still some remaining. Fig. 8 illustrates the lift cage made from the No.10 Set and this has two modifications. A pair of 2½" x 2½" Flexible Plates are used for the lift floors and a pair of 2½" Strips are bolted top and bottom of the lift cage sides to act as rubbing strakes to prevent "tram-lines" being worn into the enamel of the Flanged Plates forming the lift cage sides. Your oldest Strips should be chosen for this purpose.

It must be stated at this stage that the original winding mechanism, reproduced in this article for historical accuracy, is a bad design. The "back-to-front" arrangement of the Pulley system puts a very heavy load on the winding arms which causes the Worm Gears to 'ride up' their respective Pinions. When using the E15R Motor in the No.10 version, it is advisable to scrap both Worm Drives and to use Spur Gearing, arranging Pinions and Gear Wheels to give the necessary speed reduction and power. Pre-war dealers' models were invariably fitted with "Claxon" type mains motors which would operate the models over longer periods with adequate power and performance. A specimen of the original, carefully built to the leaflet specifications for a recent Meccano Exhibition demonstrated in no uncertain terms just how unsatisfactory the original winding gear must have been.

Finally, a word about the "Safety Devices". These are something of a gimmick and fiddly to adjust, but they may be reproduced from the No.10 Set by using for one pair the two Pawls with bosses supplied in the Set, the second pair being made from the two Pawls without bosses tightly lock-nutted against a Collar on a 1" Screwed Rod.

It is hoped that both versions of the Warehouse "ancient and modern" will be on show at the 1975 Henley Meccano Exhibition.

The list of parts required to build the Goods Warehouse was given in Part 1 of the feature in Jan's MMQ.