

"Penny-in-the-Slot" Weighing Machine

An Interesting New Meccano Model

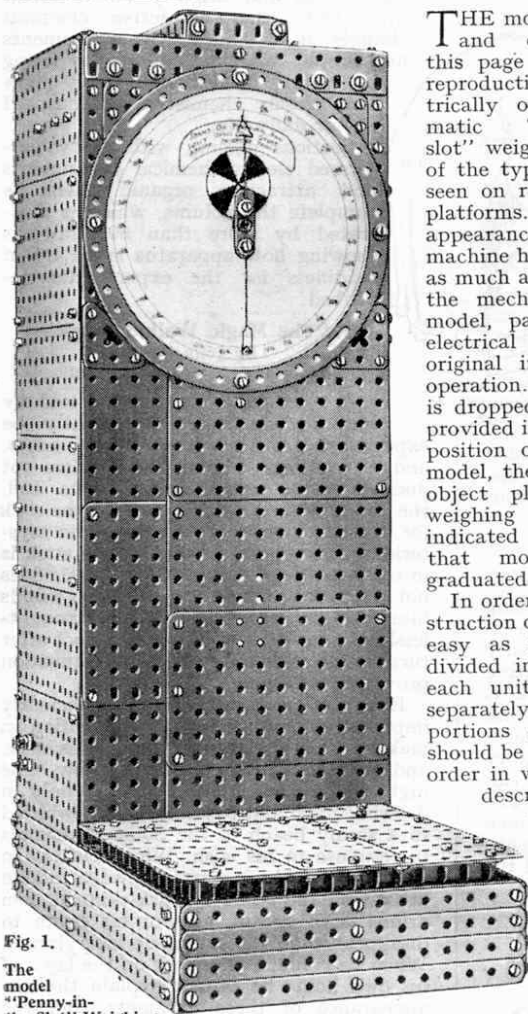


Fig. 1.
The model "Penny-in-the-Slot" Weighing Machine described in this article.

THE model illustrated and described on this page is a working reproduction of an electrically operated automatic "penny-in-the-slot" weighing machine, of the type often to be seen on railway station platforms. The outward appearance of an actual machine has been copied as much as possible, but the mechanism of the model, particularly the electrical system, is original in design and operation. When a penny is dropped down a slot provided in a convenient position on top of the model, the weight of an object placed on the weighing platform is indicated by a pointer that moves over a graduated dial.

In order to make construction of the model as easy as possible it is divided into units, and each unit is described separately. The various portions of the model should be built up in the order in which they are described.

The units comprise the main frame, the weight platform and its accompanying mechanism, the weight

recording mechanism, electric contact maker and an Electric Motor. Construction should commence with the framework, details of which are shown in Figs. 1 and 2, but the dial and the back of the machine should not be fitted until the mechanism has been assembled and tested.

The weight recording mechanism and the contact maker are shown in Fig. 3. The mechanism forms a complete self-contained unit and it may be assembled separately and adjusted before being built into the frame.

The gearing is placed between $2\frac{1}{2}'' \times 5\frac{1}{2}''$ Flat Plates, which are spaced at their corners by $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips and are fitted with four $7\frac{1}{2}''$ Angle Girders 11, by means of which the mechanism is fixed in place in the frame. Double Bent Strips bolted over the central holes of the two Flat Plates form bearings for the halves of the main spindle, one of which carries a 57-teeth Gear Wheel 1, a $\frac{1}{2}''$ Pinion 2, and a Bush Wheel 3. The Bush Wheel is fitted with a Threaded Pin 25, which points outward and engages with a $\frac{1}{2}''$ Bolt 16 that is screwed into the boss of a $\frac{1}{2}''$ Pinion 4 on the other half of the shaft. A $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket 5 bolted to one of the Plates forms a stop. In Fig. 3 the Threaded Pin and the $\frac{1}{2}''$ Bolt are shown near the limit of their movement. The $\frac{1}{2}''$ Pinion 4 engages a $2\frac{1}{2}''$ Gear Wheel on a $3\frac{1}{2}''$ Rod that rotates in bearings formed by $1''$ Corner Brackets.

The Gear Wheel 1 engages a $\frac{1}{2}''$ Pinion 7 on a Rod journalled in the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates of the mechanism frame, and on the end of which is the small dial 8. A 57-teeth Gear Wheel on the Rod 9

meshes with the $\frac{1}{2}''$ Pinion 2, and on the same shaft as the 57-teeth Gear is a $\frac{3}{4}''$ Sprocket Wheel 10 (Fig. 2) which is spaced from the Plate by a Collar.

A solenoid consisting of a Bobbin fully wound with 26 S.W.G. S.C.C. Wire is clamped between the face of a Bush Wheel and a $1\frac{1}{2}''$ Strip by two $1''$ Screwed Rods. The Bush Wheel is secured on the end of a $2\frac{1}{2}''$ Rod journalled in two $7''$ compound strips bolted between the Angle Girders 11 (see Fig. 3). On the inner end of the Rod that supports the $2\frac{1}{2}''$ Gear Wheel is a Crank 6 pivotally attached to a Coupling by a $\frac{3}{8}''$ Bolt. A $4\frac{1}{2}''$ Rod 12 is pushed through the solenoid and one end of it is fastened in the Coupling.

A $2\frac{1}{2}''$ Rod is supported by means of a Rod Socket on top of a Double Bent Strip 13, which is secured to one of the lower $7\frac{1}{2}''$ Angle Girders 11 as shown, the Double Bent Strip being insulated from the Angle Girder by means of Insulating Washers and Bushes. The $2\frac{1}{2}''$ Rod supports a Silver Tipped Contact Screw 15 that is held in a Coupling by two Grub Screws. A Pendulum Connection 30 secured to, but insulated from, the Crank 6, makes contact with the point of the Screw 15 when the $\frac{1}{2}''$ Bolt 16 is in the normal position, that is when the Bolt is right up against the stop 5.

The constructional details of the delicately balanced spring contact maker are as follows. A $2\frac{1}{2}''$ Strip is bolted to one side of a Coupling, and two Washers are placed on the shanks of the holding Bolts to space the Strip from the Coupling and to prevent the screws from nipping the Rod 17, which is able to slide freely. The same procedure is adopted on the other side of the Coupling, with the exception that the supporting $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips shown are bolted in place as well. At their lower ends the $2\frac{1}{2}''$

Strips are connected by a Double Bracket, in the centre of which is an insulated Contact Screw 19. A second Contact Screw 18 has its head filed down slightly round the sides, and is held by two Grub Screws in the end of the Coupling on the Rod 17. A very weak compression spring is placed on the upper end of the Rod, and then a Face Plate, which serves as the coin table.

The amount of clearance between the Contact Screws 18 and 19 must be adjusted so that when a penny is placed on the Face Plate the weight of the coin overcomes the resistance of the spring, and the Face Plate and its Rod sink downward, thus bringing the contacts 18 and 19 together and completing the electrical circuit.

The coin for operating the machine is dropped down a

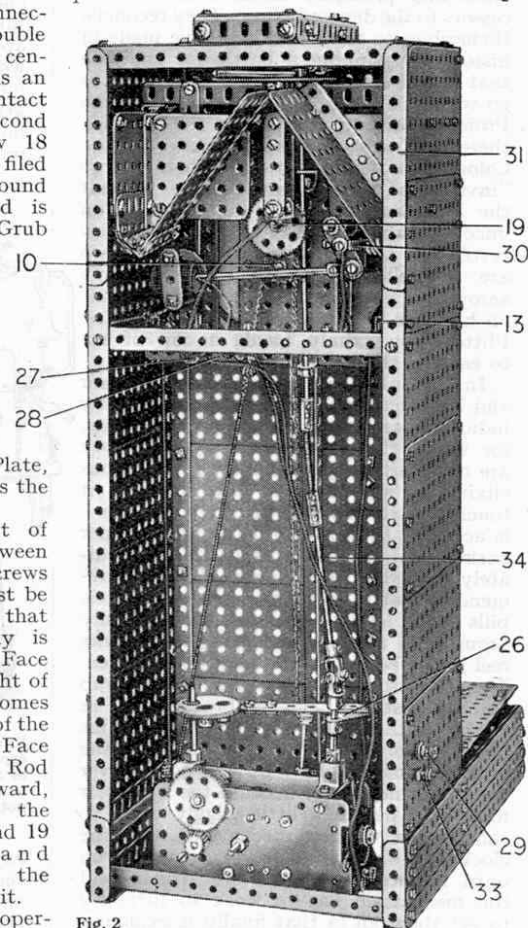


Fig. 2.
The Weighing Machine with the back removed to show the layout of the mechanism and the money boxes.

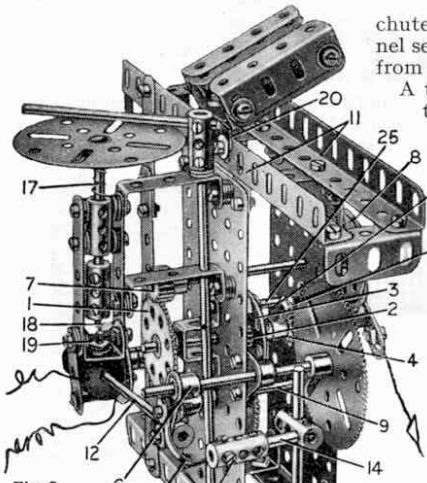


Fig. 3. The weight recording mechanism removed from the model. Constructors should note carefully the relative positions of the contact table and the coin chute.

the coin table Rod as shown.

The weighing Two $6\frac{1}{2}$ " Rods 21 $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double the horizontal Rods are held in carries two $1\frac{1}{2}$ " Strips, each of which is held between two further Collars. The other Rod is fitted with two $2\frac{1}{2}$ " Strips, which are fixed in position as in the case of the first Rod. The two $1\frac{1}{2}$ " Strips are locknuttet to $7\frac{1}{2}$ " Strips, and these in turn are each locknuttet to two Hinges held together in an End Bearing 22, all the connections being loose enough to allow the parts to move freely. The two $2\frac{1}{2}$ " Strips are connected across their ends by a $4\frac{1}{2}$ " Rod, which is linked by means of a Double Bracket to another Rod that passes through the $7\frac{1}{2}$ " Strips. The Double Bracket is held in place by the $\frac{3}{4}$ " Bolt 23.

The weighing platform itself is shown in Figs 1 and 4. A $2\frac{1}{2}$ " x 1 " Double Angle Strip is bolted 3 " from the front edge of the platform, and a 2 " Strip is attached to each of its ends. The Strips are strengthened by a $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip as shown, and in their end holes support a $4\frac{1}{2}$ " Rod. A second $2\frac{1}{2}$ " x 1 " Double Angle Strip carries two $\frac{3}{4}$ " Bolts, which are fixed in its end holes by means of Threaded Bosses.

When the platform is in position the Rod 32 and the $\frac{3}{4}$ " Bolts rest on the $7\frac{1}{2}$ " and $5\frac{1}{2}$ " Strips respectively. Four $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips, which are bolted to the underneath surface of the platform, hook over the main supporting Rods 21 of the mechanism.

A $2\frac{1}{2}$ " Screwed Rod, to which a length of Sprocket Chain is attached between locknuts, is held in the boss of an End Bearing 22, and the Chain passes over a $\frac{3}{4}$ " Sprocket 10 and is joined to a length of Spring Cord. The Spring Cord is secured to a $2\frac{1}{2}$ " Screwed Rod that passes through the lower girders of the frame, and is held in place by a Threaded Boss 24. When the platform is in its normal position, that is when there is no weight on it, the Threaded Pin 25 and the $\frac{1}{2}$ " Bolt 16 (Fig. 3) should be right up against the stop 5.

The "penny-in-the-slot" mechanism is operated by an Electric Motor mounted in the base of the model as shown in Fig. 2. On the driving shaft of the Motor is a $\frac{3}{4}$ " Pinion, which engages a 50-teeth Gear Wheel on a secondary shaft that carries at its other end a $\frac{1}{2}$ " Pinion. Through the medium of a 57-teeth Gear Wheel the $\frac{1}{2}$ " Pinion drives a Worm, which meshes with a $\frac{1}{2}$ " Pinion on a vertical Rod journalled in a $2\frac{1}{2}$ " x 1 " Double Angle Strip bolted to one of the Motor side plates. At its upper end the Rod carries a Triple Throw Eccentric, and the motion imparted to the Eccentric is transmitted to a Crank 26 by means of a $3\frac{1}{2}$ " Strip. The Strip is locknuttet to the Crank, and the latter is supported on a Rod held vertically in a bearing unit formed by a Double Arm Crank and a Double Bent Strip. The bearing is fixed between the Motor side plates by two $\frac{1}{2}$ " x $\frac{1}{2}$ " Angle Brackets. From the vertical Rod the drive is taken through a universal transmission, consisting of a Universal Coupling at the lower end of the Rod 34 and a Flexible Coupling at the top, the latter being necessary in order to avoid fouling the Sprocket Chain of the weighing mechanism.

chute consisting of two channel section girders each made from two 2" Angle Girders.

A third 2" Angle Girder is then bolted to one side of each channel girder, and pulled out to the limit of its elongated holes so that a slot, just wide enough to allow a penny to slide freely, is formed. The two parts of the chute are held parallel to each other by a $1\frac{1}{2}$ " Flat Girder. The chute is fixed to the Angle Girder 11 (Fig. 3) by means of two Angle Brackets, one of which is numbered 20 in Fig. 3. To complete the mechanism an $8\frac{1}{2}$ " Rod is pushed through a $\frac{1}{2}$ " x $\frac{1}{2}$ " Angle Bracket and the $1\frac{1}{2}$ " Double Angle Strips that support

and is extended by a Coupling and a 3"

platform mechanism is shown in Fig. 4. are journalled in the upper holes of Angle Strips, which are bolted between Angle Girders of the main frame. The position by Collars, and one of them carries two $1\frac{1}{2}$ " Strips, each of which is held between two further Collars. The other Rod is fitted with two $2\frac{1}{2}$ " Strips, which are fixed in position as in the case of the first Rod. The two $1\frac{1}{2}$ " Strips are locknuttet to $7\frac{1}{2}$ " Strips, and these in turn are each locknuttet to two Hinges held together in an End Bearing 22, all the connections being loose enough to allow the parts to move freely. The two $2\frac{1}{2}$ " Strips are connected across their ends by a $4\frac{1}{2}$ " Rod, which is linked by means of a Double Bracket to another Rod that passes through the $7\frac{1}{2}$ " Strips. The Double Bracket is held in place by the $\frac{3}{4}$ " Bolt 23.

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When the platform is in position the Rod 32 and the $\frac{3}{4}$ " Bolts rest on the $7\frac{1}{2}$ " and $5\frac{1}{2}$ " Strips respectively. Four $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips, which are bolted to the underneath surface of the platform, hook over the main supporting Rods 21 of the mechanism.

A $2\frac{1}{2}$ " Screwed Rod, to which a length of Sprocket Chain is attached between locknuts, is held in the boss of an End Bearing 22, and the Chain passes over a $\frac{3}{4}$ " Sprocket 10 and is joined to a length of Spring Cord. The Spring Cord is secured to a $2\frac{1}{2}$ " Screwed Rod that passes through the lower girders of the frame, and is held in place by a Threaded Boss 24. When the platform is in its normal position, that is when there is no weight on it, the Threaded Pin 25 and the $\frac{1}{2}$ " Bolt 16 (Fig. 3) should be right up against the stop 5.

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The electrical connections of the model are as follows. The insulated terminal 27, which is secured to a $7\frac{1}{2}$ " Angle Girder held between the vertical $18\frac{1}{2}$ " Angle Girders of the frame as shown in Fig. 2, is connected to one terminal of the Motor, then to the insulated contact point 19, and also to one end of the solenoid winding. The second terminal 28 is connected to the same terminal of the Motor as terminal 27, then to the other end of the solenoid winding and to the insulated Pendulum Connection 30. Finally the other terminal of the Motor is connected to the insulated Double Bent Strip 13. The Terminal 33 is in contact with the frame.

The operation of the machine is as follows. When a weight is placed on the platform the Bush Wheel carrying the Threaded Pin 25 (Fig. 3) is made to rotate by means of the Sprocket Chain. This movement in turn rotates the small coloured disc 8. The exact distance through which the Bush Wheel moves is controlled by the amount of weight on the platform. Before the dial pointer will move, however, a penny must be placed in the chute, this being necessary to bring the weight recording mechanism into operation. The penny slides down the chute and falls on to the Face Plate, thus closing the gap between the Contact Screws 18 and 19 and energising the solenoid in the manner already explained. The solenoid sucks in the Rod 12 (Fig. 3) and causes the Pinion that carries the $\frac{1}{2}$ " Bolt 16 to rotate until the Bolt makes contact with the Threaded Pin 25.

When the weight is removed from the platform the pull of the Spring Cord returns the Threaded Pin and $\frac{1}{2}$ " Bolt to their normal positions against the stop, and makes contact between the Pendulum Connection 30 and the Contact Screw 15, thus starting the Motor. The arm 34 then slowly rotates and pushes the penny off the platform, so disconnecting the electric circuit.

The dial can be made from thin white cardboard, gripped between two Circular Strips and fixed to the model by four $\frac{3}{8}$ " Bolts.

Before the machine can be used to weigh objects of unknown weight the dial must be calibrated. This is a simple matter, and it is only necessary to put several known weights, say 4 oz., $\frac{1}{2}$ lb., 1 lb., $1\frac{1}{2}$ lb., 1 $\frac{3}{4}$ lb., and 2 lb. on the platform, and to mark on the dial the exact position taken up by the pointer under each load.

The parts required to build the model Automatic Weighing Machine are as follows:—8 of No. 1; 6 of No. 1b; 2 of No. 2; 1 of No. 3; 6 of No. 5; 5 of No. 6; 8 of No. 6a; 4 of No. 7a; 5 of No. 8; 12 of No. 8b; 10 of No. 9; 5 of No. 9a; 3 of No. 9b; 2 of No. 9c; 6 of No. 9d; 10 of No. 9e; 4 of No. 9f; 3 of No. 10; 6 of No. 11; 8 of No. 12; 1 of No. 13a; 2 of No. 14; 4 of No. 15a; 2 of No. 16; 4 of No. 16a; 5 of No. 16b; 2 of No. 17; 2 of No. 18a; 3 of No. 24; 1 of No. 25a; 5 of No. 26; 1 of No. 27; 3 of No. 27a; 1 of No. 27c; 1 of No. 32; 269 of No. 37; 28 of No. 37a; 80 of No. 38; 4 of No. 45; 3 of No. 46; 14 of No. 48; 2 of No. 48a; 23 of No. 52a; 8 of No. 53a; 9 of No. 58; 42 of No. 59; 1 of No. 62; 1 of No. 62a; 2 of No. 62b; 8 of No. 63; 2 of No. 64; 11 of No. 70; 3 of No. 72; 2 of No. 81; 2 of No. 82; 15 of No. 94; 1 of No. 96a; 2 of No. 103; 2 of No. 103f; 4 of No. 103g; 1 of No. 103h; 1 of No. 103k; 1 of No. 109; 3 of No. 111; 4 of No. 111a; 13 of No. 111c; 2 of No. 114; 1 of No. 115; 1 of No. 116a; 1 of No. 130; 4 of No. 133; 2 of No. 133a; 1 of No. 140; 2 of No. 145; 1 of No. 166; 1 of No. 172; 1 of No. 175; 1 of No. 179; 1 of No. 181; 7 of No. 182; 1 E6 Electric Motor; 3 of No. 1569; 7 of No. 1570; 7 of No. 1575; 8 of No. 1583 and 1 of No. 1586.

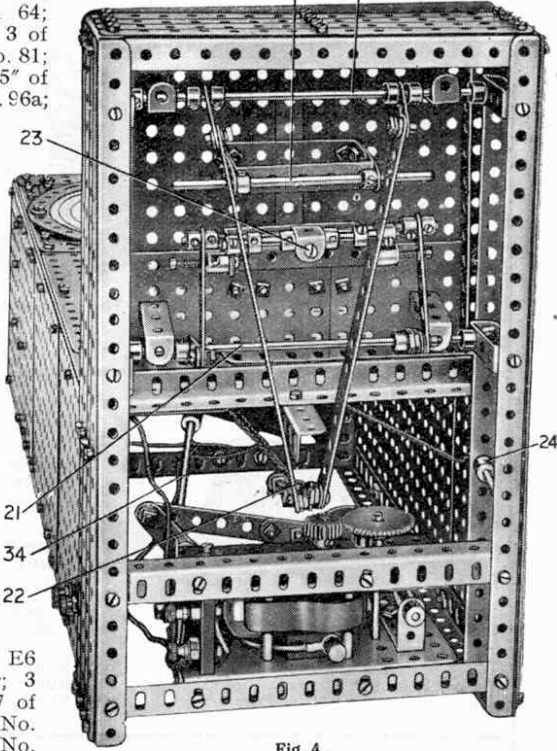


Fig. 4. An underneath view of the weight platform operating mechanism.