New Outfit Models

Five Simple Subjects for Beginners

AT this time of the year thousands of newcomers join the great army of model-builders. This month therefore we are describing five easily-built models that have been designed specially for those with little experience, and all of them can be assembled from parts contained in the smaller Outfits from No. O to No. 4.

The first model to be dealt with is a tank locomotive, that can be built with Outfit No. 2, and is illustrated in Fig. 1. The frame of this engine consists of three $5\frac{1}{2}''$ Strips, joined together at their ends by Flat Trunnions. At its forward end the boiler is mounted. This is made of two U-section Curved Plates bolted together overlapping one hole, and at the front is filled in by a Bush Wheel, which is fixed in position by two Angle Brackets. The boiler is attached to the frame at its forward end by means of an Angle Bracket and a Flat Bracket. How this is done can be seen in the illustration.

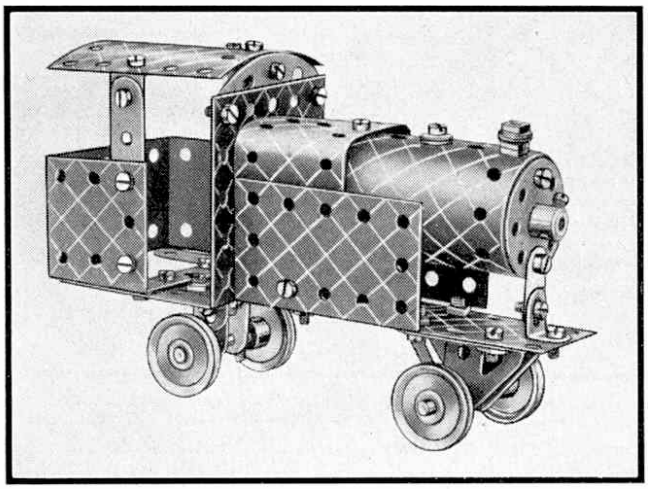


Fig. 1. A neat model shunting locomotive built with Outfit No. 2.

The boiler fire-box is made by curving a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate to the required shape and then bolting it over the rear end of the boiler. Each end of the Flexible Plate is secured to the frame by an Angle Bracket, and it provides additional support for the boiler. The chimney of the locomotive is represented by a $\frac{3}{8}''$ Bolt, which carries on its shank four nuts and a washer, and the water tanks consist of two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bolted to the sides of the fire-box.

The cab can then be built. Its floor is constructed by fixing a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip across the rear of the frame, and to each end of this Strip, and at right angles to it, a $2\frac{1}{2}''$ Strip is bolted. The front of the cab consists of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate supported by an Angle Bracket. A $2\frac{1}{2}''$ small radius Curved Strip is fastened across the top of this Flexible Plate, and it is attached also to a $1\frac{11}{16}''$ radius Curved Plate by an Angle Bracket. The Curved Plate forms the roof of the cab, and it is supported by two $2\frac{1}{2}''$ Strips and two Angle Brackets from the ends of the Double Angle Strip. The sides and back of the cab are made with a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, the ends of which are bolted to the $2\frac{1}{2}''$ Strips that support the roof.

Four 1″ Pulleys are used for the wheels, and the forward pair are fastened on a 2″ Rod journalled in two Trunnions secured under the frame. The rear axle also is a 2″ Rod, passing through holes in two Flat Brackets fastened by Angle Brackets to the chassis. The axles are prevented from sliding in their bearings by means of Spring Clips.

Parts required to build shunting locomotive: 3 of No. 2; 4 of No. 5; 3 of No. 10; 8 of No. 12; 2 of No. 17; 4 of No. 22; 1 of No. 24; 4 of No. 35; 42 of No. 37a; 41 of No. 37b; 3 of No. 38; 2 of No. 48a; 1 of No. 90a; 1 of No. 111c; 2 of No. 126a; 2 of No. 188; 2 of No. 189; 1 of No. 190; 1 of No. 199; 2 of No. 200.

The deck chair, illustrated in Fig. 2 is simple, but effective and interesting. It is built with Outfit No. O, and consists of two frames, each of which is built up by joining the ends of two $5\frac{1}{2}''$ Strips with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The frames are pivoted together by a $3\frac{1}{2}''$ Rod, which is held in place by two Spring Clips.

The back of the chair is supported by two $2\frac{1}{2}''$ Strips. These are pivotally attached to the back of the chair by lock-nutted bolts, in the positions shown, and are joined at their lower ends by a further $2\frac{1}{2}''$ Strip and two Angle Brackets. In order to lock-nut the bolt, this is first pushed through the $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips and a nut is placed on its shank and screwed up sufficiently to hold the bolt in place. The first nut is then held with the spanner while a second nut is screwed tightly up against it. The shanks of the bolt that fix the $2\frac{1}{2}''$ Strips to the Angle Brackets, catch on two bolts that are fastened through the $5\frac{1}{2}''$ Strips that form the lower frame.

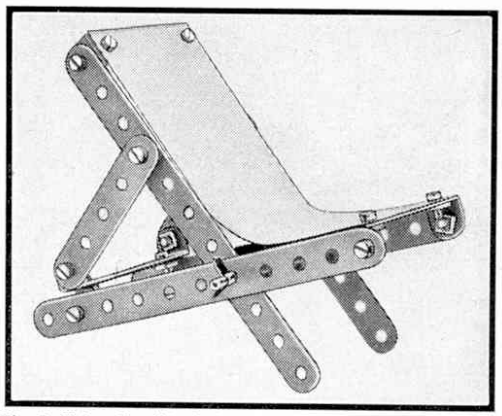


Fig. 2. This collapsible deck chair can be constructed with the contents of Outfit No. O.

The canvas of an actual deck chair is represented by a piece of thin cardboard, or other suitable material, measuring $5\frac{1}{2}'' \times 2\frac{1}{2}''$, which is bolted between the two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

Parts required to build model deck chair: 4 of No. 2; 3 of No. 5; 2 of No. 12; 1 of No. 16; 4 of No. 35; 20 of No. 37a; 16 of No. 37b; 2 of No. 48a.

The model racing car, shown in Fig. 3, can be built from the contents of Outfit No. 3. It is driven by a *Magic* Motor and runs at a good speed.

Construction is commenced by bolting two $2\frac{1}{2}''$ Strips together so that they overlap two holes. The compound strip so made is then curved, and its ends are fastened by two Angle Brackets to the flange of a Trunnion 1. This structure forms the frame of the radiator, and it is filled in by bolting a $1\frac{1}{4}''$ Disc to the Trunnion 1. The bonnet of the car consists of four $5\frac{1}{2}''$ and four $2\frac{1}{2}''$ Strips, which are fastened to the compound strip as shown in the illustration.

New Meccano Models

Four Interesting Designs for Small Outfits

IN selecting the models for description this month we have included three of special interest to owners of small Outfits, together with a fine dumping wagon that requires an Outfit No. 7 for its construction. Of the small Outfit models the first is a realistic three-wheel sports car, which is shown in Fig. 1 and can be built with Outfit No. O. The second is the letter balance seen in Fig. 2. This is built with Outfit No. 2, and if it is carefully adjusted letters can actually be weighed upon it with sufficient accuracy for general use. Finally comes a working model of a clothes wringing machine, Fig. 4, which can be made from the contents of Outfit No. 3.

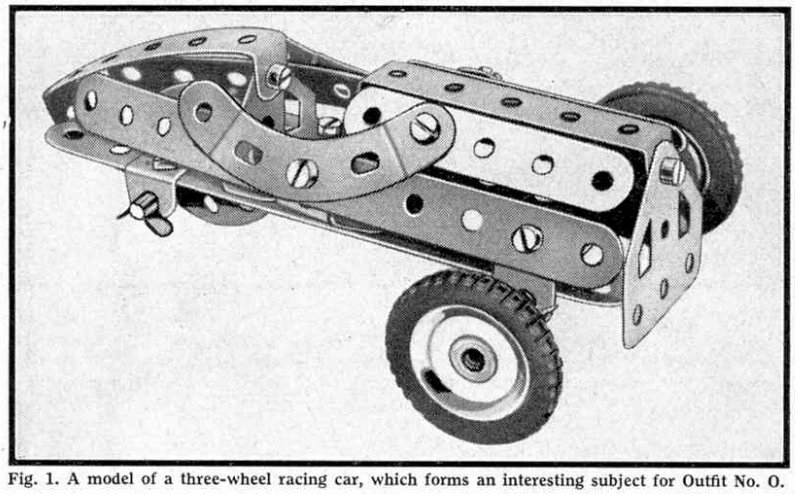


Fig. 1. A model of a three-wheel racing car, which forms an interesting subject for Outfit No. O.

Construction of the three-wheel car is commenced by making the chassis, which consists of two $5\frac{1}{2}''$ Strips joined by two Trunnions so arranged that one of them forms the rear and the other the front of the driver's cockpit. The sides of the body of the car also consist of $5\frac{1}{2}''$ Strips, two of which are fastened to the chassis by Angle Brackets. The bonnet is formed with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and two $2\frac{1}{2}''$ Strips. At its rear end the Double Angle Strip is supported by the Trunnion that represents the front of the cockpit, and a Trunnion suspended from its front end represents the radiator. The $2\frac{1}{2}''$ Strips are fastened by $2\frac{1}{2}''$ small radius Curved Strips to the $5\frac{1}{2}''$ Strips that form the sides of the car. A second Double Angle Strip, which is bolted to the Trunnion at the rear of the cockpit, is used to fill in the top of the tail of the car.

The two front wheels are fixed at the ends of a $3\frac{1}{2}''$ Rod passing through two Flat Brackets bolted to the sides of the car. Spring Clips prevent the Rod from sliding. The rear wheel is a Bush Wheel, and is fixed at the centre of a 2″ Rod, each end of which is supported in a bearing formed by an Angle Bracket bolted to the $5\frac{1}{2}''$ Strips of the chassis.

Parts required to build model racing car: 4 of No. 2; 2 of No. 5; 2 of No. 10; 4 of No. 12; 1 of No. 16; 1 of No. 17; 2 of No. 22; 1 of No. 24; 24 of No. 35; 19 of No. 37a; 19 of No. 37b; 2 of No. 48a; 2 of No. 90a; 2 of No. 126; 1 of No. 126a; Two 1″ Rubber Tyres (not included in Outfit).

The neat and practical letter balance illustrated in Fig. 2 is simple to build and can readily be calibrated or adjusted to make it useful. It is made by fastening two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates 1 to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 2 by means of Angle Brackets. The Flexible Plates are $2\frac{1}{2}''$ apart, and have their upper ends bent over and bolted together. The front of this structure is filled in by a compound plate, consisting of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate joined by two $2\frac{1}{2}''$ Strips, which is secured in position by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and two Angle Brackets.

The dial of the balance is a disc of white cardboard $2\frac{1}{2}''$ in diameter, and is marked as shown in the illustration, with a scale that extends only halfway round it. The disc is bolted to the upper end of the compound plate, with a Curved Strip on each side of it. The pointer also is made of cardboard and is fastened by a nut on the shank of a $\frac{3}{8}''$ Bolt 3, which is passed through a hole in the centre of the dial and has a Bush Wheel locked on its inner end.

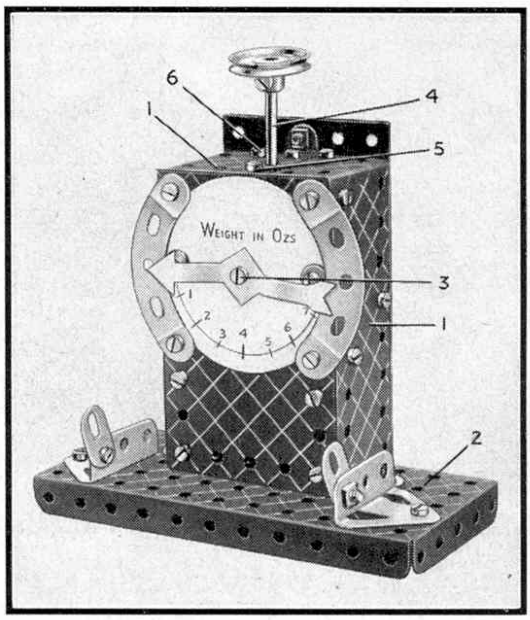


Fig. 2. A neat letter balance that is simple to construct and adjust. It can be built with Outfit No. 2.

A Flat Bracket, bolted at right angles to the end of a $2\frac{1}{2}''$ Strip, is next fastened by a lock-nutted bolt to the Bush Wheel, so that the Bush Wheel and the pointer turn if the $2\frac{1}{2}''$ Strip is pulled downwards. To the free end of the $2\frac{1}{2}''$ Strip is lock-nutted an Angle Bracket, and in this the end of the $3\frac{1}{2}''$ Rod 4 is secured by Spring Clips. The Rod is journalled in the top of the casing, and also in a Reversed Angle Bracket held by Bolt 5.

The pan on which letters to be weighed are placed is a 1″ Pulley fixed on Rod 4, and when the balance is not in use the Rod is held in its uppermost position by a Driving Band, which is looped around the Angle Bracket through which Rod 4 is fastened and also is held by Bolt 6. The back of the casing is filled in by a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, which is secured in position by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and an Angle Bracket.

A neat addition that adds to the interest of the model is a pen rack on the base. This consists of two Trunnions, each fitted with a Flat Bracket, which are bolted to Plate 2.

In Search of New Models

Machines and Tools Used in Road Making

IN these days of heavy high speed traffic there is great activity everywhere in road making and mending. In our towns and cities the laying of gas and water mains, electric cables or drains makes it necessary to break up roads and relay them, while existing roads often require to be given new surfaces and better foundations. In the countryside many entirely new roads are being constructed in practically all quarters. Wherever these operations are carried on, equipment suitable for reproduction in Meccano is brought into use, and it is great fun to build such models, especially those that can be put to work in imitation of the real thing.

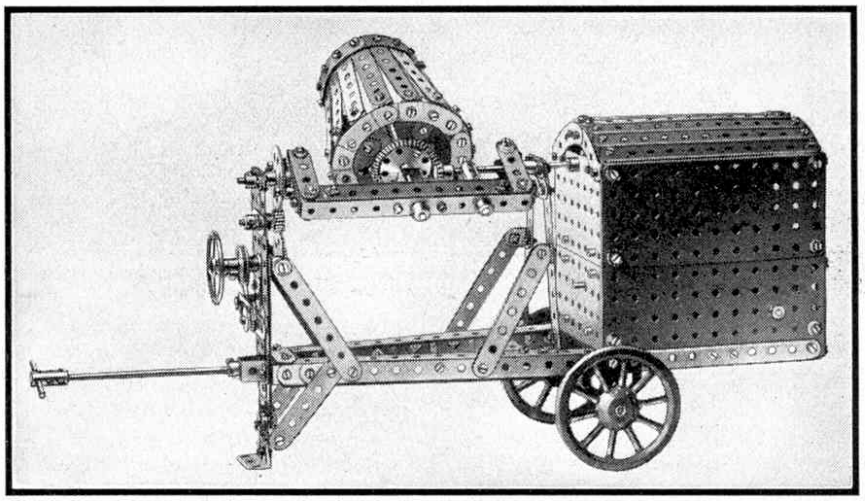


Fig. 1. A model concrete mixer that is driven by an Electric Motor and includes all the essential features of its prototype. It was built by H. Lee, Ardrossan.

Although many marvellous machines are used in this work there is still room for the workmen with spade or pick, and groups of figures using these tools make good subjects for simple and amusing working models. Some idea of the interesting effects that can be obtained in this manner is given in Fig. 3, which illustrates a very useful method of showing such models to the best advantage. The figures are mounted on a base, consisting in this case of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, and are so arranged that strings can be used to give them realistic movement. The group illustrated includes one man who works away vigorously with his pick when the string attached to his back is operated by turning the handle, and two companions who show equal industry in shovelling away the spoil.

It is easy to build up figures of this kind by pivoting Strips together, and Pulleys make good heads. The movement that adds so much fascination to such figures can be provided for in a variety of ways. The simplest is to tie lengths of Cord to each figure, the point at which this is attached depending on the direction and type of movement. For example, in the model shown in Fig. 3 the Cord controlling the movements of the man wielding the pick is tied to the $3\frac{1}{2}''$ Strip that forms his body. The arms of the other workmen have to move, and in this case they are suitably pivoted and the Cord is tied to them, passing through holes in the base to a Flat Bracket pivoted to a Bush Wheel fastened on the Crank Handle. When this is worked the Cords are alternatively pulled and released, so that the body of the first figure and the arms of the others are pulled up and allowed to fall. The effect is surprisingly realistic. It would be easy to introduce a *Magic* Motor. The movement then would be uniform, and work could be speeded up in an amusing manner.

A good working model of this kind can be made of a workman using a pneumatic drill or road breaker. These tools are used for breaking up old road surfaces when these are to be renewed, or when excavations are necessary for some purpose, and a realistic model can be made up from even the smallest Outfit. The figure can be constructed in a similar manner to those shown in Fig. 3. Double Angle Strips fitted with Rods to form the handle and bit make up an easily-built but effective model drill, and a useful alternative method of construction is shown in Fig. 2. The model seen in this was built by J. Bailie, London, N.11, who has made good use in its construction of a Universal Coupling and a Coupling. The hose that delivers the compressed air to the machine is represented by a length of Spring Cord, and in this instance the workman's "body" consists of Flat Trunnions and his "legs" of $2\frac{1}{2}''$ Strips.

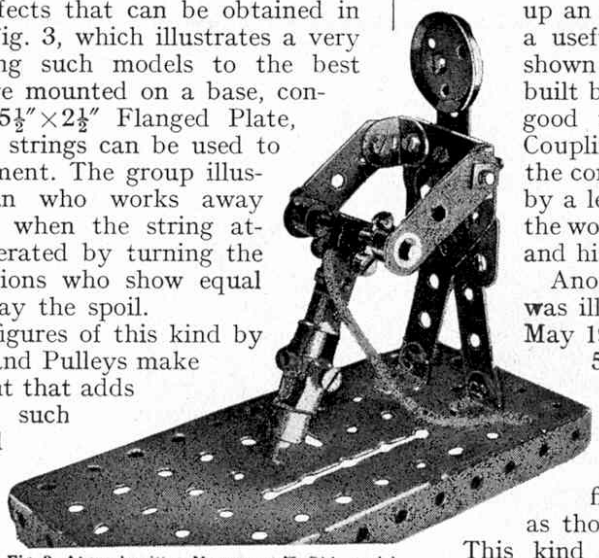


Fig. 2. At work with a Meccano drill. This model was built by J. Bailie, London, N.11, and requires comparatively few parts.

Another ingenious working model of this kind was illustrated on page 292 of the "*M.M.*" for May 1937. In this the figure was mounted on a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate standing on legs consisting of $2\frac{1}{2}''$ Strips. In the space below the Flanged Plate was a *Magic* Motor, which turned a simple cam that caused the miniature drill and the figure of the workman to vibrate rapidly, as though work was actually in progress.

This kind of model is worth developing. Model-builders with larger Outfits could attempt a more detailed reproduction of the drill, and also could include the air compressor plant necessary for its operation.

Another type of rock-breaking drill that is now frequently used in road construction is that known as the Warsop Road-Breaker, which was described in the "*M.M.*" for April 1936. This tool is operated by a small two-stroke petrol engine mounted in an inverted position,

New Outfit Models

Good Subjects for Large and Small Outfits

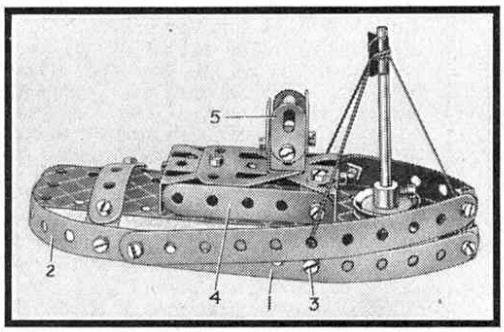


Fig. 1. A model steam tug built from Outfit No. 1.

THE five new models described this month differ so widely in type and size that every Meccano model-builder, whatever his Outfit, will find one or more that he will be delighted to construct. They include a scooter and a steam tug, built from the contents of Outfits Nos. O and 1 respectively. Then comes a trench digger that is capable of real work, and for which Outfit No. 4 is required. Finally the needs of owners of larger Outfits are met with fine working models of a horizontal steam engine and a swing bridge, each of which can be built from the contents of Outfit No. 7.

The steam tug shown in Fig. 1 is the first model to be described. This is very effective and it is very easy to assemble. Construction is commenced with the hull, which consists of two $5\frac{1}{2}''$ Strips 1 joined at the bows by an Angle Bracket and at the stern by a second $5\frac{1}{2}''$ Strip 2. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is then fixed in place by the bolt 5. The deck is a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, extended at the front by a Flat Trunnion, and it is held in place by a 1″ Pulley and a Spring Clip fixed on the $3\frac{1}{2}''$ Rod forming the mast. The sides are made to slope upward at the bows by the use at each side of a $5\frac{1}{2}''$ Strip and a $4\frac{1}{2}''$ strip made from two $2\frac{1}{2}''$ Strips. The Strips are joined at the bows by an Angle Bracket.

The deck cabin is formed with two Trunnions, which are joined together by a Flat Trunnion and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The bolt that holds the funnel is $\frac{3}{8}''$ long, and it passes through four Angle Brackets, each of which is fitted with a Flat Bracket 5. The $2\frac{1}{2}''$ Strip 4 is fixed in place by a Reversed Angle Bracket that serves to hold the deck cabin to the deck.

The model is completed by the addition of the towing beam, which consists of a $2\frac{1}{2}''$ Strip that is joined to the sides of the hull by Angle Brackets.

Parts required to build the model steam tug: 4 of No. 2; 4 of No. 5; 4 of No. 10; 8 of No. 12; 1 of No. 16; 1 of No. 22; 3 of No. 35; 24 of No. 37; 3 of No. 37a; 1 of No. 38; 3 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 1 of No. 189.

Fig. 2 shows a small but interesting model of a horizontal steam engine built with Outfit No. 7. The fire-box of this is formed of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, which are curved to the required shape and then overlap five holes. They are bolted together as shown in the illustration. The lower ends of the sides of the fire-box are joined by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip.

The boiler of the engine is represented by a Meccano Boiler, which is fixed to the top of the fire-box. The fire-box is next secured to the base, which consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates 1 bolted together, by the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip joining its sides. The forward end of the fire-box is filled in by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate, and the rear end by a compound plate formed by a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and a Semi-Circular Plate. The compound plate is secured in position by Angle Brackets.

The water supply tank 2, which forms also a support for the forward end of the Boiler, is built up by bending a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate to form a square tube, and fastening it to the base plate by a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The top of the tank consists of two overlapping $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates.

The supports for the crankshaft are provided by two $2\frac{1}{2}''$ Strips, bolted to the sides of the Boiler, the lower ends of the Strips being curved slightly to conform with the contour of the Boiler. Each web of the crank consists of two Collars. These are joined by unscrewing the Grub Screw of one of them so that it projects about $\frac{1}{8}''$, and screwing the second Collar over the projecting portion. A 1″ Rod is used for the crank pin. One of the webs is fastened on the end of a $1\frac{1}{2}''$ Rod and the other on the end of a $\frac{3}{4}''$ Bolt, both the Rod and the Bolt being journalled in the upper holes of the $2\frac{1}{2}''$ Strips.

The "big end" is formed by a large Fork Piece fitted on the crank pin. A $1\frac{1}{2}''$ Rod is locked in the boss of the Fork Piece to form the connecting rod, and to its free end a 2″ Rod is pivotally secured by two Rod and Strip Connectors. The 2″ Rod represents the piston rod, and it slides in a cylinder consisting of a Sleeve Piece, which is fastened to the top of the fire-box by a $\frac{1}{2}''$ Bolt, but spaced from it by six washers. A $\frac{3}{4}''$ Flanged Wheel is pressed on each end of the Sleeve Piece.

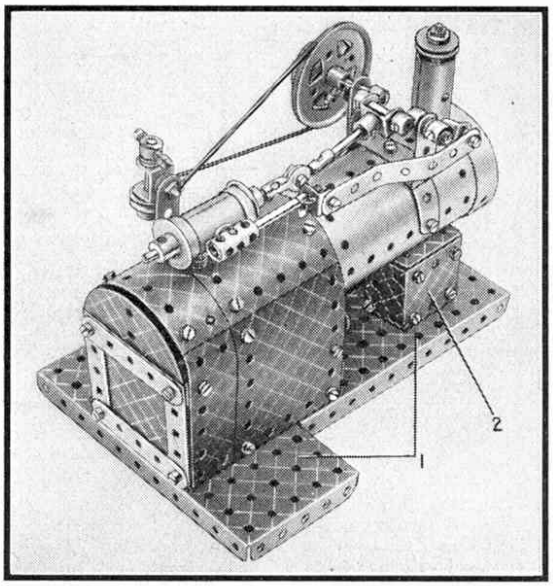


Fig. 2. A model overtype stationary steam engine and boiler, which forms an unusual subject for Outfit No. 7.

The valve chest is a Coupling, which is bolted to the side of the cylinder, and carries a 2″ Rod that is connected by a $3\frac{1}{2}''$ Strip and an Angle Bracket to a Collar on the end of the crankshaft. To make the centrifugal governor two bolts are screwed into the tapped holes of a Collar, which is mounted on the upper end of a $1\frac{1}{2}''$ Rod journalled in a Double Bracket. The Double Bracket is supported by a $1\frac{1}{2}''$ Strip and an Obtuse Angle Bracket from the top of the fire-box. At its lower end the $1\frac{1}{2}''$ Rod carries a $\frac{1}{2}''$ Pulley, which is connected by a Driving Band to the flywheel.

Parts required to build model steam engine: 1 of No. 3; 6 of No. 5; 1 of No. 6a; 1 of No. 11; 1 of No. 16; 1 of No. 17; 3 of No. 18a; 1 of No. 18b; 1 of No. 20a; 2 of No. 20b; 1 of No. 22; 1 of No. 23a; 56 of No. 37a; 48 of No. 37b; 22 of No. 38; 2 of No. 48; 2 of No. 48a; 1 of No. 51; 2 of No. 52; 6 of No. 59; 1 of No. 63; 1 of No. 80c; 1 of No. 111; 1 of No. 111a; 1 of No. 116; 1 of No. 162a; 1 of No. 162b; 2 of No. 163; 1 of No. 164; 1 of No. 186a; 2 of No. 188; 3 of No. 189; 1 of No. 190; 2 of No. 192; 2 of No. 212; 1 of No. 214; 2 of No. 217b.

The scooter is illustrated in Fig. 3. It is best to commence construction by bending a $5\frac{1}{2}''$ Strip 1 to the shape shown, and then fitting it with a Bush Wheel 2 and two Flat Trunnions. Two Angle Brackets are next bolted to the rear end of Strip 1 in the form of a reversed angle bracket, and to them are fastened two Trunnions. The rear wheel revolves between the latter on the shanks of two bolts, which are bolted in each Trunnion as shown.

The wheel at the front is supported on two bolts 5 between two $5\frac{1}{2}''$ Strips 4, arranged in a similar manner to the supports for the rear wheel. The Strips 4

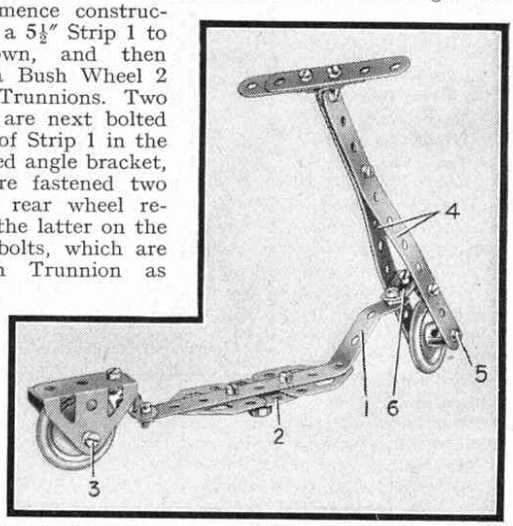


Fig. 3. The simple scooter constructed as shown above is made with parts from Outfit No. O.

New Outfit Models

A Tricycle and a Fine Double-Decker Bus

THE models described this month are designed to provide interesting subjects for both small and large Outfits. They include a simple tricycle built from Outfit No. O, a novel portable garage crane that can be built from the contents of Outfit No. 2, a No. 4 Outfit steam river tug, and a realistic double-decker bus that makes good use of the parts in Outfit No. 7. All are easily built, and will provide really good fun both in building and operation.

The tricycle is illustrated in Fig. 3, and is very easy to assemble. First, the short crossbar is built by bolting three Flat Brackets together in the manner shown. These are then bolted to the Flat Trunnion that forms the saddle, the bolt holding also two Trunnions that in turn are attached to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip by means of an Angle Bracket. The Double Angle Strip provides bearings for the $3\frac{1}{2}''$ Rod that forms the rear axle.

The front fork consists of two $2\frac{1}{2}''$ Strips joined by two Angle Brackets. The $\frac{3}{8}''$ Bolt joining the latter parts is first slipped through the Flat Bracket of the crossbar, and then a nut is screwed on its shank. After passing the Bolt through the holes in the Angle Brackets, a second nut is placed on it and the $2\frac{1}{2}''$ Curved Strip representing the handlebars is then bolted to one of the Angle Brackets. The front wheel, a Bush Wheel, is carried on the shank of two bolts passed through the $2\frac{1}{2}''$ Strips that form the forks, and two washers are used to prevent it from rubbing against the Strips.

Parts required to build the model tricycle: 2 of No. 5; 3 of No. 10; 4 of No. 12; 1 of No. 16; 2 of No. 22; 1 of No. 24; 11 of No. 37; 2 of No. 37a; 2 of No. 38; 1 of No. 48a; 1 of No. 90a; 1 of No. 111c; 2 of No. 126; 1 of No. 126a; 2 of No. 155a.

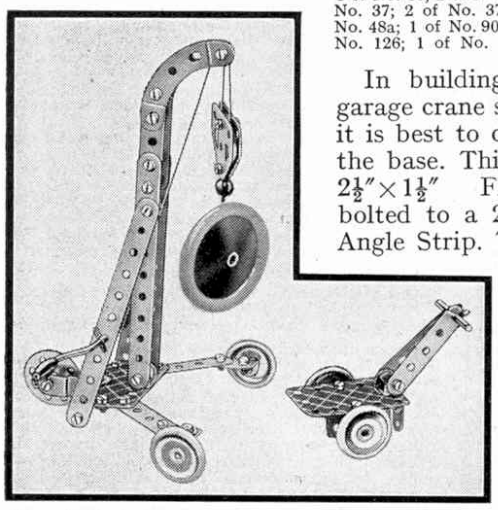


Fig. 2. This simple model represents a portable crane of the type used in motor garages. It can be built with Outfit No. 2.

In building the portable garage crane shown in Fig. 2 it is best to commence with the base. This consists of a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate bolted to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. Two $2\frac{1}{2}''$ Strips are bolted to the free corners of the Flexible Plate, each $2\frac{1}{2}''$ Strip being extended by a Flat Bracket, and to the Flat Brackets are bolted Angle Brackets to carry 1″ Pulleys fitted with Rubber Rings. The rear wheel is a Bush Wheel mounted on bolts held in a Cranked Bent Strip that is attached by an Angle Bracket to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. The jib post is composed of $5\frac{1}{2}''$ Strips extended three holes by $2\frac{1}{2}''$ Strips. Curved Strips are bolted to the latter and are joined by a lock-nutted $\frac{3}{8}''$ Bolt.

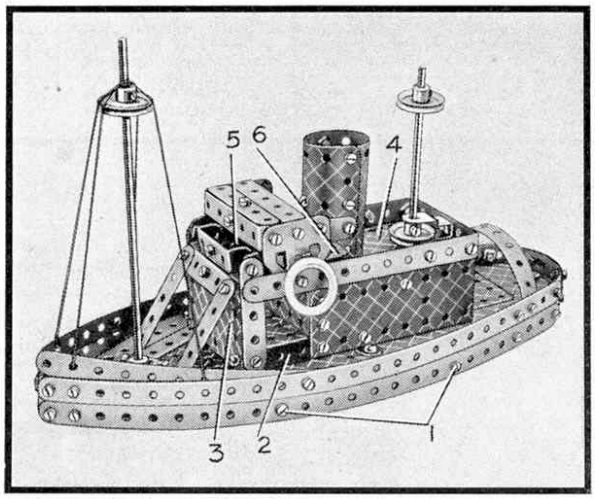


Fig. 1. A sturdy model of a steam tug, which can be built with the parts contained in Outfit No. 4.

The stays for the jib post are $5\frac{1}{2}''$ Strips, which are bolted to the Double Angle Strip of the base and to the $5\frac{1}{2}''$ Strips of the jib. The pulley block is made from two Flat Trunnions, the broad ends of which are spaced apart by three washers. The narrow ends of the Flat Trunnions carry a small Loaded Hook. The hoisting cord is tied to the $\frac{3}{8}''$ Bolt at the jib head and is led through the pulley block. It is then taken back over the $\frac{3}{8}''$ Bolt and wound around the Crank Handle journalled in the stays.

The small bogie is made from a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, bearings for the wheel axle being provided by two Trunnions. The drawbar consists of $2\frac{1}{2}''$ Strips joined to the Flexible Plate by Angle Brackets.

Parts required to build the model portable crane: 4 of No. 2; 6 of No. 5; 3 of No. 10; 8 of No. 12; 2 of No. 17; 1 of No. 19g; 4 of No. 22; 1 of No. 24; 4 of No. 35; 32 of No. 37; 3 of No. 37a; 4 of No. 38; 1 of No. 40; 1 of No. 44; 1 of No. 48a; 1 of No. 57c; 2 of No. 90a; 4 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 155a; 1 of No. 176; 1 of No. 187; 2 of No. 188.

The steam tug shown in Fig. 1 is a particularly good example of the interesting work that can be done with a No. 4 Outfit and is simple to build. The sides of the hull consist of two pairs of $12\frac{1}{2}''$ Strips, which are joined at the bows by Angle Brackets and at the stern by pairs of Formed Slotted Strips that overlap each other by half their length. The $12\frac{1}{2}''$ Strips of each pair forming the sides are connected to each other by two Flat Brackets. The Bolts 1 hold Angle Brackets, to which is attached a Hinged Flat Plate that forms the deck. The Plate is extended by Flanged Sector Plates. At the bows the spaces between the Sector Plate and the hull are closed with $3\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips, and the stern is made with $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and a Semi-Circular Plate.

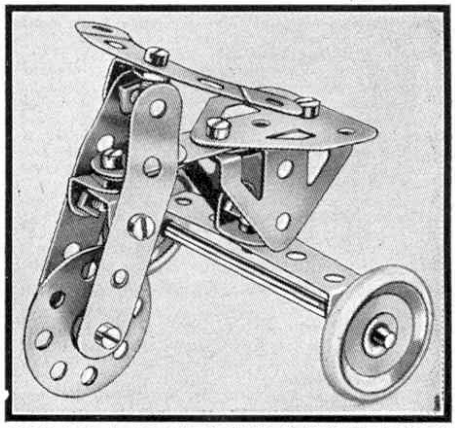


Fig. 3. A good subject for Outfit No. O. This tricycle is easy to assemble and can be steered by the handlebars.

New Meccano Models

Balance—Ice Cream Cart—Windmill—Oil-Fired Steam Plant

THE four models we are describing this month will interest owners of widely different sizes of Outfits, for they can be built with the contents of Outfits Nos. 1, 4, 5 and 7 respectively. The smallest is a balance with which letters and other light articles can really be weighed, and is easily constructed with the parts included in Outfit No. 1. The models for Outfits Nos. 4 and 5 are respectively an ice cream cart of the type often seen specially at the seaside, and a windmill that reproduces well the movements of a particularly attractive type. The largest model is an oil-fired boiler plant and steam engine designed for Outfit No. 7.

The letter balance is shown in Fig. 2. In making it two $5\frac{1}{2}''$ Strips are first bolted to two Trunnions, which are fastened to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate that forms the base. The beam of the balance consists of two $5\frac{1}{2}''$ Strips overlapping four holes, and it is pivoted on a lock-nutted $\frac{3}{8}''$ Bolt passing through the fifth hole from one end and the top holes of the vertical $5\frac{1}{2}''$ Strips. Two $2\frac{1}{2}''$ Strips overlapping two holes are then pivoted to the short arm of the beam, as shown in the illustration, and to them is pivotally attached a third $2\frac{1}{2}''$ Strip. The latter Strip is connected to the vertical $5\frac{1}{2}''$ Strips by a $2''$ Rod fitted with $1''$ Pulleys. All the joints of course are pivotal in order to allow free movement of the beam.

The tray on which the letters are placed is a Bush Wheel fitted with two Flat Trunnions and two Curved Strips, and the Bush Wheel is attached to the top of the $2\frac{1}{2}''$ Strip below it by means of an Angle Bracket. A $1''$ Pulley is fixed to the other end of the beam to balance the weight of the tray, and a rider consisting of three Angle Brackets, a Flat Bracket and a $1''$ Pulley is arranged to slide along the beam. A vertical post fitted with Flat Brackets provides stops that prevent excessive movement of the beam.

Before the balance can be put into practical use it is necessary to calibrate it. A strip of paper is glued to the beam, and weights of 1, 2, 3 and 4 oz. are placed in the scale pan in succession, the rider positions that give exact balances being marked. If actual weights are not available various objects of known weight are used instead, and the scale of marking is worked out in a similar manner.

Parts required to build the model letter balance: 4 of No. 2; 4 of No. 5; 3 of No. 10; 5 of No. 12; 1 of No. 17; 4 of No. 22; 1 of No. 24; 24 of No. 37; 6 of No. 37a; 3 of No. 38; 2 of No. 48a; 1 of No. 52; 4 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 155a.

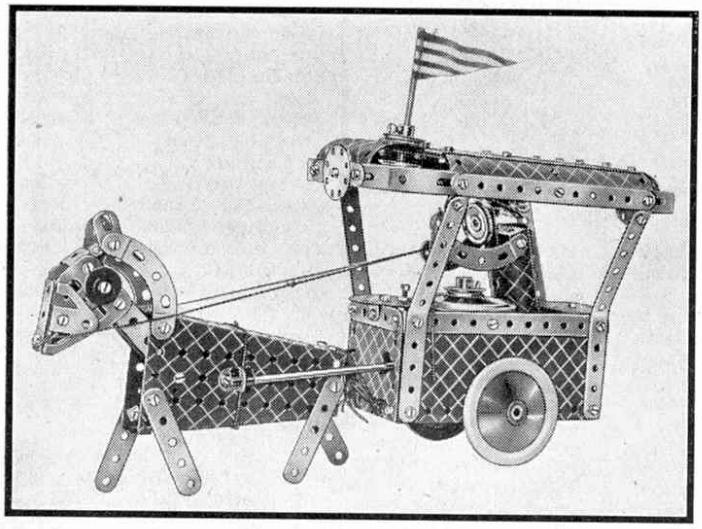


Fig. 1. An amusing model of a familiar street and seaside subject. This representation of an ice cream cart can be built from the contents of Outfit No. 4.

The ice cream vendor's vehicle is shown in Fig. 1. The bottom of the cart is a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to the flanges of which are bolted two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates to form the sides, and two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates to form the front and rear respectively. The Plates are strengthened at their upper edges by $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips, and the canopy supports are $5\frac{1}{2}''$ Strips. The canopy itself consists of a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and the halves of a Hinged Flat Plate from which the centre pin has been removed. To the long edges of the plate so formed are bolted $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates bent as shown, and $1\frac{11}{16}''$ radius Curved Plates form the front and rear. The Flexible Plates and Curved Plates are strengthened at their lower edges by $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips respectively, their ends being joined by Formed Slotted Strips.

Two Semi-Circular Plates are attached by Angle Brackets to each end of the cart, and a Double Angle Strip is bolted between the sides. The latter part supports a $3\frac{1}{2}''$ Rod, which is pushed through the centre hole in the Double Angle Strip and through the Flanged Plate. The Rod carries at its upper end the Road Wheel and the $1''$ Pulley that represents the ice cream freezer, and its lower end is fitted with a Spring Clip. The Road Wheels on which the model runs are fitted on a $3\frac{1}{2}''$ Rod that represents the axle.

The driver's body consists of two U-Section Curved Plates bolted together to form a cylinder, to the upper edge of which is attached a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip by means of an Angle Bracket, the same bolt holding also a Double Bracket. A $1''$ Pulley forms his face and his hat is a Bush Wheel, and both parts are fixed in place by $\frac{3}{8}''$ Bolts. His arms are $2\frac{1}{2}''$ Curved Strips, which are bolted to the ends of the $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The completed figure is bolted to the side of the cart.

The "horse" consists of two Flanged Sector Plates joined together with Flat Brackets. Its head is built up from Trunnions and Flat Trunnions, which are fastened to the $3\frac{1}{2}''$ Strips and Curved Strips forming the neck. The eyes are washers painted black. The shafts of the cart are $4''$ Rods, and they are attached to the horse and cart by means of Spring Clips.

Parts required to build the model ice cream cart: 8 of No. 2; 2 of No. 3; 8 of No. 5; 5 of No. 10; 2 of No. 11; 5 of No. 12; 4 of No. 12c; 2 of No. 15b; 3 of No. 16; 1 of No. 17; 4 of No. 22; 1 of No. 24; 8 of No. 35; 75 of No. 37; 2 of No. 37a; 4 of No. 38; 1 of No. 48; 3 of No. 48a; 1 of No. 52; 2 of No. 54a; 4 of No. 90a; 3 of No. 111c; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 3 of No. 187; 2 of No. 189; 2 of No. 190; 1 of No. 191; 2 of No. 192; 1 of No. 198; 2 of No. 199; 2 of No. 200; 1 of No. 212; 1 of No. 213; 2 of No. 214; 2 of No. 215; 2 of No. 217a; 2 of No. 217b.

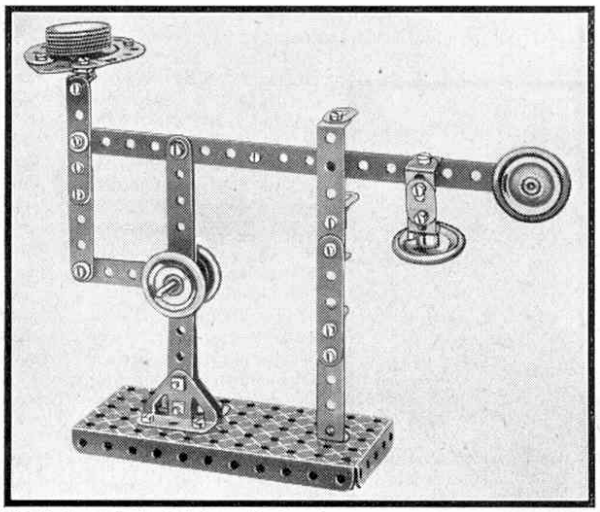


Fig. 2. An easily-built balance that can be put to practical use in weighing letters. It can be built from the contents of Outfit No. 1.

The model windmill shown in Fig. 4 is of the revolving type and is fitted with a fantail, which is mounted at the end of two booms that project from the mill and are supported at their outer ends on wheels. When the wind changes its direction the fantail is rotated and drives the wheels of the boom, thus turning the mill so that the sails always face the breeze.

The superstructure is the first part of the model to be built. A Hinged Flat Plate 2 that forms the roof of the mill is extended downwards at each side with Flexible Plates. The side shown in Fig. 4 consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates, one $4\frac{1}{2}'' \times 2\frac{1}{2}''$ and one $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate. The other side comprises three $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates. The lower $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are strengthened with $5\frac{1}{2}''$ Strips, to each end of which are fastened Angle Brackets. Similar parts are attached also to the corners of the Hinged Flat Plate and are connected by $3\frac{1}{2}''$ Strips, to which are bolted Semi-Circular Plates.

The rear wall of the mill consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ and two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, the door posts being formed by $2\frac{1}{2}''$ Strips as shown. The front wall is edged round with Strips in the same

Two Fascinating Working Models

An Anti-Aircraft Gun and a Designing Machine

THIS month we are describing working models of an anti-aircraft gun and a harmonograph, each of which can be built with a No. 5 or larger Outfit. The harmonograph is capable of producing innumerable intricate designs, such as the two illustrated in Figs. 3 and 4, and watching the machine trace out these designs is a fascinating pastime at which many hours can be spent. The anti-aircraft gun fires Washers or Collars, and can be swivelled and elevated like a real gun.

The base of the gun, which can be seen in Fig. 1, is constructed first. It consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate to which two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are bolted. The sides of the base are filled in by $5\frac{1}{2}''$ Strips that are fastened in position by Angle Brackets. A 3″ Pulley is next bolted to the centre of the base, and around it two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates 10 are fastened. The Flexible Plates are not attached to the 3″ Pulley, but it will be found that if the Plates are bolted together tightly they will grip the rim of the Pulley firmly. A 2″ Rod, which forms a swivel for the superstructure of the gun, is locked vertically in the boss of the 3″ Pulley and is further supported by the centre hole of a Double Bent Strip secured by two $\frac{1}{2}''$ Bolts to the base. Each Bolt carries four Washers on its shank to space the Double Bent Strip upwards.

At its upper end the 2″ Rod carries a second 3″ Pulley, which is spaced from the Double Bent Strip by a 1″ fast Pulley. Two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates 11 are mounted on the 3″ Pulley by a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and these are braced on their inner sides by $2\frac{1}{2}''$ Strips. Two $2\frac{1}{2}''$ small radius Curved Strips are also bolted to the Flexible Plates, as shown in Fig. 1, to form the supporting arms for the gun barrel. The front of the turret is filled in by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 12, which is fastened in position by three Angle Brackets, and is extended upward by a Flat Trunnion.

The firing platform of the gun is formed by a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate mounted on two $5\frac{1}{2}''$ Strips bolted to the 3″ Pulley.

The remaining portion of the model to be constructed is the gun itself. This is shown partially dismantled in Fig. 2. The barrel consists of two $12\frac{1}{2}''$ Angle Girders 1, which are joined together at 2, in Fig. 1, and 3 by two Double Brackets. At this stage in the construction of the model, however, the Double Brackets are only bolted to one of the Angle Girders, the other Girder being fitted later when the firing mechanism has been assembled. A $9\frac{1}{2}''$ compound rod, built up of a 5″ and a $4\frac{1}{2}''$ Rod joined by a Rod Connector, is journalled in the centre holes of the Double Brackets and it carries at its forward end a Cord Anchoring Spring. This is pressed on the rod about half an inch from the muzzle end to form a stop for the Washer or Collar used as a missile. A Washer is fitted on to the rod just behind the Rod Connector, and around this the end of a 6″ Driving Band is looped. The other end of the Driving Band is passed through the hole in the lower Angle Girder directly behind the front Double Bracket, and is anchored to a bolt secured at the extreme forward end of the barrel.

A handle 4 is provided at the rear of the $9\frac{1}{2}''$ rod to enable it to be pulled back preparatory to firing. The handle consists of a $1\frac{1}{2}''$ Strip and is attached by an Obtuse Angle Bracket to a Rod and Strip Connector on the end of the compound rod. The bolt attaching the Obtuse Angle Bracket to the Rod and Strip Connector carries three Washers on its shank, so that it does not catch against the sides of the barrel.

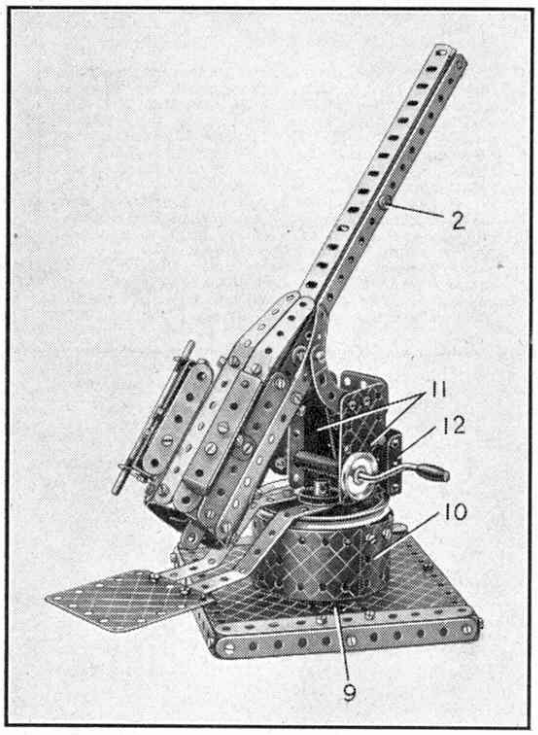


Fig. 1. A fine model of an anti-aircraft gun that shoots Washers or Collars. It is built up of parts included in Meccano Outfit No. 5.

The firing catch, which holds the $1\frac{1}{2}''$ Strip in its rearmost position until it is required to fire the gun, consists of a Threaded Pin 7. This slips down in front of the Rod and Strip Connector on the end of the $9\frac{1}{2}''$ rod, and prevents it from shooting forward under the action of the Driving Band. The Threaded Pin can be raised by a lever 5, which consists of a $2\frac{1}{2}''$ and a $1\frac{1}{2}''$ Strip bolted together overlapping two holes. The lever is lock-nutted at its end to a Flat Bracket bolted to the side of the barrel, and the Threaded Pin is secured to it by an Angle Bracket 6 and a Flat Bracket.

The wider portion of the barrel is built up on two $5\frac{1}{2}''$ Strips, each of which is carefully bent into the form of a circle and has its ends joined together by an Obtuse Angle Bracket. Further Strips of different sizes are then bolted between the two $5\frac{1}{2}''$ Strips, as shown in the illustration, and the complete unit is then pushed on to the end of the $12\frac{1}{2}''$ Angle Girders and fastened in position by a Double Bracket 8.

There are two recoil shock absorbers, each consisting of a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and two $2\frac{1}{2}''$ Strips joined by Angle Brackets, and they are mounted on the barrel by means of two Reversed Angle Brackets. One of the shock absorbers is fitted with a sight, which is represented by a $3\frac{1}{2}''$ Rod journalled in two Flat Brackets bolted to the ends of the Double Angle Strip.

This completes the barrel of the gun, and it can now be fitted on the mounting. This is done by fastening two bolts through the end holes of the Curved Strips bolted to Plates 11, in Fig. 1, so that they form swivels on which the barrel can rest. The elevation of the barrel is controlled by a Crank Handle journalled in Flexible Plate 11. Cord is tied to the Crank Handle, wound around it several times, and its other end attached to the barrel just in front of the pivot. Turning the Crank Handle in one direction pulls down the muzzle of the gun, and the weight of the butt end swings the gun to increase the elevation when the movement of the Handle is reversed. Two 1″ Pulleys fixed on the Crank Handle press tightly against the Flexible Plates 11 so that the gun does not turn too easily and is held in any desired position.

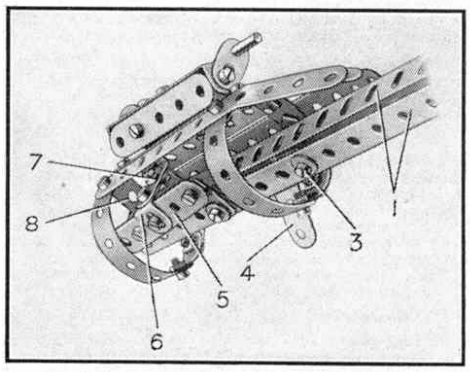


Fig. 2. The construction of the barrel of the gun.

Parts required to build model anti-aircraft gun: 14 of No. 2; 2 of No. 3; 12 of No. 5; 2 of No. 6a; 2 of No. 8; 6 of No. 10; 3 of No. 11; 12 of No. 12; 3 of No. 12c; 1 of No. 15; 1 of No. 15a; 1 of No. 16; 1 of No. 17; 2 of No. 19b; 1 of No. 19g; 3 of No. 22; 2 of No. 35; 87 of No. 37a; 82 of No. 37b; 14 of No. 38; 1 of No. 40; 1 of No. 45; 1 of No. 48; 2 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 90a; 2 of No. 111a; 1 of No. 111c; 1 of No. 115; 2 of No. 125; 1 of No. 126a; 1 of No. 176; 1 of No. 186a; 2 of No. 188; 2 of No. 189; 1 of No. 190; 2 of No. 192; 1 of No. 212; 1 of No. 213.

The harmonograph is seen in operation in Fig. 5. It consists of a pendulum that carries a table at its upper end and is mounted so that it is free to swing in any direction. A pen suspended above the table then traces out a design on a piece of card attached to the table. The addition of a second pendulum to the lower end of the first one makes the designs produced by the machine more intricate.

The base of the harmonograph is a box-shaped structure built by joining the ends of two $12\frac{1}{2}''$ Angle Girders by $5\frac{1}{2}''$ Strips. Four $2\frac{1}{2}''$ Strips are bolted vertically to the ends of the Angle Girders; the

Model-Building Competition Results

By "Spanner"

"Aircraft" Contest (Home Section)

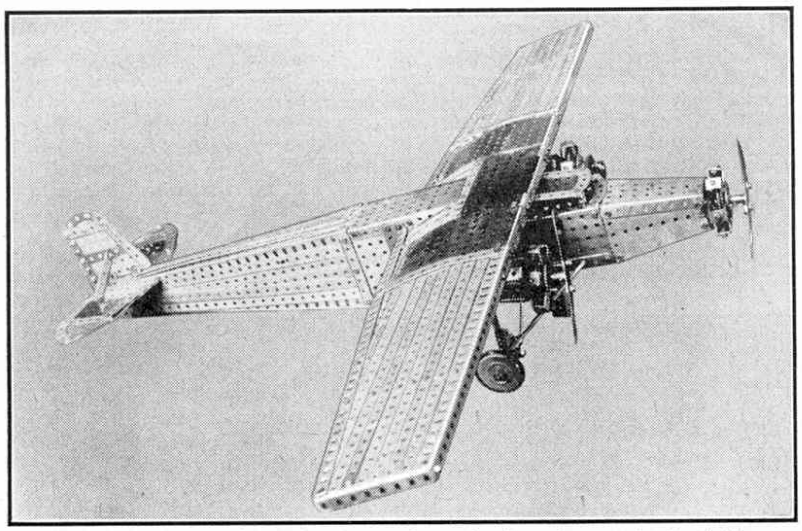
The prize-winners in the Home Section of the "Aircraft" Model-Building Competition, full details of which were announced in the April issue of the "*M.M.*," are as follows:

1st Prize, Meccano or Hornby products value £3/3/-: E. Rusted, Royston. 2nd, products value £2/2/-: D. Holden, Didcot. 3rd, products value £1/1/-: J. Brown, Fairlight Cove, Sussex.

Products value 10/6: V. Featherstone, Widnes; J. Raisbeck, Bedlington; K. Walker, Nottingham; E. Atherton, Widnes; S. Bayley, Grays.

Products value 5/-: H. Thomas, Edgware; B. Luggett, Liverpool; P. Laws, Bedlington; K. Bishop, Crowborough; J. Kennett, Richmond.

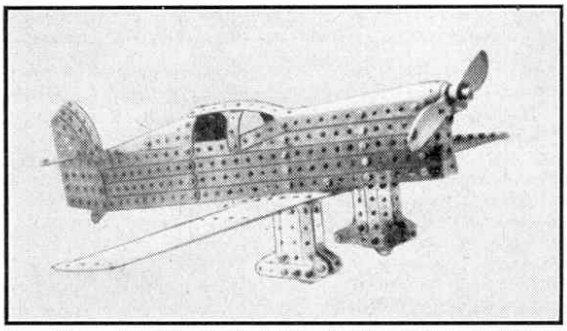
A large number of extremely realistic models of modern aircraft were received in this competition, and it needed very careful consideration to select those most worthy of the prizes. It was finally decided to award First Prize to E. Rusted, Royston, in recognition of his fine work in building a model of an Armstrong Whitworth A.W. 23 Bomber Transport machine. An actual machine of this type was illustrated in the "*Air News*" pages of the "*M.M.*" for April last, and it was that illustration that provided Rusted with the particulars he required in building the model that proved so successful in this Contest.



This high wing triple-engined monoplane is a good example of aeroplane construction in Meccano. It was built by G. K. Colenbrander Brunkelen Holland.

Flexible Plates and Strip Plates are used to good advantage in modelling the wings and fuselage, and although no attempt has been made to reproduce the rounded corners of the fuselage that are a feature of the actual machine, the appearance of the finished model is not seriously affected. Rusted displayed wisdom in selecting the prototype of his model for although it is full of interesting detail, the design of the actual machine renders it easy to reproduce realistically with Meccano parts. A point of special interest is the manner in which the transparent gun turrets are represented. On the actual machine these are metal frameworks glazed with a transparent plastic and fitted with a slot to accommodate the gun; in the model they are represented with Strips bent to shape and then threaded with Cord through their holes to form the horizontal bars. The guns are Rods fitted with Worms to represent the breeches.

Second Prize was awarded to D. Holden, Didcot, who chose for his subject the Percival "Mew Gull" monoplane. The model is very neatly constructed, and a particularly pleasing feature of it is that the fuselage is built entirely from Strips, none of which are bent. I must congratulate Holden on the realistic appearance he has succeeded in obtaining without mutilating the parts. Flexible Plates are used to form the top of the engine cowling.



A realistic model of the Percival "Mew Gull" monoplane, which won Second Prize in the "Aircraft" Competition for D. Holden, Didcot.

Another good feature of this model is the construction of the wheel fairings, which on the actual machine merge into the legs of the landing gear. The wheels are housed in Channel Bearings, which are connected to the wings by 2½" Strips. This method produces fairings that are neat and compact, and which add greatly to the fine appearance of the model.

J. Brown, Fairlight Cove, submitted a model of a D.H. "Hornet Moth," and well deserved the Third Prize awarded to him for his effort. Unfortunately the model is built to a rather small scale, which prevents the inclusion of interesting details. It is mainly the absence of these that prevented Brown from obtaining a higher award. Good use has been made of Strips and Flat Girders in the construction of the fuselage, and the wings are built entirely from Strips. The landing wheels are rather too large for the general scale of the model, however, and smaller parts would have given the model an even better appearance than it already has.

The model entered by S. Bayley was a reproduction of the Empire Flying Boat "*Caledonia*," and in view of the fact that Bayley is only 11 years of age it is a very good effort. The model is built from Meccano parts and a few Aeroplane Constructor parts combined, the latter being used mainly in the construction of the fuselage and for the wing tip floats and engines.

E. Atherton succeeded in building a sturdy model of a Bristol "Blenheim" but unfortunately this is spoilt by the fact that the wings are not of the correct outline. In other respects, however, the model is well built, and is a quite good representation of its prototype.

Among the entries winning smaller prizes, one of the most interesting is a model of a Stearman Hammond "Flying Tricycle" built by B. Luggett, Liverpool 17. This is one of the many planes that have been constructed in an effort to produce a foolproof type of machine, and it has many unorthodox features. The tail unit is mounted on two booms secured to the wings, and the propeller is of the pusher type. A tricycle type undercarriage under the cabin is said to provide an unusually safe landing gear, and it is from this feature that the machine's name is derived.

The details of Luggett's model are good, but his work tends to be rather scrappy, and it is this fault that prevented him from gaining a larger prize.

Peter Laws, Bedlington, Northumberland, submitted a model of a high wing twin-engined monoplane. The model possesses several good constructional features, including a neat shock-absorbing landing gear, but as it is not based on any actual machine it lacks some of the interest of the other entries.

"Small Outfits" and "Suggestions" Model-Building Contests

The principal prize-winners in the "*Small Outfits*" and "*Suggestions*" Competitions, details of which were announced in the March issue of the "*M.M.*" are as follows:

"SMALL OUTFITS" CONTEST

Home Section. 1st Prize, Meccano or Hornby products value £2/2/-: D. Parsons, Birmingham. 2nd, products value £1/1/-: D. Aitken, Rugby. 3rd, products value 10/6: R. Wardrop, Cumnock.

Overseas Section. 1st Prize, Meccano or Hornby products value £2/2/-: J. Lange, Stirling West, South Australia. 2nd, products value £1/1/-: D. Hutt, Hamilton, New Zealand. 3rd, products value 10/6: R. Hutton, Hango, Finland.

"SUGGESTIONS" CONTEST

Home Section. 1st Prize, Meccano or Hornby products value £3/3/-: A. Jones, Liverpool. 2nd, products value £2/2/-: B. Davies, Birmingham. 3rd, products value £1/1/-: V. Carter, London, E.5.

Overseas Section. 1st Prize, Meccano or Hornby products value £3/3/-: E. Siniscalco, Buenos Aires. 2nd, products value £2/2/-: L. Edwards, Freeman's Bay, Auckland. 3rd, products value £1/1/-: P. Giese, Buenos Aires.

New Outfit Models

Using the All-Enclosed Electric Motors

THIS month we are describing three fine models, two of which are driven by the new Meccano all-enclosed Electric Motors types E06 and E020. These Motors are very compact, and their design makes them specially suitable for building into models constructed from the smaller Outfits. The two models in which they are used are a fine motor-cycle combination, which can be assembled from the parts in Outfit No. 4, and an interesting scientific toy made from Outfit No. 2 that will provide hours of good fun when completed. The other model described in this article is a fine hammerhead crane designed for Outfit No. 6.

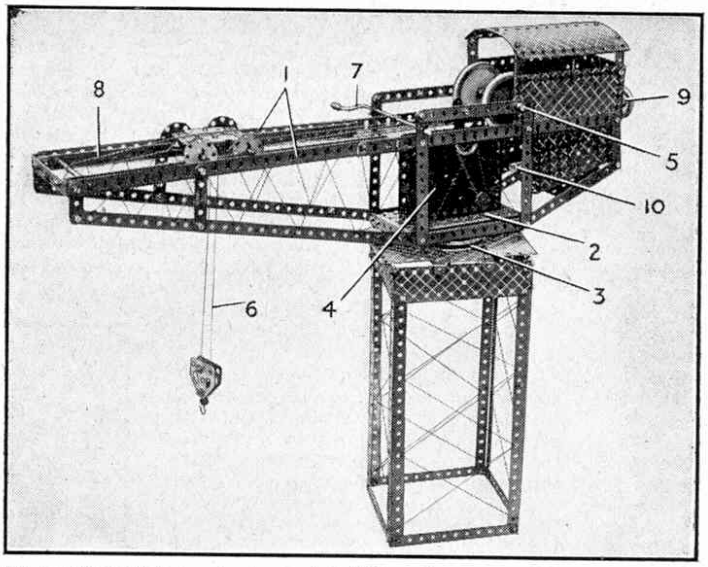


Fig. 1. This model hammerhead crane is built from the contents of Outfit No. 6, and is operated by a No. 1a Clockwork Motor controlled from the driver's cab.

The hammerhead crane is illustrated in Fig. 1. The tower is constructed as shown, and a 3″ Pulley 3 is bolted to it. The main members 1 of the rotating boom each consists of two 12½″ Angle Girders overlapped three holes, and they are connected at one end by a 3½″×½″ Double Angle Strip, and at the other end by a 3½″×2½″ Flanged Plate. A 2½″×½″ Double Angle Strip is then bolted to the first Double Angle Strip, and to its lugs are fastened 12½″ Strips, their free ends being attached by Double Brackets to the girders 1.

The girders 1 are now connected with the lower members of the boom, which consist of 12½″ Strips extended by 2½″ and 5½″ Strips. The latter are connected to the 3½″×2½″ Flanged Plate, and are joined also to the 2½″ Strips by further 5½″ Strips. The latter parts in turn are connected to the girders 1 by 5½″ Strips as shown. The lower members of the jib are joined by 3½″ Strips that support also a 5½″×2½″ Flanged Plate 2, to which is fastened a 3″ Pulley.

The No. 1a Clockwork Motor 4 is mounted on the Flanged Plate 2 by means of Double Brackets, and to its brake lever is pivoted a 5″ Rod by means of Collar 10. In a similar manner an 11½″ Rod 9 is pivotally attached to the reverse lever of the Motor. Both Rods protrude through the 3½″×2½″ Flanged Plate at the rear end of the jib and are each fitted with a 1″ Pulley.

The sides of the control cabin consist of 5½″×2½″ Flexible Plates, which are joined at the rear by a 3½″×½″ Double Angle Strip and two 2½″×2½″ Flexible Plates. The roof consists of two 5½″×2½″ Flexible Plates, and is supported by four 2½″ Strips. The jib is pivoted on a 3½″ Rod locked in the boss of the upper 3″ Pulley and retained in position by a Spring Clip below Pulley 3.

The hoisting trolley is a 2½″×1½″ Flanged Plate, to each flange of which is bolted a 1½″×½″ Double Angle Strip. The latter provide bearings for the 3½″ Rods that carry the 1¼″ Discs forming the wheels. Trunnions bolted to the Flanged Plate carry a 2″ Rod, on which are two 1″ loose Pulleys.

The Crank Handle 7 controls the traversing movement of the hoisting trolley. Cord 8 is tied to the rear of the trolley, then wound a few times round Crank Handle 7 and led around a 3½″ Rod journalled at the front end of the jib. It is then tied to the front of the trolley.

The hoisting drum is a 4½″ Rod 5, and is driven in the following manner. A ½″ Pulley on the driving shaft of the Motor is connected by a Driving Band to a 1″ Pulley fastened on a 2″ Rod journalled in the side plates of the Motor. A second Driving Band connects the 2″ Rod to a 1″ Pulley on Rod 5.

The hoisting Cord 6 is tied to a Cord Anchoring Spring on Rod 5 and is led over one of the 1″ loose Pulleys in the hoisting trolley. It is then passed around the ½″ Pulley in the hoisting block and led over the second 1″ loose Pulley in the hoisting trolley. Finally it is tied to the front end of the boom.

Parts required to build the model hammerhead crane: 12 of No. 1; 14 of No. 2; 4 of No. 3; 2 of No. 4; 8 of No. 5; 2 of No. 6a; 4 of No. 8; 4 of No. 11; 16 of No. 12; 4 of No. 12c; 1 of No. 13; 1 of No. 15; 1 of No. 15a; 4 of No. 16; 2 of No. 17; 2 of No. 19b; 1 of No. 19b; 4 of No. 22; 2 of No. 22a; 1 of No. 23; 1 of No. 23a; 14 of No. 35; 105 of No. 37; 5 of No. 37a; 12 of No. 38; 2 of No. 40; 2 of No. 48; 1 of No. 48a; 2 of No. 48b; 1 of No. 51; 1 of No. 52; 2 of No. 53; 2 of No. 54a; 1 of No. 57c; 4 of No. 59; 2 of No. 111; 1 of No. 111a; 2 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a; 1 of No. 147b; 2 of No. 155a; 2 of No. 186; 2 of No. 187; 4 of No. 189; 4 of No. 190; 4 of No. 192; 1 of No. 198; 4 of No. 217a; 1 No. 1a Clockwork Motor (not included in Outfit).

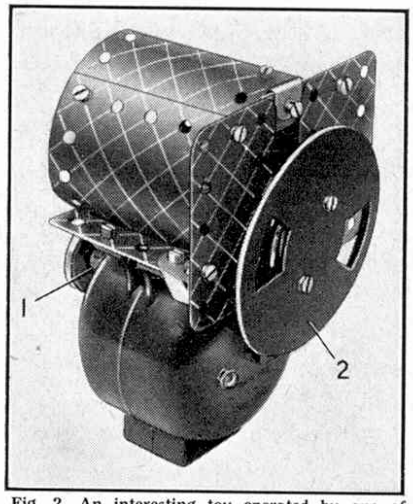


Fig. 2. An interesting toy operated by one of the new all-enclosed Electric Motors.

The model shown in Fig. 2 is a very interesting toy based on the ingenious instrument known as the stroboscope, which is used for observing the behaviour of gears, shafts and other parts of machinery while actually in motion. When viewed through the stroboscope these appear to be at rest, an effect that is attained by observing them through a slit placed in front of a rapidly revolving shutter, the speed of which can be varied at will. If the

New Outfit Models

Special Subjects for Smaller Outfits

THIS month we have chosen four unusually interesting models for illustration and description. Two of these are simple but very realistic models for owners of small Outfits. They are a mobile searchlight unit and a lifting platform truck, both of which can be built from Outfit No. 2. The others are a novel aeroplane roundabout with a fascinating movement and a model Hawker "Hurricane" monoplane, which are slightly more elaborate and require Outfits Nos. 5 and 6 respectively for their construction.

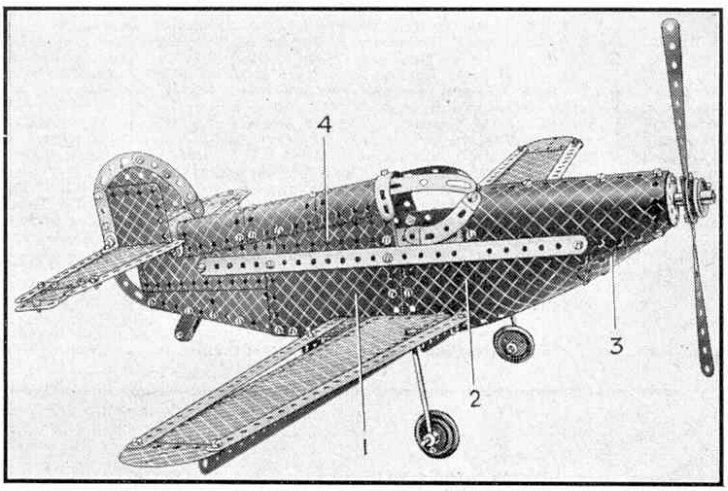


Fig. 1. The realistic outline of this model Hawker "Hurricane" monoplane is obtained mainly by the use of Flexible Plates. The model is built from Outfit No. 6.

The aeroplane roundabout is shown in Fig. 4. It comprises an aeroplane pivotally attached to the end of a radial beam supported by a central tower, the beam being rotated by an Electric Motor. When the Motor is set in motion the aeroplane circles at a gradually increasing speed around the tower and rises slowly from the ground.

Construction of the model is commenced with the base of the tower, the details of which are shown in the illustration. The four $12\frac{1}{2}''$ Angle Girders that form the corners of the tower are fastened to the base by means of Obtuse Angle Brackets. At their upper ends the Angle Girders are bolted to a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate.

Fitted inside the lower portion of the tower is an E1 or E120 Electric Motor that forms the power unit. The Motor is secured at one end of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate by bolts passed through its flanges, and its driving shaft is connected by a $2\frac{1}{2}''$ Driving Band to a 1″ Pulley on the $3\frac{1}{2}''$ Rod 1. This Rod is journalled in a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip supported from the Flanged Plate by two Reversed Angle Brackets, and it is connected by a 6″ Driving Band to a 1″ Pulley 2 on the centre shaft. The Driving Band also passes around two 1″ loose Pulleys on a 4″ Rod that revolves in Reversed Angle Brackets bolted to two corners of the tower.

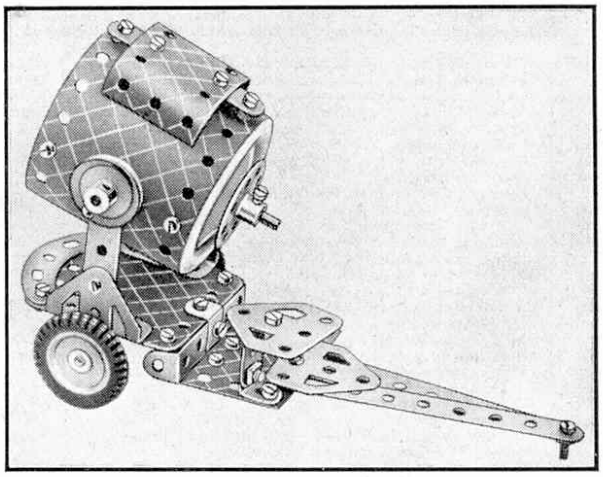


Fig. 2. A mobile searchlight unit, which can be constructed from the parts in Outfit No. 2.

The central shaft is a compound rod consisting of a $4\frac{1}{2}''$ and a $5\frac{1}{2}''$ Rod joined by a Rod Connector. Two Spring Clips pressed on to the Rod Connector ensure that the Rods are gripped securely. At its upper end this shaft carries a 3″ Pulley, on the upper surface of which two $2\frac{1}{2}''$ Strips are mounted by means of Trunnions. A 1″ Rod journalled in the upper end holes of these Strips provides the support for the radial beam, at the ends of which the aeroplane and counterbalance are attached.

The beam itself consists of four $12\frac{1}{2}''$ Strips placed face to face, and at one end it carries a counterbalance consisting of six $12\frac{1}{2}''$ Strips and two Flanged Sector Plates, which are attached to it by two $\frac{1}{2}''$ Bolts. A $3\frac{1}{2}''$ Rod passed through the two Sector Plates carries also four Road Wheels, four $2\frac{1}{2}''$ Strips, four Curved Strips and four $1\frac{1}{4}''$ Discs as an extra weight.

The constructional details of the aeroplane are quite simple. The fuselage consists of four $5\frac{1}{2}''$ Strips extended by four $2\frac{1}{2}''$ Strips. The nose of the machine is a Bush Wheel fixed to one of the $2\frac{1}{2}''$ Strips by a $1'' \times 1''$ Angle Bracket. Two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, braced by $5\frac{1}{2}''$ Strips are used for the wings.

The upper and lower wings are connected by a 3″ Screwed Rod, and the upper one is attached by a $\frac{3}{8}''$ Bolt to the centre of the Double Angle Strip joining the sides of the fuselage. The Screwed Rod supports also the undercarriage, which consists of a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, the landing wheels being $\frac{3}{4}''$ Discs loosely fastened to the latter part by lock-nutted bolts. The tail unit is built up from a Semi-Circular Plate and a Flat Trunnion. The aeroplane is pivotally attached to the longer arm of the beam by a Cranked Bent Strip and a lock-nutted bolt as shown in Fig. 4.

Parts required to build model roundabout: 10 of No. 1; 11 of No. 2; 2 of No. 3; 12 of No. 5; 4 of No. 8; 7 of No. 10; 10 of No. 12; 1 of No. 12a; 4 of No. 12c; 1 of No. 15; 1 of No. 15a; 1 of No. 15b; 2 of No. 16; 1 of No. 18b; 1 of No. 19b; 3 of No. 22; 2 of No. 22a; 1 of No. 24; 5 of No. 35; 88 of No. 37a; 77 of No. 37b; 14 of No. 38; 1 of No. 44; 1 of No. 48; 1 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 1 of No. 80c; 4 of No. 90a; 2 of No. 111a; 5 of No. 111c; 4 of No. 125; 2 of No. 126; 1 of No. 126a; 1 of No. 186; 1 of No. 186a; 4 of No. 187; 2 of No. 189; 2 of No. 191; 4 of No. 192; 1 of No. 198; 2 of No. 213; 1 of No. 214; 4 of No. 217a; 2 of No. 217b; 1 E120 Electric Motor (not included in Outfit).

An Outfit No. 6 is required for the construction of the realistic model of a Hawker "Hurricane" monoplane shown in Fig. 1. The "Hurricane" is a particularly interesting subject in view of the recent fine accomplishment of 11 of these machines in flying from Northolt to Le Bourget in 55

New Outfit Models

Gantry Crane—Tricycle—Motor Car—Aircraft Carrier

THE chief feature of the four new models described this month is their variety. They range from an aircraft carrier and a small motor car, built from Outfits Nos. 1 and 2 respectively, to a realistic model of an ice cream tricycle and a splendid gantry crane. The ice cream tricycle requires an Outfit No. 4 for its construction, while the gantry crane can be built from an Outfit No. 7 or one larger.

The model aircraft carrier is shown in Fig. 1. Each side of the hull consists of two $6\frac{1}{2}''$ compound strips built up from $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips, which are fastened together by Flat Brackets. The sides are joined by $\frac{3}{8}''$ Bolts at the forward end, and the flight deck is fastened to them by Angle Brackets inside the hull.

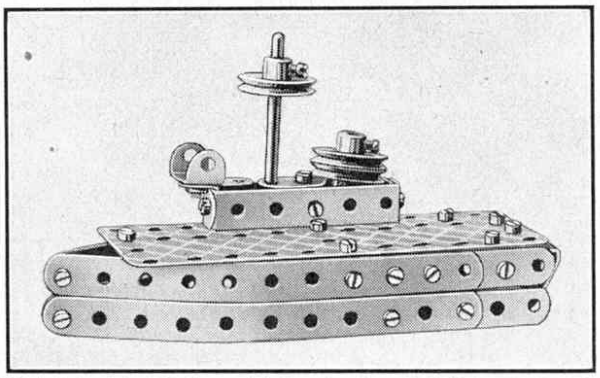


Fig. 1. A simple but effective model of an aircraft carrier built from Outfit No.1.

The deck is formed by two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates overlapped two holes, and at one side of it two Double Angle Strips are fitted by a Reversed Angle Bracket to form the base of the island superstructure. The Reversed Angle Bracket also supports two Angle Brackets that represent the bridge. A Flat Bracket is fastened to the top of the superstructure by an Angle Bracket to form a support for the $3\frac{1}{2}''$ Rod that is used for the mast.

Parts required to build model aircraft carrier: 4 of No. 2; 4 of No. 5; 2 of No. 10; 7 of No. 12; 1 of No. 16; 1 of No. 17; 3 of No. 22; 26 of No. 27a; 28 of No. 37b; 2 of No. 48a; 2 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 189.

The chassis of the simple model two-seater motor car shown in Fig. 2 consists of two $5\frac{1}{2}''$ Strips 1, which are joined at their rear ends by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. Two $2\frac{1}{2}''$ Strips 2 are bolted to each Strip 1 to form the supports for the sides and the roof of the car.

The near side of the car is built up from a $5\frac{1}{2}''$ and a $2\frac{1}{2}''$ Strip together with a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, while the side not seen is similar except that the Double Angle Strip is replaced by Flat Trunnion 4. A $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate fixed in position by two Trunnions 3 is used for the top of the bonnet and the radiator is represented by a Flat Trunnion attached to the sides of the car by two Angle Brackets.

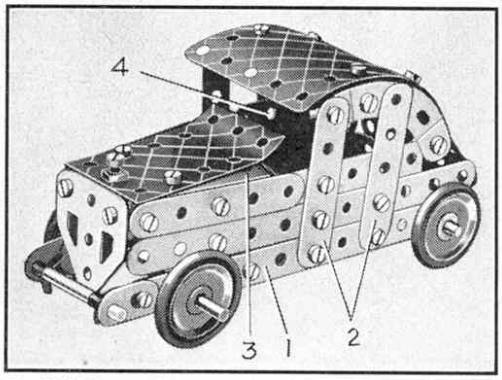


Fig. 2. A Meccano two-seater coupé driven by a Magic Motor.

The roof of the body consists of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates curved to shape and fastened by Angle Brackets to two $2\frac{1}{2}''$ Curved Strips, which are secured to the upper ends of $2\frac{1}{2}''$ Strips 2.

Parts required to build model two-seater motor car: 4 of No. 2; 6 of No. 5; 2 of No. 10; 6 of No. 12; 2 of No. 16; 1 of No. 17; 4 of No. 22; 1 of No. 23a; 2 of No. 35; 40 of No. 37a; 38 of No. 37b; 2 of No. 38; 2 of No. 48a; 2 of No. 90a; 1 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 155a; 1 of No. 186; 1 of No. 188; 2 of No. 190; 1 *Magic* Motor (not included in Outfit).

Construction of the ice cream man and his tricycle shown in Fig. 3 is commenced with the ice cream container. The top of this consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to each of the longer flanges of which a $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate is bolted. One of the $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates is extended downwards by a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate to form one side of the container, but to the other are bolted two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates so that a space is left for the winding shaft of a No. 1 Clockwork Motor. The latter is bolted direct to the flange of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The lower edges of the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and the two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are braced by $5\frac{1}{2}''$ Strips.

The front and rear of the container are each formed by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and a $2\frac{1}{2}''$ Curved Strip, all of which are bolted to the end flanges of the Flanged Plate and also are attached to the sides of the ice cream container by two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips.

The front Road Wheels are locked on a $3\frac{1}{2}''$ Rod that is journalled in two Flat Brackets bolted to the sides of the container. The Rod carries at its centre a $1''$ Pulley, which is connected by a $2\frac{1}{2}''$ Driving Band to the driving shaft of the Motor.

The lower frame of the tricycle consists of two $5\frac{1}{2}''$ Strips. The latter are bolted at their forward ends to a Double Bracket that in turn is secured by a lock-nutted bolt to the centre hole of a Double Angle Strip fastened between the sides of the container. A pair of $3''$ compound strips, each consisting of two $2\frac{1}{2}''$ Strips overlapped four holes, are used for the rear forks, and they are mounted on the two $5\frac{1}{2}''$ Strips by a $2''$ Rod that forms the axle for the rear wheel. Two $3\frac{1}{2}''$ Strips are mounted on a $1\frac{1}{2}''$ Rod passed through the sixth hole from the forward ends of the $5\frac{1}{2}''$ Strips. The upper ends of the $3\frac{1}{2}''$ Strips and those of the $3''$ compound strips are bolted to the lugs of a Double Bracket. Two Flat Trunnions are fastened to the Double Bracket to represent the saddle. One end of the $1\frac{1}{2}''$ Rod carries a Bush Wheel and at the other end is a $1''$ Pulley that is connected to another $1''$ Pulley on the rear axle.

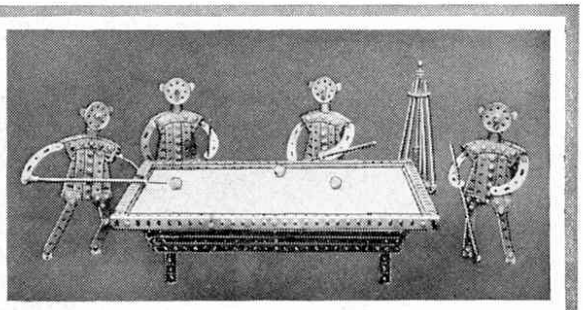
The illustration shows how the ice cream man himself is built up and secured on the saddle by means of an Angle Bracket. The $2\frac{1}{2}''$ Strips forming his legs are fastened together by lock-nutted bolts. One of his feet is attached to the Bush Wheel and the other to an Angle Bracket bolted to the boss of the $1''$ Pulley on the $1\frac{1}{2}''$ Rod, so that as the model runs along the floor his feet move up and down realistically, as if he were pedalling.

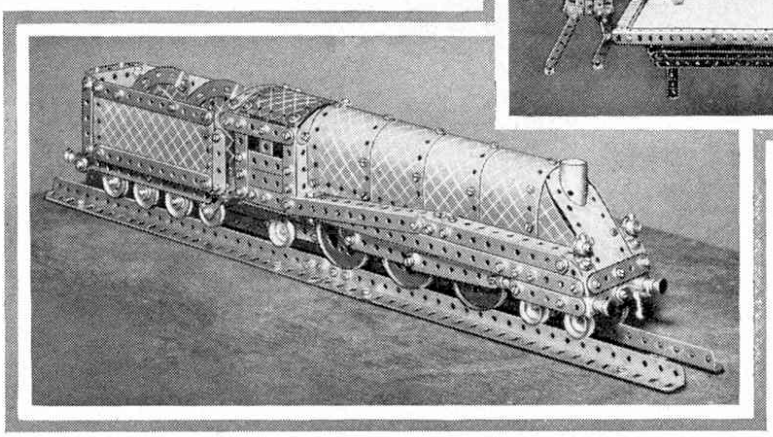
Our Great "Autumn" Competition

Handsome Cash Prizes for Meccano Models

The winter model-building season has now commenced in earnest, and every keen owner of a Meccano Outfit should be busy planning his entry in our great "Autumn" Model-building Competition. This was announced in our October issue. It is the first important competition of the present indoor hobby season, and there is still plenty of time for all model-builders at home or overseas to plan and prepare their entries, as the closing date is 31st December. Valuable cash prizes are offered, and there also will be consolation awards, so that every competitor will have a splendid chance of earning recognition of his skill and merits as a Meccano constructor.

For the benefit of readers who did not see last month's announcement of this contest we again give full particulars. The competition is a general one, that is, the models submitted may be of any size or kind whatever, the only stipulation being that they shall be the competitor's own work. Ships, bridges, locomotives, motor cars, machines and buildings and structures of all kinds are among the many suitable subjects, and any size of Meccano Outfit or any number of parts can be used in constructing entries. There is no age limit, and Meccano owners living in any part of the world can compete on equal terms.





Simple models that won prizes in Meccano Competitions. The group of billiards players shown above is the work of J. Willems, Antwerp, and the model on the left is a reproduction by Edwin Rusted, Royston, of the L.N.E.R. streamlined locomotive "Silver Jubilee."

When the model is built it is only necessary to obtain a photograph of it or, if this is not possible, a good drawing. A small photograph will do, provided it is clear enough to show the general appearance and important details of the model, and it is not necessary that either photographs or drawings shall have been prepared by the competitor himself.

The competitor should write his age, name and full address on the back of each photograph or drawing, and enclose it, together with a brief description of the model, in an envelope addressed *"Autumn Model-Building Competition,"* Meccano Ltd., Binns Road, Liverpool 13. Entries must be posted in time to reach this office not later than 31st December.

The prizes to be awarded for the most interesting and best built models entered include cheques and Meccano and Hornby products. The complete list of these is as follows: First Prize, Cheque for £5/5/–; Second, Cheque for £3/3/–; Third, Cheque for £2/2/–. There also will be ten prizes of Meccano or Hornby products to the value of 10/6 each in addition to a number of consolation awards and Certificates of Merit.

A Chance for Owners of Small Outfits

This is a special model-building contest in which every owner of a Meccano Outfit can enter, for only the few parts shown in the list in the panel at the foot of this page are required. Each competitor can please himself in regard to the subject of his entry, provided only the selected parts are used; but if he wishes he can add either a Clockwork Motor or an Electric Motor to drive his model. It is not necessary to use all the parts; any not needed can be left out.

The more original a model is, the better will be its builder's chance of winning a prize; and all who enter will have the same chance of success.

The actual model must not be sent in. A photograph or a good drawing is all that is required, but should be as clear and detailed as possible. The competitor's age, name and address must be written in block letters on the back of each photograph or sheet of paper used, and competitors must send also a list of the parts used in their models. Envelopes containing entries should be addressed "Selected Parts Contest," Meccano Ltd., Binns Road, Liverpool 13.

Build Your Model with These Parts

4 of Part No. 1	4 of Part No. 22	3 of Part No. 90a
6 of Part No. 2	1 of Part No. 23	2 of Part No. 126
8 of Part No. 5	1 of Part No. 24	1 of Part No. 186
6 of Part No. 12	6 of Part No. 35	4 of Part No. 187
3 of Part No. 16	1 of Part No. 44	2 of Part No. 189
2 of Part No. 17	4 of Part No. 48a	2 of Part No. 190
1 of Part No. 19g	1 of Part No. 52	2 of Part No. 192
2 of Part No. 19b	1 of Part No. 54a	2 of Part No. 217a

The competition will be divided into two sections: A, for competitors living in the British Isles; B, for competitors living Overseas. In each section there will be prizes of Meccano or Hornby products value £2/2/–; £1/1/– and 10/6 respectively. Section A will close on 30th November and Section B on 31st January, 1939.

Fun with Small Meccano Outfits

Amusing Models for Christmas

ONE of the greatest attractions of a Meccano Outfit is that it can be used for building models of so many different kinds. It is just as fascinating to build small and amusing models as it is to reproduce exactly some wonderful engineering structure or a remarkable machine. At this time of the year with parties and amusements of all kinds ahead of us, it is the lighter side of model-building that arouses the greatest interest, and in this article we are explaining the building of amusing mechanical toys that will interest younger folk and grown ups alike. These models are just the thing for the proud possessor of a Meccano Outfit, for they require only a few parts and can be put together quickly and easily with the help of the descriptions given below and of the illustrations, which are photographs of the actual models.

The first of these models is a Trick Tricyclist, and he is shown in Fig. 1. The contents of Outfit No. 2 are sufficient for his construction, and a *Magic* Motor is just the thing to make him work. Then he pedals furiously and travels along at great speed with an almost comical air of being engaged in important business.

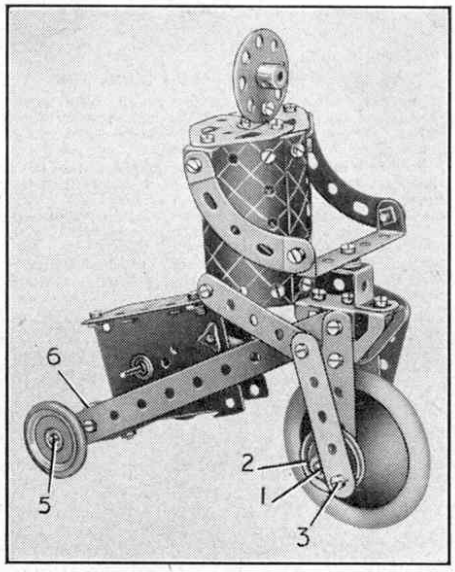


Fig. 1. This model tricycle and rider forms a jolly toy. It is built from Outfit No. 2 and is driven by a Magic Motor.

The tricycle should first be assembled. To begin with two Trunnions are bolted together, and to them are attached two $2\frac{1}{2}''$ Strips and two $5\frac{1}{2}''$ Strips. The $5\frac{1}{2}''$ Strips are bent outward, and then spaced apart by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip bolted in the second holes from their rear ends. A $3\frac{1}{2}''$ Rod 5 is next passed through the end holes of the Strips, and to it a $\frac{1}{2}''$ Pulley 6 and two 1″ Pulleys complete with Rubber Rings are fitted. Spring clips hold the Rod 5 in position. The front wheel is fastened on a 2″ Rod 1. The handlebars are mounted on a Reversed Angle Bracket, but are spaced from it by a nut and two Washers. The *Magic* Motor is then bolted to the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip at the rear of the tricycle, as shown in the illustration.

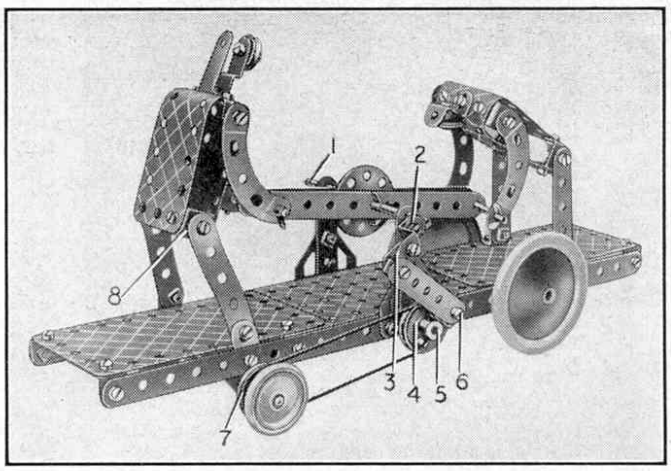


Fig. 2. A model hand-car that can be built from the contents of Outfit No. 3. The men work with surprising vigour as the car moves along.

The rider's body consists of three Curved Plates bolted together to form a cylinder, to the upper end of which two Flat Trunnions are fixed by means of an Angle Bracket. The head is a Bush Wheel, and is held in place by an Angle Bracket. Two $2\frac{1}{2}''$ Curved Strips form the arms. The rider's body is connected by Angle Brackets to the Trunnion and to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate covering the Motor.

The next step is to fix an Angle Bracket to the 1″ Pulley 2 by means of a bolt and two nuts, another Pulley also with an Angle Bracket fitted to it, being fixed to the other end of Rod 1. Each of the cyclist's legs consists of two $2\frac{1}{2}''$ Strips bolted together end to end, with two nuts on each bolt, and they are attached to the body of the rider and also to the Angle Bracket on 1″ Pulley 2 by Bolt 3, on which they can pivot when he is pedalling. To complete the model a Driving Band is arranged to drive the Pulley 6 on Rod 5, and all that then remains is to set it in motion and enjoy the fun.

Parts required to build the model trick tricyclist: 2 of No. 2; 6 of No. 5; 8 of No. 12; 1 of No. 16; 1 of No. 17; 4 of No. 22; 1 of No. 23a; 1 of No. 24; 38 of No. 37; 8 of No. 37a; 2 of No. 38; 2 of No. 48a; 2 of No. 90a; 1 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a; 2 of No. 155a; 1 of No. 186; 1 of No. 187; 1 of No. 188; 1 of No. 199; 2 of No. 200. 1 *Magic* Motor (not included in Outfit).

Another easily-built toy with a very "busy" movement is the hand-car shown in Fig. 2. It seems to be a little too much for the two Meccano men in charge of it, but if they are helped by giving the car a push in the rear they appear to be working very hard indeed, and the same result follows when the model is hauled along the ground.

The frame of the model is built up of two $12\frac{1}{2}''$ Strips bolted to a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, and joined at their ends by $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The axle for the Road Wheels is journalled direct in the $12\frac{1}{2}''$ Strips, and the Rod on which the 1″ Pulleys are mounted is carried in two Trunnions.

At the centres of the sides two vertical $2\frac{1}{2}''$ Strips are fixed, and they carry in their upper end holes a 4″ Rod 1, held in position by Spring Clips. This Rod is fitted with a Bush Wheel to which the operating beam is fastened. The beam is moved up and down by a crank arrangement built as follows. The lug of a Rod and Strip Connector 2 is bent at right angles, and to it is bolted a Reversed Angle Bracket, the free arm of which is extended by a Flat Bracket 3. The latter is connected by a $2\frac{1}{2}''$ Strip to a 1″ Pulley 4 on a $3\frac{1}{2}''$ Rod 5, and the bolt 6 is fixed by means of two nuts to an Angle Bracket fixed to the boss of the Pulley 4. The bolt holding the Angle Bracket in place carries three spacing Washers under its head. Pulley 4 is driven from Pulley 7 by a Driving Band.