New Meccano Models

Three-engined Monoplane—Tipping Steam Wagon—Archer—Derrick

ONE of the most popular types of passenger-carrying aeroplanes in use to-day is the multi-engined high-wing cabin monoplane. Machines of this type are employed extensively on the Continental Air Lines, and also in America.

The model shown in Fig. 1 although of comparatively simple construction, reproduces many of the chief features of a three-engined monoplane, and it forms an interesting addition to the already large selection of Meccano-built aircraft.

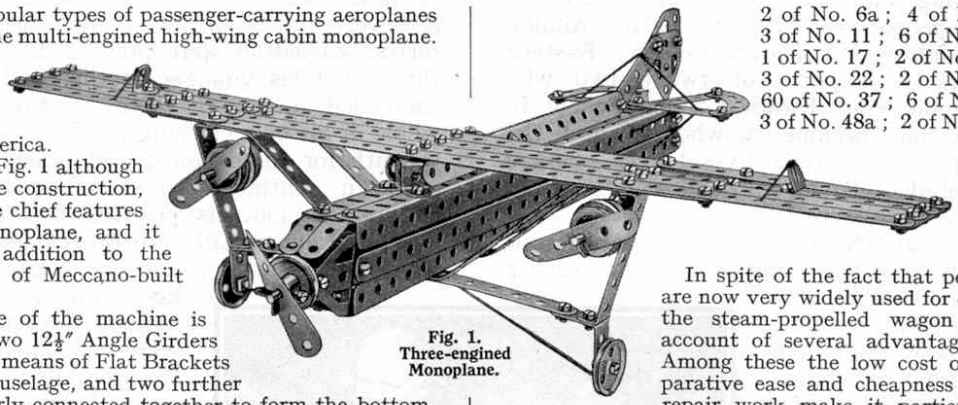

Fig. 1. Three-engined Monoplane.

The tapered fuselage of the machine is built up as follows. Two 12½" Angle Girders are secured together by means of Flat Brackets to form the top of the fuselage, and two further 12½" Girders are similarly connected together to form the bottom. These pairs of Girders are held together at the tail by means of further Flat Brackets, and a 12½" Strip is also attached at each side. At the nose, the Angle Girders are spaced apart at one side by a 1½" Strip. The Trunnions are held in place by means of Angle Brackets, and a Double Bracket is secured between the Trunnions to provide a bearing for the short Axle Rod that carries the centre engine, a 1" Pulley, and its accompanying propeller. Two short Strips are attached to the top and bottom pairs of Girders and are bent slightly downward so as to complete the nose. The upper part of the cabin is made up of two composite strips consisting of 5½" and 2½" Strips overlapped and bolted together, and two Reversed Angle Brackets are bolted to the top Angle Girders of the fuselage, to complete this portion.

The wing of the model is composed of three 12½" Strips and six 5½" Strips overlapped and bolted together. The complete wing is secured at its centre to a 2½" Strip, which in turn is bolted to the ½" Reversed Angle Brackets mounted on the top of the fuselage. The wing is further supported at each side by 5½" Strips, bent as shown and bolted to the lower pair of Angle Girders of the fuselage. Each engine nacelle is composed of two ¾" Flanged Wheels and a 1" Pulley, all three wheels being mounted on a short Rod, while a 2½" Strip held in place by means of a Spring Clip does duty for a propeller. Each nacelle is suspended from the underside of the wing by a Reversed Angle Bracket. One lug of the Bracket is bolted to the wing and the other is secured to the side of the boss of the rear ¾" Flanged Wheel by means of its set-screw, washers being used so that the lug of the Bracket is gripped tightly. The aileron control standards to the wing must not be overlooked; they are represented by Angle Brackets and short lengths of cord.

The tail plane and rudder are built up from 2½" Strips and Curved Strips, the rudder itself consisting of two Flat Trunnions and a 2½" Strip. Lengths of cord to act as bracing should be attached as shown in the illustration.

In order to build the model monoplane the following parts will be required: 6 of No. 1; 14 of No. 2; 2 of No. 3; 12 of No. 5; 2 of No. 6a; 4 of No. 8; 6 of No. 10; 3 of No. 11; 6 of No. 12; 2 of No. 12a; 1 of No. 17; 2 of No. 18a; 4 of No. 20b; 3 of No. 22; 2 of No. 22a; 4 of No. 35; 60 of No. 37; 6 of No. 37a; 2 of No. 38; 3 of No. 48a; 2 of No. 90a; 6 of No. 111c; 4 of No. 125; 2 of No. 126; 2 of No. 126a.

Tipping Steam Wagon

In spite of the fact that petrol-engined vehicles are now very widely used for commercial purposes, the steam-propelled wagon holds its own on account of several advantages that it possesses. Among these the low cost of fuel and the comparative ease and cheapness of maintenance and repair work make it particularly suited to the needs of certain industries, and some of the recently-designed types are capable of remarkable performances.

The model steam wagon shown in Fig. 2 is of the type used by excavating engineers and contractors, and it is fitted with a power-operated tipping mechanism whereby the contents of the hinged body may be ejected.

Each main side member of the chassis consists of two 12½" Angle Girders overlapped seven holes. The front axle is duplicated for strength, each portion consisting of two 5½" Strips overlapped nine holes and bolted to one side of the leaf springs. Each of the latter consists of one 3½", one 2½", and one 1½" Strip, a ⅜" Bolt passing through all three Strips serving to secure the spring to the axle. The ends of the Springs are secured to Angle Brackets, the front Angle Brackets being mounted on a Rod 1 (Fig. 3) carried in Trunnions bolted to the chassis. The rear Brackets have Flat Brackets attached pivotally to them by lock-nutted bolts and mounted on a Rod in a similar way to the front ones. The Springs for the rear Wheels are constructed and mounted in an exactly similar manner to the front springs.

The equalising beams of each bogie are two 4½" Strips connected at their centres by 1"×1" Angle Brackets 2. Each pair of equalising beams pivots freely about an 8" Rod 3, which is passed through Collars attached by ⅜" Bolts to the Springs. The steering gear is based on the correct Ackermann principle and is built up in the following way. The stub axles are secured in Couplings 4, which are free to turn about ¾" Bolts inserted in their centre holes and attached by double nuts to the extremities of the front axle. The track rod (which connects the Wheels so that they turn together) is attached pivotally by means of Swivel Bearings 5 to the ends of short Rods that are held in the end bores of the Couplings. The free end of one of these Rods carries a third Swivel Bearing 6, which is connected by a Rod to a Double Arm Crank

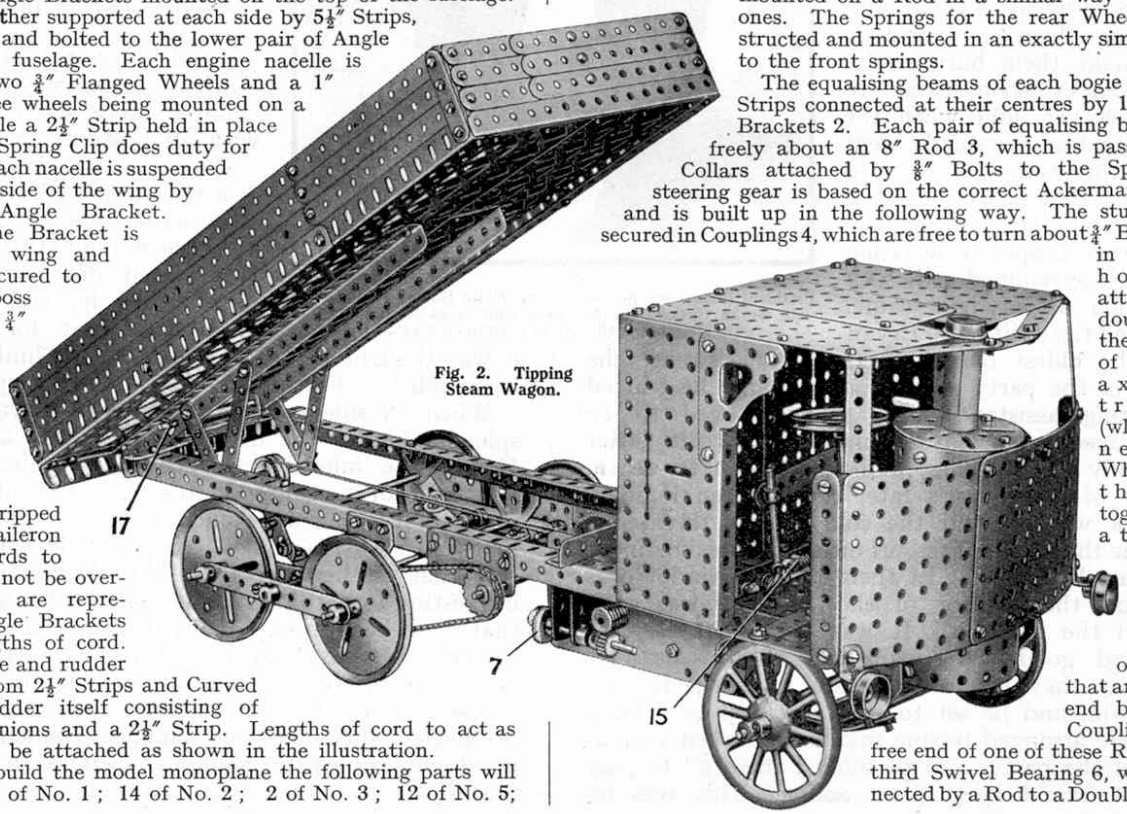

Fig. 2. Tipping Steam Wagon.

on the lower extremity of the steering column. The latter is journalled in a reinforced bearing consisting of a ½" Reversed Angle Bracket bolted to the floor of the cab.

The Motor armature spindle (see Fig. 3) carries a Worm meshing with a ½" Pinion on a Rod that has also a ¾" Contrate Wheel 7 secured to it. The Contrate Wheel is in constant mesh with a ½" Pinion on a sliding Rod 8. This Rod has two further ½" Pinions, one between and the other outside the Motor side plates, and by sliding it in its bearings the Pinions may be brought into mesh with either of the 57-teeth Gears 9 and 10. The Gear 10 is secured to a short Rod journalled in the Motor side plates and carrying also a 1" loose Pulley 11, which is retained in place on the Rod, together with a Flat Bracket, by Collars. One end of a length of cord is tied to the Flat Bracket and is passed over one of the 1" loose Pulleys 12 that are free on a Rod. This Rod is carried by Strips attached rigidly to the underside of the tipping body. The cord then passes to the Pulley 11, back over the second Pulley 12, and is attached finally to the Rod on which the Gear 10 is secured.

The Gear 9 is mounted on a 6½" Rod that passes completely through both Motor side plates and is also supported in additional bearings consisting of 2½" Flat Girders bolted to the chassis members. On each end of the Rod are secured 1" Sprocket Wheels, connected by Sprocket Chain to the 2" Sprockets on the road wheel axles. It will be seen, therefore, that by sliding the Rod 8, either the travelling or tipping movement may be brought into gear. The sliding of the Rod is accomplished by a 2" Rod that engages between a ½" loose and a ½" fast Pulley, and is secured in a Coupling on a Rod 13. The Rod 13 is journalled in a 3½" Double Angle Strip bolted to the chassis, and carries on its other end another Coupling in which is held a Rod to serve as a lever. In order to manipulate the latter conveniently, a Strip 14, which projects through the slot of the 5½"×2½" Flanged Plate forming the side of the cab, is attached pivotally to it by a bolt inserted in a Collar on the upper extremity of the lever. A Spring 15 (see Fig. 2) keeps the lever normally in the travelling position, so that to engage the tipping movement it is necessary to pull out the Strip against the tension of the Spring. A similar scheme is followed in regard to the Motor control switch. In this case a 5½" Strip 16 is attached pivotally to the top end of a Crank Handle, which is secured rigidly by means of a Coupling to the motor switch arm.

The tipping body pivots about a 3½" Rod 17 that is passed through holes in two 12½" Angle Girders bolted to the underside of the body, and also through the ends of a 2½"×½" Double Angle Strip. This Double Angle Strip is secured by ⅜" Bolts to a 5½" Angle Girder spanning the end of the chassis, and is spaced therefrom by three 2½" Strips.

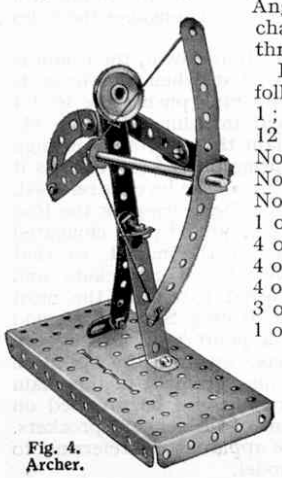

Fig. 4. Archer.

In order to build the Steam Wagon the following parts will be required: 6 of No. 1; 2 of No. 1b; 19 of No. 2; 4 of No. 2a; 12 of No. 3; 1 of No. 4; 8 of No. 5; 4 of No. 6; 4 of No. 6a; 10 of No. 8; 2 of No. 8b; 4 of No. 9; 7 of No. 10; 21 of No. 12; 4 of No. 12a; 1 of No. 13a; 1 of No. 14; 4 of No. 15; 3 of No. 15a; 4 of No. 16; 3 of No. 16a; 5 of No. 17; 4 of No. 18a; 1 of No. 19s; 2 of No. 19a; 4 of No. 19b; 1 of No. 20a; 3 of No. 20b; 3 of No. 22; 2 of No. 22a; 1 of No. 23; 1 of No. 23a; 3 of No. 26; 2 of No. 27a; 1 of No. 29; 1 of No. 32; 14 of No. 35; 164 of No. 37; 10 of No. 37a; 24 of No. 38; 1 of No. 40; 1 of No. 43; 1 of No. 48a; 1 of No. 48b; 2 of No. 48d; 4 of No. 52; 4 of No. 52a; 2 of No. 53a; 1 of No. 57; 19 of No. 59; 1 of No. 62b; 5 of No. 63; 1 of No. 70; 1 of No. 90; 24" of No. 94; 2 of No. 95; 2 of No. 96; 4 of No. 99; 4 of No. 100; 2 of No. 103f; 2 of No. 108; 1 of No. 109; 2 of No. 111; 4 of No. 111c; 2 of No. 115; 1 of No. 116a; 1 of No. 125; 4 of No. 126; 4 of No. 126a; 1 of No. 160; 1 of No. 162; 1 of No. 163; 1 of No. 164; 2 of No. 165; 1 of No. 166; 1 E6 Motor.

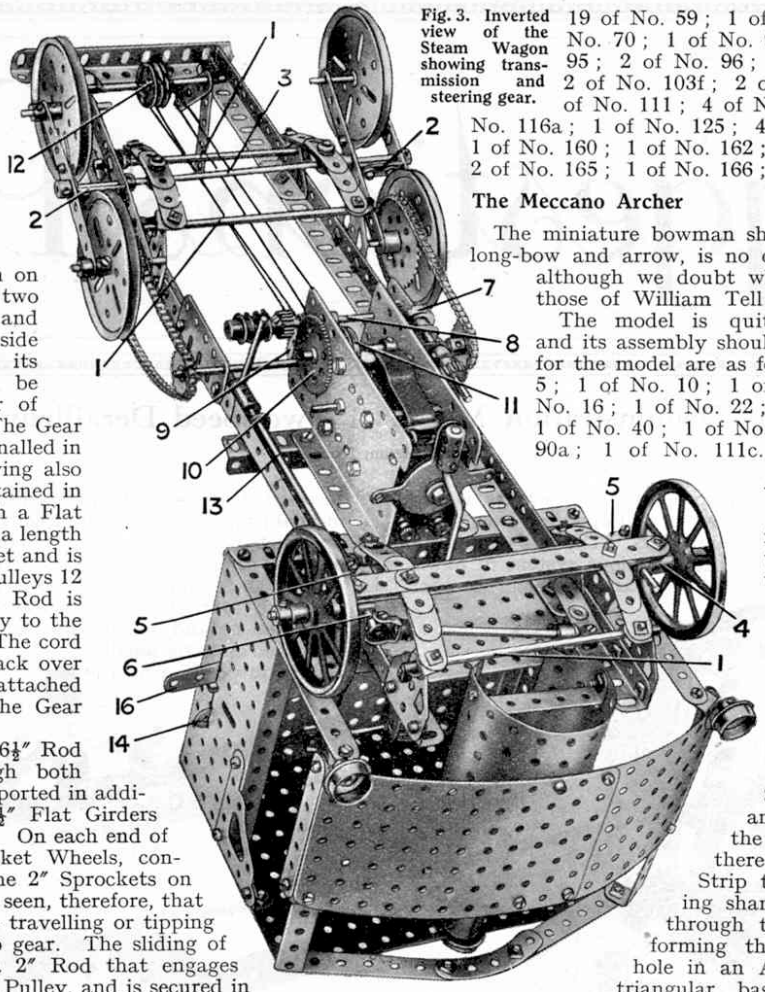

Fig. 3. Inverted view of the Steam Wagon showing transmission and steering gear.

The Meccano Archer

The miniature bowman shown in Fig. 4, complete with long-bow and arrow, is no doubt a highly skilled archer, although we doubt whether his efforts would rival those of William Tell!

The model is quite straightforward to build and its assembly should present no difficulty. Parts for the model are as follows: 2 of No. 2; 3 of No. 5; 1 of No. 10; 1 of No. 11; 3 of No. 12; 1 of No. 16; 1 of No. 22; 1 of No. 35; 11 of No. 37; 1 of No. 40; 1 of No. 48a; 1 of No. 52; 1 of No. 90a; 1 of No. 111c.

A Diminutive Stiff-leg Derrick

Owners of very small outfits (the 000 Outfit in particular) will be interested in the model derrick shown in Fig. 5. The construction of this model is very simple indeed, but one point that requires explanation is the method of pivoting the jib to the upright leg. A bolt is first of all placed in the end hole of the 5½" Strip that forms the jib, and a nut is screwed on to the shank of the bolt so that there is sufficient room for the Strip to pivot freely. The projecting shank of the bolt is next passed through the bottom hole of the Strip forming the upright, and through the hole in an Angle Bracket secured to the triangular base. A second nut is then placed on the shank of the bolt. The two nuts should then be rotated in opposite directions by means of two Spanners so that the Angle Bracket and upright Strip are clamped rigidly together, while the second 5½" Strip forming the jib is free to rotate.

A 1" loose Pulley is mounted on the upright Strip so that the jib suspension cord may be passed round it. The Pulley rotates on a ⅜" Bolt which is secured as follows. The Bolt is first of all passed through the centre hole in the Pulley and a nut is screwed on to the Shank so that there is sufficient room for the Pulley to rotate freely. The projecting end of the Bolt is then passed through the Strip and a second nut is screwed on to the shank of the Bolt. The two nuts are rotated in opposite directions by means of Spanners (as in the case of those holding the upright 5½" Strip in place), so that the ⅜" Bolt is locked securely to the upright Strip. A second 1" loose Pulley is mounted in an exactly similar manner at the top of the Strip forming the jib. The hoist cord is passed round this Pulley and is then wound round a 2" Axle Rod that is mounted in two Trunnions secured to the base of the crane.

This model represents perhaps the limit in simplicity of construction in a model derrick crane, and it provides a remarkable contrast with the Super Models of this type of crane, the Stiff-Leg Crane, Super Model No. 6, and the Scotch Type Electric Derrick Crane, Model No. 36. Although these models may score over our example in mechanical features and realism, the crane shown in Fig. 5 certainly possesses the advantage of a very economical "parts required" list, which is as follows:—2 of No. 2; 2 of No. 5; 3 of No. 12; 1 of No. 17; 2 of No. 22a; 1 of No. 35; 7 of No. 37; 3 of No. 37a; 1 of No. 40; 1 of No. 48; 2 of No. 111c; 2 of No. 126.

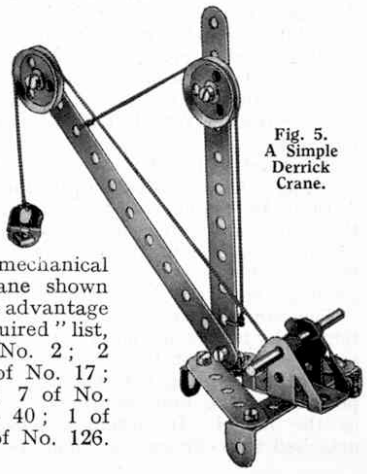

Fig. 5. A Simple Derrick Crane.

Suggestions Page

(248) Demonstration Model of Two-speed Derailleur Gear

(S. Higson, Exeter)

The usual form of gear box incorporated in bicycles is the three-speed hub built into the rear wheel and operated by a small lever attached to the top tube or handlebars. The hub contains a small planetary gear box, and by an ingenious system of pawls and ratchets, the three different speed ratios are obtained. Another form of gearing, generally a two-speed gear, is incorporated in the bottom bracket of some machines. The latest gear change device is the Derailleur system, whereby the chain is made to jump from one sprocket to another on the rear wheel. This system has been in use on the Continent for some considerable time, but is comparatively new in this country.

The chief advantage of the Derailleur over the hub gear is that practically any range of gears is obtainable, and it is possible to have a choice of as many as eight different speeds, by fitting two cogs on each side of the rear wheel, and having a double chain wheel at the bottom bracket. The rear wheel can then be reversed, or the chain moved from one driving sprocket to the other, but these operations must be carried out by hand. Three different sprockets can be fitted to the rear wheel to give a three-speed gear, the changing of the chain being controlled by a lever. Other advantages of this form of gearing are direct drive on all gears, and easy accessibility of working parts for cleaning and adjustment. The misalignment of the chain on extreme gears, although theoretically incorrect, does not interfere with the smooth working of the mechanism, and the damage done to the chain when changing gear is negligible.

The Meccano model illustrated on this page demonstrates clearly the principle of the Derailleur, and will be found suitable for incorporation in many models where a change speed gear is required. In this case two speed ratios may be obtained by changing the Sprocket Chain from one to the other of the Sprocket Wheels 1 and 2, which are mounted face to face, but spaced apart approximately $\frac{1}{8}$". The $\frac{3}{4}$" Sprocket Wheel 3 is free to rotate on the Rod 4 carrying a Crank, which forms the tensioning arm. A Pivot Bolt is held by two nuts in the end hole of the Crank, and carries a $\frac{3}{4}$" Sprocket Wheel 5. The Chain passes round the driving Sprocket 6, under the Sprocket 5, and over Sprocket 3, eventually passing round one of the wheels 1 and 2.

The Sprocket 5 keeps the chain at the correct tension by means of a length of Spring Cord attached to a $\frac{3}{8}$" bolt held in the boss of the Crank. The tension of the Spring can be varied by altering the position of the bolt securing it to the framework of the model. In actual practice the spring is attached to a clip on the chain stay of the bicycle, to which also a second clip is attached for supporting the changing mechanism. As shown in Fig. 248, the chain passes from the Sprocket 3 to the Sprocket 1, consequently these two Sprockets must be in perfect alignment. Operation of the gear-change lever causes the tensioning arm, complete with both Sprockets, to move outward, so that the Sprocket 3 is brought into line with the Sprocket 2; and as the driving Sprocket rotates, the Chain is conveyed on to the smaller driven Sprocket. The Wheel 3 is held in position on the Rod 4 by the Crank and a Collar, a washer being placed behind the Crank for spacing purposes.

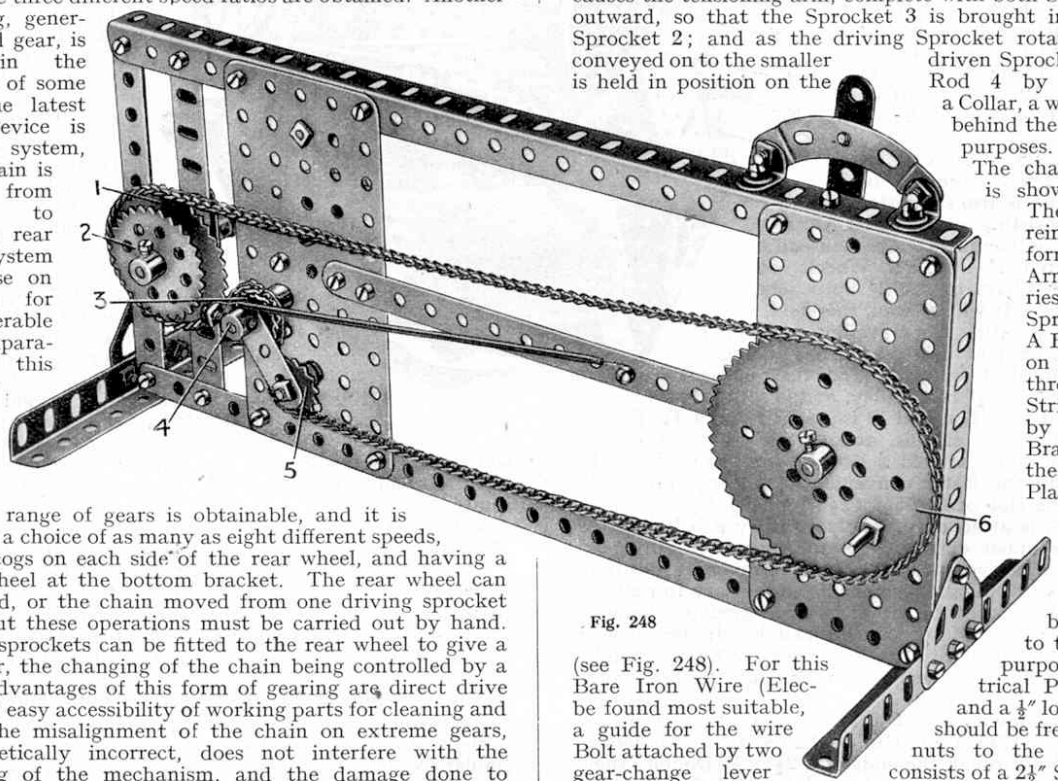

Fig. 248

The changing mechanism is shown in Fig. 248a. The Rod 4 is held in a reinforced bearing formed from a Double Arm Crank, and carries a Compression Spring and Collar. A Bell Crank is fitted on a $1\frac{1}{2}$" Rod passing through two $1\frac{1}{2}$" Strips that are held by $1" \times \frac{1}{2}$" Angle Brackets secured to the $5\frac{1}{2}" \times 2\frac{1}{2}$" Flat Plate. One arm of the Crank presses against the end of the Rod 4, and the other arm is connected by a length of wire to the changing lever (see Fig. 248). For this purpose No. 27 Gauge Bare Iron Wire (Electrical Part No. 312) will be found most suitable, and a $\frac{1}{2}$" loose Pulley forming a guide for the wire should be free to rotate on a $\frac{3}{8}$" Bolt attached by two nuts to the Flat Plate. The gear-change lever consists of a $2\frac{1}{2}$" Strip pivoted to an Angle Bracket, and so arranged that the shank of a bolt near the upper end of the lever engages the holes in a $2\frac{1}{2}$" Curved Strip.

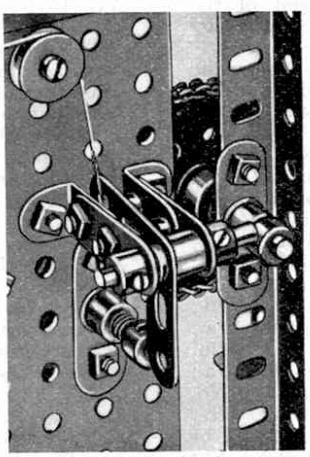
Fig. 248a

With the lever in the position shown, the Chain is fed on to the 2" Sprocket 1; but when the lever is moved to the left, the Bell Crank pushes the Rod 4 until Sprocket 3 is brought into line with the $1\frac{1}{2}$" driven Sprocket. The chain then operates on high gear. The compression Spring on the rod returns it to its former position as soon as the lever is released. The Angle Girder supporting the bearing for the Rod of the driven Sprockets is secured by its elongated holes to the outer frame of the model, so that the distance between the driven Sprockets and the Wheel 3 can be adjusted to obtain the most satisfactory results. The driving Sprocket should be directly in line with a point midway between the two driven Sprockets, and in this position it will be found that the misalignment of the chain is imperceptible. The drive cannot be reversed on account of the arrangement of the jockey sprockets. The reason for this will be apparent on referring to the general view of the model.