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The top of the housing is fixed in place by a bolt screwed into a Threaded Boss, held by a second Bolt passed through the Flat Girders at a point marked 24. The gear-change lever Pivot Bolt is passed through a Fishplate 25 before it is fitted with lock-nuts.

Bottom gear is engaged by sliding Rod 13 to the left (Fig. 2) so that Pinion 16 meshes with Pinion 7. Reverse is obtained by sliding Pinion 16 into mesh with Pinion 17, which is in constant mesh with Pinion 8. Second gear is obtained by sliding Rod 9 to the right, so that Pinion 10 engages both Pinions 5 and 7. When Rod 9 is moved to the left Pinion 12 is meshed with Pinion 8 to provide top gear.

**A NEW USE FOR SPRING CLIPS**

A fundamental feature of the Meccano model-building system is the adaptability of its various parts. Many readers have written to tell me of new and ingenious

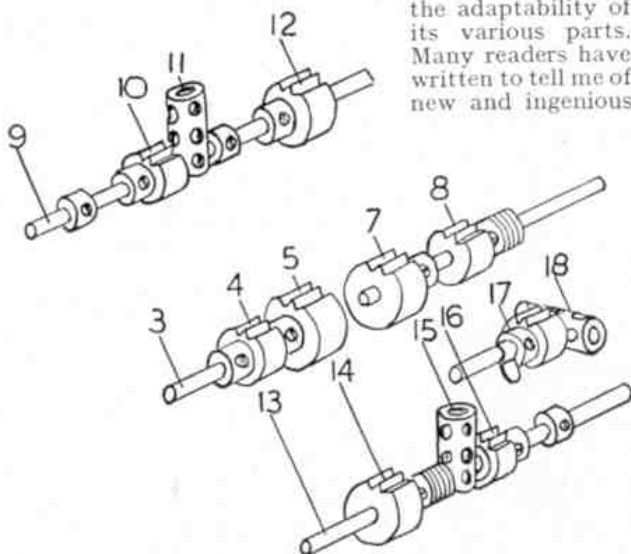


Fig. 2. These drawings show the arrangement of the gears and shafts in the three-speed and reverse gearbox seen in Fig. 1.

applications they have found for even the most simple parts, which at first glance might seem to have only a few obvious uses. A good example of this adaptability was brought to my notice recently by David de Wit, Blackburn, who sent details of a very neat independent suspension unit he has designed for the front wheels of a model vehicle. The main feature of the unit, which is shown in Fig. 3, lies in the novel use de Wit has found for Spring Clips.

The suspension unit for each wheel is assembled between two Flat Trunnions. In Fig. 3 one of the Flat Trunnions is omitted in order to show the details of the device clearly.

The Coupling 1 is fixed tightly to the Flat Trunnion by a bolt, and a Collar 2 is pivoted on a bolt passed through the apex hole of the Flat Trunnion. A  $2$ " Rod is gripped in the Collar,

and carries a Coupling 3 fixed to it as shown. Two Spring Clips are arranged with their lugs inserted in holes in Couplings 1 and 3, and a  $\frac{1}{4}$ " Bolt 4 serves to compress the Clips slightly and so hold them in position. The road wheel is free to turn on a Pivot Bolt screwed into Coupling 3. It is important to ensure that the Collar 2 pivots freely so that a smooth springing action is obtained.

When the essential working parts are in position the second Flat Trunnion can be added. It is held between two nuts on Bolt 4, and also by a bolt screwed into the Collar 2. A Threaded Pin 5 is passed through the Flat Trunnion and screwed tightly into the Coupling 1. This Threaded Pin is used to attach the assembly to a suitable swivel mechanism connected to the steering wheel, and it serves as the connecting link between the spring unit and the chassis. The Threaded Pin should be fixed as tightly as possible in the Coupling.

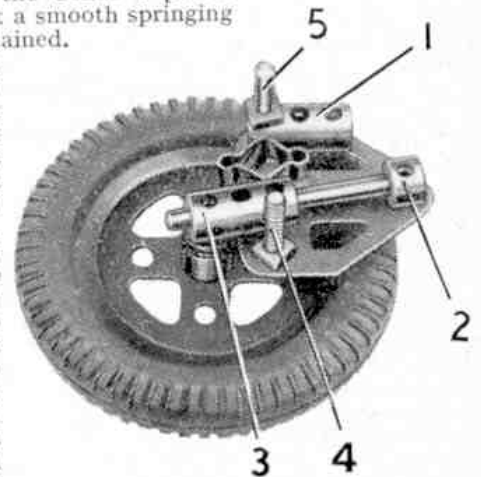
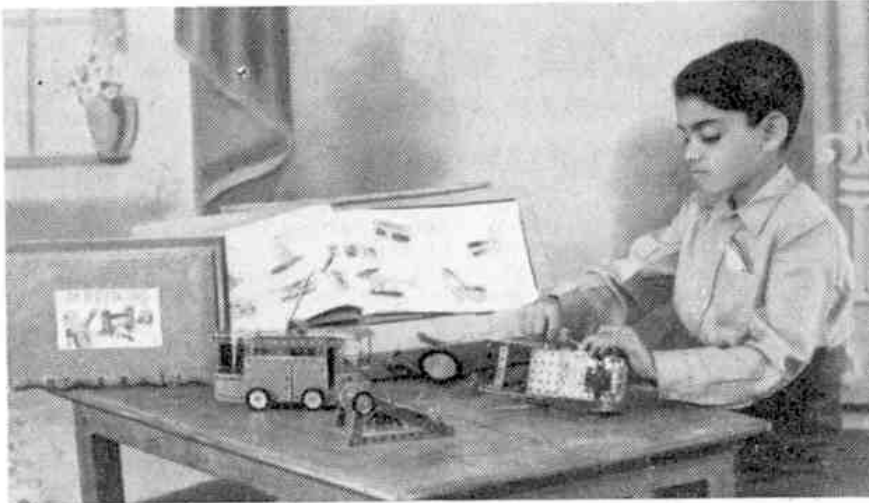


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**REMOVING ROD AND STRIP CONNECTORS**

The Meccano Rod and Strip Connector enables a neat connection to be made between a Strip and a Rod, and it is especially useful when a pivoted joint is required. The part is made so that when it is pushed on to a Rod, it grips the Rod tightly. To remove the Connector after use it is a good plan to fix a Pulley or a Road Wheel on the Rod to provide a good hold. It is then quite easy to twist the parts until the Rod and Strip Connector slides off the Rod.



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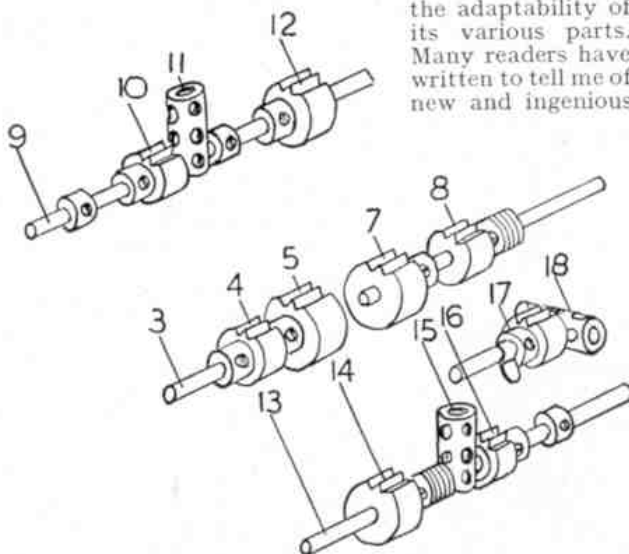


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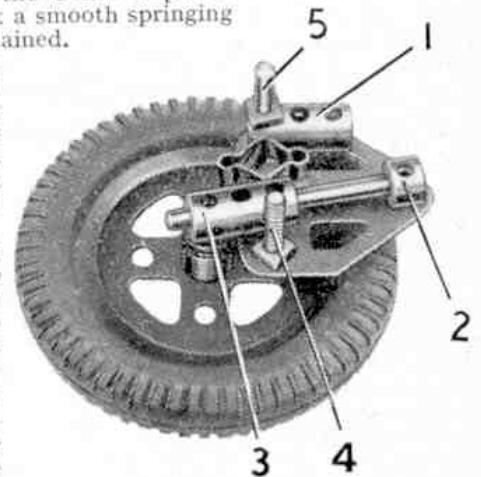


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By "Spanner"

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One of the most important points in any mechanism designed for a model vehicle is that it should be as compact as possible, and the three-speed and reverse gear-box I am describing this month has been designed with this in mind. The gear selector mechanism of the gear-box is a particularly attractive feature that follows closely actual practice and permits a quick and positive gear change.

The complete gear-box is shown in Fig. 1, and an "exploded" drawing showing the arrangement of the shafts and the positions of the gears, is reproduced as Fig. 2.

The base of the housing consists of a  $2\frac{1}{2} \times 1\frac{1}{2}$ " Flanged Plate, fitted along its sides with  $4\frac{1}{2}$ " Angle Girders that are used to attach the gear-box to the engine unit. The bearings for the shafts at each end are provided by two  $1\frac{1}{2}$ " Flat Girders bolted to the flanges of the Flanged Plate. Each set of Flat Girders is arranged so that the round holes overlap, and a Fishplate 1 is bolted to each of the lower corners. The angles of the Fishplates are adjusted so that a  $\frac{3}{4}$ " Pinion placed on a Rod mounted in them will mesh accurately with a  $\frac{1}{2}$ " Pinion on a Rod passed through the centre holes of the Flat Girders. A centre bearing consisting of a  $1\frac{1}{2} \times \frac{1}{2}$ " Double Angle Strip 2 bolted to the Flanged Plate, is provided for the main shaft.

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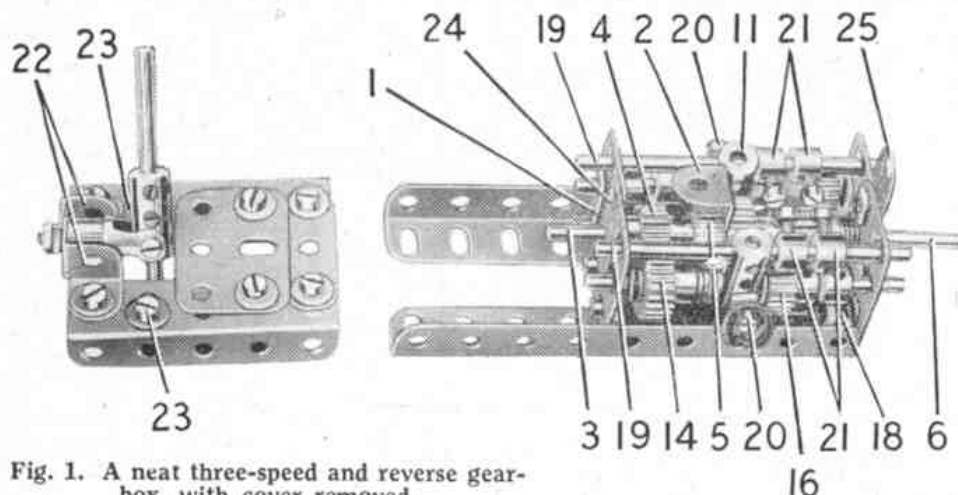


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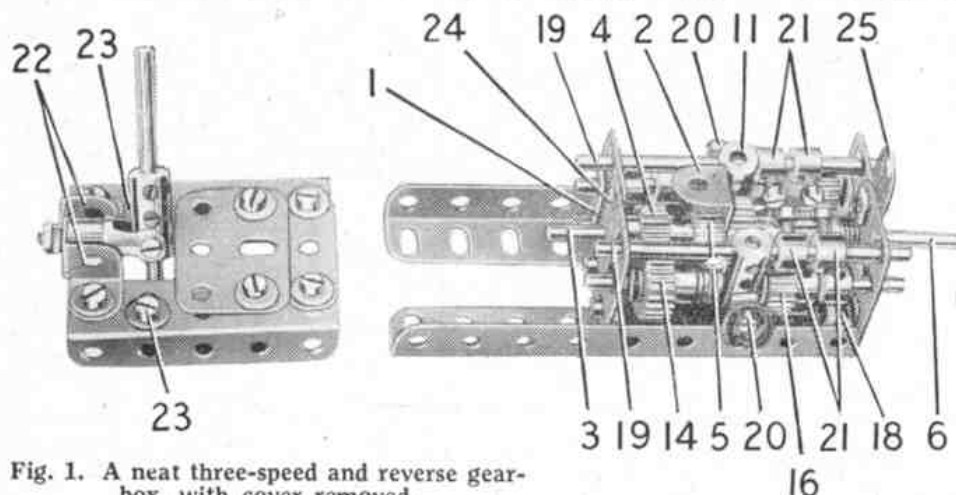


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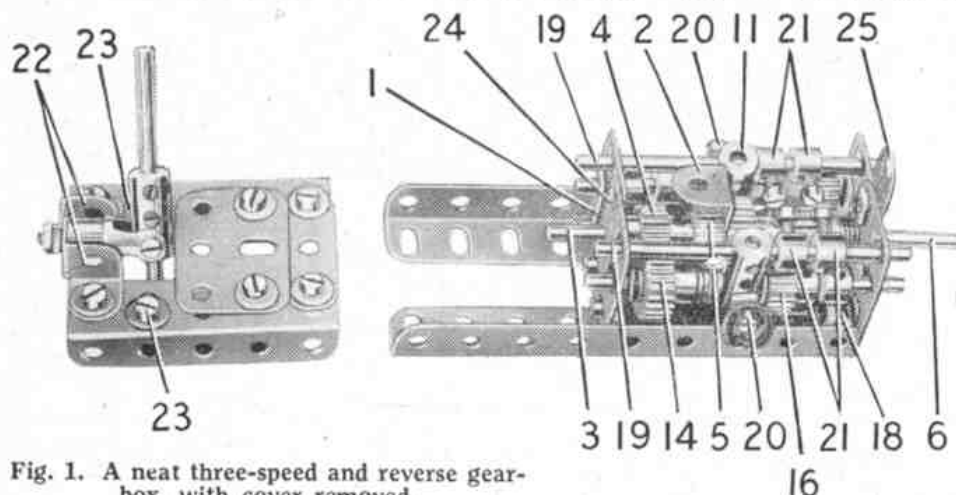


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## Two Speed and Reverse Gear Box

IN order to provide variable speeds for working Meccano Models, below are given details of a gearbox which, besides giving one reverse and two forward speeds, also incorporates a simple clutch. However, a glance at the photograph will show that no gear-change or clutch lever is fitted. I have purposely omitted these as I should like builders to design these features themselves. I will be glad to receive details of suitable arrangements from readers, and will try to include one or two of them in a future issue. No prizes are offered as this is an exercise rather than a competition. The framework is built up from two 3½ in. by ½ in. Double Angle Strips 1, connected at one end by an eight-hole Wheel Disc 2 and, at the other end, by a 1½ in. Flat Girder 3, overlaid by a 1½ in. Strip 4. The Flat Girder is spaced from the lugs of the Double Angle Strips by three Washers on one of the Bolts and by three Washers and a Fishplate 5 on the other Bolt. Through the centre holes of the Double Angle Strips a 1½ in. by ½ in. Double Angle Strip 6 is secured, being spaced by a Washer on each Bolt. Another 1½ in. Flat Girder is bolted to this Double Angle Strip.

A 2 in. Rod carrying a ¾ in. Pinion 7, a ½ in. Pinion 8, a Compression Spring 9 and a 1½ in. Flanged Wheel 10 is passed through the centre hole of Double Angle Strip 6.

The Rod extends only approximately half-way into the boss of Pinion 7, and the Flanged Wheel is free, being held in place by a Collar hidden inside the Flanged Wheel. In this case also the Rod fits only half-way into the Collar. Bolts in the transversed tapped bores of the Collar engage with Bolts secured through the Flanged Wheel. Another 2½ in. Rod 11, carrying a 1 in. Pulley and a 1 in. Pulley with Rubber Ring 12, fits into the other side of the Collar.

### Movable Lay-shaft

The 2 in. Rod 13 that serves as the output shaft fits into the other side of Pinion 7. Mounted on this Rod are a further two ¾ in. Pinions 14 and 15. Care should be taken to see that Pinion 14 is almost touching Pinion 7, and that the two sets of teeth are in line. Pinion 15 is in constant mesh with Pinion 14 give first gear, and second gear is mounted in Fishplate 5.

A 3 in. Rod 17, carrying a Collar, a ½ in. Pinion 18 and a ¾ in. Pinion 19, forms the movable lay-shaft. Neutral is obtained when Pinion 18 is out of mesh with all other gears. When Pinion 18 is in mesh with Pinion 16, reverse is engaged. Pinion 19 in mesh with Pinion 8 and Pinion 18 in mesh with Pinion 14 give first gear, and second gear is obtained when Pinion 18 is in mesh with both Pinions 7 and 14, provided that Pinion 19 is out of mesh. Finally, clutch guards are provided by two 1½ in. Flat Girders.

**Parts required:**—1 of No. 6a; 1 of No. 10; 1 or No. 16; 1 of No. 16a; 2 of No. 17; 1 of No. 20; 2 of No. 22; 1 of No. 24a; 4 of No. 25; 3 of No. 26; 15 of No. 37a; 10 of No. 37b; 9 of No. 38; 1 of No. 48; 2 of No. 48b; 1 of No. 59; 4 of No. 103h; 1 of No. 111; 2 of No. 111c; 1 of No. 120b; 1 of No. 155.

