

# How To Steer Your Model Motor Cars

## Interesting Meccano Mechanisms

By "Lock-Nut"

IF I were asked "Which are the most popular subjects for Meccano models?" I should not hesitate to reply "Motor cars and lorries." Thousands of models of this kind are built every year, and there are very few boys indeed who have not constructed a model vehicle at some period during their Meccano careers. This widespread interest in these vehicles is partly due to the fact that there are so many different types from which to choose and which can be seen everywhere around us, but I think the main reason for their popularity lies in the fascinating mechanisms a modern car chassis incorporates. Most of these mechanisms can be reproduced quite easily in Meccano, and in building them up the Meccano enthusiast gains an excellent knowledge of the principles on which an actual car is based.

In building models of this kind, however, little problems sometimes arise as to the best way in which the various mechanisms can be reproduced with the Meccano parts available. These problems occur most frequently in connection with the steering gear and transmission mechanisms, and in this and a subsequent article therefore I intend to describe various methods of assembling these that are suitable for both small and large models. In the present article I am dealing with the steering gear.

In the simplest type of steering gear a Rod journalled in a Double Angle Strip and fitted at each end with a wheel forms the front axle, and the Double Angle Strip is pivoted at its centre to the underside of the model, usually by means of a lock-nutted bolt. Unfortunately this form of steering is not under control and it is therefore suitable for only the simplest models. A better method, if the parts required are available, is to bolt a Bush Wheel to the

centre of the Double Angle Strip used to support the front wheel axle, and to fix a Rod in its boss to form the steering column. The Rod is journalled in bearings formed by the baseplate of the model, and a

Reversed Angle Bracket. A Pulley fixed to the upper end of the Rod can be used as the steering wheel.

In instances where the model has a long bonnet the arrangement shown in Fig. 2 should be used. A Bush Wheel is fixed to the lower end of the steering column and is connected by Cord to the Double Angle Strip carrying the front axle. The Double Angle Strip is pivoted directly to the underside of the model. Alternatively the Bush Wheel may be dispensed with,

the Cord being tied to one end of the Double Angle Strip, wound tightly several times around the steering column, and then tied to the other end of the Double Angle Strip. There is sufficient grip between the Cord and the Rod to enable the model to be steered by turning the steering wheel.

The mechanisms already mentioned are intended only for small models, and are designed so that only a few parts

are needed for their construction. Builders of large models will require a steering gear that conforms more closely with the mechanisms used in actual vehicles. On an actual motor vehicle the front axle is sprung to the chassis, and the wheels revolve on stub axles pivoted to its ends. This arrangement is easy to follow in a model. From Fig. 2, it will be seen that a Strip can be bolted across the chassis, in place of the Double Angle Strip, so that its ends project on each side. Two sets of Flat Brackets are then fastened by  $\frac{3}{8}$ " Bolts to two Double Brackets, so that each forms in effect a  $1\frac{1}{2}$ " strip with a Double Bracket at the centre. In the lugs of the Double Brackets are journalled  $1\frac{1}{2}$ " Rods on which the wheels are free to turn, the  $1\frac{1}{2}$ " Rods being at right angles to the Flat Brackets. These stub axle units are then pivoted by the  $\frac{3}{8}$ " Bolt to the ends of the Strip bolted to the chassis, further lock-nuts being used to hold them in place.

The front and rear pairs of Flat Brackets are connected together by Cord, the rear Cord being coiled tightly around the lower end of

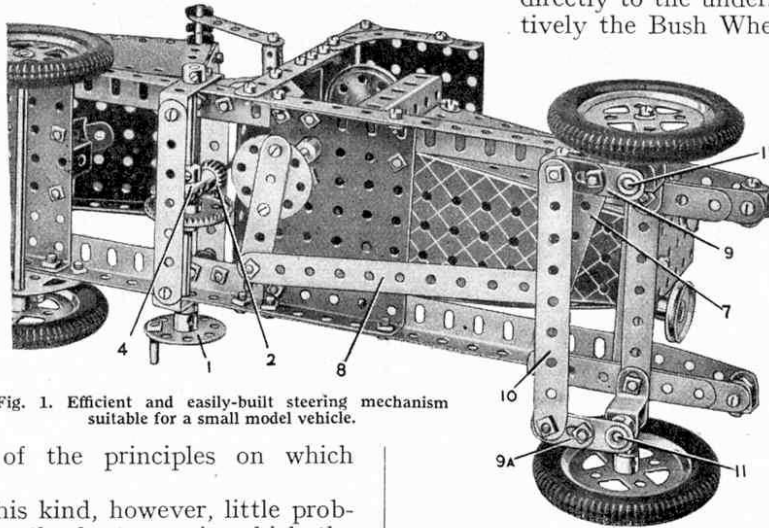


Fig. 1. Efficient and easily-built steering mechanism suitable for a small model vehicle.

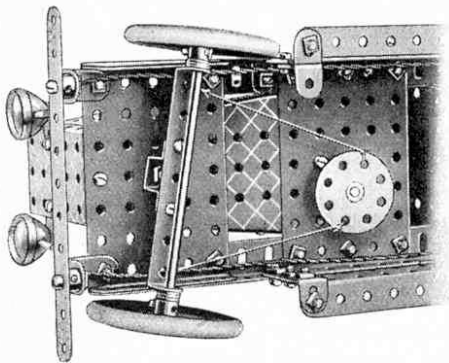


Fig. 2. A simple steering arrangement.

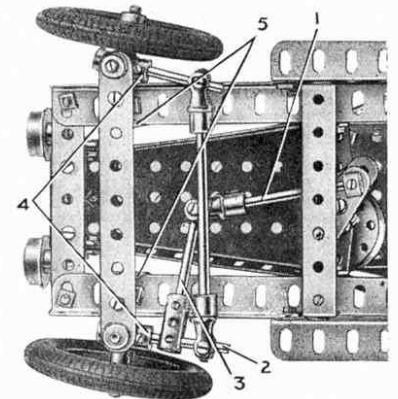


Fig. 3. A robust steering mechanism for heavy models.

the steering column before its ends are tied to the Flat Brackets. This steering mechanism can be fitted to most small models, and works well if it is carefully assembled.

It will be realised that these systems will work satisfactorily only if the steering column is close to the front axle, and although this position is no disadvantage on small models it seriously interferes with the design of larger models. The simplest way of overcoming the trouble is to connect the two rear Flat Brackets in the mechanism previously described with a Strip, the Bolts being lock-nutted. The front Flat Brackets can be omitted. The Strip is fitted with an Angle Bracket at its centre hole, and a small Crank Handle (without Erinoid Grip) is so arranged that its cranked end engages in the slotted hole of the Angle Bracket. A Pulley is fitted to the other end of the Crank Handle and when this is turned the Angle Bracket moves the track rod, which in turn swivels the wheels.

For use in large models this mechanism should be modified slightly. The Flat Brackets or, to give them their proper name, the pivot arms, should be lengthened or replaced by  $1\frac{1}{2}$ " Strips. A Strip of suitable length is then used to connect one of the pivot arms to a Bush Wheel fixed to the lower end of the steering column.

A scheme similar to this is illustrated in Fig. 1. The front axle is a  $4\frac{1}{2}$ " Strip fitted with Reversed Angle Brackets to provide bearings for the swivel pins 11. These are 1" Rods that carry Collars at their upper ends, and the Cranks 9 and 9a at their lower ends. The wheels are 2" Pulleys and are free to rotate on  $\frac{3}{4}$ " Bolts screwed into the Collars. The arms of the Cranks are connected together by the Strip 10, which forms the track rod, the bolts being lock-nutted. The steering arm is a  $2\frac{1}{2}$ " Strip 7, which is bolted at one end to Crank 9, but is pivoted at its other end to the  $5\frac{1}{2}$ " Strip 8. Strip 8 in turn is pivoted to a  $2\frac{1}{2}$ " Strip bolted across the Bush Wheel. When the steering wheel is turned its movement is transmitted through Strips 8 and 7 to the Cranks 9 and 9a and thence to the road wheels.

The steering arrangement shown in Fig. 3 is similar in principle to that just described, but the constructional details are slightly different.

These steering systems can be simplified somewhat by connecting

the pivot arm directly to the drag link, represented by Strip 8 in Fig. 1 and by Rod 1 in Fig. 3.

In actual vehicles, the steering column is not in direct connection with the drag link, but usually is geared to it by a worm and worm wheel or a worm and nut arrangement. This method enables a finer degree of control to be obtained and should always be incorporated in a Meccano model when the stock of parts allows. The best arrangement is to use a  $\frac{1}{2}$ " Pinion and 57-teeth Gear. Alternatively, if the steering gear is required for a model having a long bonnet, the system shown in Fig. 5 should be adopted. In this case the steering column 2 is mounted in an almost horizontal position, and a Worm fixed to its end meshes with a  $\frac{1}{2}$ " Pinion fastened on the vertical Rod 2.

Instead of a track rod to couple the two front wheels, and a steering arm and drag link as in Figs. 1 and 3, the Strips 4 are pivotally attached to the Double Arm Cranks, and are connected together at the centre to a Crank fixed on Rod 3.

When a motor vehicle turns a corner the near side road wheels describe a sharper curve than the outer wheels. This will more readily

be understood when it is remembered that the outer wheels are at a greater distance from the centre of the turning circle. To allow the front wheels to travel through their respective arcs when the car is turning, which is necessary to prevent undue tyre wear and skidding, it is necessary to turn the inner wheel through a greater angle than the outer one, no matter whether the vehicle is turning right or left. This object is achieved by what is known as the Ackermann steering system, and the method by which this can be reproduced in Meccano is shown in Fig. 4.

The gear used in this mechanism comprises two short levers rigidly connected to the stub axles. The levers are joined by the track rod and lie at a slightly obtuse angle to the stub axles, this angle being such that the centre lines of the levers, if extended, would cross at a point on the centre line of the car. Usually the design is arranged so that this point

lies just in front of the back axle. The stub axles 13 and 13a are fixed in Couplings 17 that in turn are pivoted on vertical Rods or swivel pins. It is not possible to fix levers at an obtuse angle to these Couplings, but a similar effect is obtained by fixing the Rods 11 in the positions shown, and joining them by the Rod 12 and Swivel Bearings. It will be seen that the lines joining the centres of the swivel pins and the bolts of the Swivel Bearings would meet on the centre line of the model if they were extended. The actual point at which the lines intersect depends on the length of Rods 11.

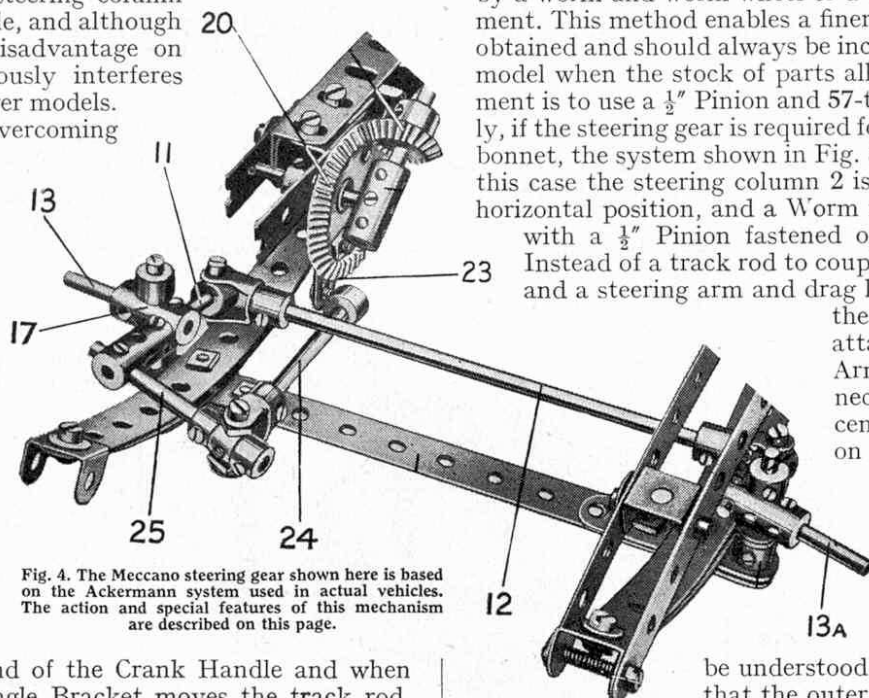


Fig. 4. The Meccano steering gear shown here is based on the Ackermann system used in actual vehicles. The action and special features of this mechanism are described on this page.

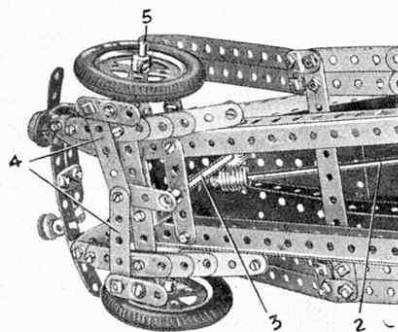


Fig. 5. Originality is a feature of this simple but effective steering mechanism.

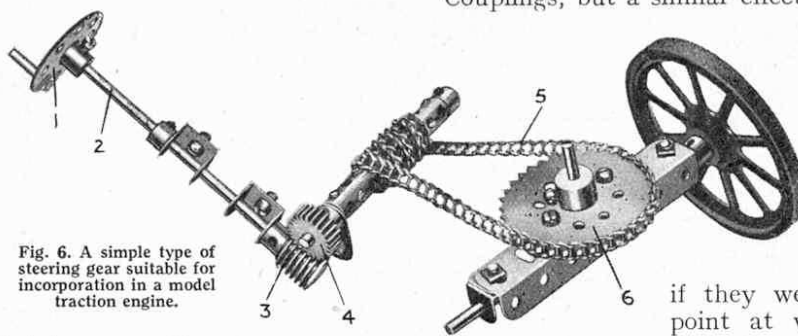


Fig. 6. A simple type of steering gear suitable for incorporation in a model traction engine.