

# Modern Transport in Meccano

## A Fine Eight-Wheeled Steam Wagon

THIS month we describe a realistic working scale model of an eight-wheeled steam wagon fitted with a four-wheel compensating steering arrangement. The advantages of distributing a heavy load over a number of wheels are many, especially if the ground to be negotiated is rough. These advantages are made still more evident if all the wheels are compensating, thereby enabling them to be continually in contact with the ground.

The Meccano model is a miniature replica of a D.G.8 type steam wagon, and all the main features of the original have been incorporated. The model is commenced by building the main frames, each side member of which consists of two  $2\frac{1}{2}$ " Angle Girders joined together to form a channel section girder. These two complete channel section girders are bolted together, parallel to each other, by a  $4\frac{1}{2}$ " Angle Girder 2 at the front and three  $7\frac{1}{2}$ " Strips at the rear, as shown in Fig. 4. The two girders are made rigid by the addition of the  $4\frac{1}{2}$ " Strip 30A and also a  $3\frac{1}{2}$ " Strip.

The imitation water tank also helps to stiffen the main frames. This is composed of a  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate 36, secured to the underside of the frames by two  $3\frac{1}{2}$ " Angle Girders, two  $3\frac{1}{2}$ " and two  $2\frac{1}{2}$ " Flat Girders and four  $\frac{1}{2}$ " x  $\frac{3}{4}$ " Angle Brackets. The  $3\frac{1}{2}$ " Angle Girders are bolted to the rear of the main frames, as shown in Fig. 4, and to them are attached the  $3\frac{1}{2}$ " Flat Girders. The bottom corners of these Flat Girders carry the  $\frac{1}{2}$ " x  $\frac{1}{2}$ " Angle Brackets, to which are secured the  $2\frac{1}{2}$ " Flat Girders forming the ends of the dummy water tank. These Flat Girders are also bolted to the flanges of the  $3\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate 36. An imitation hose is added at 35, and this consists of a length of Spring Cord clamped in a coil behind a Flat Bracket attached to the tank by means of two  $\frac{1}{2}$ " Bolts.

The power unit, an E6 Electric Motor, and the transmission are next fitted to the main frame. The Motor is bolted to the upper flanges of the main girders of the frame by two  $3\frac{1}{2}$ " reversed girders 7, and it carries a  $\frac{1}{2}$ " Pinion on its armature shaft. This meshes with a 57-teeth Gear carried on a 2" Rod journalled in the side plates of the Motor, and also in two  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates. These Plates are held in place by  $\frac{3}{8}$ " Bolts, each shank of which carries five Washers as shown in Fig. 2.

The Rod carrying the 57-teeth Gear also carries a  $\frac{1}{2}$ " Pinion 8 that is in engagement with another 57-teeth Gear carried, together with a  $\frac{1}{2}$ " Pinion 9 and 50-teeth Gear 10, on a sliding Rod. The movement of this Rod is controlled by a 1" loose Pulley, free to rotate on a  $\frac{3}{8}$ " Bolt that is locked to the lower extremity of a Crank 16. A  $6\frac{1}{2}$ " Rod, on which this Crank is locked, is journalled at one end in the centre hole of a Coupling 15 and is prevented from moving longitudinally by means of a Collar as shown in Fig. 4. The end of the  $6\frac{1}{2}$ " Rod that enters the cab is fitted with a second Collar that carries a  $2\frac{1}{2}$ " Threaded Rod forming a gear change lever. The upper end of the Threaded Rod is fitted with a Handrail Support 14.

When the gear lever is in the position shown in Fig. 4, the 50-teeth Gear 10 meshes with a 57-teeth Gear 12 forming the differential crown wheel. This latter Gear is free to rotate on one

side of a split shaft, both inner ends of which are journalled in a Coupling. This side of the shaft carries also a  $\frac{3}{4}$ " Contrate Wheel that is caused to transmit its movement to a second similar part by means of two  $\frac{3}{4}$ " Pinions. These Pinions are free to rotate on Pivot Bolts that are screwed into the centre tapped hole of the middle Coupling so that they grip a  $1\frac{1}{2}$ " Rod 12A. Two Collars and

two  $\frac{3}{4}$ " Bolts secure the Rod 12A to the crown wheel. Each side of the split shaft, carrying the differential just described, has a  $\frac{3}{4}$ " Sprocket Wheel locked on its extremity.

When the gear lever is moved into the opposite position shown in Fig. 4, the  $\frac{1}{2}$ " Pinion 9 engages with a  $\frac{3}{4}$ " Contrate

Wheel secured by two grub screws to one end of a 5" Threaded Rod 11. This Rod carries a "spider" 34A, free to

move along its length, and a Threaded Coupling that is locked on the rear end by a lock nut. The plain bore of the Coupling is fitted with a  $1\frac{1}{2}$ " Rod journalled in a Handrail Support secured to a transverse  $3\frac{1}{2}$ " Strip. The inner end of the Rod 11 is journalled in the lower hole of a 1" Triangular Plate attached to the two  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates by a 2" Strip and two  $\frac{1}{2}$ " x  $\frac{1}{2}$ " Angle Brackets.

Before proceeding further with the transmission it is advisable to construct and fit the cab. The floor of this section of the model is built up from two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " and two  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat

Plates as shown in Figs. 2 and 4. The front edges of the smaller Plates are fitted with  $1\frac{1}{2}$ " Flat Girders and a  $1\frac{1}{2}$ "

Corner Bracket, the protruding corners of this latter part being bolted to the ends of the  $4\frac{1}{2}$ " Angle Girder 2. The  $\frac{1}{2}$ " x  $\frac{1}{2}$ " Angle Brackets, forming supports for the imitation headlight, are fitted at this stage. The back of the cab

consists of three  $4\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates, one of which is laid with its long edge horizontal. The two remaining Plates are secured

to this in a vertical position, and their outer edges support two  $4\frac{1}{2}$ " Angle Girders to which are bolted the Cranks 33A and also two  $2\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates forming the sides of the cab. The free edge of these Plates are bolted to the  $4\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips shown in the illustration.

Three further  $4\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strips 4 are now bolted in place, and these carry the front of the cab, which is composed of two  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates curved to the shape shown in Fig. 1. The three Double Angle Strips 4 are joined together by two  $3\frac{1}{2}$ " Strips and four Flat Brackets, and the space between these parts

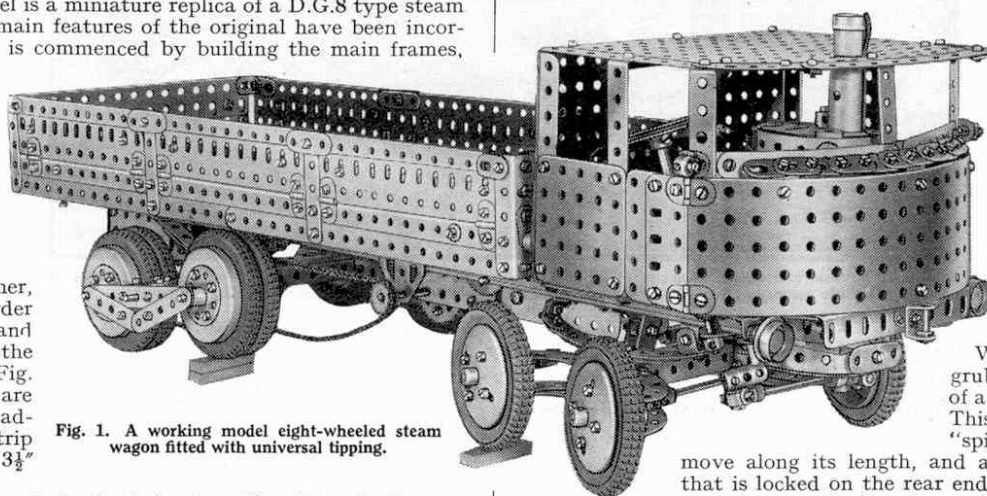


Fig. 1. A working model eight-wheeled steam wagon fitted with universal tipping.

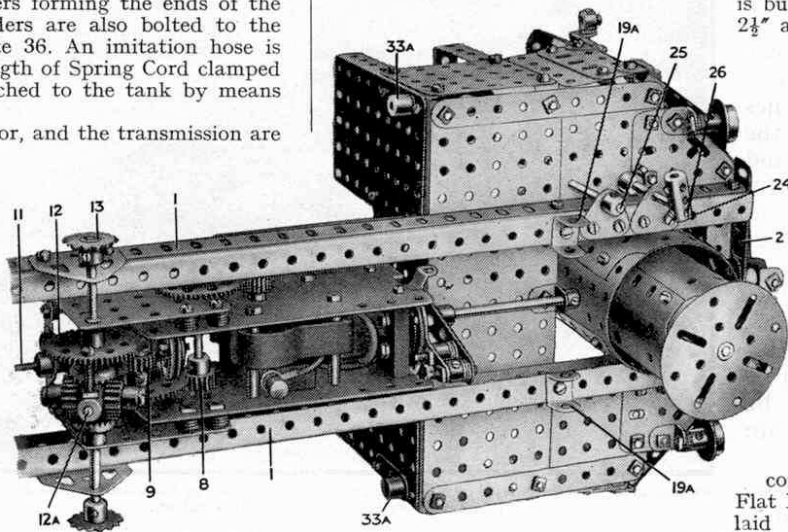
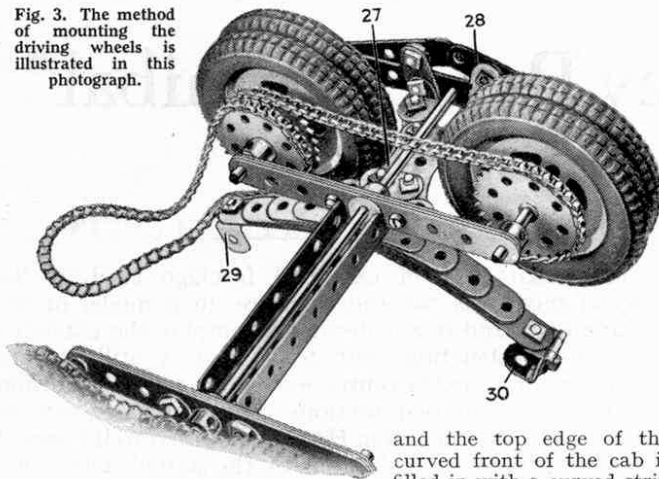


Fig. 2. An underneath view showing the power unit and boiler.

Fig. 3. The method of mounting the driving wheels is illustrated in this photograph.



and the top edge of the curved front of the cab is filled in with a curved strip

built up from 12 Flat Brackets. A Double Bracket 3 secures the bottom of the cab front to the centre Double Angle Strip 4. Side lights consist of Collars fitted with bolts and fixed to the cab sides by means of bent  $\frac{1}{2}$ " x  $\frac{1}{2}$ " Angle Brackets. Doors are represented by bolting two  $2\frac{1}{2}$ " Flat Girders together as shown in Fig. 1 and attaching them to the cab by Hinges. Two Hinges are allotted to each door. The draw-bar hook is built up from a Large Fork Piece fitted with a Threaded Pin and attached to the centre of the Girder 2 by a  $\frac{1}{2}$ " Bolt.

The outer casing of the boiler consists of two Boilers, without Ends, bolted together to form a tube  $2\frac{1}{2}$ " in diameter. This tube is attached to the main frames by two Trunnions, and the top is covered in by a Face Plate secured between four nuts and the upper flanges of four  $\frac{1}{2}$ " x  $\frac{1}{2}$ " Angle Brackets. The inner Boiler is fitted at its upper end with a Boiler End and at its lower end with a Face Plate and a Boiler End. A Rod passes through the centre of this complete boiler, and its upper end is gripped in the boss of the Face Plate forming top of the boiler casing. When it is desired to release the boiler from its casing all that is necessary is to unscrew the set screw of the upper Face Plate. The lower edge of the boiler casing carries the number plate as shown in Fig. 1.

The lower portion of the chimney is shown in Figs. 1 and 4. It is built up round a 2" Threaded Rod and consists of a Sleeve Piece and two Chimney Adaptors, one of which is shown at 6. Both of these Adaptors are locked in place by means of two nuts each. The upper end of the Threaded Rod protrudes above the cab roof and is fitted with a Chimney Adaptor and  $\frac{3}{4}$ " Flanged Wheel. The escape steam pipe is represented by a short length of Spring Cord.

The cab roof is built up from two  $5\frac{1}{2}$ " x  $3\frac{1}{2}$ " Flat Plates, and the curved front edge is represented by a number of Curved Strips of different sizes. The sides of the roof are extended by  $4\frac{1}{2}$ " Strips.

The steering wheel, a 2" Pulley, is mounted on the upper end of a  $4\frac{1}{2}$ " Rod 25 forming the steering column. This Rod passes through a hole in the floor of the cab and is journalled at its lower extremity in a 1" Triangular Plate. A  $\frac{3}{4}$ " Pinion on the steering column meshes with a 50-teeth Gear on the 2" Rod 26 that is journalled as shown in Fig. 2. A Coupling 24 is carried on the 2" Rod, and this forms the crank for operating the four front steering wheels.

The framework for carrying the steering wheels is shown in Fig. 5, and it is attached to the main frames of the wagons by the spring shackles. In the illustration one of the springs have been removed. A Rod 18, secured by a  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip to the centre beam of the unit, carries the two curved compensating frames, the points of attachment being the Double Arm Cranks 17 and two Double Brackets, one of which is shown on the near side of the illustration. The Double Arm Cranks 17 are held in place by means of Double Brackets. In securing the springs to the main frames the Hinges forming the pivoted shackles are bolted in place and the Double Brackets 19 are pivotally secured to the Double Brackets 19A, Fig. 2.

The Coupling 24 is coupled up, as shown in Fig. 5, by the

Threaded Boss 22 and Swivel Bearing 23 to the Coupling 20 that is mounted together with a Crank on the stub axle pivot 20A. The Crank is linked up with a second Crank by a Rod and two End Bearings, and this second Crank is locked on a stub axle pivot connected to a third pivot by a  $3\frac{1}{2}$ " Threaded Rod and two Threaded Bosses 22. These Threaded Bosses are secured pivotally to their respective Couplings carrying the stub axles by means of Swivel Bearings and 1" Rods. It should be noted that a Flat Bracket is bolted to the underside of each of the Cranks in order to prevent play in their slotted holes. The two Couplings 20 are connected together in a similar manner to that already described.

The four driving wheels shown in Figs. 1 and 3 are represented by pairs of 2" Pulleys and Dunlop tyres, fitted outside with a Wheel Flange mounted on a 3" Rod, together with single or double  $1\frac{1}{2}$ " Sprocket Wheels, as illustrated. The 3" Rods are carried in compensating beams. One of these is shown in Fig. 3, and from this it will be seen that  $4\frac{1}{2}$ " Strips are used for the sides of the beam. One side of the beam carries two extra Strips 28 and both complete sides are joined together by a built-up curved member 27. The link shackles 30 of the springs are bolted to the underside of the main frames, and the Double Brackets 29 are mounted on the Rods 29A Fig. 4.

The last part of the model to be constructed is the body. As will be seen from Fig. 1, this consists of a number of  $5\frac{1}{2}$ " x  $3\frac{1}{2}$ " and  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flat Plates bolted to four longitudinal Angle Girders. The hinged plates of the body are held in a vertical position by means of the  $1\frac{1}{2}$ " Strips and Flat Brackets. The operation of the movable pivot points is shown in this illustration.

Tipping is carried out in the following manner. The spider 34A is secured by two locknitted bolts to a Single Bent Strip connected to the underside of the tipping body by a  $3\frac{1}{2}$ " Threaded Rod and Collar. The Collar carries two set screws, the shanks of which pass through two  $\frac{1}{2}$ " x  $\frac{1}{2}$ " Angle Brackets bolted to the body.

When the Electric Motor is running and the shaft 11 is being

driven, the spider 34A moves towards the rear of the model. This action causes the Single Bent Strip and its attendant Threaded Rod to assume a vertical position. If, for example, a pivot bolt is engaging with the Crank 33A and a similar bolt with the Angle Bracket mounted on the rear of the main frames, the body

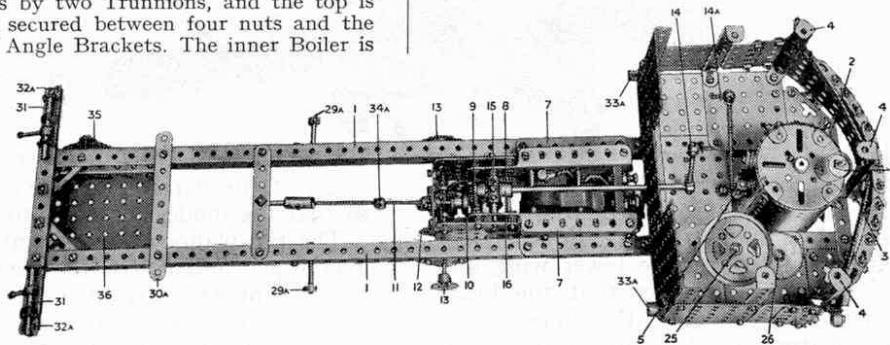


Fig. 4. A plan view of the model showing the cab and tipping mechanism.

will tip sideways. Two pivot bolts similarly control the end tipping movement. The construction of these special pivot bolts is shown in Fig. 1.

When the body is tipped to the left, for example, the catches holding the hinged flaps on the left-hand side are turned into a vertical position. This allows the flaps to fall and the load may then be deposited on the ground.

The control for the Electric Motor is situated at 14A. This Handrail Support is mounted on the upper end of a  $3\frac{1}{2}$ " Threaded Rod that is secured by a Collar to a  $2\frac{1}{2}$ " Rod shown in Fig. 2. The free end of this Rod is journalled in a 2" Strip that is bolted to the reversing lever of the Motor by means of two  $\frac{1}{2}$ " Bolts. Collars and Washers are used for spacing purposes between the Strip and the reversing lever.

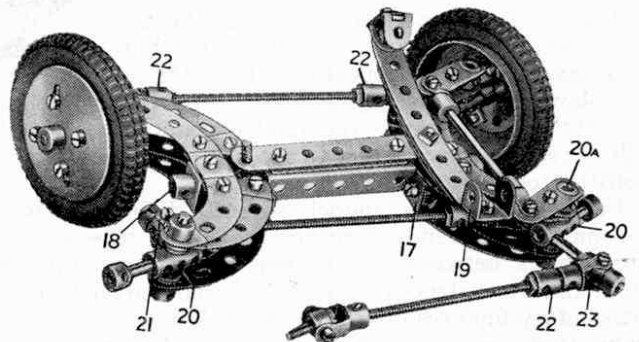


Fig. 5. The steering mechanism with two wheels removed to show the construction.