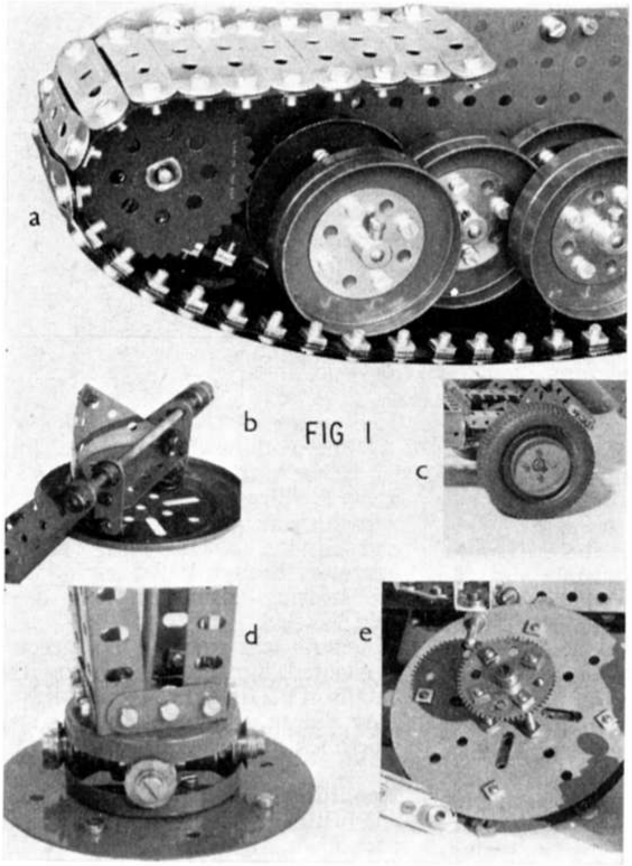


Meccano Parts and how to use them

Part 10

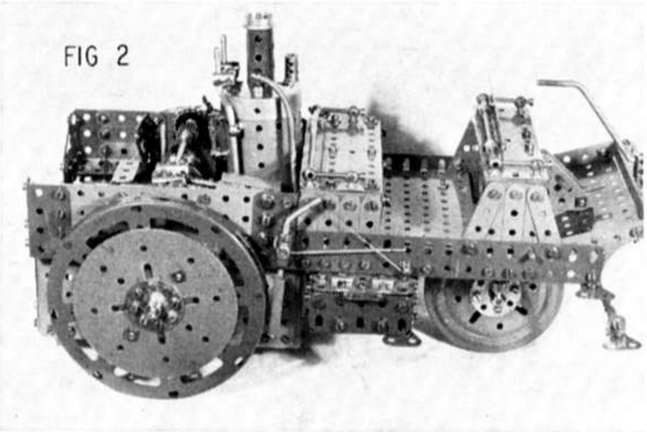
Rigid Circular Parts

By B. N. Love

Fig. 1a. Wheel Flanges form neat running gear for model tank tracks.
Fig. 1b. The flanged disc of the Ball Thrust Bearing serves as part of a passenger car on a fairground ride.
Fig. 1c. Footstep ring on a lorry wheel provided by a Wheel Flange.
Fig. 1d. Two Wheel Flanges form a strong thrust roller bearing with ½ in. Pulleys.
Fig. 1e. The 4 in. Circular Plate used as a power sprocket on a Crawler Tractor.

As the modeller develops his skill and increases his stocks of Meccano parts, he will come across the various rigid circular pieces in the system. Washers and Wheel Discs come into this category at the small diameter end of the range and the 9½ in. Flanged Ring, which is illustrated in Part 9 of this series, is the largest circular part in the standard list of parts. The smallest of the flanged discs is Part No. 137, Wheel Flange, which is designed to fit over a Face Plate with sufficient clearance to pass over the boss and Set Screw of the Face Plate to simulate a railway wheel. In fact, the clearance hole in the centre of the Wheel Flange is of ½ in. diameter, so it will also fit over the bosses of the larger Sprocket Wheels and the 3½ in. Gear Wheel. Fig. 1c shows a simple application of this part where it is serving as a footstep ring on a lorry wheel. The Wheel Flange can be used as a built-up wheel by bolting it to a Bush Wheel as shown in Fig. 1a, either single or twin flanges being used to provide running gear for a wide-form tank-track reminiscent of the famous German Panther and Tiger tanks. In Fig. 1d we see a further use of this part where it forms a thrust roller bearing with ½ in. Pulleys capable of supporting a large revolving crane superstructure or fairground model. Having a large clearance hole at its centre, the Wheel Flange permits cable entry up through a rotating mast to feed electric motors and lights in control cabins at the top. When bolted to a 4 in. diameter Circular Plate as shown, a strong base is provided and as the Circular Plate is also designed with a ½ in. diameter centre hole, cable entry is obtained through both components illustrated in Fig. 1d. Standard Meccano Sprocket Wheels are available up to 3 in. diameter but this does not limit the dedicated constructor. A special built-up "sprocket" wheel is shown in Fig. 1e and although it has only eight teeth, it is capable of driving the tracks of a model bulldozer of very generous proportions. In this case, two 4 in. diameter Circular Plates, Part No. 146a, are fitted with Narrow Strips sandwiched between them, suitably spaced by Washers. The tips of the Narrow Strips protrude ½ in. all round to engage driving dogs in the form of Angle Brackets bolted to the bulldozer crawler tracks. Slotted holes in the 4 in. plates can be clearly seen, and this permits the attachment of assemblies requiring latitude in spacing. Part No. 146 is a larger edition of Circular Plate No. 146a being 6 in. diameter but it is made in a gauge of steel about twice as thick as the 4 in. version. It, too, has a ½ in. centre hole and is suitable for making the base plates of turntables etc.

One of the "special-purpose" Meccano parts is the 4 in. diameter Ball Thrust Bearing which has useful sub-assemblies. One of these is the flanged disc illustrated in Fig. 1b where it is simply used as an ornamental dished base for a passenger cupola on a fairground ride. However, when these flanged discs are paired up, they become versatile wheels as Figs 2 and 3 illustrate. Fig. 2 shows a neat model of an Experimental Steam Carriage for which a solid single front wheel was required of appropriate scale. This was achieved by mounting two of the flanged discs, Part No. 168a, on Bush Wheels and placing them face-to-face on a short Axle Rod held in a forked steering arm. A second use for a pair of these flanged discs is shown in Fig. 3 where they form a neatly proportioned flywheel on a model Showman's Engine. However, this time the discs are not set face-to-face but are both mounted on the flywheel shaft with their flanges facing inwards. This gives the most suitable rim surface for maintaining a belt drive to the dynamo at the front of the model, but the



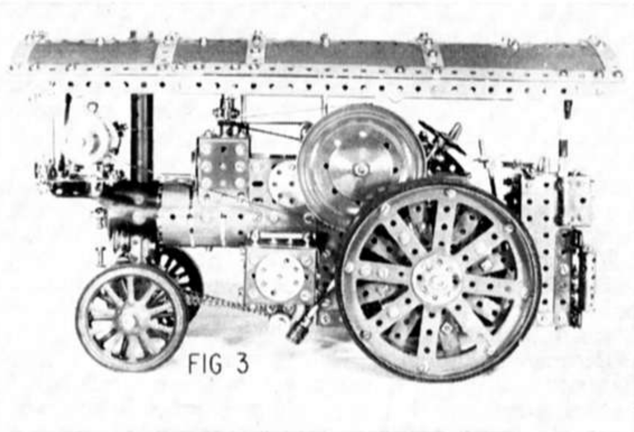
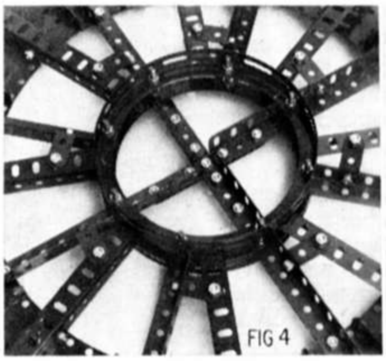


Fig. 2. An Experimental Steam Carriage model makes use of Hub Discs, Circular Plates and flanged discs for scale wheels.

Fig. 3. A Showman's Engine making excellent use of Meccano circular parts for wheels and ornamentation.

setting up of a pair of these discs in this manner requires patience and care for trouble-free running. These latter two illustrations also show a further rigid circular part, i.e. the Hub Disc, Part No. 118. On the Steam Carriage in Fig. 2, the wheel is made from one Hub Disc largely covered in by a 4 in. Circular Plate and held in position by a Bush Wheel bolted to both parts. The Showman's Engine in Fig. 3 uses a pair of Hub Discs, each of which has eight spokes, but by staggering the spokes as shown and securing the Hub Discs together by Reversed Angle Brackets, the "interwoven" pattern, common to most traction engine wheels, is neatly suggested. Note that a similar staggering is given to the twin sets of 3 in. Spoked Wheels at the front of the Showman's Engine to give the multiple spoke effect. Wheel Discs mounted on the steam chest, belly tanks, and rear wheel hubs show the decorative effect of using these smaller circular parts.

Of similar proportions to the Hub Disc is the Circular Girder, Part No. 143. Both are 5½ in. diameter and the Circular Girder may be considered as a Hub Disc with the spokes removed. Although not visible in Fig. 3, a Circular Girder is sandwiched between the two Hub Discs forming the rear wheel of the Showman's Engine. This gives a 1½ in. broad rim to the rear wheel which permits a wide "tyre" to be attached for good scale appearance. Fig. 4 shows a pair of Circular Girders forming the centralising joint of a radial network of Angle Girders forming a large circular base or massive wheel for a fairground ride. A feature of both the Hub Disc and the Circular Girder are the long slots in the flanges of both parts. Basically, these components have eight holes spaced round their circular rims at 45°, but there are occasions when a six point attachment is required, or multiples thereof. The points on a clock dial is one case where an eight spacing is very awkward, but by placing Bolts or Threaded Pins in the slotted holes of the flanges, a twelve point attachment is simple. Finally, the 167b Flanged Ring, (which is actually listed as 9⅞ in. diameter), is illustrated in Fig. 5. It has two sets of attachment holes, one set of eight in the rim and one set of sixteen in the flange. These can be clearly seen in Fig. 5, and it would appear that there is a convenient 5 hole spacing between the sixteen flange holes. This is not the case however, and the Flexible Plates shown are stood off from the flanges by Washers to increase the radius of attachment to accommodate the five hole spacing shown. As the Flexible Plates have slotted end holes, this helps with the spacing problem. In larger scale traction and showmen's engines, these large Flanged Rings are commonly used for the rear wheel sections but the depth of the rim gives an out of scale appearance. It is better, therefore, from the constructional point of view, to avoid these for traction engine wheels and to build up from Curved Strips. Although Fig. 5 shows the base of a turntable drum, the advanced constructor will see its possibilities as a flywheel for a full size model of a motor car engine!



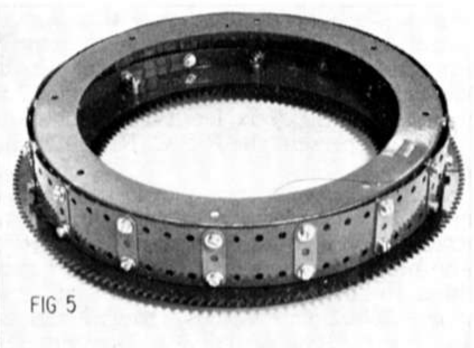


Fig. 4. Right, the Circular Girder as a hub centre. Note elongated slots in the flange for varying attachment points. Fig. 5. Far right, Part 167b large Flanged Ring gives shape and strength to circular bases for turntables and flywheels.

nuts, are fixed by a pair of ½ in. Bolts. A third Bolt retains a freely-rotating ½ in. Pulley, acting as a roller. Actuating this roller is a cam comprised of a Bush Wheel 103 to which is bolted a Paxolin or metal disc 1¾ in. in diameter which has a "dwell" approximately ⅝ in. long, the radius of this portion being 11/16 in., i.e. the same as the Bush Wheel. The cam is secured by a pair of Bolts.

The right hand Crank is extended forwards by a 3½ in. Strip, to the free end of which an End Bearing 104 is pivotally secured by a lock-nutted Bolt. A 2 in. Rod is carried in the boss of the End Bearing.

Now journalled in Double Bent Strip 14 fixed below the die block is a 2½ in. Rod, retained by two Collars. The forward end of this Rod carries a further Collar secured by a 1⅛ in. Bolt projecting horizontally towards the right-hand side of the machine. Under the head of this Bolt a ½ in. Pulley 105 is secured to serve as a counterweight to keep the cam roller in contact with the cam. Adjacent to the rear Collar of the 2½ in. Rod is mounted a Coupling arranged vertically and secured by its end transverse hole. In the longitudinal bore is fixed a 1 in. Rod, on the upper end of which is carried a Rod and Strip Connector, to which is bolted by its "middle" hole a Pawl without Boss 106, the pointed end facing to the right. This serves as the "knock off arm" which gives a quick flick across the die at each cycle of the machine.

It now remains to fit a further Coupling 107 on the rear end of the 2½ in. Rod, the upper transverse plain hole of this carrying a 1 in. Rod upon which pivots a Small Fork Piece, in the boss of which is held the lower end of the 2 in. Rod projecting down from End Bearing 104. The timing of the cam must be adjusted so that the arm quickly whips across the die and returns while the Ram is at the back of its stroke—thus avoiding a collision!

Wire Feed Mechanism

The mechanism which actually feeds the wire to the forming and cutting units is built up from an Eccentric 108, mounted boss outwards on the left-hand side of the Crankshaft. Bolted to the arm of this Eccentric is a 9½ in. Strip extended a further three holes by a 3 in. Strip 109. A Pawl carrier is supplied by a 3 in. Strip 110, to one end of which is fixed a Threaded Pin. One hole down from the opposite end is a Pawl with boss 111 (boss outward) pivotally attached by a Pivot Bolt, the Threaded Pin and Pawl being situated on opposite sides of the Strip.

The upper feed roller shaft is a 5½ in. Rod, to the left-hand end of which is fixed a 1 in. Gear 112. The right-hand end carries a 1 in. Pulley 113 representing a feed roller. The shaft is, of course, journalled in the Flat Girder and Flanged Plate at each end of the feed roller housing.

The lower Rod is 6½ in. long and similarly journalled and also carries a 1 in. Gear and Pulley. Fixed on the left-hand end of this lower Rod, next to the Gear, are three Washers, the Pawl carrier assembly (Pawl outwards) and a Ratchet Wheel, also mounted boss outwards. Finally, Strip 110 is secured to the Threaded Pin on the bottom of the pawl carrier by a Collar. *(to be concluded)*

Meccano Parts and How to Use Them

PART II — SOME MISCELLANEOUS PARTS

By B. N. Love

ALTHOUGH competitors of the Meccano system have been numerous over the years, the majority of them have failed for one simple reason: they could never compete with the wide range of additional parts which the Meccano system offers.

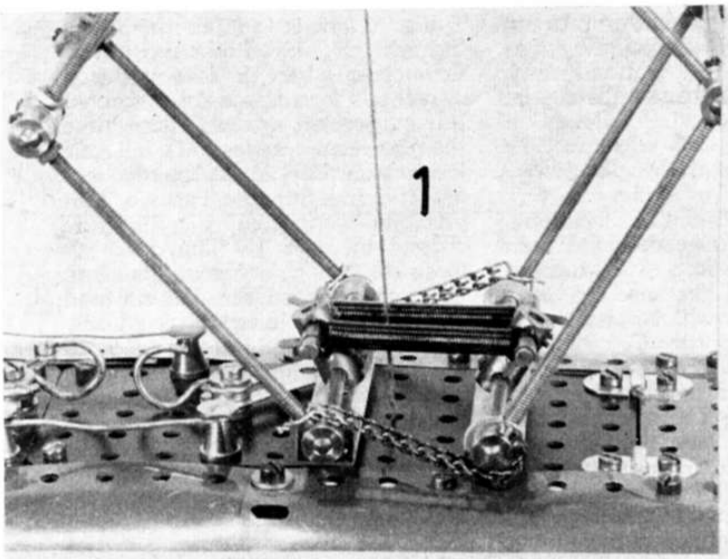
Once the basic construction of a model has been completed, detailed modelling and mechanical reliability depend to a large extent on the "brassware" available to provide both working and decorative features Meccano is rich in brassware, but, because of the very wide range available, it is only possible to feature here a few of the more popular and perhaps most useful of the miscellaneous parts.

Every serious constructor is familiar with the Collar, Part No. 59, as being a basic holding device for keeping Axle Rods in place. It is very much more versatile than this, however, and some additional applications are shown in Figs 1 and 2. In Fig. 1, a working pantograph is shown which will pick up current from a bare conductor wire overhead to drive a model train or tramcar. Although this particular design is well known to older readers, the introduction of the Meccano electrical parts of the 1960's enables an insulated fibre baseplate to be used for the pantograph anchorage, effectively insulating it from the metal framework of the electric locomotive. The use of a pair of Hinges, Part No. 114, can be seen in Fig. 1 and this allows the pantograph to be tilted back for wiring connections below. Collars are used extensively in this design and in their simplest form at the base of the pantograph, where they locate the two 2½ in. Axle Rods forming the lower pivots for the Screwed Rod framework. Again, we see an unorthodox use for another part – Sprocket Chain, short lengths of which are attached to the Screwed Rods entered into the Collar bosses as shown. Note that the two lengths of chain are rigged in opposite slope on the two sides of the loco roof and this ensures that, as the whole framework of the pantograph moves in concertina fashion to keep its tension against the overhead conductor, it does not topple fore and aft.

The middle joints of the pantograph can just be seen in the illustration of Fig. 1 and these require six Collars on each Axle Rod. The outside Collars are locked in place by their Screwed Rods and a lock-nut, but the Collars immediately inboard are free to turn on the Axle Rod, the second set of Screwed Rods being entered into the tapped hole of the Collars sufficient to make a firm hold, but not enough to bind against the Axle Rod. Finally, the inside Collars are locked to the Axle Rod to keep the middle free-turning Collars in place.

A development of the Collar is Part No. 63, the Coupling, and this also appears in Fig. 1. A pair of Couplings are locked to the lower Axle Rods of the pantograph as shown and linked by Tension Springs, Part No. 43, the Springs being held in place by 1 in. Axle Rods and Spring Clips. This ensures that the pantograph maintains an upper thrust towards the overhead conductor. The top of the pantograph is a 2½ in. Double Angle Strip, joined by an Axle Rod and more Collars to the upper set of Screwed Rods. A length of Meccano Cord, attached to the centre of the Double Angle Strip and passing down into the driver's compartment, allows the pantograph to be drawn downwards for stowage.

Similar applications are shown in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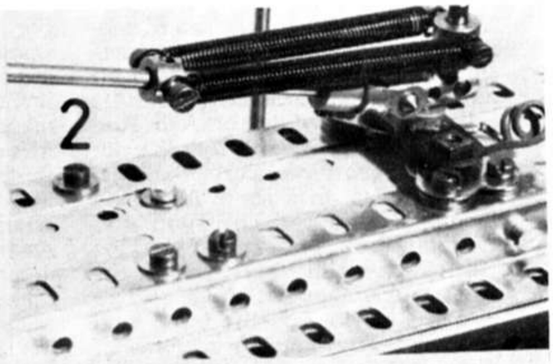
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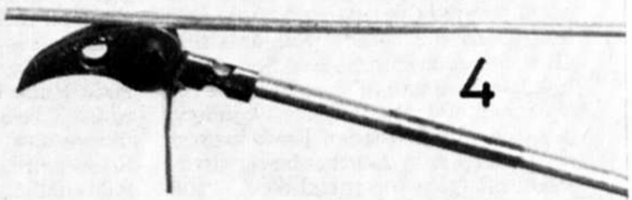
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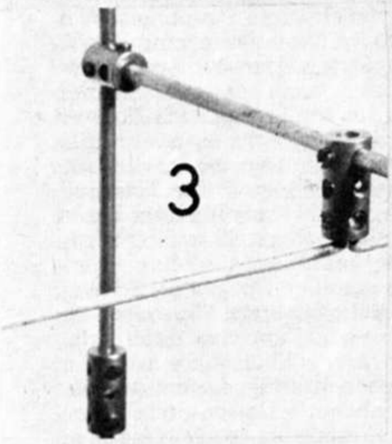
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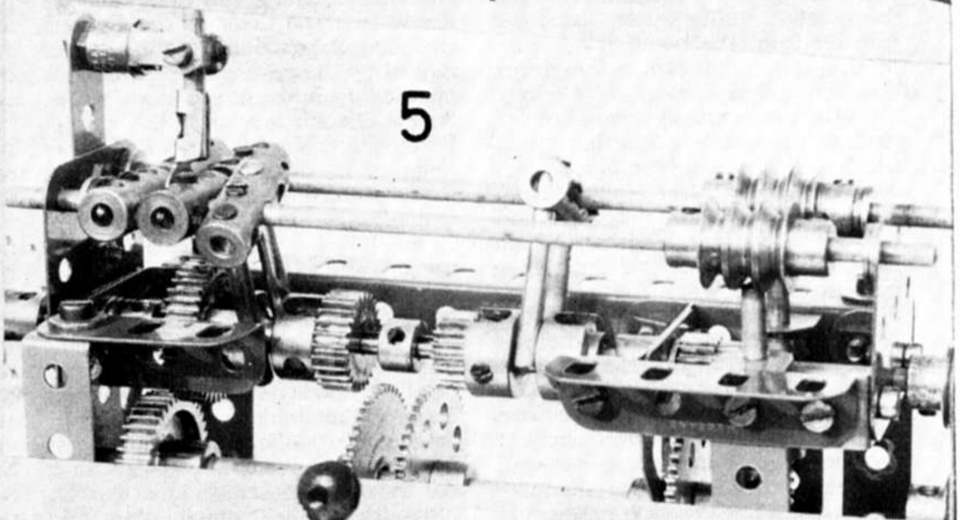
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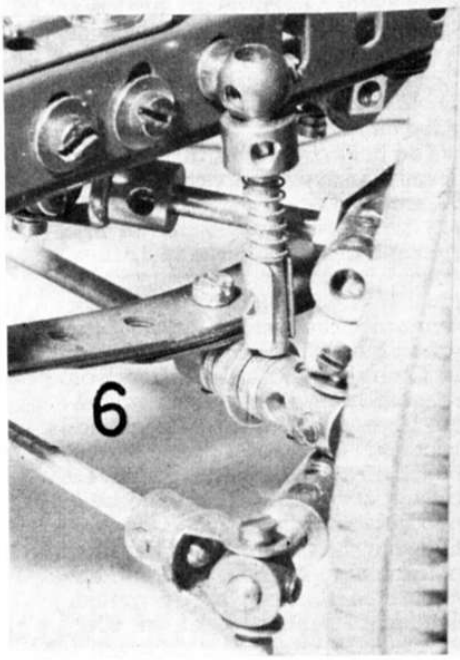
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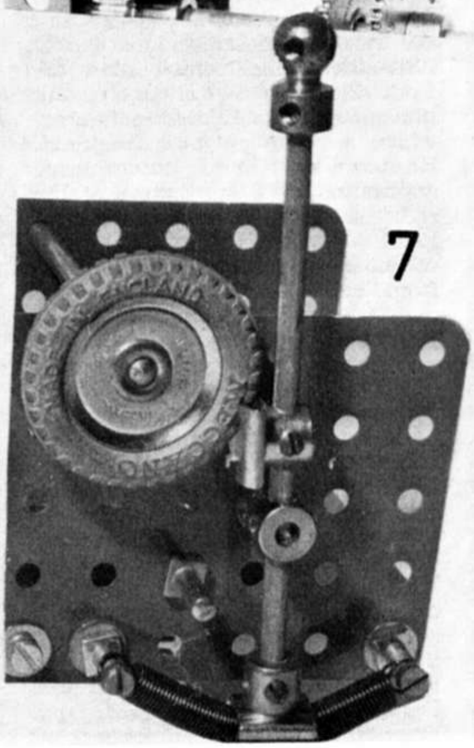
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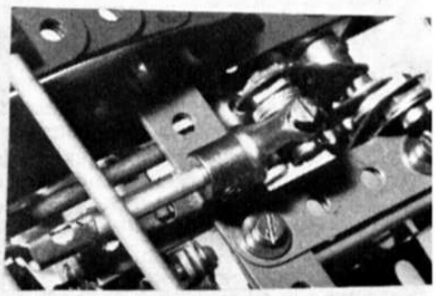
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Fig. 2 with much the same miscellaneous items. This time, tension is required on a trolley pole for an electric tramcar and this is achieved by pivoting the Axle Rod forming the trolley pole by means of a Small Fork Piece, Part No. 116a, which pivots on a short Axle Rod mounted in the rear cross-bore of a Coupling. A Threaded Pin, Part No. 115, is mounted vertically in the front tapped bore of the Coupling and this carries a Collar fitted with two Set Screws which trap a pair of Tension Springs. A second Collar is set on the trolley pole at a critical point to give the required angle and tension to the trolley pole and this also carries a pair of Set Screws to hold the rear end of the two Tension Springs. By pivoting the Coupling on a second Threaded Pin which is secured to a 1½ in. Insulating Strip stood off from the metal roof of the tram, the trolley pole becomes isolated from the metal framework of the tram and can be used for direct overhead pick-up.

Fig. 4 shows the upper end of the trolley pole where further miscellaneous parts are employed. A Rod Connector, Part No. 213, can just be seen under the numeral 4 and this allows various lengths of Axle Rods to be used to extend the trolley pole to critical length, as required. A Rod and Strip Connector, Part No. 212, is attached to the end of the trolley pole and this carries a pair of Pawls without boss, Part No. 147c, bolted in place, but separated by two or three Washers to permit entry of the bare wire acting as the overhead conductor. This is quite adequate for "straight line" track running. If a fairly stout copper wire is chosen, then it may be mounted as shown in Fig. 3, where the Coupling comes into its own again as the joints of the tramway standard. If the standards are used on wooden boards, no further insulation is required.

Somewhat larger than the standard Coupling is the Socket Coupling, Part No. 171, and two of these are shown in a sliding gearbox in Fig. 5. Something like dumb-bell in shape, the Socket Coupling has cylindrical recesses at each end which will accommodate the standard ⅜ in. diameter boss of the majority of Meccano gears and wheels. The centre portion of the Socket Coupling is waisted to recieve a fork arrangement intended to slide along. As this particular gearbox has been described elsewhere in Meccano literature, only the use of miscellaneous parts will be dealt with here. The versatile Coupling in this case provides a four-position "gate" for the gearbox and the use of the Rod and Strip Connector is again also seen, this time acting as a selector for either the near or farside Axle Rods forming the gear-change rods. Two of the Couplings are mounted at an angle on the sliding Rods so that a pair of 1½ in. Axle Rods which they both carry engage the waisted portions of the Socket Couplings, thus allowing them to be moved by the gear lever. Although not clear from the illustrations, these Socket Couplings are fitted with Key Bolts, Part No. 231, which allow them to be driven by the Keyway Rod on which they are mounted, but which permit the Socket Couplings to be slid along the Rod to engage the different gears, as required.

Notice the gear lever in Fig. 5 is mounted in a Swivel Bearing, Part No. 165, and this is really a Small Fork Piece attached to a special "Collar" having four tapped holes. Two of the holes are available for locking the "Collar" or "Spider", as it is sometimes called, to a shaft, but the two larger screws are special "Shoulder Bolts" which allow the Fork Piece to swivel freely, but prevent an Axle Rod from binding where a free pivot is required. Readers will note an unusual application of ½ in. Pulleys at the right-hand end of the gear-change Rods. These bear against the tips of short Axle Rods, spring-loaded from below, and give a positive register of the gear-change Rods in neutral or active gear.

Fig. 6 shows yet another application of the Rod and Strip Connector where it is used as a swivel end for a shock absorber on a leaf suspension system. This time the Connector carries a 1½ in. Axle Rod which slides in the smooth bore of a Handrail Support, Part No. 136, pivotally connected to the side chassis member by lock-nuts. A loose Collar below the Handrail Support takes up the distance and acts as a thrust ring for the Compression Spring. Further uses of the Coupling and Swivel Bearing are also illustrated in Fig. 6 where they form pivot joints in the steering linkage. Similar uses are shown in Fig. 8 where the drop arm from the steering column gearing, in the form of a Crank, is connected to the drag link.

Neighbour of the Handrail Support is the Handrail Coupling shown at the top of the brake lever in Fig. 7. Although the Handrail parts are commonly used, as their names suggest, in supporting Axle Rods as handrails, they are also versatile parts in their own right. In the application of Fig. 7 the Handrail Coupling simply acts as a lever knob.

The Slide Piece, Part No. 50, is normally used as a sliding component running along a Perforated Strip, but the brake illustrated in Fig. 7 uses it somewhat differently. In one case, a Slide Piece acts as a brake shoe bearing against a 1 in. Tyre, while the lower Slide Piece acts as a restricting and holding shoe as it bears against the Tension Spring, as shown. The Coupling on which the brake lever pivots permits adjustment of the Axle Rod to vary the pressure of the lower Slide Piece against the Tension Spring, while the upper Slide Piece may be set above or below the Tyre centre to vary the effective direction of the brake.

The final chapter of this series of 12 articles will appear in the December edition of the Magazine and will deal with some of the Meccano Electrical Parts.

MODEL-BUILDERS (*from page* 539)

1972 Report

Last, but by no means least this month, I give below a brief outline of the activities so far this year of the Stevenage Meccano Club, taken from a report submitted by Club Secretary Mr. Dennis Higginson, 7, Buckthorn Avenue, Stevenage, Herts.

The year got off to a good start with a visit in January to the Model Engineer Exhibition in London. This was enjoyed by all and prompted plans for further outings in the future. On May 13, the Club exhibited at the Pin Green School Fete, Stevenage, where a very large collection of models was shown—too large to list here, in fact. The builders involved included Peter Walton, Peter Brown, Paul Bourbousson, Geoff Long, Chris Buckland, Keith Langdon, Steven Hodges, Stephen Kuc, Peter Phillipson, Bernard Dunkley, Simon Baker and Dennis Higginson combined, and Peter Neville. Peter Neville has not been mentioned in these pages before, but he has been a member of the Club since 1970. Mr. Higginson tells me he is a very keen model-builder with a first-class attendance record at Club meetings. Several models designed by Mr. Roger Le Rolland of Stoke-of-Trent and built by Club members were also exhibited at the Fete. I was delighted to learn that Mr. Le Rolland has been offered, and has accepted, Honorary Membership of the Club—an excellent gesture, I feel, and a

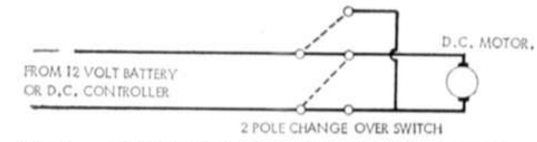


FIG 6 (a) TWO WIRE REVERSING SYSTEM FOR MECCANO D.C. MOTOR.

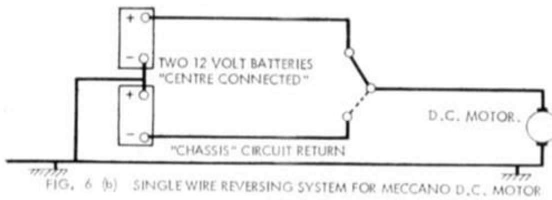


FIG. 6 (b) SINGLE WIRE REVERSING SYSTEM FOR MECCANO D.C. MOTOR

Meccano Parts and How to Use Them

Part 12—Power supplies for motors, etc

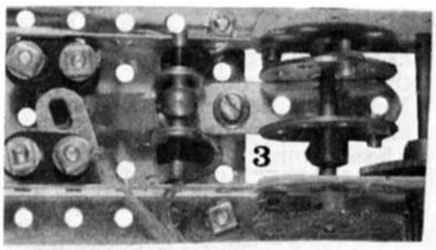
By B. N. Love

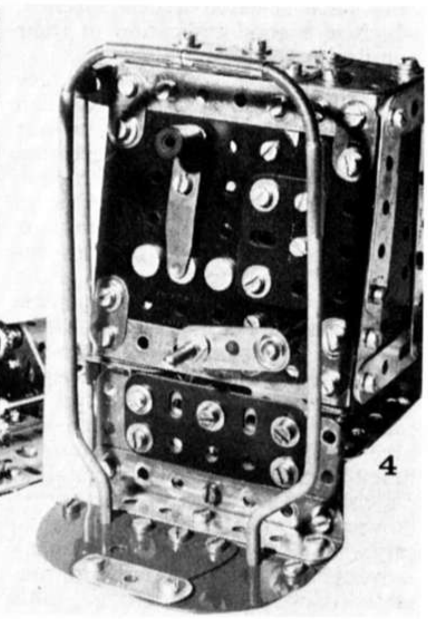
IN this final chapter of this series of brief articles on using Meccano parts we will look at the power supplies required for operating Meccano motors.

Two distinct types of electric motors are currently available for Meccano models, one type being a 'universal' A.C./D.C. motor, the E15R, and the other being D.C. only, such as the 3–12 volt Motor with six-speed Gearbox and the 4½ volt reversible Motor. Generally speaking, the E15R motor is driven by means of a mains transformer which reduces the 240 volt household mains (in the U.K.) to an output of approximately 15 volts A.C. Although Meccano Ltd. no longer market a transformer of any sort, units bearing the name HORNBY, MARSHALL, or MECCANO have been produced over the years at Binns Road and it is useful to know which transformer is required for which motor.

Fig. 1 shows a Hornby transformer known as a T20 which stands for "Train; 20 volts" and was made principally for operating 20 volt Hornby locomotives. It can be seen from the illustration that a speed controller is built into this transformer and two sockets are provided so that radio type wander plugs can be used for making connections to the electric rails. Such a speed controller depends on a coil of resistance wire looped between five of the contact studs showing and, as the lever is moved from stud to stud, the resistance is increased, or decreased according to the direction of rotation of the lever. Theoretically, this gives a speed control of the motor connected to the transformer. However, the current flowing through the motor also flows through the resistance wire and this is fine so long as the motor has a constant load. In the case of a Hornby 'O' gauge 20 volt locomotive, the running current was reasonably constant and the speed controller is reasonably effective. One interesting point here; it often comes as a surprise to Meccano modellers using the T20 for Meccano electric motor control to find that the first position on the controller next to the "off" position is full speed! This is quite a deliberate design feature to enable a locomotive to get a full "burst" of voltage when at a standstill in order to overcome the inertia of the locomotive and its rolling stock.

An E15R motor, or its predecessor, the E20R motor, can certainly be run from the T20 transformer, but the speed regulation will be poor for different load conditions. The harder the motor is required to drive, the more current it consumes and the more voltage does it drop across the resistance wire behind the controller contact studs. Fig. 2 shows the type of transformer which was designed for motor driving as its title implies, i.e. the M20 (Motor – 20 volt). As no resistance wire is included with this transformer there is a constant 20 volts available at the terminals under normal load conditions which permits the motor to run at its design speed. If the constructor requires





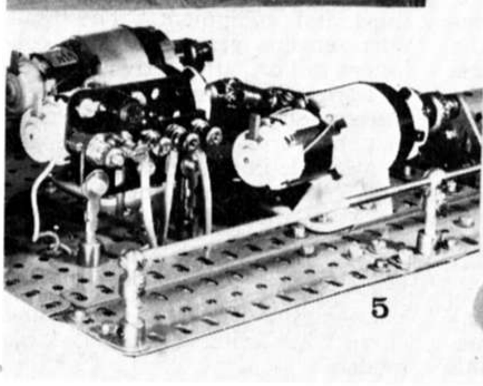


Fig. 1 Hornby transformer Type T20 for 20 volt locomotives with speed controller. Fig. 2 Similar transformer Type M20 for 20 volt Meccano A.C./D.C. motors such as E20R and E15R. Fig. 3 One way of making a two-way switch, mechanically operated, from Standard Meccano and Electrical parts. Fig. 4 Another two-way switch, hand-operated, also made from standard parts. Fig. 5 Meccano electrical parts used to make a neat distribution board on the control platform of a giant crane.

low speed outputs from the E15R then he should arrange gearboxes to give the necessary output speed and power.

As mentioned above, Meccano Ltd. no longer market a transformer of any sort, but all current Meccano motors will operate successfully from the Meccano Battery Box which gives D.C. outputs of 4½ and 12 volts. If a Mains source is preferred, however, then any of the popular model railway power control units will generally prove adequate, such as those manufactured by Rovex and Hammant and Morgan.

By far the most versatile of electric motors for Meccano models is the 3–12 volt D.C. Motor with Gearbox, as illustrated in Fig. 5. Three motors are shown in this illustration where they form part of the main drives to a Giant Block-Setting Crane. When fully ballasted with counterweights the model weighs over half a hundredweight but is driven along a set of rails via four bogies by one single 12 volt D.C. unit and, since much of the bulk of the motors illustrated is taken up with internal gear reduction trains, the small diameter motor incorporated gives a surprising power output.

As the D.C. power unit uses a high quality ring-field magnet for its 'field', it requires electrical connections only to the armature and when these are reversed, the direction of rotation of the armature is also reversed. In the case of the E15R motor, however, no fewer than four connections need to be changed over, unless structural modifications are made to the motor. Because the D.C. unit reverses so easily, it is very suitable for remote control and the circuit diagram of Fig. 6(a) shows the connections and switch required for this operation.

There are occasions when a model may be fitted with a number of D.C. units operating the various motions of a crane and the number of leads for remote control increases accordingly. However, there is a method of remotely controlling these D.C. motors by the "one wire method" which uses the metal chassis of the model as a common return path for all of the motor circuits. Fig. 6(b) shows how this is done, but two power sources are required for the operation. These could be supplied by two Meccano battery boxes or two D.C. controllers operating from the house mains so long as their output leads are independent and not separately 'earthed'. The important thing to ensure is that, when the battery or D.C. supplies are linked, one battery has its terminal "positive with respect to centre". The 'centre' in this case is the junction of the other two battery terminals according to the polarity indicated in Fig. 6(b).

Thanks to the versatility of the Meccano Electrical parts, the required switches can be made from standard items. Fig. 3 shows a single-pole 2-way switch made from Meccano parts and this one is operated by boltheads in a Bush Wheel providing automatic sequencing in a programmed model. A simpler hand-operated switch is shown on the front of a mobile crane trolley in Fig. 4. In this case, the switch studs are electrical Contact Studs (Part No. 544), the centre Stud being disconnected and merely providing smooth passage of the Wiper Arm above, which is pivoted on a Bolt lock-nutted to the fibre Insulating Plate forming the switchboard at the front of the trolley. The addition of an Insulated Spacer to the second hole of the 2 in. Wiper Arm forms a hand-knob for operating the switch.

It would be quite impossible here to illustrate the tremendous scope of the Meccano electrical parts in both elementary and advanced model-building, but the reader should be encouraged to exploit their possibilities in adding realism and control to his models. Some constructors, incidentally, will be familiar with the electrical Insulating Plates and Strips in black finish. This is obtained by loading the basic material with carbon black which gives an excellent surface finish but unfortunately it can also make the original fibre mix somewhat brittle. To improve the mechanical strength of the electrical fibre parts therefore, the carbon black is omitted in current production batches and the amber colour now supplied is the basic colour of the fibre when bonded.

Looking back over the past 12 chapters it is obvious that it has been possible to touch on just a few salient points in the use of Meccano parts, scope for which is virtually endless. However, I hope the areas we have covered have been of interest and help to aspiring modellers and, if this is so, then the series has been worthwhile.

The author will always welcome correspondence on Meccano topics and readers interested may write to him at 61 Southam Road, Hall Green, Birmingham 28. A stamped addressed envelope should be included if a reply is required.

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500 Mountains Could Blow Their Tops

By Sam Napier

As the boiling lava flowed down the slopes of Mount Etna a few months ago, experts recalled that there were about 500 other volcanoes on earth, active today, and which could blow their tops at any time.

In more than a month of rumbling and bubbling, Mt. Etna gave one of the most dangerous and dazzling displays of Nature's powers for many years. The power behind a volcanic eruption is enormous. One Russian eruption in 1956 was estimated by scientists to be equal to the explosive power of 200 hydrogen bombs. These experts claimed that such violence in the centre of a densely populated part of earth would kill more than 1 million people.

As it is, Etna slowly added up a growing toll of destruction. An observatory, bridges, roads, buildings and power lines were all destroyed by the hot lava flowing in rivers down the slopes of Europe's tallest and most active volcano. In Sicily men grappled for weeks with the problem of turning off the fiery mountain. A village of 2,000 people, lying in the lava's path, became a major target as the burning mountain's raging continued.

For those who live in the shadow of volcanoes known to be active there are two urgent problems. The first is devising some accurate way of predicting when the mountain is likely to erupt. The other is discovering a technique for stopping it once the bursting into activity has begun.

When a mountain decides to blow its top the first action begins many miles below the earth's surface. Then the steam, gases and lava (sometimes as hot as 2,000 degrees Fahrenheit) shower out. But the accurate prediction of a volcano's conduct is still quite a way off. Control of the burning mountains is even more remote.

Mount Etna's record has shown it to be dangerous at all times. It has erupted violently on more than 100 known occasions. In 1928 it blew a new crater and 1950 witnessed one of its most powerful eruptions, but it was three hundred years ago that it caused the greatest disaster in its history. Then the mountain awakened and, accompanied by an earthquake, killed 60,000 people.

Experts have been studying Etna and its behaviour for years. Seismologists have been keeping careful watch on nearby earth tremors, and an international team has been studying the crater floor. Other scientists have kept careful watch on other aspects of the dangerous mountain. Yet when it began to erupt, scientists were helpless. Some people suggested the bombing of the crater to control the lava flow; others suggested a rocket attack by aircraft on the mountainside for the same purpose.

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