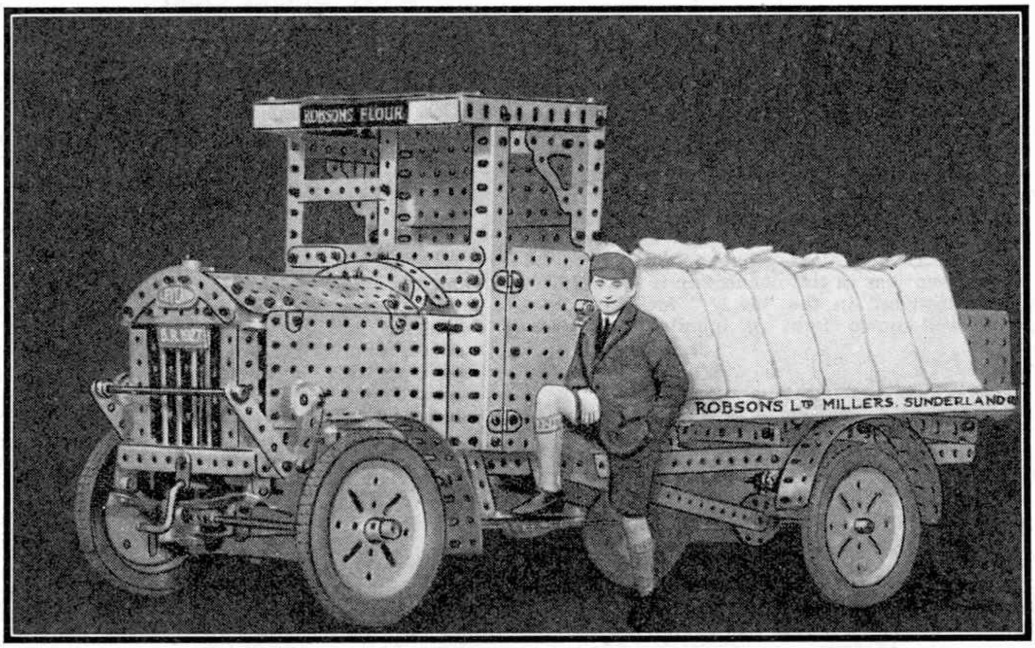
A Realistic Meccano Motor Lorry

Built by an "*M.M.*" Reader

THE motor lorry shown on this page might easily be mistaken for a full-sized vehicle, the outside of which had been painted to resemble gigantic Meccano parts. It is an actual Meccano model, however, and the illustration is merely an ingenious example of "fake" photography. The designer and constructor of the lorry, J. W. Vipond of Sunderland, obtained for his work an award in a recent "*M.M.*" Model-building Competition and prizes in two shows held a short time ago in Co. Durham. One of the shows was held at Seaham Harbour, where he obtained First Prize and in the other, which took place at Shildon, he secured a silver medal.

The realistic illustration was obtained, of course, by superimposing a separate photograph of the constructor upon a photograph of the lorry. The final print, prepared from the paste-up, gives the illusion of a Meccano boy (of somewhat sturdy proportions !) standing with one foot on the step (seemingly a full 18" high) of the Meccano lorry.



This is not a scene from Meccanoland, nor yet the production of a "super" Meccano Outfit. The photographs of J. W. Vipond and his model motor lorry have been "faked" so that the designer appears to be standing with one foot upon his handiwork

Quite apart from the novelty of the photograph, the model should prove of great interest to our readers. In every detail it is an almost perfect reproduction of the outward appearance of the actual vehicle. It has a hinged door (complete with catch), a hinged bonnet, lamps, starting handle, etc., and the bars of the radiator are convincingly represented by Axle Rods. The inscriptions on the sides and front of the lorry, together with its Dunlop tyres and the miniature sacks with which it is loaded, give a final touch of realism to its appearance.

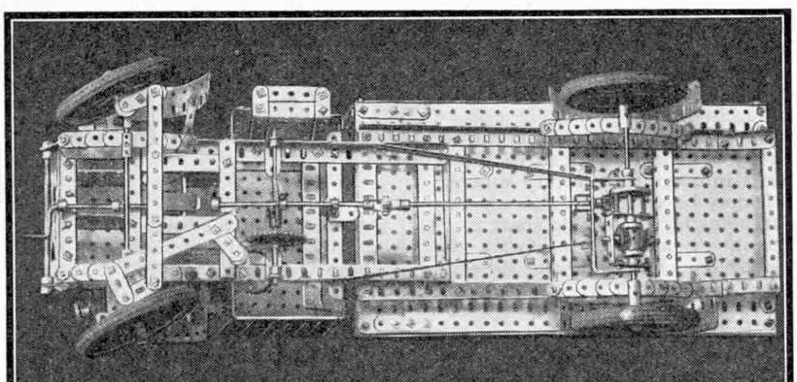
In the lower illustration we show a view of the underside of the model. It will be seen that the mechanism is of a very simple and straightforward design. The drive from the Electric Motor is transmitted via a short Sprocket Chain drive and a Worm gear to a 57-teeth Gear Wheel secured to the propeller shaft. The latter incorporates a Universal Coupling, which maintains a uniform transmission of power to the rear axle whilst allowing for movements in the back axle caused by irregularities in the road surface.

The steering gear is somewhat unorthodox, for it consists chiefly of Strips and Cranks, which are actuated directly by a Crank secured to the end of the steering column. This arrangement has, as it stands, two distinct disadvantages. The first is that it is not of the Ackermann type, i.e., the road wheels do not turn through unequal angles in order to compensate for the difference in radius of the arcs described by the front wheels in rounding a corner. The steering gear may easily be converted to the Ackermann system, however, by altering the positions of the two Cranks secured to the stub axles, so that they lie at obtuse angles to the front wheels instead of right-angles, and shortening the tie-rod that joins them.

The second disadvantage of the steering mechanism is that no reduction gearing is introduced in the connections between the steering column and the stub axles, with the consequence that the front wheels are turned to their fullest extent by only a fraction of a revolution of the steering wheel. A slight movement of the latter would thus cause too great a deviation in the road wheels, and steering would be difficult and dangerous.

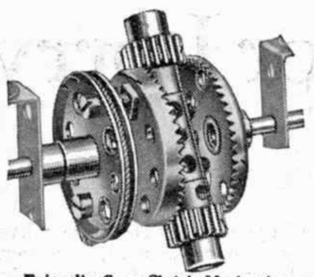
A differential similar to that described under detail No. 251 in the Standard Mechanisms Manual is embodied in the model, and torque rods are represented by two Strips bolted to the differential frame and to the side members of the chassis.

Vipond's main object in building the model was to reproduce the original as closely as possible in appearance, and most of our readers will agree that he has fully attained his end. From the point of view of the model engineering enthusiast, however, the mechanism offers scope for improvement and additions. We are of the opinion that the reproduction of mechanical essentials is quite as important as the perfection of external details, and the size of the builder's outfit permitting, an effort should be made to reproduce at least the more important features of the actual mechanism.



This is an underside view of the model motor lorry. Note the arrangement of the drive transmission, rear springs, and novel steering gear

The addition of a clutch, gear box, and braking system similar to those used in the new Meccano chassis would result in a reproduction of the real thing of which even an experienced engineer might well be proud.



Epicyclic Gear Clutch Mechanism

Suggestions Section

Edited by "Spanner"

(123)—"Wobble Shaft" Variable Speed Gear

(Harold W. Turner, Hastings, New Zealand)

THE interesting model shown in Fig. 123 is of a new and very ingenious type of infinitely variable speed gear. It is known as "wobble shaft" transmission, owing to the curious motion of the principal part of the mechanism.

It is a recognised fact that the ordinary type of gear box, with sliding gears, is very far from the ideal form of drive transmission, and for some years past there have been many and varied attempts to devise a really efficient and practical gear box that will provide a speed ratio capable of very fine variation and that at the same time will eliminate the necessity of engaging toothed wheels. One of the best known inventions in this connection is the P.I.V. Gear, which was fully described in the "*M.M.*" for May and June, 1927. Another well-known form of infinitely variable speed gear is the torque converter, a Meccano model of which is illustrated and described in the Standard Mechanisms Manual (detail No. 254, Section XIII).

The construction of these devices in Meccano is very instructive. Moreover, when completed, they may be incorporated in all kinds of models and some extremely interesting results thereby obtained. The principle embodied in the wobble-shaft transmission has not been applied previously to a Meccano model.

The most important feature of the mechanism is a shaft that is actuated by some form of motor in such a way that one of its ends describes a circular path. The other end of the shaft is attached by means of a universal joint to a fixed point; hence the diameter of the circular path described by the shaft varies from a maximum at one end to zero at the fixed end. If some convenient means can be found to convert this circular movement into ordinary rotary motion, then the speed of the driven shaft may be varied within very fine limits according to the particular point in the wobble shaft from which the drive is taken. The means adopted to obtain the required result will be perfectly clear on reference to the Meccano model.

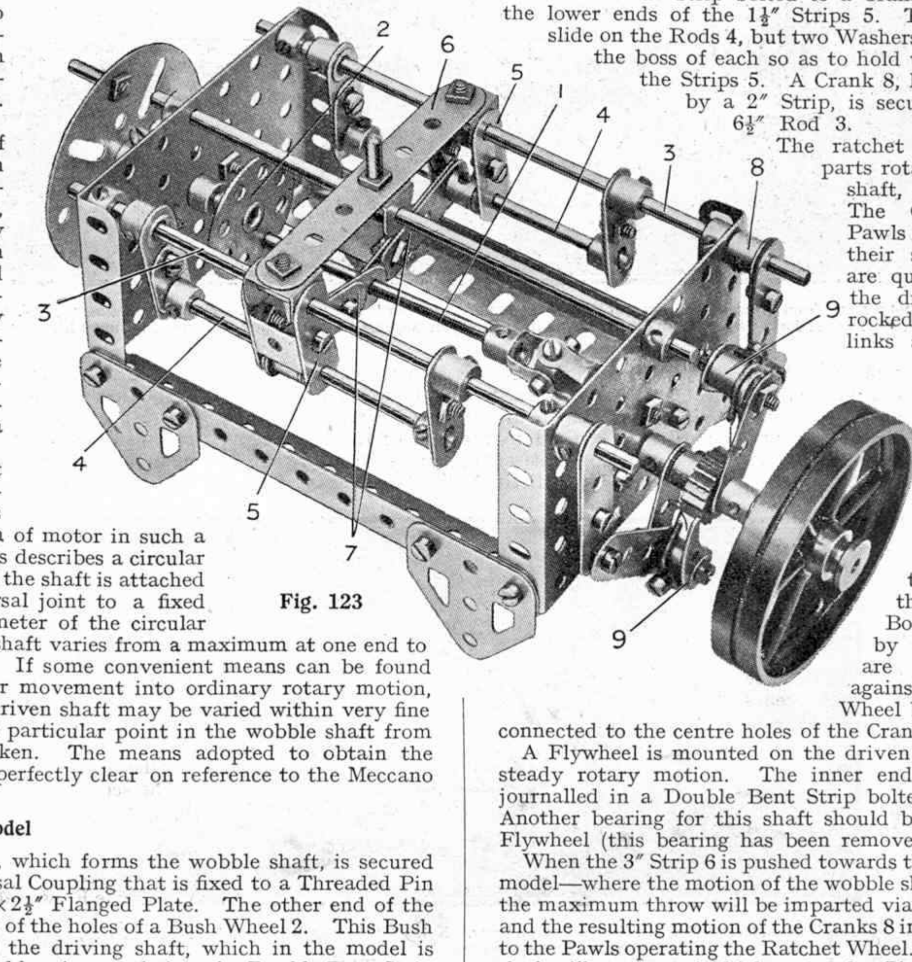


Fig. 123

Construction of the Model

The 4½" Axle Rod 1, which forms the wobble shaft, is secured at one end to a Universal Coupling that is fixed to a Threaded Pin bolted on the end 3½"×2½" Flanged Plate. The other end of the Rod 1 is inserted in one of the holes of a Bush Wheel 2. This Bush Wheel 2 is secured to the driving shaft, which in the model is journalled in a reinforced bearing consisting of a Double Bent Strip bolted to the 3½"×2½" Flanged Plate. By rotating the hand wheel secured to this Rod the end of the wobble shaft 1 inserted in the Bush Wheel is caused to describe a circular motion. The shaft itself does not rotate of course. Two 6½" Axle Rods 3 should now be journalled in the Flanged Plates and held in position by Collars and set-screws, as shown. Two Cranks are secured to each Rod, and each pair of Cranks carries a 3½" Rod 4 in their end holes. The bearings for the Rods 4 in the Crank arms are reinforced by Flat Brackets bolted to the Cranks.

The 1½" Strips 5 are free to slide on the Rods 3 and 4, and are bolted together in pairs by means of Double Brackets. All the Strips 5 are moved simultaneously to and fro by means of the 3½" Strip 6, each end of which is bolted to further Double Brackets held between the ends of the Strips 5. The handle provided at the centre of the Strip 6 consists of a Threaded Pin, the shank of which is employed to secure another Double Bracket which slides upon a further 6½" Axle Rod. This Rod serves merely as a guide.

Each link 7 connecting the Rods 4 and the wobble shaft 1 consists of a 2" Strip bolted to a Crank that is placed between the lower ends of the 1½" Strips 5. These Cranks are free to slide on the Rods 4, but two Washers should be placed against the boss of each so as to hold them in position between the Strips 5. A Crank 8, having its arm prolonged by a 2" Strip, is secured at one end of each 6½" Rod 3.

The ratchet mechanism, which imparts rotary motion to the driven shaft, is shown fairly clearly. The Cranks on which the Pawls 9 are mounted have their set-screws removed and are quite free to move about the driven shaft. They are rocked to and fro by connecting links attached to the Cranks 8. The connecting links consist of 2" Strips pivotally attached by bolts and nuts (see Standard Mechanism No. 263) to the end holes of the 2" Strips bolted to the Cranks 8, and their other ends are mounted loosely on the ¾" Bolts carrying the Pawls 9. Each ¾" Bolt is secured to its Crank by two nuts. The Pawls are held in engagement against the teeth of the Ratchet Wheel by pieces of Spring Cord connected to the centre holes of the Cranks and to the Pawls.

A Flywheel is mounted on the driven shaft in order to obtain steady rotary motion. The inner end of the driven shaft is journalled in a Double Bent Strip bolted to the Flanged Plate. Another bearing for this shaft should be placed in front of the Flywheel (this bearing has been removed from the illustration).

When the 3" Strip 6 is pushed towards the Bush Wheel end of the model—where the motion of the wobble shaft 1 is at a maximum—the maximum throw will be imparted via the links 7 to the Rod 4, and the resulting motion of the Cranks 8 imparts a maximum throw to the Pawls operating the Ratchet Wheel. Consequently the driven shaft will revolve at its highest speed. If the Strip 6 is moved in the opposite direction—that is, towards the Universal Joint—the throw of the links 7 decreases and the speed of the driven shaft falls.

The neutral position is obtained by sliding the links 7 as closely as possible to the Universal Joint. In this position the throw imparted to the links 7 is insufficient to rotate the Ratchet Wheel.

(124)—A Meccano Desk Agenda

(P. B. Brown, Godalming, Surrey)

From time to time we have described in the Magazine many articles built with Meccano parts that may be put to really practical use, and the desk agenda, or memo. pad, illustrated in Fig. 124 is the latest addition to the list. It is possible that some *"M.M."* readers will welcome this model as a means to induce Father to provide further new parts (on the desk in his den, or at his office, the Meccano agenda will be of great value to him !) Others will probably find many uses for it themselves. We should like to recommend it especially to all hard-working Club secretaries !

The device consists principally of two Meccano Wood Rollers mounted on 4½" Axle Rods journalled in the frame in the positions shown. The Rollers are secured to the Rods by means of Collars having ordinary bolts inserted in place of their grub screws. The Collars are inserted in the recesses in the ends of the Rollers and secured to the Rods so that their bolts lie in the grooves specially cut for the purpose.

A long narrow strip of paper, specially prepared for the purpose by cutting strips and

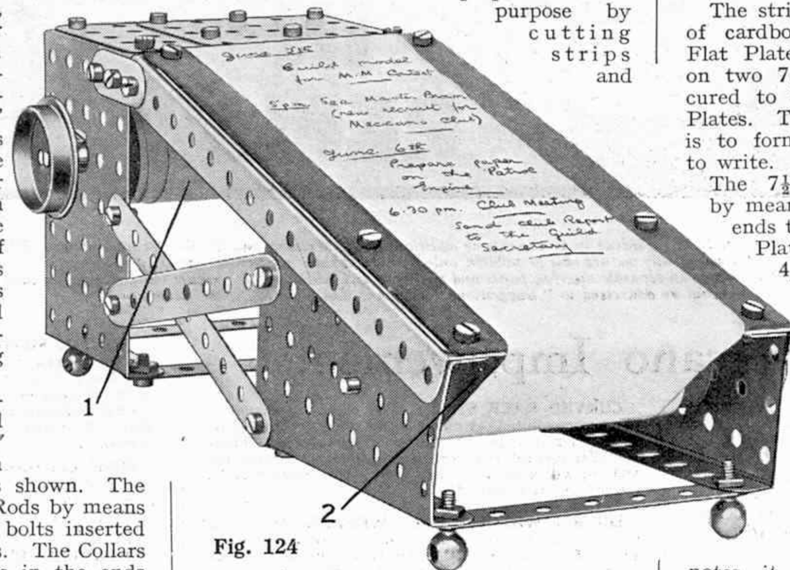


Fig. 124

pasting them end to end, is wound round the Roller 2 and its other end is attached to the Roller 1. In order to transfer the paper from one Roller to the other, the 4½" Rods are rotated simultaneously by means of two Flanged Wheels, secured one on each Rod and on opposite sides of the model.

The strip of paper passes over a sheet of cardboard, bolted to two 5½"×3½" Flat Plates, which, in turn, are placed on two 7½" Angle Girders that are secured to the upper sides of the Sector Plates. The purpose of the cardboard is to form a smooth surface on which to write.

The 7½" Angle Girders are secured by means of 1½" Strips at their upper ends to the upright 3½"×2½" Flanged Plates in which is journalled the 4½" Rod carrying the Roller 1. Four Handrail Supports secured underneath the frame at each corner form legs on which the agenda stands firmly. Handrail Supports are very useful for this purpose, for their rounded surfaces allow the model to be placed upon highly polished furniture without fear of scratching. When the exposed strip of paper becomes filled with notes, it is only necessary to turn the Rollers to bring a further supply of paper into position.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.18). Meccano Radiators.—*"M.M."* readers are constantly devising realistic radiators for use in Meccano model motor cars. R. Musgreave, of Wakefield, tells us that he uses a small piece of copper gauze or perforated zinc of the kind used for meat safes, etc. This is attached to a suitable framework built up from Meccano Strips, and the complete radiator looks very well indeed.

(M.19). Improved Gear Change.—A useful gear-changing device is suggested by S. Hobday, of Windsor. It consists principally of a Threaded Crank mounted on a Threaded Rod of convenient length. The sliding Rod carrying the change gears is passed through the slotted hole in the end of the Threaded Crank and is fitted with a Collar on each side of the Crank. On rotation of the Threaded Rod, the Crank is caused to travel to and fro along its length, carrying with it the sliding Rod and thereby effecting the gear changes. One advantage of this device is that, once set in the desired position, the gears cannot be moved out of engagement through vibration, etc.

(M.20). Drip-feed Lubrication.—There are many instances where the moving parts of a model require constant lubrication, and for this purpose the drip-feed lubricator suggested by T. Smith (Woodley) is eminently suitable. Briefly, it consists of a small funnel, of the kind that is sold with model steam engines, secured in position above the part requiring lubrication, and a strand or two of round lamp wick threaded through the funnel, so that the end rests on the part to be oiled. The funnel is then filled and the oil allowed to soak through the wick.

(125)—Worssman's Silent Feed

(Kenneth Brooks, Sale, Cheshire)

There are many examples in engineering practice where ratchet mechanism is employed to impart intermittent rotary motion to a shaft, and such mechanism has frequently been reproduced in Meccano. By arranging two or more ratchets to work alternately on a single shaft, a series of impulses may be imparted so as to produce a comparatively

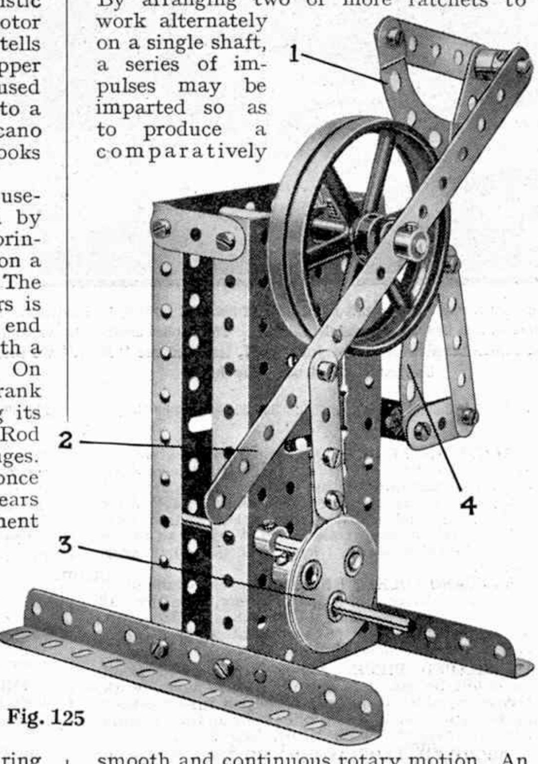


Fig. 125

smooth and continuous rotary motion. An example of this form of gearing is included in the " wobble-shaft " transmission gear described on the opposite page.

In practice the teeth of the pawls and ratchets are subjected to excessive wear, and any device that tends to reduce this is very welcome. The amount of wear in the Worssman silent feed, which dispenses with the ordinary type of pawl and toothed ratchets while obtaining the same results, is practically negligible. It forms an excellent substitute for the ordinary ratchet motion when a light drive is required.

A Meccano model of this interesting mechanism is shown in Fig. 125. As will be seen the mechanism is extremely simple and there is doubtless many ways in which it can be used in conjunction with Meccano models. The Flywheel is secured to a 3½" Axle Rod that is journalled in the Upright Flanged Plates, and the 7½" Strip 2 is mounted pivotally on the Rod. The 2½" small radius Curved Strip 1, which corresponds to the pawl in the orthodox ratchet mechanism, has a 2½" Strip bolted to one of its ends and a 1½" Strip bolted to the other. The cam unit so formed is attached to the end of the 7½" Strip 2 by means of a ¾" Bolt, which is secured to the unit by two nuts. Two Collars should be placed on the bolt between the cam and the Strip 2.

The Strip 2 is rocked about its pivot on the Rod of the Flywheel by the Eccentric 3, to which it is connected by a 2" Strip. This Strip is attached pivotally to the Strip 2, and the motion imparted to the Flywheel can be modified by altering its point of attachment.

The second cam unit is identical in construction to the first, but is attached pivotally to a 1"×1" Angle Bracket that is bolted to the flanges of the upright Plates. When the shaft carrying the Eccentric is set in motion the Flywheel is rotated intermittently by the Curved Strip 1, which when moving in one direction rides freely over the Flywheel but in the reverse direction grips the milled groove that is cut in the circumference of the Flywheel. The object of the Curved Strip 4 is merely to prevent the Flywheel moving backward when the Curved Strip 1 is making its return stroke.

Electricity Applied to Meccano

VIII—Electric Bell; Relay; Lamp Standard; Ammeter

These articles are intended to draw every Meccano boy's attention to the numerous fascinating uses to which the Meccano electrical parts may be put. The first two articles of the series dealt with the elementary principles of electricity, and subsequent articles described various Meccano switches, a coil-winding machine, a Meccano electric telegraph system, electro-magnets, a galvanometer, motors, an electric locomotive, and other simple apparatus. Below we deal with a Meccano bell and other instruments that can be put to practical use. All these models are constructed from a few ordinary Meccano parts used in conjunction with the special electric accessories.

OF all electrical instruments the electric bell must be one of the most familiar to Meccano boys. The majority of houses to-day are fitted with a complete system of electric bells, which for reliability, simplicity of working, and convenience, far surpass the antiquated wire-actuated bells. Their simplicity and cheapness of operation is remarkable, especially when one takes into consideration the many valuable services that they perform.

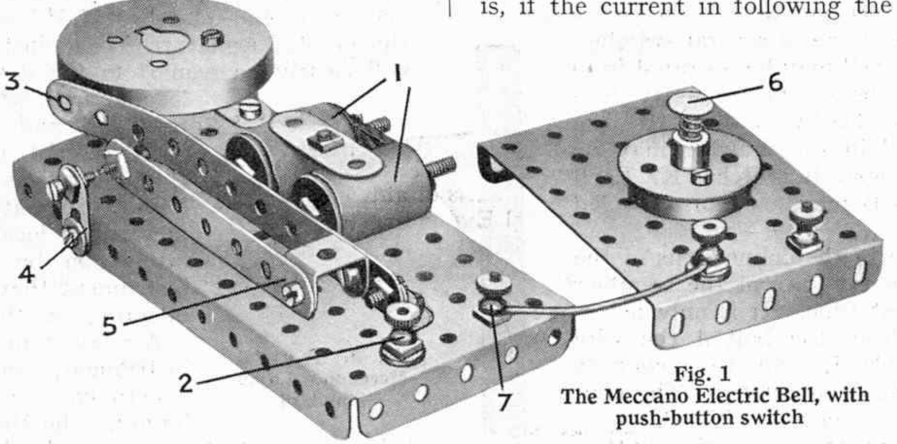


Fig. 1
The Meccano Electric Bell, with push-button switch

We feel sure that all *"M.M."* readers will desire to make the practical Meccano electric bell that is illustrated in Fig. 1. When completed it may be installed in the house and used for many different purposes. It is a very useful model.

Meccano Electric Bell

The construction of the model should be commenced by winding to capacity the two Bobbins of the magnet with 26 S.W.G. insulated wire. Each of the completed Bobbins 1 is mounted on a Pole Piece that is bolted to two 1½" Strips, which are placed one upon the other to form a yoke or connecting piece. This magnet is identical to that described in the article in this series which appeared in the March *"M.M."* The coils are covered with brown paper, which enhances their appearance and protects the insulation of the wire, and are clamped in position on the 5½"×2½" Flanged Plate by means of a 1" Threaded Rod secured to the Plate by two nuts. The upper end of this Threaded Rod passes through a 1½" Strip and a third nut placed on the Rod clamps the Strip firmly down upon the coils.

A wire from one of the coils is attached to a 6 B.A. Bolt that is insulated from the base Plate by an Insulating Bush and Washer and carries the terminal 2. The second wire from the same coil is secured to one wire of the other coil, and the remaining wire of the latter is attached to the 6 B.A. Bolt 4. This bolt is insulated from the base Plate in the usual manner and carries a Flat Bracket, in the upper hole of which is secured a Meccano Silver-tipped Contact Screw. A second Contact Screw is bolted to a 3½" Strip 5 that, in turn, is attached by means of a Double Bracket to a 5½" Strip 3.

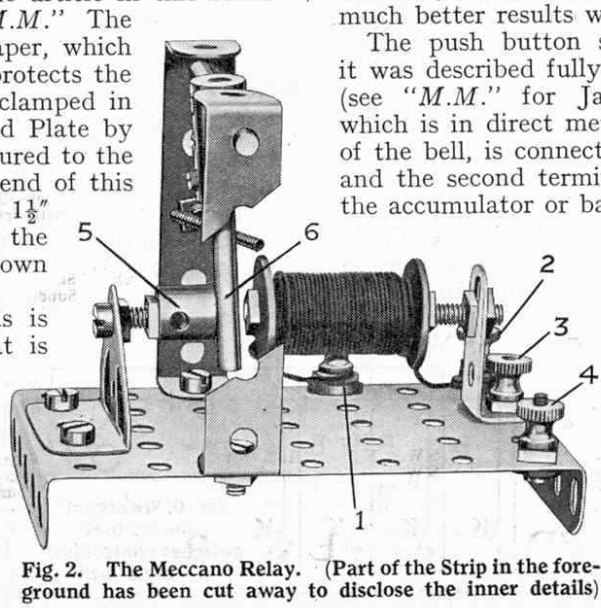


Fig. 2. The Meccano Relay. (Part of the Strip in the foreground has been cut away to disclose the inner details)

The coils 1 should be connected together so that the current flows round them in opposite directions. That is, if the current in following the turns of wire passes round one coil in a clockwise direction, the ends of the wires should be so connected that the current passes round the second coil in an anti-clockwise direction. This method of connecting the coils gives a north polarity to one end of one coil and a south polarity to the corresponding end of the second coil, and adds to the efficiency of the model.

The 5½" Strip 3 serves as a combined armature and hammer, and is attached rigidly at one end to the Flanged Plate by a ½"×½" Angle Bracket in such a manner that it is in close proximity to the pole faces of the magnet 1.

The gong consists of a Wheel Flange secured to a ½" Reversed Angle Bracket, which, in turn, is bolted to the 5½"×2½" Flanged Plate. The Wheel Flange is quite effective, but if it can be substituted by an actual bell much better results will be obtained, of course.

The push button switch needs no comment, since it was described fully in the third article of this series (see *"M.M."* for January, 1928). The terminal 7, which is in direct metallic contact with the base Plate of the bell, is connected to one terminal of the switch, and the second terminal of the switch is connected to the accumulator or battery. The second wire from the accumulator is attached to the terminal 2 of the bell.

When the button 6 of the switch is depressed the circuit is completed and the current flows through the switch and through the frame of the bell to the Silver-tipped Contact Screw mounted on the Flat Bracket 4. From there it passes through the coils and back to the accumulator via the terminal 2. The current flowing through the coils 1 causes the Pole Pieces to attract the armature 3, and the end of the latter strikes the bell. As soon as the armature is attracted in this way, however, the Contact Screws are drawn apart and the circuit is broken. Consequently the coils are de-energised and the armature 3 flies back to its former position. But in doing so it brings the Contact Screws together once more and closes the gap in the circuit, and the cycle of operations is then repeated. The movements of the armature are very rapid, and produce a continuous ringing of the bell for so long as the push 6 is depressed. This type of bell is known as a "trembler," since the armature trembles, or vibrates.

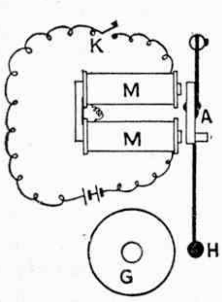


Fig. 3. Diagram of connections for single-beat bell

Control by Several Switches

It is quite a simple matter to arrange the connections so that the bell may be rung by closing any one of several switches. In this way the same bell may be operated from various parts of a house. The necessary connections are shown clearly in Fig. 5. The electric bell indicated in the drawing may be controlled from four separate switches K. Each pair of branch wires B may, of course, be led into different rooms.

A simple alteration in the connections of the Meccano bell will convert it from the trembler type to the single-beat type. It is only necessary to disconnect from the bolt 4 the wire attached to the coils 1, and to reconnect the wire direct to the accumulator. The connections will then be as shown in Fig. 3.

With this arrangement, when the button (K in Fig. 3) is pressed the current passes directly to the magnet M, which attracts the armature A. The end H of the latter produces a single beat on the bell G, for the magnet will hold the armature against the ends of the Pole Pieces as long as the button K is pressed. To sound the bell a second time the button must first be released and then pressed down again.

It will be obvious that the number of strokes or beats given by the bell is absolutely under the control of the operator. For this reason the single-stroke bell is of considerable value for signalling purposes. It is used exclusively on British railways in communicating from one signal box to another.

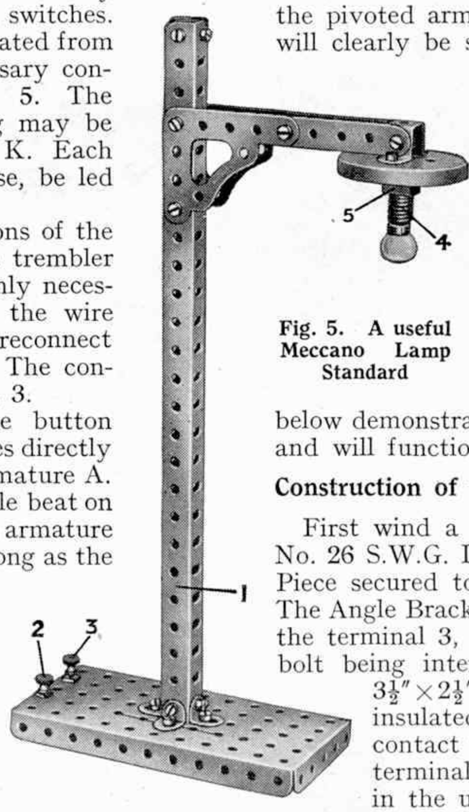


Fig. 5. A useful Meccano Lamp Standard

Functions of a Relay

If a current flows through a long length of wire in order to work an instrument—such as a telegraph sounder—situated at a distance from the operating point, it becomes comparatively weak because of the resistance in the wire through which it passes. Hence, if an ordinary circuit is used, the battery power will have to be increased in accordance with the distance through which the current is required to flow. There is a better method of getting over this difficulty, however. It is to employ two small batteries in conjunction with a relay, in place of one very large battery. The function of the relay is to bring into action, on receipt of the weak current flowing through the "line wire" from the battery at the sending station, the secondary, or local, battery that operates the sounder or other instrument. The necessary connections for an arrangement of this kind are shown diagramatically in Fig. 4.

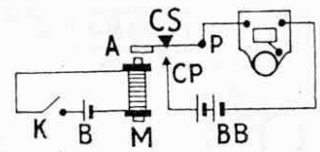


Fig. 4. Diagram showing connections for operation of Bell by Relay

The relay consists essentially of a magnet (M in the drawing), having a large number of turns of wire, and a pivoted armature AP. The switch K is situated at the operating end, and when it is closed it causes current to flow round the magnet. The magnetic effect of the incoming current is thereby enhanced—in accordance with the ampere-turn law mentioned in the "Electricity" article in the March *"M.M."*—sufficiently to move the pivoted armature AP against the contact CP. As will clearly be seen from the diagram, this closes the local circuit, which contains the battery BB and the instrument that it is desired to work. Therefore the relay has enabled the weak "line" current to control the more powerful "local" current, and the latter can be used to operate an instrument that could not have been operated by the weak line current.

A relay is an extremely interesting instrument, and many instructive experiments can be carried out with its aid. The Meccano relay described below demonstrates very clearly the principles involved, and will function well on an extremely small current.

Construction of the Meccano Relay

First wind a Meccano Bobbin to full capacity with No. 26 S.W.G. Insulated Wire, and mount it on a Pole Piece secured to a $1'' \times \frac{1}{2}''$ Angle Bracket (see Fig. 2). The Angle Bracket is secured to the 6 B.A. Bolt carrying the terminal 3, the Insulating Bush or Washer on the bolt being interposed between the Bracket and the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. The Bracket is thus insulated from the Plate and yet in electrical contact with the shank of the terminal 3. The terminals 1 and 2 are insulated from the Plate in the usual manner, and the two ends of the magnet winding are connected to them. The remaining terminal 4 is in metallic contact with the Plate, for reasons that will become apparent later.

The moving armature 6 consists of a $1\frac{1}{2}''$ Rod mounted in the longitudinal bore of a Coupling that, in turn, is secured to a transverse Rod journalled in the upright $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. Part of one of these Strips is cut away in the illustration to disclose the mechanism of the relay.

The movement of the armature is limited by an adjustable stop, which consists of a Threaded Boss 5 mounted on a $\frac{3}{4}''$ Bolt. The latter is secured rigidly to a Trunnion. By altering the position of the Boss 5 on the shank of the $\frac{3}{4}''$

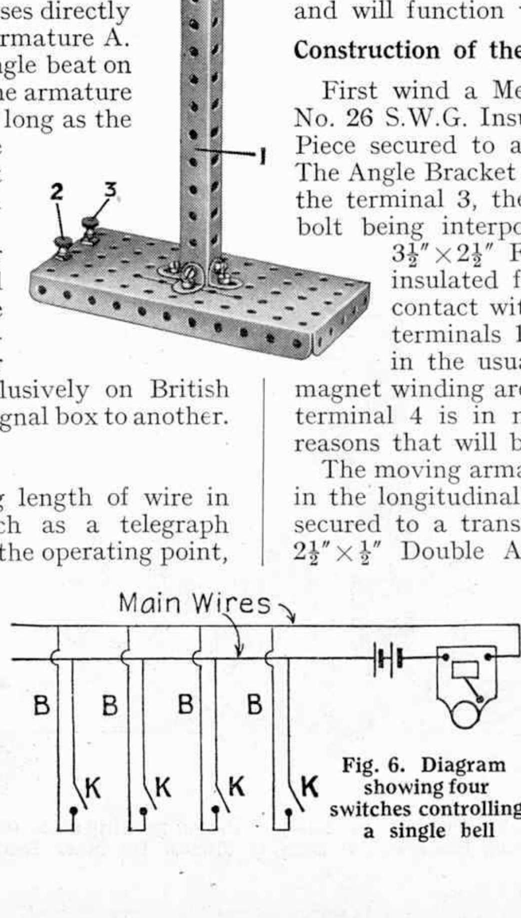


Fig. 6. Diagram showing four switches controlling a single bell

Bolt, the gap between the armature 6 and the Pole Piece may be modified to suit different conditions of working. The smallest gap possible should be used as this makes the instrument sensitive to the effect of very weak currents. When the correct gap has been ascertained the Threaded Boss may be locked on the shank of the $\frac{3}{4}''$ Bolt by a nut. A short length of Spring Cord attached by a nut and bolt to one of the upright $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips normally holds the armature 6 against the stop 5.

The line battery, which may consist of a single small dry cell, is connected to the terminals 1 and 2 of the relay, and a switch should be included at a convenient operating position in the circuit. The local circuit containing the bell (or other instrument that it is desired to work) and the local battery, which may be a Meccano 4-volt Accumulator, is connected to the terminals 3 and 4 of the relay.

When the switch in the line circuit is closed, a weak current flows through the coil of the relay and energises it. This causes the armature 6 to be attracted to the Pole Piece, which is secured to the $1'' \times \frac{1}{2}''$ Angle Bracket that is in electrical contact with the terminal 3, and as soon as contact is effected, the local circuit is completed. The current from the Accumulator flows from the terminal 3 along the Pole Piece and armature 6 and back through the frame of the model to the terminal 4. When the line current ceases the magnet no longer holds the armature and the latter flies back under the action of the Spring Cord, thus breaking the local circuit.

The Meccano electric bell and relay form a most interesting combination from which much pleasure and instruction may be derived.

Meccano Lamp Standard

The Meccano lamp standard illustrated in Fig. 5 will make an effective addition to a model railway. A few of these accessories placed about the station "yard" lend a touch of realism to any layout. Also, we have no doubt that many Meccano boys make a habit of reading in bed—especially the "*M.M.*" It is a practice that generally ought not to be encouraged, of course. Nevertheless, we must say that for a bedside reading lamp the Meccano standard is eminently suitable.

The upright is composed of two $12\frac{1}{2}''$ Angle Girders 1 joined together at the top and bottom by $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets so as to form a square column. The Girders are secured to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate by four $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets placed one on each side of the column.

The Meccano Lamp Holder 4 is secured to the Double Bent Strip 5 by means of a 6 B.A. Bolt, which, with its head inside the lamp holder, is passed through the centre hole in the Double Bent Strip. An Insulating Bush is placed on the shank of the bolt to insulate it from the Strip, and the bolt is secured in place by a nut, which is used also to secure a short length of insulated wire. This wire is led down the centre of the vertical column, under the base Plate, and is attached to the bolt of the terminal 3, which is insulated from the Plate in the usual manner. The terminal 2 is in direct metallic contact with the model.

The Double Bent Strip carrying the lamp holder is bolted to a Wheel Flange, which serves as a reflector, and to a second Double Bent Strip that is secured between the ends of the $5\frac{1}{2}''$ Strips projecting horizontally from the vertical $12\frac{1}{2}''$ Angle Girders 1. The wires from the Accumulator are connected to the terminals 2 and 3. The lamp is earthed by way of the Holder 4, which is in metallic contact with the Double Bent Strip 5.

Meccano Hot Wire Ammeter

An ammeter is an essential part of the young experimenter's equipment. With its aid he can discover many interesting points in regard to the behaviour of an electric current in any particular circuit. For instance, it is not generally realised that the current is the same in all parts of a circuit; a high resistance and one of lower value connected in series would both have the same number of amperes flowing through them. Perhaps the most interesting use to which an ammeter may be put, is to connect it in series with the Meccano 4-volt Electric Motor. By altering or removing the load on the Motor the current consumed will be seen to vary from a minimum when the motor is running "light"—that is, with no load—to a maximum when the motor is running under its greatest load.

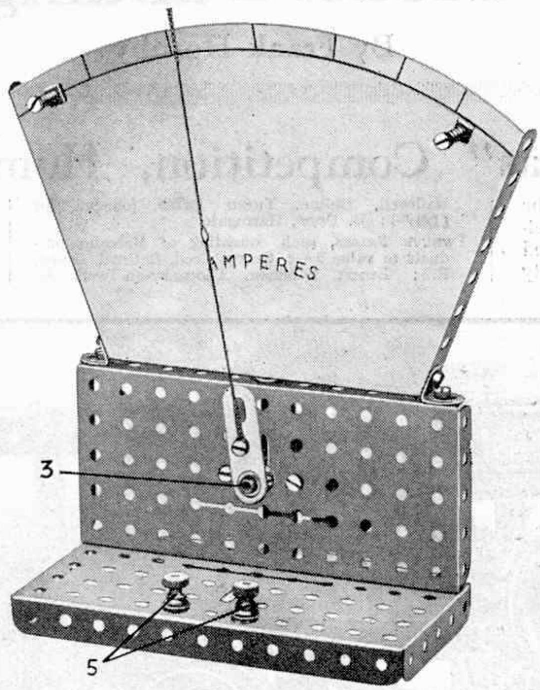


Fig. 7. A practical Hot Wire Ammeter (front view)

In order to enable Meccano boys to carry out interesting experiments of this kind, we have designed a hot wire ammeter that, with the exception of a short length of fine copper wire, may be made entirely from Meccano parts. The model will work excellently if connected in series with the Meccano 4-volt Motor and Accumulator. It may be useful to explain here that to connect the ammeter "in series," a wire is taken from the Accumulator to one of the terminals 5 of the ammeter. The second terminal of the model is connected to a terminal of the Motor, and the other Motor terminal is connected to the remaining terminal of the Accumulator.

Fig. 7 is a general view of the Meccano Ammeter, and Fig. 8 is a view of the reverse side. The most important part of the model is the length of resistance wire 1 (Fig. 8), termed the "hot wire," which is stretched tightly between the 6 B.A. Bolts 2. These two bolts are attached to and insulated from the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate forming the base of the model. Each is connected by a short length of wire to an insulated terminal 5 on the front of the model (Fig. 7). A Collar having an ordinary set-screw substituted for its grub-screw is secured on the $1\frac{1}{2}''$ Rod 3, which is journalled in the upright $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and also in a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. A short length of fine copper wire attached to the set-screw of the Collar is taken round the Rod 3 several times and then secured to the centre of the wire 1. The 25-gramme Weight 4 is bolted to a Crank that is secured on the Rod 3. The Crank should normally be in a horizontal position so that the weight pulls against the wire 1. The Crank carrying the pointer (which consists of a Loom Heald, part No. 101) is next attached to the front end of the Rod 3 so that the pointer rests lightly against one of the $\frac{3}{4}''$ Bolts at the end of the scale.

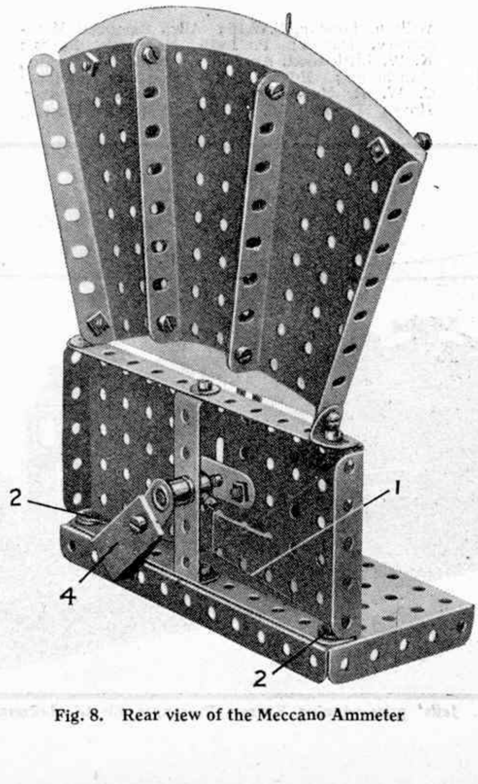


Fig. 8. Rear view of the Meccano Ammeter

When the current flows through the resistance wire 1, the latter becomes hot and expands. Since the weight 4 maintains the wire 1 in a constant state of tension, any slackening of the latter must result in a downward movement of the weight 4, and this movement causes the pointer to commence to travel across the scale. When the current decreases the wire 1 contracts, or tightens, in cooling, and thereby pulls the weight 4 in an upward direction and causes the pointer to move back again across the scale.

If possible the scale should be calibrated with the aid of a standard ammeter, otherwise purely arbitrary divisions will have to be used. The principle employed in the model described is used actually in many well-known makes of ammeter. It is employed mostly in instruments designed for use with alternating current work.