MECCANO STANDARD MECHANISMS

Section X. Overhead Trolleys and Trucks for Gantries, etc.

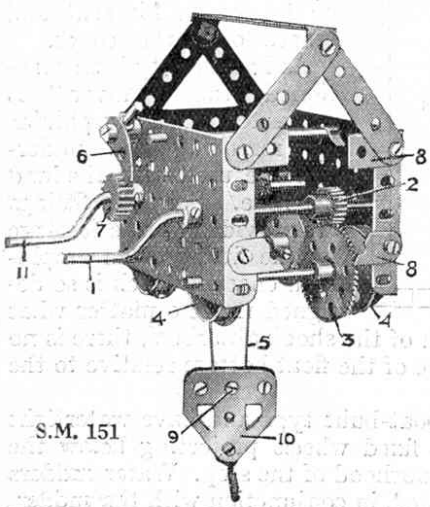
Continuing the series of articles dealing with various novel aspects of Meccano model-building practice, we describe in this number several different types of overhead travelling mechanisms for model cranes, gantries, etc. In previous issues we have dealt with Gear Ratios, Belt Mechanism, Pulleys, Levers, Clutches, Drive-Changing Mechanisms, Brakes, Bearings, Steering Gear, Screw Mechanism, etc. We have termed these Meccano movements "Standard Mechanisms," for they may be adapted with advantage to numerous Meccano models—in most cases without any alteration, but in some few instances with only slight alterations to the standard movement.

STANDARD MECHANISM No. 151 illustrates an overhead traveller of a type that is in common use in almost every branch of constructional engineering. It is designed for use in connection with gantry cranes, and is sometimes adapted to traverse the length of a large girder slung between two carriages running on rails built into the walls of a factory or workshop, thus making it possible to bring the hoisting block over any point in the available floor space.

The construction of the trolley is simple and will be readily followed from the illustration. Sections of the front $2\frac{1}{2}$" Strips 8 have been cut away in order to reveal the mechanism more clearly. The wheels 4 are arranged to run on rails, constructed from Angle Girders laid down on the gantry, while the pulley block and hoisting cord 5 are suspended between them.

The traversing movement is obtained from the handle 1, on the shaft of which is mounted a $\frac{1}{2}$" Pinion 2 engaging with the 57-teeth Gear Wheel 3; the latter is secured to the axle of one pair of running wheels 4, and so imparts motion to the trolley.

One end of the hoisting cord 5 is connected to the framework of the trolley, while the other end is led round a $\frac{1}{2}$" loose Pulley carried on the shank of a bolt 9 in the pulley block 10, and wound on the Crank Handle 11. The load is prevented from falling back when hoisted by means of a Pawl 6 and Ratchet Wheel 7 (see S.M. 84).



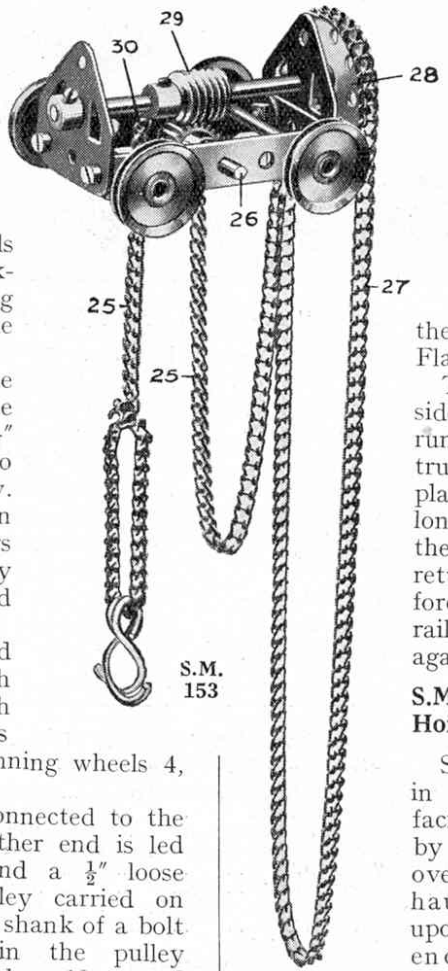
S.M. 151

S.M. 152—Truck, with Automatic Discharge

This truck is designed to run on overhead rails and to discharge its contents automatically on reaching a predetermined point.

The $4\frac{1}{2}$"×$2\frac{1}{2}$" Flat Plate 1, forming the bottom of the truck, pivots about the Rod 2, and carries a short Double Angle Strip 3, which is spaced away from the Plate by means of five Washers placed on each of the bolts 4. A short Rod 5 journalled in the strip 3 carries a $\frac{1}{2}$" loose Pulley 6, which runs upon a third rail laid in the centre of the track on which the Flanged Wheels 7 are guided.

This centre third rail dips down the side of a chute placed beneath the truck runway, with the result that, on the truck reaching this spot, the bottom plate 1 falls open, since the Pulley 6 is no longer supported, and the contents of the truck are discharged. As the truck returns for a fresh load, the Pulley is forced up the sloping end of the centre rail, until the bottom of the truck is again closed.

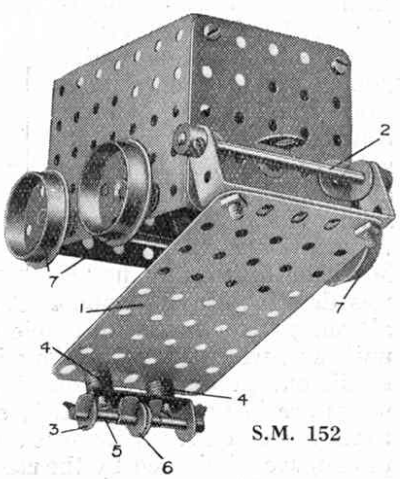


S.M. 153

S.M. 153—Overhead Trolley, with Chain Hoist

S.M. 153 illustrates a device employed in many factories and workshops to facilitate the movement of heavy loads by hand power. The trolley runs upon overhead rails, and the load is raised by hauling upon an endless chain (represented by Sprocket Chain 27 in the model).

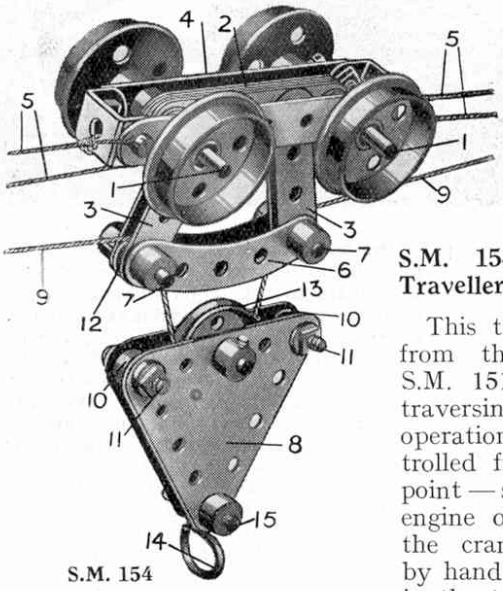
It will be observed that the trolley is constructed from two $2\frac{1}{2}$"×$\frac{1}{2}$" Double Angle Strips bolted together at each end by two Flat Trunnions. The chain 27 rotates a Sprocket Wheel 28, on the shaft of which is a



S.M. 152

Worm 29 engaging a ½″ Pinion on the Rod 26. A ¾″ Sprocket Wheel 30, also secured to the Rod 26, engages a further length of Sprocket Chain 25, one end of which is secured to the framework of the trolley, and the other carries the hooks supporting the load.

This Hoist is used to handle the material to be cut in the Meccano Stone-Sawing Machine (Model No. 617) and may be employed in all similar models.



S.M. 154

S.M. 154—Overhead Traveller for Gantry

This traveller differs from that shown in S.M. 151 in that the traversing and hoisting operations are controlled from a distant point — such as the engine or gear-box of the crane—instead of by hand gear mounted in the traveller itself.

The axles 1 of the travelling wheels are journalled through the ends of four 2½″ Strips 2 placed together and spaced by Washers in a central position in the trolley 4. Two pairs of 2″ Strips 3 are bolted to the Strips 2 and are connected at their lower ends by Curved Strips 6. ½″ loose Pulleys 12 on short Rods 7 form guides for the hoisting cord 9, which passes round a 1″ Pulley 13 in the pulley block 8. The latter is constructed from two Triangular Plates spaced apart by Collars 10 and secured by ¾″ Bolts 11. The Hook 14 is suspended from a 1″ Axle Rod 15.

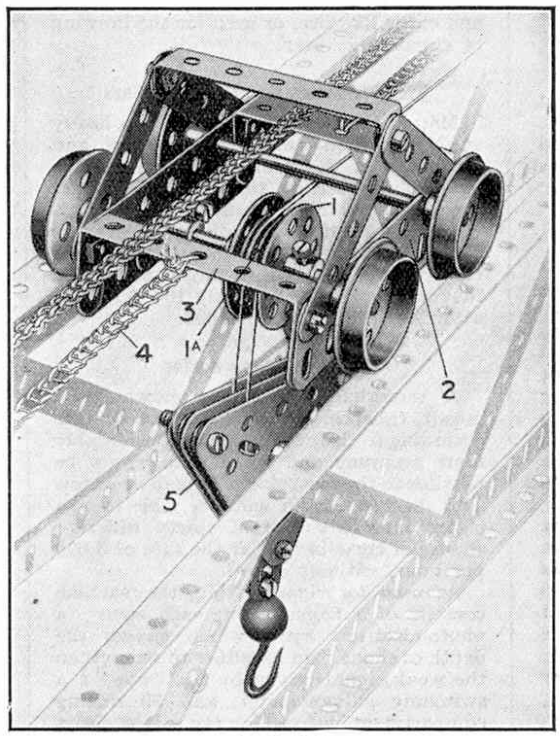
The trolley is caused to travel along the rails by means of the cord 5, both ends of which are secured to the framework 4 (see S.M. 169, Endless Rope Traversing Gear).

S.M. 155—Overhead Traveller for Gantry

This apparatus fulfils similar duties to S.M. 154 but is of slightly larger and more sturdy construction. The wheel-base 2 is constructed from two 3½″ Flat Girders connected by 2½″ × 1″ Double Angle Strips 3. The traversing movement is imparted by means of a Sprocket Chain 4, the ends of which are connected to the Bent Strips 3 (see S.M. 169).

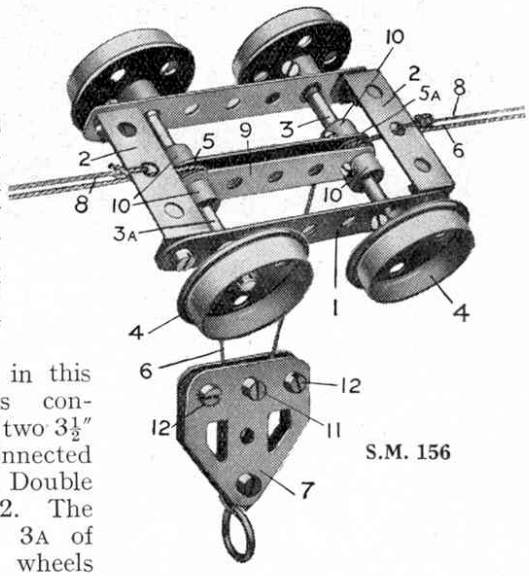
A feature of this trolley is the two-sheaved pulley 1 with specially deep grooves, which form guides for the hoisting cord. This pulley consists of two Bush Wheels and two 1″ loose Pulleys, and is built up in a similar manner to that described in S.M. 39, but in this case the 1″ Pulleys 1A should be free to rotate at different speeds between the Bush Wheels. If necessary Washers may be placed between the wheels to reduce friction.

The pulley block 5 is described in S.M. 32 (Section III.)



S.M. 155

S.M. 156—Overhead Traveller for Gantry



S.M. 156

S.M. 156 shows an alternative form of traveller having similar functions to those of S.M. Nos. 154 and 155.

The trolley in this illustration is constructed from two 3½″ Strips 1 connected by 1½″ × ½″ Double Angle Strips 2. The axles 3 and 3A of the running wheels carry two 2½″ Strips 9 held between Collars and set-screws 10. The hoisting cord 6 is led over a ½″ loose Pulley 5, situated between the 2½″ Strips 9 on the axle 3A, and passes round a second ½″ Pulley carried on the shank of the bolt 11 in the pulley block 7; from thence it passes over a further ½″ Pulley 5A on the axle 3.

The traversing movement of the trolley is obtained from the cord 8, the ends of which are shown connected to the cross Strips 2.

The pulley block 7 is built up from two Flat Trunnions bolted together, Washers being placed between the Trunnions on the shanks of the bolts 12.

Travelling Mechanism for Transporter Bridge

Another interesting overhead traveller is incorporated in the Meccano Transporter Bridge (Model No. 713). The trolley in this case is of the inverted type —that is, it hangs below the rails upon which its travelling wheels are guided—and supports a passenger carriage suspended from it by a number of cords, representing the cables used in actual practice.

The object of this arrangement is to bring the floor of the carriage on a level with the roadway on either side of the river, while the bridge that supports it on its travels to and fro across the water is at such a height that even the largest ships may pass beneath it without hindrance.

A further example of Overhead Trolley mechanism is shown in S.M. 68 (Section V.)

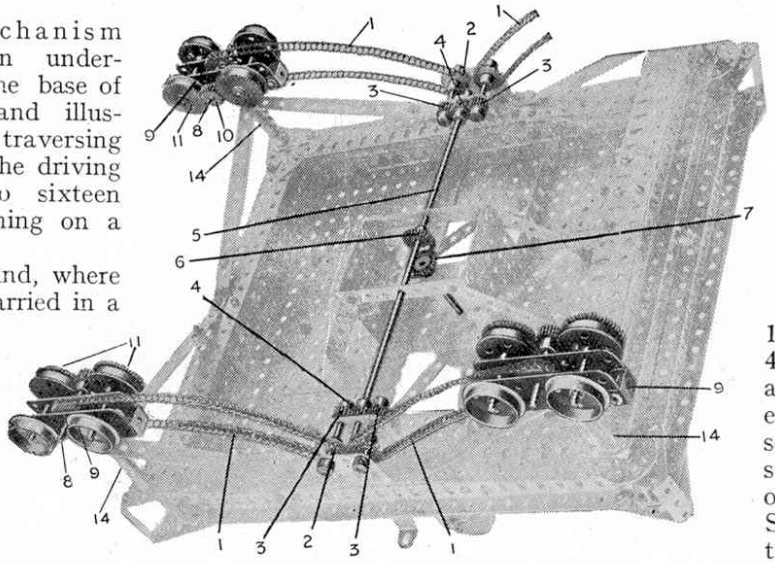
MECCANO STANDARD MECHANISMS

Section XI. Traversing Mechanism

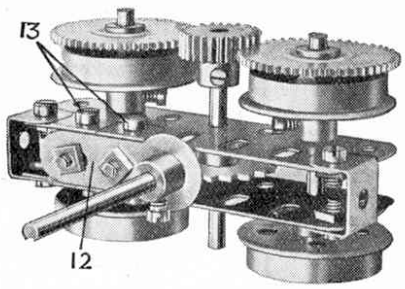
This article is one of a series dealing with a number of interesting Meccano movements that we have termed "Standard Mechanisms," for the reason that they may be adapted with advantage to numerous Meccano models—in most cases without any alteration, but in some few instances with only slight alterations to the standard movement. We have already dealt with a number of interesting subjects, including Gear Ratios, Belt Mechanism, Pulleys, Levers, Drive-Changing Mechanisms, Brakes, Steering Gear, Screw Mechanism, etc., and this month we describe several types of Meccano Traversing Mechanisms that are applicable to a variety of models.

STANDARD Mechanism No. 165 is an underneath view of the base of a heavy Dragline, and illustrates a type of traversing mechanism in which the driving power is coupled to sixteen travelling wheels running on a quadruple track.

In models of this kind, where the motive power is carried in a swivelling superstructure, it is sometimes a difficult matter to devise a means by which the drive can be transmitted smoothly and easily to the road wheels. The transmission must necessarily pass through the pivotal centre of the structure, and in models of the weight and dimensions of the Dragline, steps must be taken to obviate the great strain that in the ordinary way would centre upon that point. The solution to this difficulty usually lies in the adoption of roller bearings, which distribute the weight of the pivoting body over a large area and reduce friction to a minimum by the provision of rolling contact surfaces. The bearings for the Meccano Dragline are identical in form to Standard Mechanism No. 101 (Section VII.)



S.M. 165



S.M. 165a

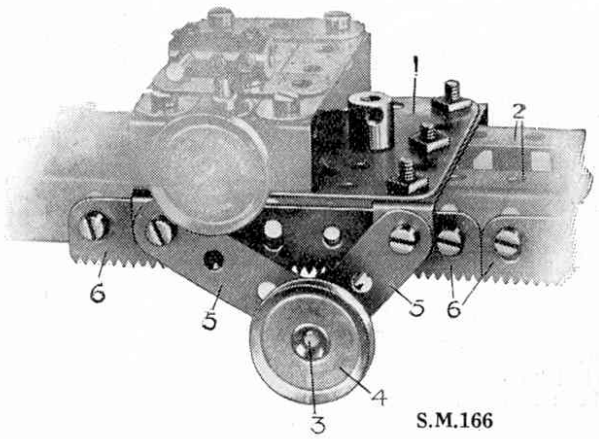
S.M. 165. Traversing Mechanism

It will be seen from the illustration that the drive is led by way of a vertical shaft and Bevel Gears 6 and 7 to the transverse 11½" Rod 5, and two ½" Pinions 4 on either end of this Rod actuate further ½" Pinions 3, each of which is mounted separately on a short Rod suitably journalled in the base of the machine. Four ¾" Sprocket Wheels 2 secured to the shafts of the Pinions 3 are each connected by lengths of Sprocket Chain 1 to 1" Sprocket Wheels mounted on short Rods 8 journalled in the centre of the bogies 9. The eight wheel axles are all rotated in the same direction by means of ¾" Pinions 10 gearing with 50-teeth Gear Wheels 11.

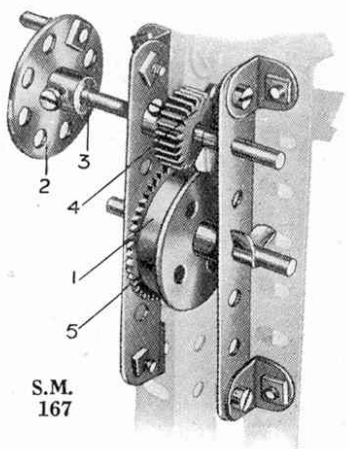
One of the four-wheeled bogies is shown in detail in S.M. 165a. The Crank 12, seen in this illustration, is bolted to two Double Brackets 13, and forms a socket to receive the upright columns 14, which are secured in Bush Wheels bolted to each corner of the base.

It will be noted that these columns are reinforced by a series of Collars and Set-screws, or Couplings, and they are further stayed by a number of Perforated Strips.

The play allowed in the Sprocket Chain transmission is sufficient to permit the bogies to turn slightly when negotiating curves in the track.



S.M.166



S.M. 167

S.M. 166—Rack and Pinion Mechanism

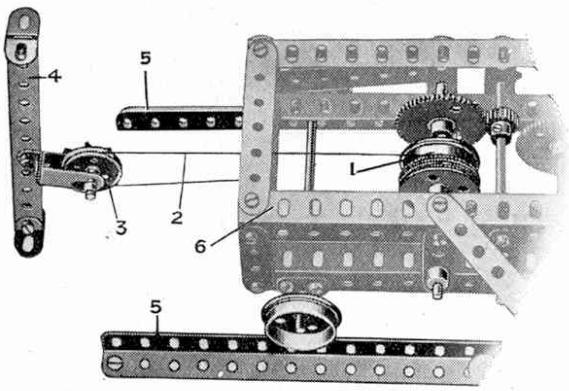
Rack and Pinion gear possesses a wide range of utility. In actual practice it is employed for an innumerable variety of purposes, ranging from the operation of a steep mountain railway to the simple gear sometimes used in opening a row of factory windows.

S.M. 166 shows Rack and Pinion gear adapted to actuate the saddle of a lathe. The saddle 1 rests upon the Girders 2, and is bolted to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, the ends of which slide upon a Rod set longitudinally between the Girders. The shaft 3 of the hand-wheel 4 is journalled in strips 5 bolted to the saddle, and carries a $\frac{1}{2}''$ Pinion which engages the Rack Strips 6.

As the hand-wheel rotates, the Pinion is forced along the Rack, carrying the saddle with it.

S.M. 167—Traversing Mechanism

This illustrates the foot of a crane or similar model, in which the travelling wheel 1 is operated from a hand-wheel 2.



S.M. 168

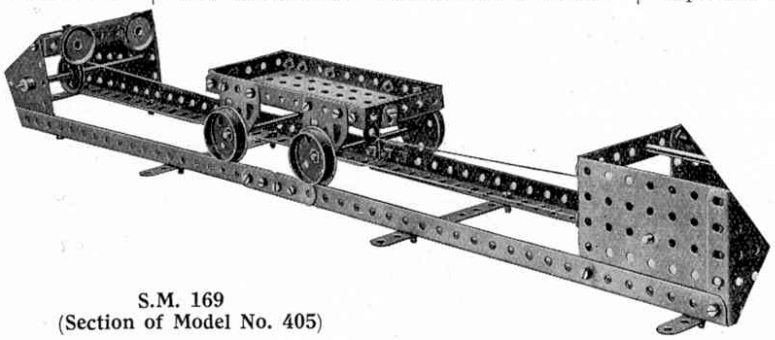
The shaft 3 of the hand-wheel carries a $\frac{3}{4}''$ Pinion 4 which engages a 50-teeth Gear Wheel 5 secured to the axle of the Flanged Wheel 1. The latter is one of four wheels similarly situated in the base of the model, and all are arranged to traverse a suitable stretch of track.

If desired, the shaft 3 may be operated from an Electric Motor or other source of power by substituting a Sprocket Wheel for the hand-wheel 2 and driving same through a Sprocket Chain or similar gear.

S.M. 168—Self-Hauled Travelling Carriage

In this interesting apparatus the moving machine *pulls* itself along by means of a revolving drum 1 which slowly winds up a cord 2. The latter passes round a 1" Pulley 3, carried from the post 4 secured in position at the head of the track 5, and its end is attached to the framework of the carriage 6. S.M. 168 illustrates a section of the Coal-Cutting Machine (Model No. 703), in which this type of traversing mechanism is employed in moving the cutting tools slowly along the coal face as the coal is cut away.

The principal advantage possessed by this system over the ordinary method of coupling the motive power direct to the road wheels lies in the fact that it enables



S.M. 169
(Section of Model No. 405)

a comparatively light machine to proceed against a greater resistance than would be possible if it depended for its motion upon the adhesive power of its wheels on the rails.

S.M. 169—Endless Rope Traversing Gear

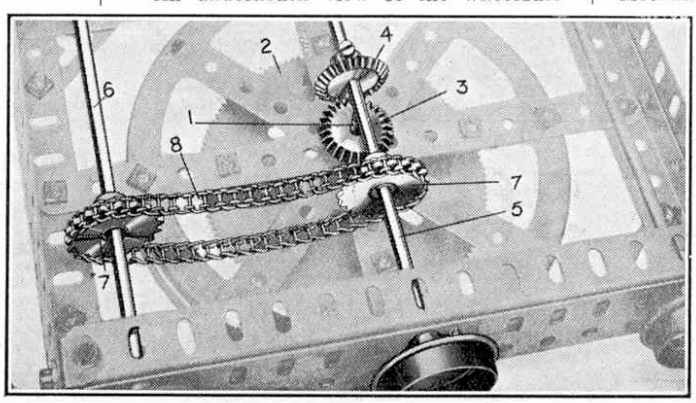
This movement is employed in overhead cranes, gantries, endless-rope railways, transporters, conveyors, etc., and numerous other models where it is required to move a trolley or truck to and fro along a stretch of track. Its construction consists of an endless cord secured to the trolley and passing round a pulley at either end of the runway. One of the pulleys imparts the motive power, and the cord should be given an additional turn round this pulley to obtain sufficient "grip."

Sprocket Chain and Wheels may be used in place of the cord and pulleys, when a more powerful and reliable drive will be obtained.

S.M. 170—Transmission of Motive Power to Road Wheels

The method of transmitting motive power illustrated in S.M. 170 is similar in principle to that described in S.M. 165, but is designed on a much smaller scale. In this case the gear is shown fitted to the Meccano Steam Shovel (Model No. 707), the swivelling superstructure of which is also supported on roller bearings (see S.M. No. 106, Section VII.)

An underneath view of the wheelbase of the Steam Shovel is shown in the illustration (S.M. 170).



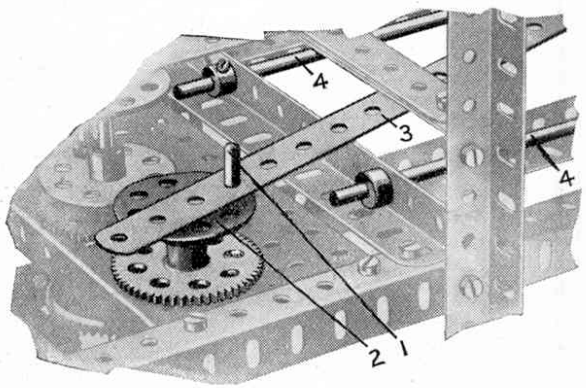
S.M. 170

The Motor is carried in the swivelling superstructure and the drive is led down to the road wheels by way of the vertical shaft 1. This shaft is journalled through the boss of the $3\frac{1}{2}''$ Gear Wheel 2, about which the superstructure pivots, and carries a Bevel Wheel 3 gearing with a similar wheel 4 on the transverse rod 5. The latter forms an axle for the centre pair of the six road wheels.

Motion is imparted to a second pair of wheels on the axle 6 by means of 1" Sprocket Wheels 7 and Sprocket Chain 8. The third axle may be coupled to the driving rod by similar means if desired, but the four driving wheels will be found to give sufficient adhesive power for ordinary purposes.

S.M. 171—Reciprocating Motion

Where a part of a machine is required to reciprocate over a comparatively short distance, the necessary traversing movement may be imparted by ordinary crank and connecting-rod gear. In S.M. 171



S.M. 171

a Threaded Pin 1, secured to the Bush Wheel 2, pivotally carries a connecting Strip 3, which imparts to and fro movement to a carriage sliding on guide Rods 4.

Observant readers will note that this illustration reproduces part of the Meccanograph, in which the mechanism described is employed to impart a short reciprocal movement to the carriage supporting the arm that carries the designing pen.

Alternative types of Reciprocating Drive Mechanism are shown in S.M. Nos. 252 and 264 (Section XIII.), while further interesting examples of Meccano traversing mechanism will be found in several models included in the complete Manual of Instructions. The aerial bucket in the Telpher Span (Model Nos. 34 and 108), and the passenger cars in the Funicular Railway (Model No. 728), are operated by similar methods to the endless rope gear described under S.M. 169.

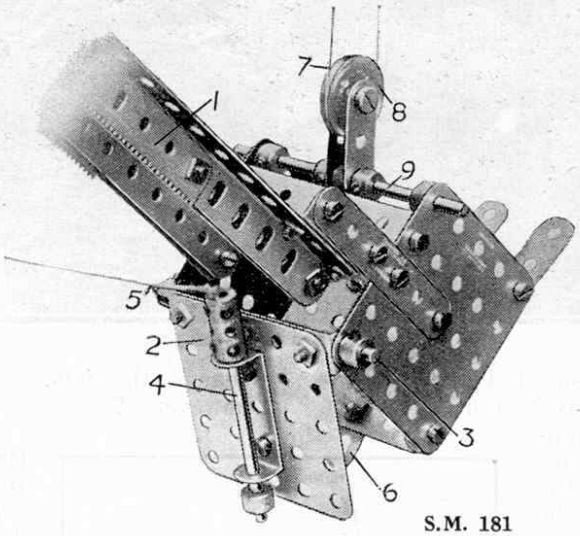
Another useful device that should be mentioned in this Section consists of the Quick-Return Motion illustrated under S.M. No. 261. By means of this ingenious apparatus a rapid return movement is imparted to a sliding table or carriage.

MECCANO STANDARD MECHANISMS

This article is one of a series dealing with a number of interesting Meccano movements that we have termed "Standard Mechanisms," for the reason that they may be adapted with advantage to numerous Meccano models—in most cases without any alteration, but in some few instances with slight alterations to the standard movement. We have already dealt with a number of interesting subjects, including Gear Ratios, Belt Mechanism, Pulleys, Levers, Drive-Changing Mechanisms, Brakes, Steering Gear, Screw and Traversing Mechanisms, etc. This month we reproduce some Meccano examples of the giant mechanical shovels used in Dredging, Excavating, and Conveying Machinery, and on the following page we commence the last of the thirteen Sections in which these movements have been grouped. S.M. 254, which describes the Torque Converter, has been held over pending a fuller description in a later issue.

Section XII. Grabs, Buckets and Dredging Apparatus

THE bucket illustrated in S.M. 181 is designed for use in Mechanical Shovels or other excavating machines. It is identical with that fitted to Model No. 707, which represents a type of Steam Shovel that is used to a large extent in actual practice, especially in the construction of canals, railway cuttings, and similar works. With each sweep of its arm a machine of this description scoops out of the earth many tons of mud or rock and, swinging round, deposits its load in a waiting truck, ready for removal to a more distant point.



S.M. 181

The Meccano bucket is bolted to the arm 1, which pivots from a point in the jib of the excavator. The bottom plate 2 of the bucket is hinged to the Rod 3, and is closed or opened as desired by means of a sliding Rod 4, operated by a cord 5. During the cutting stroke the Plate 2 is held in a closed position by the end of the Rod 4 engaging the aperture in a Flat Bracket 6. When the loaded bucket is moved over to the point where the material is to be dumped, its contents are discharged by pulling the cord 5. This action withdraws the Rod 4 from the Bracket 6, and so releases the plate 2.

The bucket is raised or lowered by a hoisting cord 7 engaging a Pulley 8 pivotally carried from a Rod 9. The radius of the cut is regulated by altering the length of the arm 1. This alteration is effected by rack and pinion mechanism mounted in the centre of the jib.

S.M. 182—Bucket Dredging Apparatus, or Bucket Conveyor

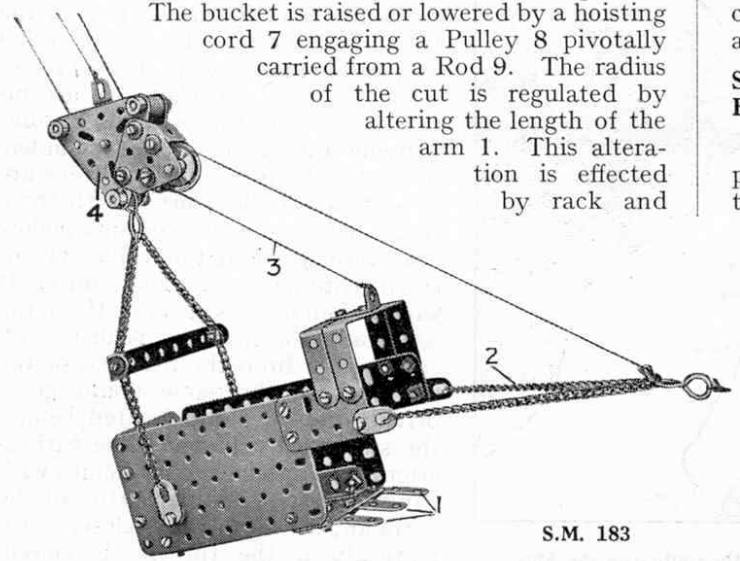
S.M. 182 illustrates a device that is used in actual practice for handling materials of a fairly pliable nature, such as mud and sand. The principle of the apparatus is frequently employed in marine dredging operations, and is sometimes adopted in elevators or conveyors for coal, slack, gravel, cement, and for loading similar materials in wagons.

It consists of a number of buckets secured to an endless chain that is driven continuously from any convenient form of motive power. In the case of dredgers, the buckets serve as shovels and dig into the face of the material to be excavated, but in conveyors they form merely receptacles to receive the material for transportation. The moving chain rapidly conveys the laden buckets away from the scene of action.

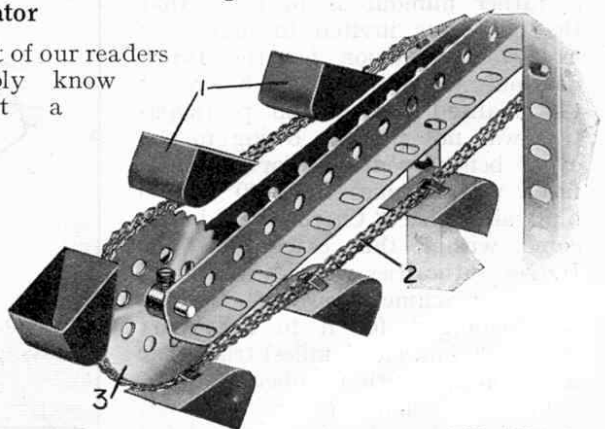
The illustration clearly shows the method by which Meccano Dredger buckets (Part No. 131) may be secured to Sprocket Chains. Any number of buckets 1 may be connected to the endless chain 2, which passes round a Sprocket Wheel 3 carried in the end of the dredger arm.

S.M. 183—Bucket for Dragline Excavator

Most of our readers probably know that a



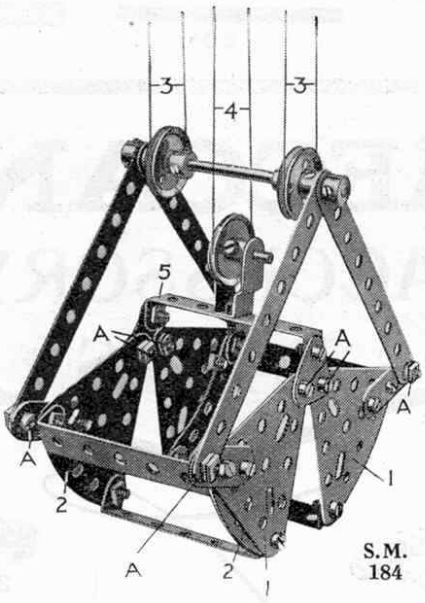
S.M. 183



S.M. 182

Dragline is designed to perform similar duties to the ordinary Mechanical Shovel, and that the principal difference between the two types of excavators lies in the fact that the bucket of the Dragline is drawn along by means of cables, with the result that its cutting stroke is directed always towards the machine, whereas the stroke of the Shovel is in a direction away from the machine. Hence the Dragline is most usefully employed in levelling or increasing the depth of a cutting or canal bed, while the Shovel is used more often to widen such works, by cutting away the perpendicular sides of the excavation.

The construction of the Meccano bucket will be followed from the illustration (S.M. 183). On the cutting stroke, the teeth 1 are drawn into the earth by means of the Chain 2, while a cord 3 sustains the bucket at the requisite angle. The apparatus is raised or lowered by means of a hoisting cord and pulley block 4.



S.M. 184

S.M. 184—Grab

A " grab " is a device used in conjunction with coalers or similar machines. It consists of two hinged jaws that may be opened or shut at the will of the operator, and is usually suspended by two separate hoisting cables. The movement of the jaws is effected by operating one or both of these cables.

Let us suppose, for example, that it is required to raise a quantity of coal. The grab is lowered in the open position until it rests upon the loose coal, when the cable that closes the jaws is hauled in. This draws together the movable sections, and the grab gathers up a huge " mouthful " of coal. It is then hoisted and swung round to the desired position, where the coal is discharged by re-opening the grab.

The jaws of the Meccano grab are constructed from 2½" Triangular Plates 1 extended at their bases by 2½" Curved Strips 2. The grab is raised or lowered by means of four lengths of cord 3, while another cord 4 passes round a 1" Pulley carried from the cross-piece 5. If both the cords 3 and 4 are hauled in or paid out at the same speed, the grab travels up or down without the jaws moving, but if one cord ceases to move, the grab opens or closes according to the movement of the other cord. The joints marked " A " are all connected pivotally by means of bolts and lock-nuts (see S.M. 263).

If the outer sides of the grab jaws are filled in with cardboard, or additional parts, the grab will pick up small loads of sand, marbles, etc. It will then form a very useful adjunct to a Hornby goods yard.

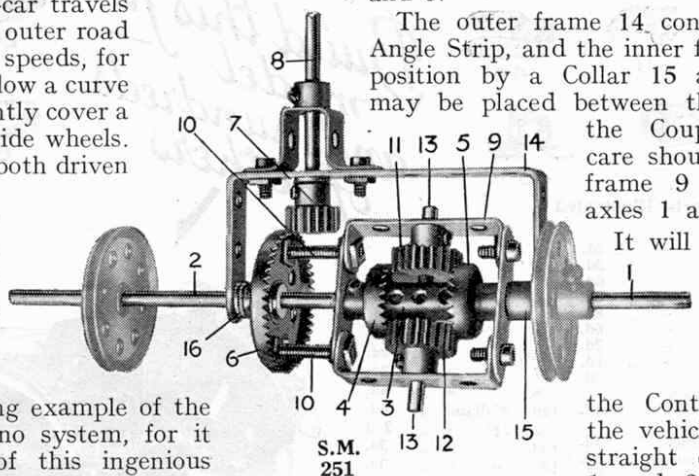
Section XIII. Miscellaneous Appliances

S.M. 251—Differential Gear

If we were to examine the tracks of a motor-car that has travelled in a complete circle we should find that the diameter of the circular path of the outside wheels is greater than that of the path of the inside wheels, the difference being equal to twice the length of the axle connecting one inner wheel to one outer wheel. It is obvious, therefore, that when a motor-car travels in a curved line the inner and outer road wheels must rotate at unequal speeds, for the inside road wheels must follow a curve of smaller radius and consequently cover a shorter distance than the outside wheels.

But the two rear wheels are both driven from the same engine, and no doubt all Meccano boys are aware that the difficulty of the variation in speed is overcome by incorporating in the drive transmission some form of *differential gear*.

The model differential gear shown in S.M. 251 is a striking example of the practical value of the Meccano system, for it demonstrates the principle of this ingenious mechanism in a clear and interesting manner.



S.M. 251

The back axle shown in the Meccano model is built up from two separate units—a 3½" Rod 1 and a 5½" Rod 2, which are inserted in the Coupling 3 and allowed to revolve freely. A Contrate Wheel, 4 and 5, is secured to each unit. A 1½" Contrate Wheel 6, with set screw removed, revolves freely upon the Rod 2, and is driven from the ½" Pinion 7 on the propeller shaft 8.

The frame 9, consisting of two 1½" Double Angle Strips bolted to 1½" Strips, revolves with the Contrate Wheel 6, to which it is secured by 1" Threaded Rods 10. Two ¾" Pinions 11 and 12 are mounted on 1" Rods 13, for which the centre transverse hole of the Coupling 3 forms a bearing ; they are thus free to revolve independently of each other, but they are engaged by the Contrates 4 and 5.

The outer frame 14 consists of a 3½" × 1½" Double Angle Strip, and the inner frame 9 is held in its correct position by a Collar 15 and Washers 16. Washers may be placed between the Pinions 11 and 12 and the Coupling 3 if required, and care should be taken that the inner frame 9 revolves freely upon the axles 1 and 2.

It will now be seen that if one road wheel revolves at a greater speed than the other the Pinions 11 and 12 begin to rotate and adjust the difference in speed between the Contrate Wheels 4 and 5. If the vehicle is running in a perfectly straight course, however, the axles 1 and 2, Contrates 4 and 5, and Pinions 11 and 12, must all rotate as one unit, since the road-wheels are travelling at the same speed.

The 1½" Pulley Wheels shown in the illustration are affixed to the Rods 1 and 2 and are intended for use as brake drums. They do not concern the differential movement.

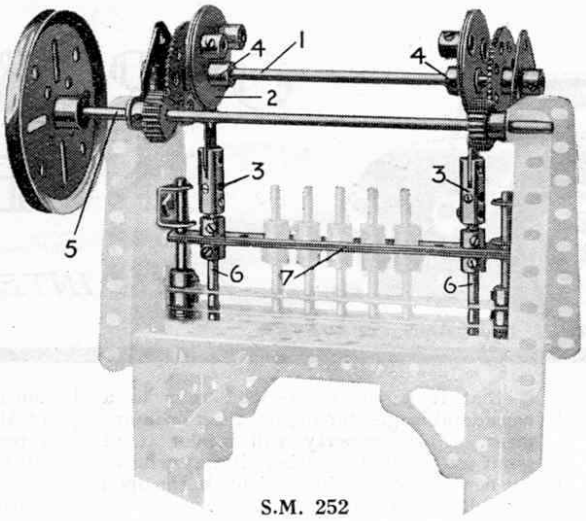
(*Further Standard Mechanisms appear on page 61*)

Standard Mechanisms—*(continued)*

S.M. 252—Reciprocating Gear

The Meccano Eccentric forms a valuable method by which any continuous movement may be converted into reciprocating motion. It is fitted with three separate bosses with set-screws, and its stroke, or throw, varies according to the particular boss in which the shaft is secured. The dimensions of the three different strokes available—i.e. ½", ¾", and 1"—are stamped on the face of the Eccentric under their respective bosses.

S.M. 252 shows two Eccentrics operating the tools of a punching machine. The Rod 1 is driven from the main shaft 5, and is journalled through the Eccentric bosses 4, each of which provides a throw of half-an-inch. The Eccentrics 2 are connected pivotally to Strip Couplings 3 mounted on sliding Rods 6. These carry the punches from a cross piece 7 constructed from two 5½" Strips placed one upon the other with their ends engaging short vertical Rods.



S.M. 252


S.M. 253

S.M. 253—Laminated Spring

Laminated Springs—sometimes referred to as "leaf" springs—may be constructed from a number of Meccano Strips of varying lengths. The Strips are slightly bent and bolted together as shown in S.M. 253. The spring illustrated is designed for use in a motor chassis; it is connected to the framework of the vehicle by means of the Angle Brackets shown, and supports the road wheels from the Double Bracket at the end.

A similar spring in common use has both ends bolted to the vehicle, whilst its centre rests upon the axle of the road wheels. In this case, the points of suspension between the springs and the chassis should be so arranged as to permit of free lateral movement when the springs are flattened.

A further example of laminated springs for chassis suspension is shown in S.M. 115 (Section VIII.)

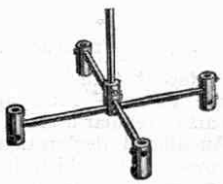
S.M. 255-259—Handles, etc.

In certain models the Meccano Crank Handle (Part No. 19) does not always represent the most desirable form of handle, and it is frequently replaced by a more convenient lever fashioned from other accessory parts. The different forms of hand wheels and levers that are used in Meccano models are too numerous to mention here, but we illustrate a few of the most common types. These should prove useful in a very large number of models and should lead Meccano boys to devise scores of others to suit their individual requirements.

S.M. 255 illustrates a hand wheel constructed from a Face Plate 18 secured by means of its set-screw to the shaft 17, which it is required to rotate. A Threaded Pin carried in one of the outer holes of the wheel 18 serves as the handle.

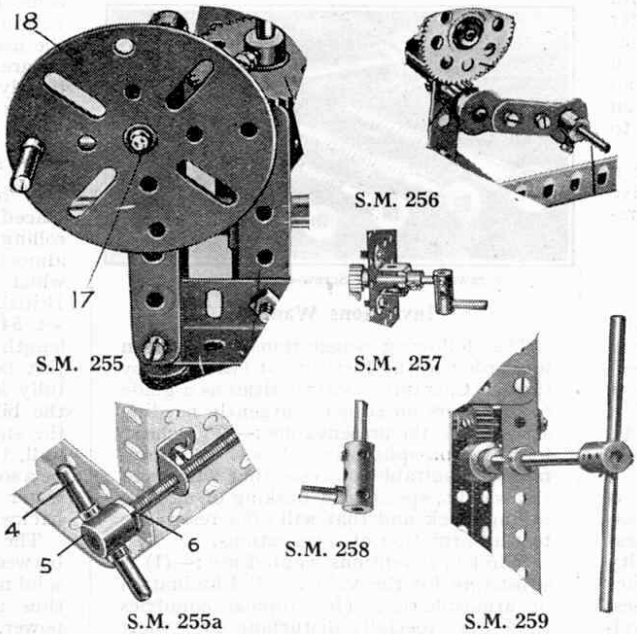
The T-shaped lever shown in S.M. 255a is constructed from two Threaded Pins 4 engaging opposite ends of the transverse bore in the Threaded Boss 5, and is intended for use in conjunction with the Meccano Threaded Rod. It is locked in position on the Rod by means of the nut 6 screwed tightly against the Boss.

S.M. Nos. 256 and 257 represent two different types of crank handles. The first is composed of two Cranks bolted together and a short Rod 1, and is designed for use where considerable leverage is required. The second is a smaller type altogether, and consists of a Coupling and 1" Rod.


S.M. 260

The device illustrated in S.M. 259 is intended for use principally as a sliding hand lever. The Threaded Pin engages one of the threaded borings in the end of the Coupling. If desired a second Pin may be inserted in the opposite side, to form a T-lever similar to S.M. 255a.

S.M. 259 is a double hand lever for use when great leverage is required. It consists of a Rod of any convenient size secured transversely in the end of a Coupling. Further examples of Meccano handles will be found under S.M. Nos. 5, 61, 63, 67, 72, 86, 137, etc.



S.M. 255 S.M. 256 S.M. 257 S.M. 258 S.M. 255a S.M. 259

Examples of Meccano Handles

S.M. 260—Pedestal

This detail illustrates an interesting adaptation of Meccano Couplings and Rods to form a firm base, or pedestal, for a vertical column, etc.

It will be observed that one of the horizontal Rods passes through the centre of the Coupling that is secured to the foot of the vertical shaft, and is gripped at each end in the upper transverse hole of one of the four Couplings forming the feet of the model. The other Rod passes through the lowest hole in the central column and is secured in the middle holes of its respective pair of Couplings.

The Meccanograph Table forms a useful base for certain small models.

MECCANO
STANDARD MECHANISMS

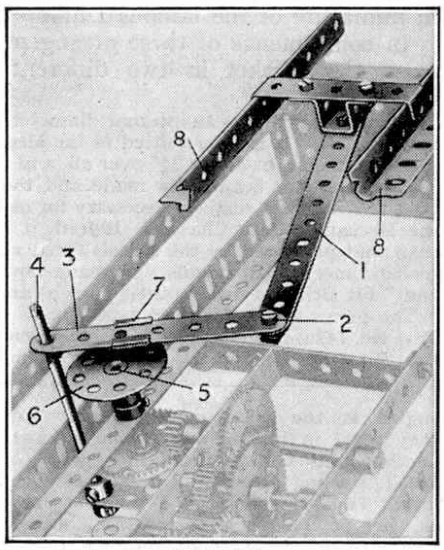
Section XIII. Miscellaneous Appliances—(*continued*)

Below we publish a further selection of Meccano movements included under Section XIII of "Meccano Standard Mechanisms." These Meccano movements have been termed "Standard Mechanisms" for the reason that they may be adapted with advantage to numerous Meccano models—in most cases without any alteration, but in some few instances with slight alterations to the standard movement. We have already dealt with a number of interesting subjects, including Gear Ratios, Belt Mechanism, Pulleys, Levers, Drive-Changing Mechanisms, Brakes, Steering Gear, Screw and Traversing Mechanisms, Grabs and Dredging Apparatus, etc. Section XIII, which is the last of the present series, will be concluded in next month's "M.M."

IN actual practice a quick-return gear forms a valuable means of speeding-up production and for that reason it is adapted to numerous types of machine tools, etc. When fitted to a planing-machine for example, as in S.M. 261, this gear so controls the drive that the table carrying the material to be shaped moves slowly during the cutting stroke, but on the return movement, during which the cutting tool performs no work on the material, the table travels much faster.

A vertical driven shaft 5 carries a Bush Wheel 6 to which an Eye Piece 7 is pivoted by means of bolt and lock nuts (see S.M. 263). A 3½" Strip 3 passed through the Eye Piece pivots about an upright fixed Rod 4, and is attached pivotally at its outer end 2 by bolt and nuts to a connecting lever 1. The latter, in turn, is connected pivotally to the underside of the table, which slides on the girders 8.

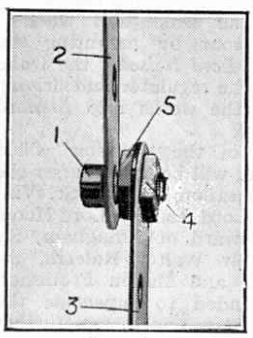
The Bush Wheel 6 rotates in an anti-clockwise direction, rocking the lever 3 to and fro, and the swivel-guide 7 slides on the lever as it follows the movement of the Bush Wheel. Consequently the guide 7 is at a greater distance from the fulcrum of the lever during the forward stroke than it is on the return, with the result that the point 2 moves slowly on the forward stroke and more rapidly on the return.



S.M. 261

S.M. 262—Pivot, Formed from Bolt and Nuts

It is often required in Meccano models to connect two Strips or other parts together in such a way that one or both may have perfectly free rotary movement about the joint. A simple type of pivot, or swivel-bearing, which proves extremely useful in this connection is shown in S.M. 262.



S.M. 262

The bolt 1 passes through the Strip 2 and is securely held to Strip 3 by means of two nuts 4 and 5, which are screwed tight against opposite sides of the Strip. Sufficient space is left between the nut 5 and the bolt head to allow free movement of the Strip 2. This arrangement makes it quite impossible for the pivotal connection to work loose or, oppositely, to "bind" while in operation.

The device may also be employed as a fixed axle or bearing for a Pulley Wheel, etc., by substituting for the bolt 1 another of greater length, or a Pivot Bolt, to allow for the additional width of the Pulley.

S.M. 263—Bolt and Lock-Nuts

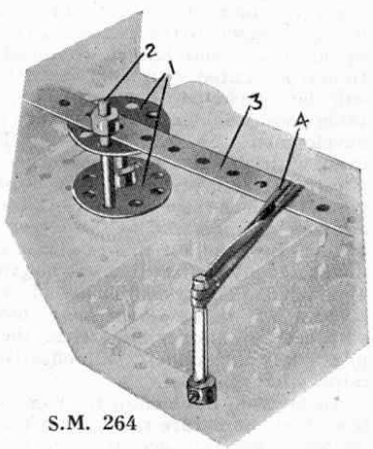
Another form of pivot or swivel-joint having similar functions to S.M. 262 may be constructed by first placing the Strips 2 and 3 (see illustration, S.M. 262) on the bolt 1 and locking the nuts 4 and 5 on its shank. The nuts are turned in opposite directions until they securely grip each other in position on the bolt.

This method allows for free movement of both Strips 2 and 3, independently of the bolt, but it is only in rare instances that it is likely to prove more efficient than the type of pivotal connection described under S.M. 262. The amount of play obtaining in the latter, for example, is not so great as in the bolt and lock-nuts method.

S.M. 264—Cam, or Tappet

S.M. 264 illustrates a simple method by which regular rotary motion may be converted into reciprocating or intermittent motion.

Two Bush Wheels 1 are mounted on a vertical rotating shaft and carry a short Rod 2 which pushes a lever 3 to and fro. The lever is held against the Rod 2 by means of a piece of elastic 4 (or Spring Cord). A suitable stop may be placed in position to prevent the lever following the Rod 2 through the full distance as the latter retreats; in this way

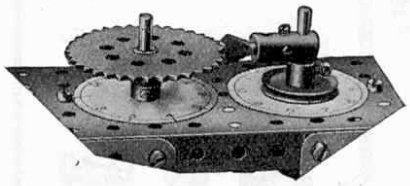


S.M. 264

intermittent motion will be produced, for the lever will become stationary at the end of each stroke, until the Rod 2 is again in position to push it outwards.

S.M. 265—Intermittent Rotary Motion

The device shown in this example is designed to impart intermittent rotary movement to a secondary shaft by means of a primary shaft that is in continuous rotary motion. A Centre Fork, carried in a Coupling secured to the primary shaft, engages for a brief period in each revolution with the teeth of a 2″ Sprocket Wheel secured to the secondary shaft, so imparting to the latter the required movement. This device is useful in revolution indicators, measuring instruments, etc.



S.M. 265

Intermittent rotary motion may also be obtained by means of Pawl and Ratchet gear, the arrangement of the necessary apparatus being principally as follows: A driving shaft is caused to actuate a rocking lever by means of crank or eccentric motion. The centre of oscillation of the lever coincides with the centre of the shaft that it is required to drive intermittently, and a Pawl, which is pivotally attached to a point in the length of the lever, engages the teeth of a Ratchet Wheel secured to this secondary shaft. Rotary motion is imparted to the Ratchet, and therefore the secondary shaft, during each forward stroke of the lever, while on the return stroke the Pawl rides idly over the teeth of the Ratchet and the secondary shaft remains stationary.

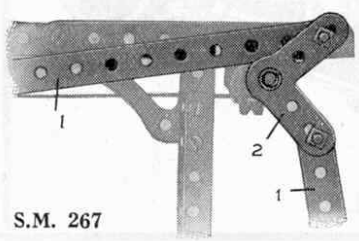
S.M. 266—Cam, or Tappet

This resembles S.M. 264 in that it converts a regular rotary motion into a reciprocating or intermittent motion. It consists of two 1½″ Pulley Wheels 1, or Bush Wheels, carrying three Double Brackets 2 and secured to a revolving shaft 3. As the cam rotates, the Brackets 2 raise or lower a lever resting transversely upon the Rod 3.

The extent of the movement of the lever may be varied, of course, by altering the number of Double Brackets 2. In the example illustrated, a slight pause would occur after each stroke of the lever, for the lever is allowed to rest momentarily on the Rod 3 while the cam portion 2 completes the lower half of its rotation.

The Eccentric is a form of cam and may be used for similar purposes. The functions of the Meccano Eccentric were made clear in S.M. 252 (see last month's "*M.M.*")

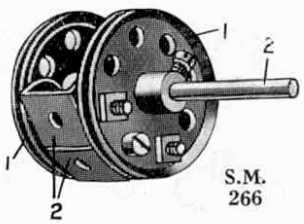
S.M. 267—Bell Crank



S.M. 267

The bell crank is a lever of the first order (see Section IV., page 11) and is employed as a means of altering the extent of the movement or power exerted by a force. It may also be used for changing the direction of a force.

In S.M. 267, the levers 1 are set at right-angles to each other, and one imparts motion to the other through the Bell Crank 2 (Part No. 128), to which the levers are pivotally connected by bolts and nuts (see S.M. 262). In this case no mechanical advantage is obtained by the use of the Bell Crank, since the levers are pivoted at equal distances from the fulcrum. If the length or relative angles of the levers are altered, however, the ratio of mechanical advantage varies accordingly, as will be understood clearly from Section IV.

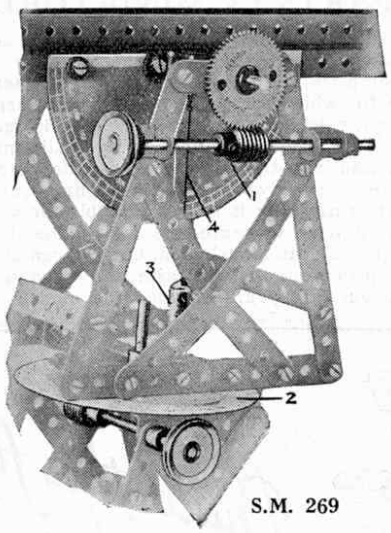


S.M. 266

If the levers 1 are placed in parallel positions, it is obvious that their direction of movement will be opposite. That is to say, if one lever moves longitudinally from left to right, the other will move from right to left.

S.M. 268—Epicycloidal Gear

In epicycloidal gear one toothed wheel is caused to rotate about the circumference of another. The Pinion 1 in S.M. 268 engages with the Gear Wheel 2, and is carried on a shaft journalled in a 1½″ Strip 3 bolted to a Contrate Wheel 4, which rotates freely upon the vertical Rod. The latter may be secured in position, so preventing the Gear Wheel 2 from turning, or it may be rotated at a different speed—or in an opposite direction—to the Contrate Wheel 4.



S.M. 269

The number of revolutions described by the Pinion 1 always exceeds that of the Contrate Wheel 4, but the speed ratio varies according to the sizes of the Pinion and Gear Wheel 2, and to the movement (if any) of the latter.

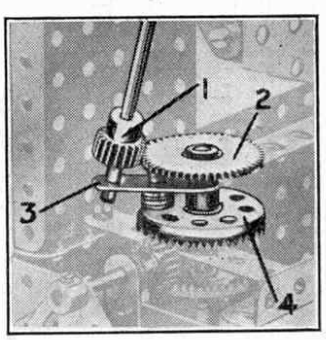
S.M. 269—Measurement of Angles

The Meccano Protractor (Part No. 135) consists of a sheet of superfine Esparto Board on which are printed graduated circular and semicircular scales. These may be cut out and affixed to models in which it is desired to measure angles, degrees, etc.

S.M. 269 shows the semicircular scale 1 and the circular scale 2 attached to the sighting arm and fixed base respectively of a theodolite, which, as every Meccano boy knows, is an instrument used in surveying and measuring. Note the "plumb-line"—the Coupling 3 suspended by cord 4—by which the perpendicular is ascertained.

The Meccano Theodolite (Model No. 605 in the Complete Manual) forms a very interesting instrument that may be put to practical purposes. Another excellent model that makes good use of the Protractor is the Sighting Apparatus (Model No. 508), with which the height of any object may easily be determined.

(*Further Standard Mechanisms appear on page* 159).

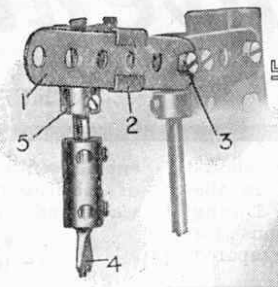


S.M. 268

Standard Mechanisms, Section XIII.—(*continued from page* 157)

VARIABLE AND MULTIPLE DRIVING MECHANISM

When it is required in actual practice to arrange a shaft so that it may be moved longitudinally whilst being rotated from a fixed driving point, the necessary adjustment is obtained usually by employing squared or splined shafting threaded through the driving pulley or gear wheel. Such a method does not lend itself readily to the Meccano system, for obvious reasons, and the following Standard Mechanism illustrates a simple device by which the required results can be obtained.

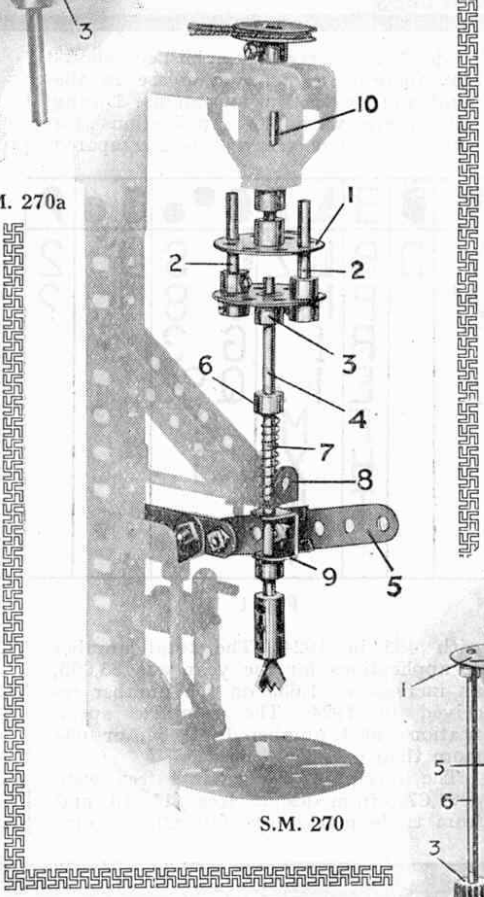


S.M. 270a

S.M. 270—Variable Rotary Drive

S.M. 270 shows a portion of a Meccano drilling machine, in which it is required to lower the drill into contact with the work and raise it again without stopping the motion of the machine.

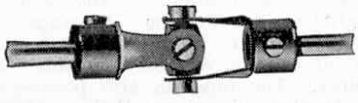
It will be noticed that the vertical drill shaft is in two sections, the upper driven section 10 being connected to the lower section by means of a Bush Wheel 1 engaging two short Rods 2 mounted in another Bush Wheel 3, which is secured to the lower section 4. The drilling tool carried on the latter is applied to the work on pressing a lever 5, and on release is returned to its former position by the compression spring 7, which is mounted on the shaft 4 between a Collar 6 and the Double Angle Strip forming the bearing 8. A suitable spring for the purpose is supplied in the Meccano Spring Buffer (Part No. 120a); the spring should be slightly stretched before being used in this apparatus.



S.M. 270

The short Rods 2 adjust themselves to the movement of the drill by sliding in the holes of the Bush Wheel 1, with the result that the lower section 4 remains in gear with the driven shaft 10 throughout its vertical movement.

This type of longitudinal adjustment may also be adapted with good results to certain forms of speed-changing mechanism. In such cases the movable portion of the driving shaft, corresponding to Rod 4 in the illustration, should carry a number of gears of varying sizes, which may be thrown in or out of engagement with corresponding gears on a secondary shaft. Hence the speed of the latter may be varied as desired without affecting the position or operation of the primary or non-slidable portion of the driving shaft.



S.M. 272

S.M. 270a is another view of the drill-adjusting device. The lever 1 is mounted pivotally at 3 by means of bolt and lock-nuts (see S.M. 263) and engages with the Eye-Piece 2. The latter is connected—also by bolt and lock-nuts—to a Double Bracket 9 (S.M. 270) mounted on the drill shaft 4.

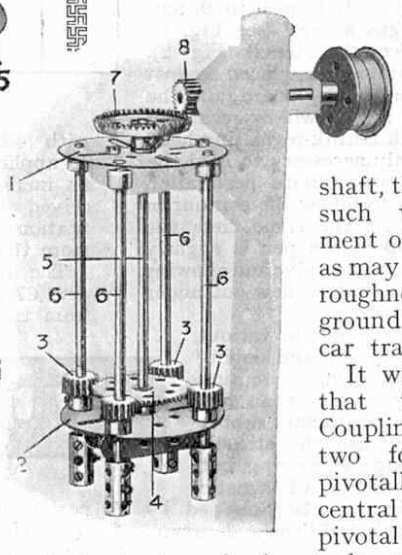
S.M. 271—Multiple-Drive Mechanism

This mechanism is frequently employed in multiple drilling machines and similar apparatus where several shafts are required to rotate at a uniform speed and in the same direction.

A vertical Rod 5 carries a 1½" Contrate Wheel 7, which is driven by the ½" Pinion 8 secured to the belt pulley shaft. The Rod 5 is journalled through the bosses of two Face Plates 1 and 2, bolted to the upright column of the machine, and carries a 57-teeth Gear Wheel 4. The latter drives ½" Pinions 3 secured to the four countershafts 6, which carry the tools mounted in Couplings on their lower ends.

S.M. 272—Universal Joint

The Meccano Universal Coupling, or universal joint (part No. 140), is designed to connect two rotating shafts lying in different planes, or meeting at a varying angle. An example of the universal joint is found in all motor cars, where it forms a flexible connection between the propeller shaft and the engine crankshaft, thus allowing for such vertical movement of the back axle as may be set up by the roughness of the ground over which the car travels.



S.M. 271

It will be observed that the Universal Coupling consists of two forks or links pivotally attached to a central collar. This pivotal connection permits the shafts to turn freely at almost any angle to each other.

S.M. 273—Speed Indicator

An efficient instrument for measuring the speed of any rotating shaft may be constructed on the centrifugal governor principle (see S.M. 87, Section VI) by employing the movement of the governing weights to actuate a pointer moving over a graduated scale (see Model No. 439, Manual of Instructions).

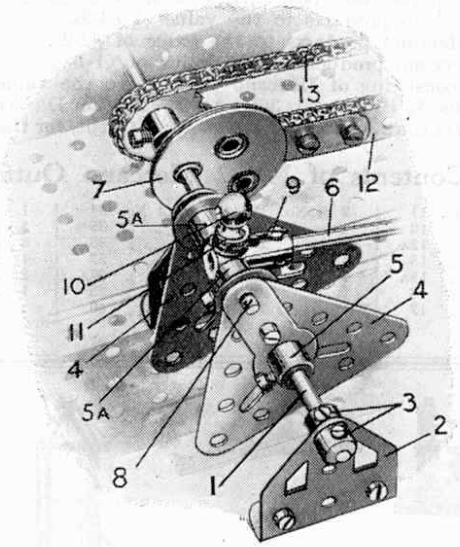
As the speed of the engine or motor increases, the weights fly out farther from the centre of rotation, and the sliding collar to which they are connected is caused to mount the vertical shaft. This collar is connected to the pointer and the movement of the latter over the dial serves to register the alteration in speed.

MECCANO
STANDARD MECHANISMS

Section XIII. Miscellaneous Appliances—(*continued*)

Below we conclude the series of articles that have appeared under the title of "Meccano Standard Mechanisms." These Meccano movements have been termed "Standard Mechanisms" for the reason that they may be adapted with advantage to numerous Meccano models—in most cases without any alteration, but in some few instances with slight alterations to the standard movement. The whole series now may be obtained in book form (Post free 1/1½d., Overseas 1/7½d.) We recommend those readers who have shown so much interest in the articles to keep a copy of the "Standard Mechanisms" Manual close at hand when model-building, for it forms a reference book that all keen Meccano boys will appreciate.

A CRANKSHAFT having a stroke of 1" is included in the Meccano system under part No. 134 (see Suggestion No. 78, page 253 of this issue), but obviously this accessory is not suitable for the larger models of reciprocating engines or similar mechanisms. It would be extremely difficult, even if desirable, to introduce a standardised unit to serve as a crankshaft in all Meccano models that require such a part. On the other hand it is quite a simple matter to build up a crankshaft to any specified design from existing parts. A typical Meccano crankshaft, complete with balanced cranks, eccentric, etc., is shown in S.M. 274, and this detail should serve to indicate the manner in which certain parts can be used to the best advantage in order to construct a strong and smoothly working model of a reciprocating engine.



S.M. 274

S.M. 274—Built-up Crankshaft

The end bearing for the crankshaft 1 is formed by a Trunnion 2, Collars 3 being secured to the shaft on either side of the bearing. Similar bearings are provided at the centre of the crankshaft and at its opposite end.

The crank arms are built up from Cranks 5 and 5a bolted to opposite sides of two 2½" Triangular Plates 4, which form a balance weight. The crank-pin 8 is secured in the bosses of the inner Cranks 5a, and carries the Coupling 9 secured to the connecting rod 6. A Handrail Support 10 screws into the Coupling 9, but is spaced by Washers 11 in order that its shank shall not grip the crank-pin. The Handrail Support is removed to admit oil through the Coupling to the crank-pin when lubricating the model.

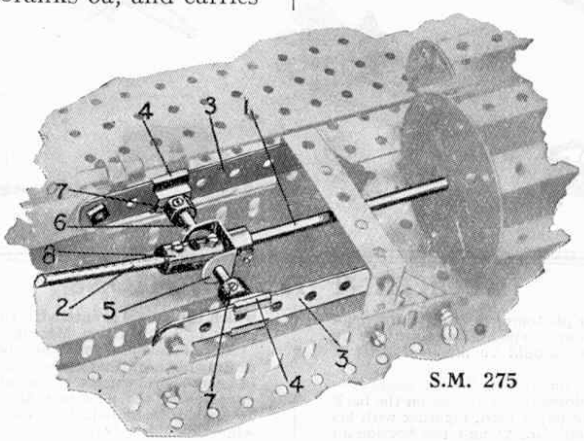
The Eccentric 7 operates the valve mechanism, its arm being extended by a Strip 12, while the Sprocket Chain 13 rotates the engine governor as can be seen on reference to Standard Mechanism 87.

S.M. 275—Crosshead

The construction of a crosshead calls for much care, for a considerable amount of friction will be set up between the various sliding surfaces unless all the elements are properly placed in their relative positions. Special attention should be paid to mounting the connecting rod in correct line with the piston.

The crosshead shown in S.M. 275 is composed of a short Rod 6 loosely mounted in Eye Pieces 4 and held in place by Collars 7. A Fork Piece 5, mounted on the end of the piston rod 1, engages the transverse Rod 6, whilst on the latter is secured a Coupling 8 carrying the connecting rod 2. Washers should be placed on either side of the Coupling 8 to retain it in the correct position in the centre of the Fork Piece.

The Eye Pieces 4 engage the slide-bars 3 (3½" Strips) mounted in position in the base of the engine. The slide-bars, piston, and connecting-rod bearings should be oiled occasionally to ensure smooth running.



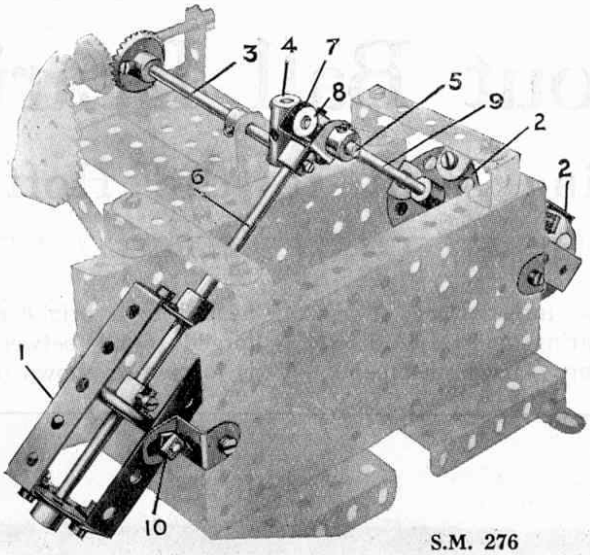
S.M. 275

S.M. 276—Oscillating Cylinders

Readers are probably aware that the oscillating-cylinder principle is applied to small steam engines, pumps, etc., to obviate the use of sliding valves. As the cylinder turns upon its pivot, it automatically uncovers first the inlet port in the steam chest and then the exhaust port. This arrangement also dispenses with connecting rods and crossheads, for the piston rod is attached direct to the crank pin. S.M. 276 shows how two oscillating cylinders may be connected to a single crank.

The cylinders 1 and 2 are pivoted at their centres by means of bolts and lock-nuts 10 (see S.M. 263) and the piston rods 6 and 9 are journalled on the crank

pin 5. The latter is secured in the end of a Coupling 4 mounted on the crankshaft 3. The piston rod 6 is pivoted to the crank pin by means of the Fork Piece 7, while the piston 9 carries a Coupling 8, through the transverse hole of which the crank pin is journalled. Washers should be placed between the Coupling 8 and the sides of the Fork Pieces.



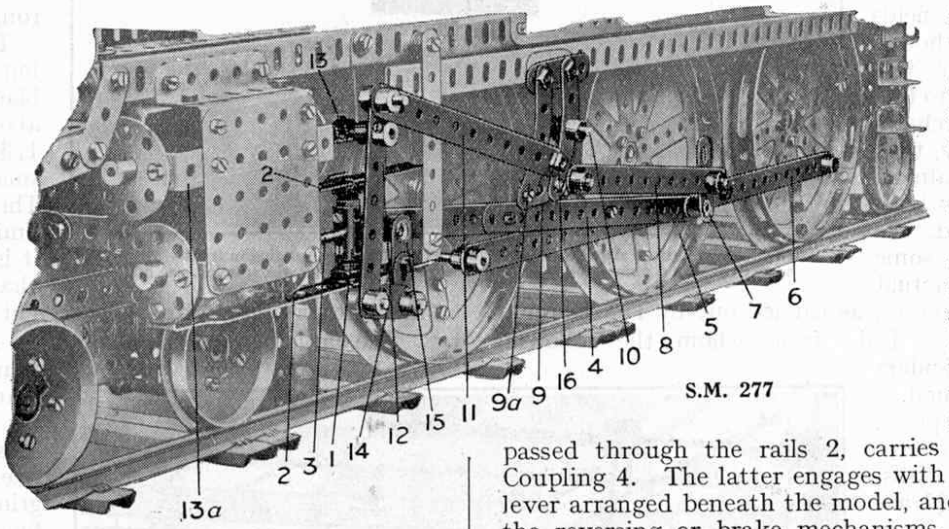
S.M. 276

S.M. 277—Walschaerts' Valve Gear

S.M. 277 illustrates an interesting model of Walschaerts' valve gear and also shows a typical Meccano connecting rod gear which is applicable to most types of locomotives.

The crosshead 1 is composed of a Coupling mounted between Eye Pieces engaging slide bars 2. A Strip Coupling mounted on the end of the piston rod 3 carries the connecting rod 4 pivoted to the crank pin in the centre driving wheel 5. The coupling rod 6 is also journalled on this crank pin and on the crank pins of the leading and trailing driving wheels, thus imparting the motion of the piston over the three wheels.

The crank pins consist of short Rods passed through the driving wheels and secured in Cranks bolted to their inner sides. A Crank 7 rigidly secured to the pin of the centre driving wheel 5 pivotally carries the return crank rod 8, and the latter is pivoted to the outer end of a short Slotted Strip forming the base of the link 9, which is constructed from 2½" Curved Strips (No. 90). The link rocks about a pivot 10 and pushes to and fro the radius rod 11, which is pivoted to the upper hole of the combining lever 12. This lever 12 is journalled on a short Rod secured in a Coupling 13 mounted on the end of the piston valve rod sliding in the valve chest 13a, and is connected pivotally to a guiding link 14. The latter is pivoted to a Crank 15 secured to a short Rod mounted in the Strip Coupling on the end of the piston rod.



S.M. 277

How a Locomotive is Reversed

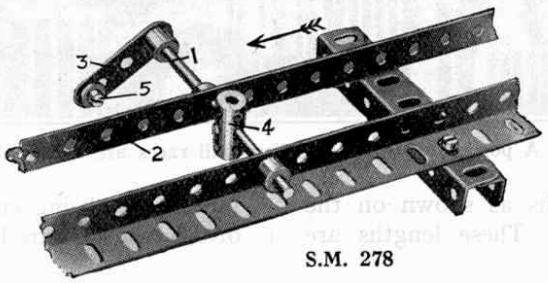
It will now be seen that as the wheel 5 rotates, the combining lever 12, operated by the radius rod 11 and guiding link 14, imparts a sliding movement to the valve rod 13. The radius rod 11 is pivoted at 16 by means of bolt and locknuts to an Eye Piece, representing the link block, sliding on the strip 9a of the link 9. The link block is connected to a lever in the cab, so that the driver may move it to any position in the link that he may desire. This connection is not shown in the illustration, but Meccano boys should find no difficulty in devising a suitable control movement.

By moving the block 16 towards the pivot 10, the throw of the radius rod 11 is diminished, until it reaches its minimum when the block 16 is at the centre of the link 9. Further movement of the block to any point above the pivot 10 reverses the direction of the valve rod 13, and consequently reverses the order in which the cylinder valves open, so causing the locomotive to run in an opposite direction. The alteration to the throw of the radius rod also enables the driver to vary the amount of steam which is supplied to the cylinder for each stroke of the piston, for the inlet valve is held open for a short or long period according to the extent of the "throw" of the radius rod. This variation of the steam supply is known as the "cut-off."

S.M. 278—Automatic Brake or Reverse Device

This simple apparatus may be employed to operate automatically a brake or reversing gear in Meccano models that are required to travel upon rails. A Rod 1, passed through the rails 2, carries a Crank 3 and Coupling 4. The latter engages with a small projecting lever arranged beneath the model, and thereby operates the reversing or brake mechanisms. The web of the Crank carries a nut, bolt and Washer 5 as additional weight.

The apparatus is designed to affect only models travelling in the direction of the arrow shown in the illustration. A model moving in the contrary direction strikes the Coupling 4 on the opposite side and the Coupling, falling into a horizontal position, allows the model to pass unaffected and is then returned to its former position by the weighted Crank 3. If a lever of this type is mounted at either end of a single length of track, a Meccano model or Hornby Loco may be allowed to travel to and fro without outside supervision or aid, or fear of its overreaching the ends of the track. The Cranks, or balance arms of the two levers should be set in opposite positions, of course.



S.M. 278

We hope to describe in a future issue an entirely revised model of the Meccano Chassis.