



### (126)—Meccano Demonstration Model of Corliss' Valve Gear

ON this page we illustrate a Meccano model of the Corliss valve gear, a type that is used on mill engines and other slow speed engines. It is an extremely interesting model and demonstrates faithfully all the characteristic movements of its prototype.

In the Corliss gear, unlike most others, there is a separate exhaust and inlet valve for each end of the cylinder. There are thus four valves in all. They are given an oscillatory movement by means of a "wrist plate" that is actuated by an eccentric mounted on the crankshaft. Means are adopted to vary automatically the cut off by a centrifugal governor as the speed alters.

The "wrist plate" 2, which consists of a Bush Wheel, is free to turn about a Pivot Bolt that is secured to the  $5\frac{1}{2} \times 3\frac{1}{2}$  Flat Plate forming one side of the cylinder block. The links connecting the four valves 7, 7a, 11, and 11a, consist of  $2\frac{1}{2}$  Strips that are attached pivotally to the wrist plate by  $\frac{3}{8}$  Bolts. The latter serve also to secure in place a  $2\frac{1}{2}$  Strip 14, a nut being placed on each side of the Bush Wheel to hold the  $\frac{3}{8}$  Bolts firmly in position. Care should be taken that all four Strips turn freely on their Bolts, and a Washer should be placed on each Bolt between the pair of  $2\frac{1}{2}$  Strips.

The Eccentric 1 is secured on a  $4\frac{1}{2}$  Rod journalled in  $2\frac{1}{2}$  Triangular Plates and is connected to the wrist plate 2 by a  $5\frac{1}{2}$  Strip. This Strip is attached pivotally to the end of the Strip 14 by a Pivot Bolt, a Collar being placed on the latter for spacing purposes. The two exhaust valve cranks 11 and 11a are attached pivotally to their respective links by lock-nutted bolts (see Standard Mechanism No. 263). The Cranks are mounted on the ends of 3" Rods that are journalled in the side plates, Collars holding the Rods in place.

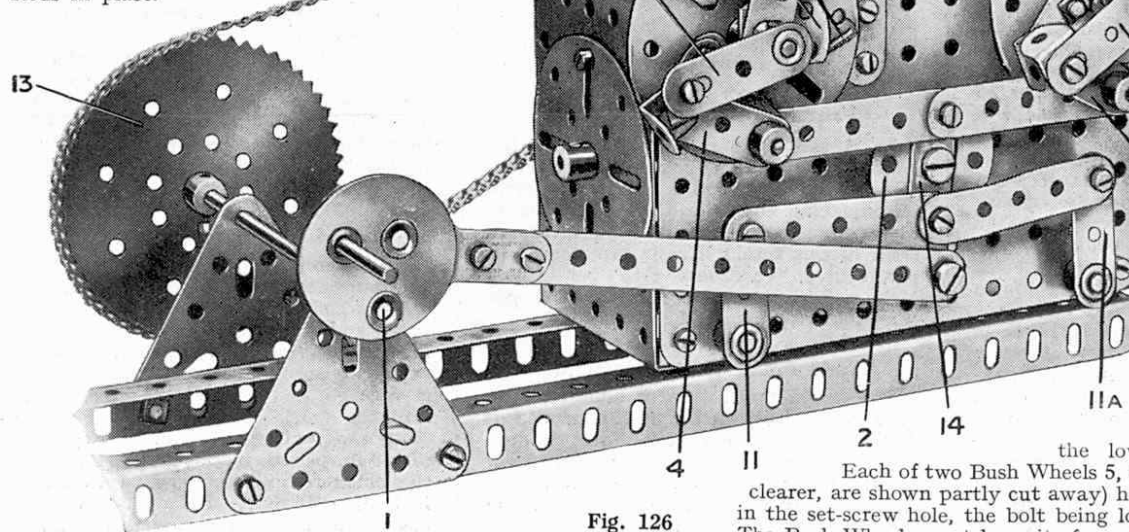


Fig. 126

These Rods are intended to represent the rotary valves of the Corliss type, which, when rocked by the wrist plate, alternately open the ends of the cylinder to exhaust.

The steam valves on the end of the spindles on which the Cranks 7, 7a are secured, have to be operated by a slightly more complicated mechanism than the exhaust valves, for it is necessary

that the time during which the steam is entering the cylinder for any one stroke of the piston must be capable of modification by the governor. To this end the steam valve Cranks 7 and 7a are each operated by a trip mechanism, which trips the cranks earlier as the speed of the engine increases, so diminishing the amount of steam admitted. This is known as the "cut off."

The Face Plates 3 and 3a are mounted loosely on  $4\frac{1}{2}$  Rods journalled in the side plates of the cylinder. The  $4\frac{1}{2}$  Rods represent the steam valve

spindles. Each trip 4 and 4a consists of two  $1\frac{1}{2}$  Strips and a Flat Bracket bolted together in the form of a triangle, the apex of which is pivoted on a Threaded Pin secured to the Face Plate 3 or 3a. In the construction of each of the trips 4 and 4a the set-screws extracted from Bush Wheels, etc.,

are used instead of ordinary bolts, which are too long for the purpose. A  $\frac{1}{2} \times \frac{1}{2}$  Angle Bracket is bolted to each trip by its slotted hole as indicated in the illustration. Before placing the trips on the Threaded Pins the connecting links from the wrist plate should be mounted on the Pins. Here it should be noted that the connecting links for the exhaust Cranks are slightly bent to form an efficient connection. This is the case also with the connecting link to the Face Plate 3a, which has to be bent towards the Face Plate to clear the lower edge of the trip 4a.

Each of two Bush Wheels 5, 5a (which, to make matters clearer, are shown partly cut away) has an ordinary bolt inserted in the set-screw hole, the bolt being locked in position by a nut. The Bush Wheels must be quite free on the valve spindles. A 2" Strip is now bolted to each Bush Wheel, so that the bolt on the boss of the Bush Wheel 5 is pointing—to use a clock face as a comparison—to 5 o'clock while the bolt 6 on the boss of the Bush Wheel 5a points to 10 o'clock. Two Washers are placed on each valve spindle and lastly, the two Cranks 7 and 7a are secured in place. A  $\frac{1}{2} \times \frac{1}{2}$  Angle Bracket is bolted in the end hole of

each Crank as shown. Short lengths of Spring Cord 18 are secured to the trips 4 and 4a and to the Face Plates 3 and 3a, so that the trips normally are held against the bosses of the Bush Wheels 5 and 5a.

The 5" Rod carrying the governor is journaled in a  $2\frac{1}{2}$ " Strip and in a hole of the  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate forming the top of the cylinder. A Collar and three Washers on the lower end of the 5" Rod take the downward thrust of the governor. The links 12 ( $1\frac{1}{2}$ " Strips) are attached pivotally at their top ends to Double Brackets bolted to the Bush Wheel 15 and at their lower extremities to the 2" Pulleys 10. The Pulleys 10 are secured rigidly to each other by  $\frac{1}{2}$ " Bolts, a Collar and Washer on each bolt spacing the Pulleys a short distance apart. The Pulleys 10 must slide quite freely on the 5" Rod. The drive for the governor is taken off the 3" Sprocket Wheel 13 to a 1" Sprocket on a short Rod that is journaled in a Double Bent Strip bolted to an upright Strip at the rear of the model. The short Rod carries a  $1\frac{1}{2}$ " Contrate 17 that meshes with a  $\frac{1}{2}$ " Pinion on the 5" Rod.

The Simple Bell Crank 9 is bolted to a Crank that, in turn, is secured to the 3" Rod carrying the Bush Wheel 8. One arm of the Bell Crank 9 is extended by a 2" Strip that has a Threaded Pin bolted to it, so that the Pin rests in the space between the two 2" Pulleys 10.

Two Collars (new style) are attached in diametrically opposite holes in the Bush Wheel 8 by ordinary bolts, nuts being locked against the Collars to prevent the bolts working loose. The  $1\frac{1}{2}$ " Rod 16 is attached to the 2" Strip on the Bush Wheel 4 by means of an End Bearing, and the 2" Rod 16a is attached to the 2" Strip on the Bush Wheel 4a in a similar way.

In the illustration the Crank 7a is about to be lifted by the Angle Bracket on the trip 4a engaging with that on the Crank as the trip rises. As the trip moves, it rides up the bolt 6, which thrusts it outward to the left. Presently the Crank 7a is released and flies back under the action of a piece of Spring Cord attached to a Crank secured to the valve spindle at the rear of the model. This Crank normally is held by the tension of the Spring Cord against a stop consisting of a Threaded Pin so that directly the Crank 7a is released by the trip, it flies back on to the stop. (The Crank 7 is controlled in a similar manner).

It is now the turn of the left hand valve to come into operation. In this case the Crank 7 is drawn downward by the trip 4 instead of upward as in the case of the right hand valve. It is evident that as the two steam valves open alternately, the exhaust valves must do the same, so that when the left hand valve is open to steam the right hand exhaust valve is open, and vice versa.

As the governor weights fly out with increase of engine speed the Pulleys 10 rise and pull up the arm of the Bell Crank 9, so partially rotating the Bush Wheel 8. This in turn alters the position of the Bush Wheels 5 and 5a, so that the trips ride up their respective Bolts and trip the Cranks 7 and 7a earlier in the stroke and cause the engine to work with a shorter cut off.

By altering the position of the Rods 16 and 16a in their respective Collars both valves may be arranged to lift an equal amount by their trips. The Angle Brackets on the trips and Cranks 7 and 7a must be adjusted very carefully.

## (127)—Meccano Recording Calipers

(T. J. Hobbs, Birmingham)

Meccano measuring instruments are very popular with many "M.M." readers, for quite accurate measurements may be made with their aid. The Meccano spherometer described in the "Suggestions Section" of the May "M.M." is a good example of this kind of model and this month we are able to give particulars of another instrument of a similar kind.

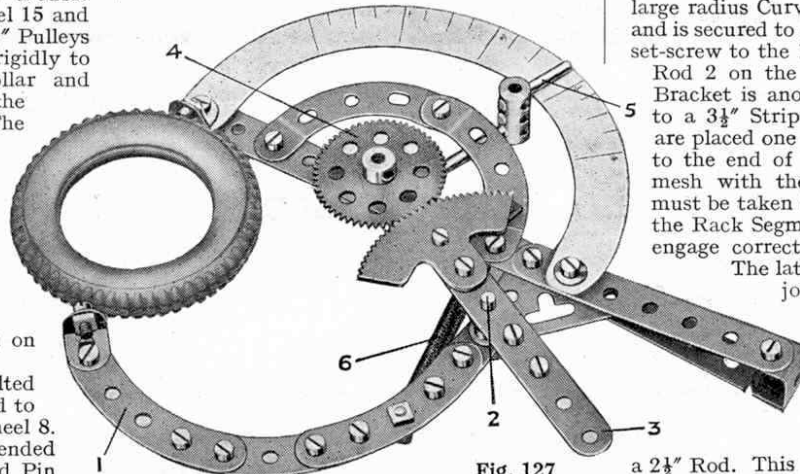


Fig. 127

The Meccano recording calipers are designed for measuring the outside diameter of objects. The size of the object is shown directly on a scale instead of having to refer to a rule, as is the case with calipers of the usual type.

The portion of the model to which the cardboard scale is attached consists of a  $5\frac{1}{2}$ " Strip to which two  $3\frac{1}{2}$ " Strips are bolted

to form a convenient handle. The  $3\frac{1}{2}$ " Strips are bolted one on each side of the  $5\frac{1}{2}$ " Strip, their free ends being bent apart slightly to enable a Double Bracket to be inserted between their ends. A Corner Bracket, in which the 1" Rod 2 is journaled, is secured also by the Bolts that fix the handle to the  $5\frac{1}{2}$ " Strip.

The moving arm consists of three  $2\frac{1}{2}$ " large radius Curved Strips bolted together, and is secured to a Crank that is fixed by its set-screw to the 1" Rod 2. Secured to the Rod 2 on the other side of the Corner Bracket is another Crank that is bolted to a  $3\frac{1}{2}$ " Strip 3. Two Rack Segments are placed one upon the other and bolted to the end of the Strip 3. Their teeth mesh with the 57-teeth Gear 4. Care must be taken to ensure that the teeth of the Rack Segments coincide so that they engage correctly with the Gear Wheel.

The latter is fastened on a 1" Rod journaled in a Double Arm Crank that is bolted to the  $5\frac{1}{2}$ " Strip.

On the lower end of the Rod carrying the Gear 4 a Coupling is secured and in its longitudinal bore is gripped a  $2\frac{1}{2}$ " Rod. This Rod forms the longer portion of the pointer 5.

The pointer 5 is returned to normal by means of a Spring 6, which is attached to both the moving and fixed arms by  $\frac{3}{8}$ " Bolts.

The parts used in this model are:—

1 of No. 2	22 of No. 37	2 of No. 63
3 " " 3	4 " " 37A	3 " " 90
2 " " 12	1 " " 38	2 " " 90A
1 " " 17	1 " " 43	3 " " 111C
3 " " 18B	2 " " 62	2 " " 129
1 " " 27A	1 " " 62B	1 " " 133

## (128)—Meccano Boat Steering Gear

(J. K. Robinson, Manchester)

The device shown in Fig. 128 will doubtless be welcomed by model boat enthusiasts. It may be used in numerous Meccano models of ships—in some cases, of course, with slight alterations to its layout.

The  $5\frac{1}{2}$ " Strip that represents the tiller is bolted to a Bush Wheel that in turn is secured to the end of a short Rod. This Rod is journaled in a footstep bearing

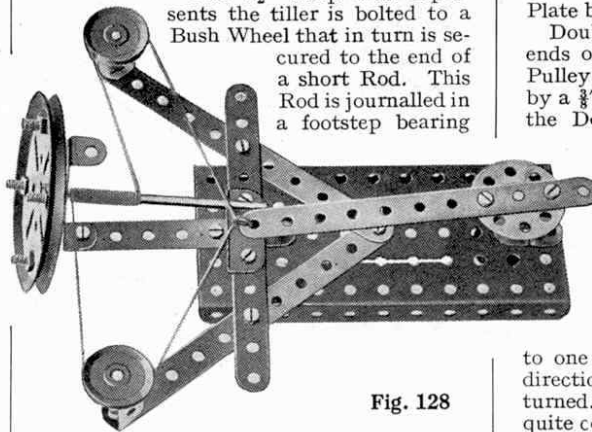


Fig. 128

consisting of a  $\frac{1}{2}$ " Reversed Angle Bracket bolted to the  $5\frac{1}{2}$ " x  $2\frac{1}{2}$ " Flanged Plate.

At the opposite end of the Plate a  $2\frac{1}{2}$ " x  $\frac{1}{2}$ " Double Angle Strip is bolted in a vertical position to a  $3\frac{1}{2}$ " Strip that in turn, is secured to the Flanged Plate. The Double Angle Strip forms a bearing for one end of the  $3\frac{1}{2}$ " Rod on which is mounted the 3" Pulley representing the steering wheel.

The other end of the  $3\frac{1}{2}$ " Rod is journaled in a Trunnion secured to the Plate. Two  $5\frac{1}{2}$ " Strips are bolted together in the sixth hole from the tiller end of the Flanged Plate, and are braced apart by a further  $5\frac{1}{2}$ " Strip. This last Strip is secured to the Flanged Plate by the bolts that retain the Trunnion.

Double Brackets are fixed to the outer ends of the two  $5\frac{1}{2}$ " Strips, and a 1" fast Pulley is mounted on each Double Bracket by a  $\frac{3}{8}$ " Bolt. The latter is passed through the Double Bracket and secured in the boss of the Pulley by the set-screw. A length of cord is taken round the  $4\frac{1}{2}$ " Rod several times, and each end is then passed over the 1" fast Pulleys and secured to the tiller.

It will now be seen that as the Rod carrying the steering wheel is rotated, one end of the cord is paid out while the other is wound on to the Rod. Hence the tiller is pulled to one side or the other according to the direction in which the steering wheel is turned. The steering wheel may be placed quite conveniently on the bridge of a model ship and the cords taken to the tiller through suitable guides fixed to the deck or inside the hull.

The parts required to build the mechanism as illustrated are as follows:—

4 of No. 2	1 of No. 19B	1 of No. 48A
1 " " 3	3 " " 22	1 " " 52
2 " " 11	1 " " 24	6 " " 111C
1 " " 12	14 " " 37	1 " " 126
1 " " 16	4 " " 37A	
1 " " 18A	1 " " 40	