

A Meccano Demonstration of Hunting Gear

As Applied to Power-Steering of Ships

By H. F. Lane

Mr. Lane's second article deals with a very ingenious device known as "hunting gear," and describes a simple Meccano model that demonstrates the operation of this essential adjunct to the power-operated steering gear of ships. Last month our contributor, who is an authority on nautical subjects, described a helm indicator constructed principally from Meccano parts that has been in use on a certain steamship for some years, and future articles that we anticipate publishing from his pen will deal with emergency steering gear and the Flettner Rudder.

FOR many years past, ships have been of a tonnage, power, and speed that rendered hand-steering no longer feasible. In even a comparatively small vessel nowadays the weight of the rudder may be as much as ten tons, and when "hard over" (35 degrees of helm) this may be required to exert a pressure on the water of anything between one hundred and two hundred tons. It is stipulated by Board of Trade regulations that all merchant ships must be fitted with some means of operating the rudder by hand as an alternative system of control in the event of failure of the power, or other emergency, but the reduction gear that must be used in such a system to overcome the enormous forces involved renders the movement of the rudder so sluggish that, save under the most favourable conditions of wind and sea, the ship becomes very nearly unmanageable.

In vessels of 100 tons and upwards, therefore, some type of power unit controls the movement of the rudder, and in all types of power steering gear a special apparatus must be provided that will cause the rudder to respond to the smallest movements of the steering wheel. The rudder must move only when the quartermaster moves the wheel on the bridge, and must come to rest at whatever position is indicated by the wheel when the rotation of the latter ceases. Moreover, it must remain stationary in that position until the quartermaster again moves the wheel—either to return the rudder to the 'midships' position, or to increase the existing angle of helm.

Operation of the Model

The device that fulfils all these requirements is known as "hunting gear," and the operation of this ingenious mechanism should be clearly understood on examination of the Meccano demonstration model illustrated herewith. The Perforated Plate on which the model is mounted represents the exterior of the power unit controlling the rudder.

In actual practice a shaft corresponding to the Rod 1 in the photograph is coupled through suitable bevel gears and universal joints to the steering wheel on the bridge. The helmsman, by moving his wheel, let us say, to the left, communicates a turning movement in a clockwise direction to a Bevel Wheel 2 and, via the second Bevel 3 and Pinions 4 and 5 rotates the Threaded Rod 6.

It will be seen from the illustration that the Threaded Coupling 7, the longitudinal bore of which engages the threads of the Rod 6, is held against longitudinal travel; therefore the Threaded Rod, in turning, descends in the Coupling, carrying

with it the Collar 8. The latter is spaced by five Washers in the centre of a Fork-Piece 9, which carries a $1\frac{1}{2}$ " Rod engaging the end elongated hole of a Crank 10; hence the descent of the Rod 6 lowers this Crank and imparts a slight rotary movement to the shaft to which it is secured. This shaft operates the valves (or switches, if electrically driven) of the power unit controlling the rudder, and accordingly the rudder commences to move.

Let us suppose the original position of the steering wheel to have been "midships" (with rudder central), and the helmsman to have given the wheel one complete turn to the left, which, in universal practice, requires the helm to come to a position ten degrees to starboard of the fore and aft line of the ship. This will cause one complete revolution of the

Threaded Rod, and the Collar 8 will fall a distance equal to the pitch of the Threaded Rod, thereby setting the power unit in motion and commencing to move the rudder.

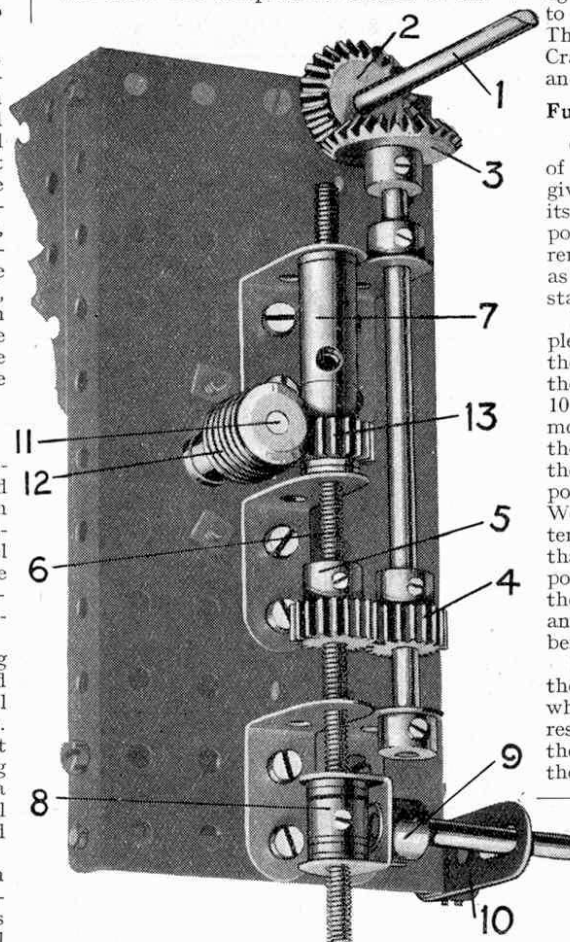
But the motion of the power unit, in addition to operating the rudder, is arranged to revolve also the shaft 11 (in this instance in an anti-clockwise direction seen from the fore side, as in the illustration), and this in turn rotates the Pinion 13 by means of the Worm 12. The Pinion has been soldered to the Coupling 7, so that the two parts revolve as one unit,* and as the Threaded Rod is no longer rotating, assuming the helmsman to be holding his wheel steady at one turn to the left, the revolution of the Coupling 7 causes the Threaded Rod to start to rise again. When the Coupling has rotated to an extent equal to that which the Threaded Rod turned originally, the Crank 10 is again in the horizontal position and power is cut off.

Functions of Hunting Gear

Consequently, one complete revolution of the steering wheel to the left from any given position will cause the helm to set itself ten degrees to starboard of the position that it originally occupied, and remain stationary at this new angle for as long as the steering wheel itself remains stationary.

Let the helmsman now make one complete turn to the right, which will return the wheel to 'midships.' In this case, the Threaded Rod 6, and with it the Crank 10, will rise, causing the power unit to move in a direction opposite to that in the previous instance, thereby starting the rudder moving back to the central position. But, at the same time, the Worm 12 will have a clockwise rotation, tending to lower the Threaded Rod, so that just as the rudder reaches the central position the Crank 10 will have returned to the horizontal, the power will be shut off, and the rudder will remain stationary as before until the wheel is again moved.

It should be sufficiently obvious from the above that rotation of the steering wheel in either direction immediately results in a corresponding movement of the ship's rudder, and that the latter, after the movement of the steering wheel



Hunting Gear illustrated in a practical manner with Meccano

*We mentioned in the October "In Reply" page that we hope to introduce in the near future a Meccano Sleeve Coupling. This part, when ready, will serve admirably as a means of rigidly connecting together the Coupling and Pinion. Meanwhile, readers who prefer this method of connection to the soldering process may easily manufacture a part to serve the purpose from a $\frac{1}{2}$ " length of metal piping. This should have an internal diameter of $\frac{3}{8}$ ", and must be drilled to receive the two set-screws.