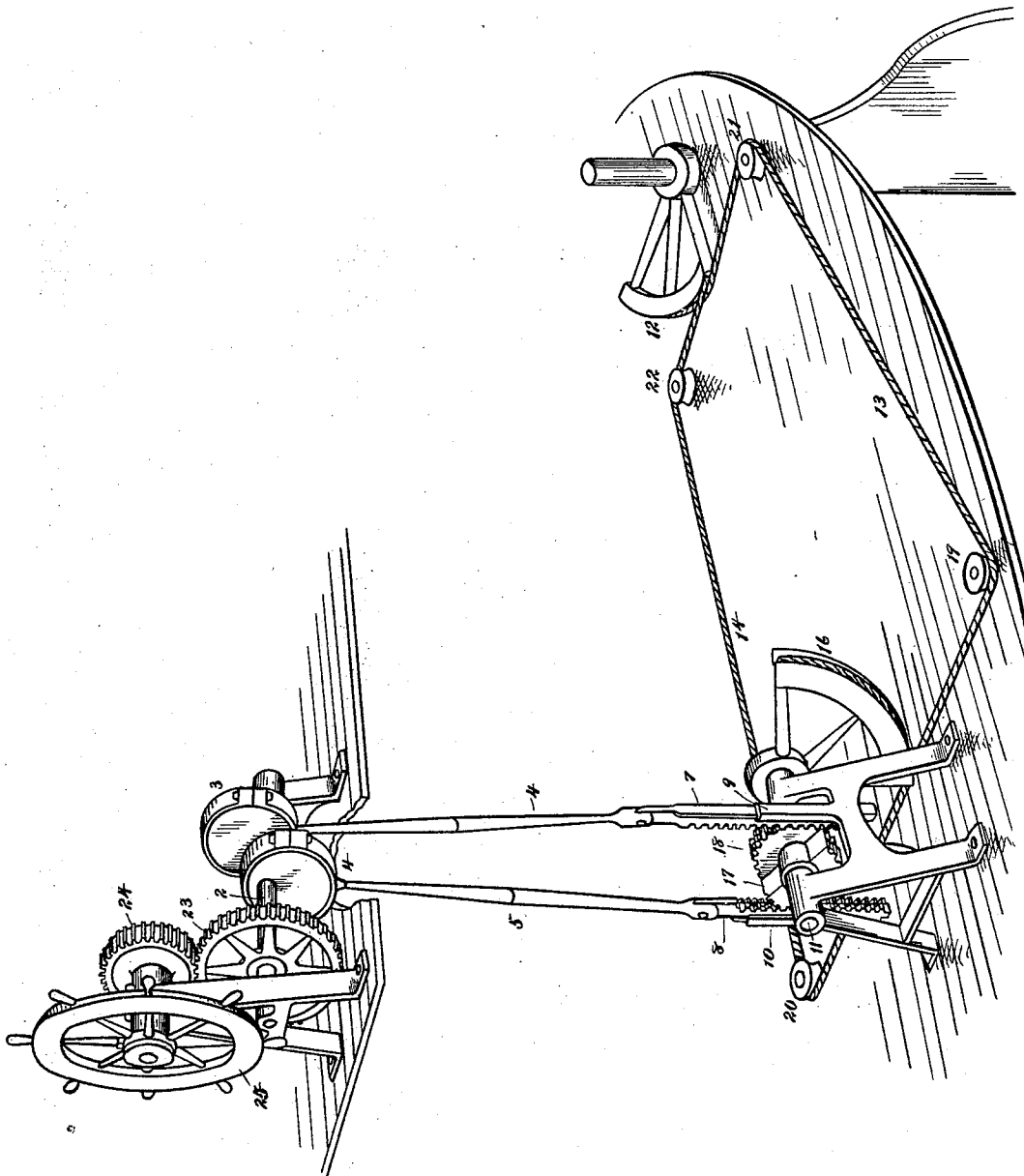


(No Model.)

J. E. ALLEN.
STEERING GEAR.

No. 530,154.

Patented Dec. 4, 1894.



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN E. ALLEN, OF DETROIT, MICHIGAN.

STEERING-GEAR.

SPECIFICATION forming part of Letters Patent No. 530,154, dated December 4, 1894.

Application filed March 22, 1894. Serial No. 504,605. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. ALLEN, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Steering-Gear; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawing, which forms a part of this specification.

This invention relates to steering gear, and has for its object an improvement in the connections interposed between the steering wheel and the rudder, by means of which the rotation of the steering wheel can readily turn the rudder on its axis, and by means of which, also, the rudder can be more securely held in a position of resistance to the action of the water than heretofore.

When the rudder is amidships, projecting nearly straight astern, it requires no force, or almost no force, to hold it in position, and, when in this position, it effects little or no result on the motion of the ship; but, whenever it is desired to turn the ship, the rudder is turned over to one side or the other, and must be held there with considerable force. The farther the rudder is turned over, the more force must be exerted in order to hold it in place. In the system of connection devised by me, I so arrange the leverage that the power of the steersman is exerted to greater advantage upon the rudder in proportion as the rudder reaches the position shown as "clear over," and such that, when the rudder is clear over, the power of the steersman is exerted so efficiently that it may be considered as greatly larger than the resistance. I effect this result by means of the mechanism shown in the drawing, in which—

The drawing illustrates the steering mechanism, showing it somewhat as it would appear if detached from the ship with which it is connected, but arranged in a position similar to that which it would occupy in the ship.

On the main deck of the vessel is mounted an axle 11, to which are secured two or more pinions 17 and 18. These pinions are shown in the drawing as mutilated wheels, each one

being a half wheel,—that much of the wheel being all that will commonly be used in a steering gear. Each one of these half wheels is preferably geared with two rows of teeth of the same pitch, but alternating with each other. On the end of the axle is a quadrant 16, to which are secured the two leading lines 13 and 14, one being secured to one end of the quadrant 16, and the other being secured to the other end of the quadrant 16, and arranged to lead in opposite directions and around shifting blocks 19 and 20, and shifting blocks 21 and 22, to a second quadrant 12, which forms the tiller of the rudder. The lines 13 and 14 are secured to the quadrant 12 in the same way that they are secured to the quadrant 16, and the swinging of either quadrant is accompanied by corresponding movement of the other quadrant.

7 and 8 indicate two racks, one of which, 7, engages with the half wheel 18, and the other of which, 8, engages with the half wheel, 17, on the axle 11. The rack 7 is held in engagement with the wheel 18, and is guided by a guard or cover 9, which is secured to the frame-work that supports the axle 11, and forces the rack 7 to reciprocate when it is actuated by the steering wheel in a vertical line, and constantly in engagement with the gear wheel 18. The corresponding covering guide 10 guides the rack 8 in a precisely similar manner. To the upper end of the rack 7 is pinned a pitman 4, the upper end of which is connected by a strap to an eccentric wheel 3. The rack 8 is pinned to a pitman 5, the upper end of which is connected by a strap to the eccentric wheel 4. The two eccentrics 3 and 4 are mounted on an axle 2, and are set at an angle of one hundred and eighty degrees to each other. On the axle 2 is mounted a gear wheel 23, which may be toothed entirely around it, or only about half way around it, as only about one-half of it will ever come into engagement with the pinion 24 on the axle of the steering wheel 25. The steering wheel 25 and its axle are mounted on the upper deck. When now the rudder is amidships, the two eccentrics are so constructed that the two pitmen 4 and 5 are separated, at their upper ends, as far as possible. When in this position, the result of the back action

of the rudder upon them is the greatest, because when so situated, the leverage of each pitman on the axle 2 is greater than at any other point at which it can be located; but, when in this position, the back action of the water which must be resisted, is the least possible, and, consequently, this location is the most advantageous for use. If now the rudder be shifted, either to the right or left, by the turning of the steering wheel 25 or the mechanism between it and the rudder, the eccentrics change their position, and the leverage of the pitmen, acting upon the axle 2, is shortened, so that the back action of the rudder on the axle works at a less advantage than in the first position; and, when the rudder has been shifted so that it is clear over, the leverage of the pitman 5, acting through the eccentric 4 on the axle, is reduced to a minimum, as the pitman and axle have now reached the point known as the dead center point, *i. e.*, the point at which the line of stress through the pitman on the axle 2 is in a straight line, or almost a straight line. At the same time, the eccentric 3 has taken a position such that the center of the eccentric is vertically nearly above the center of the axle 2, and this also is nearly on the "center." If the rudder be shifted correspondingly to the opposite side, the relative positions of the two eccentrics will be the same, except that now the eccentric 4 will lie with its center above the axle 2, and the eccentric 3 will lie with its center below the axle 2; but the efficiency of the back action of the rudder to act upon the axle 2 will be neutralized in the same way. When in this position, it requires very little power to hold the rudder in position, the only power necessary being sufficient to keep the wheels steady so that they will not jar or rotate out of the position into which they have been forced, and, as they approach this position, the power necessary to be applied at the steering wheel in order to bring the rudder clear over, decreases.

By the use of the small pinion 24, and a comparatively large pinion 23, any desired

amount of increase of power on the axle 2 can be attained, and it is desirable that the pinion 24 shall be considerably smaller than the pinion 23, not only to provide for an increase of power, but also to provide at the same time for a decrease in the speed with which the axle 2 is turned as it is not always desirable that the shifting of the rudder be accomplished as quickly as a man can turn the steering wheel, particularly as, with the systems of steering gear now in use, the helmsmen have become accustomed to the rapid turning of the steering gear, producing a comparatively slow effect on the rudder.

What I claim is—

1. In a steering gear, the combination of an axle and means for turning the axle, a pair of eccentrics, set with their centers to form an angle with the axis of the axle upon which they are set, racks actuated by the eccentrics, and pinions actuated by the racks, and means for transmitting the motion of the rack actuated pinions to the rudder post, substantially as described.

2. In a steering gear, in combination with an axle and means for actuating the same, a rudder and its tiller, a pitman connected eccentrically to the axle, a rack upon said pitman, and a pinion actuated thereby, and means for transmitting the motion of the pinion to the rudder post, substantially as described.

3. In a steering gear, the combination of a rudder post, tiller, leading lines, horizontal axle, quadrant to which the leading lines are attached, gear wheels on the horizontal axle, racks engaging the gear wheels, a second horizontal axle, and means for actuating it, eccentrics on said second horizontal axle connected with and adapted to actuate said racks, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

JOHN E. ALLEN.

Witnesses:

D. W. BRADFORD,
FRANCES CLOUGH.