

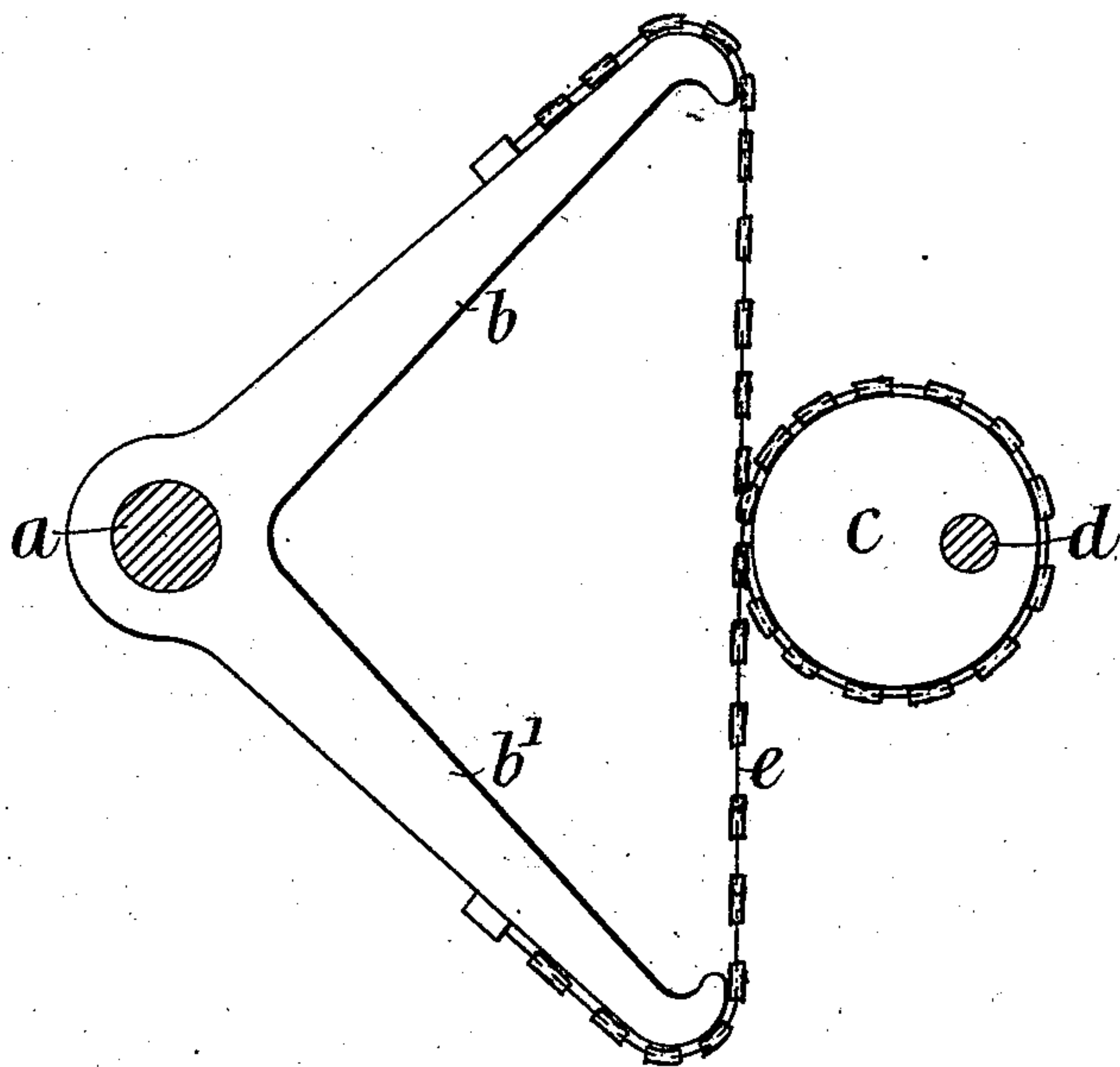
(No Model.)

W. H. HARFIELD.  
STEERING GEAR FOR SHIPS.

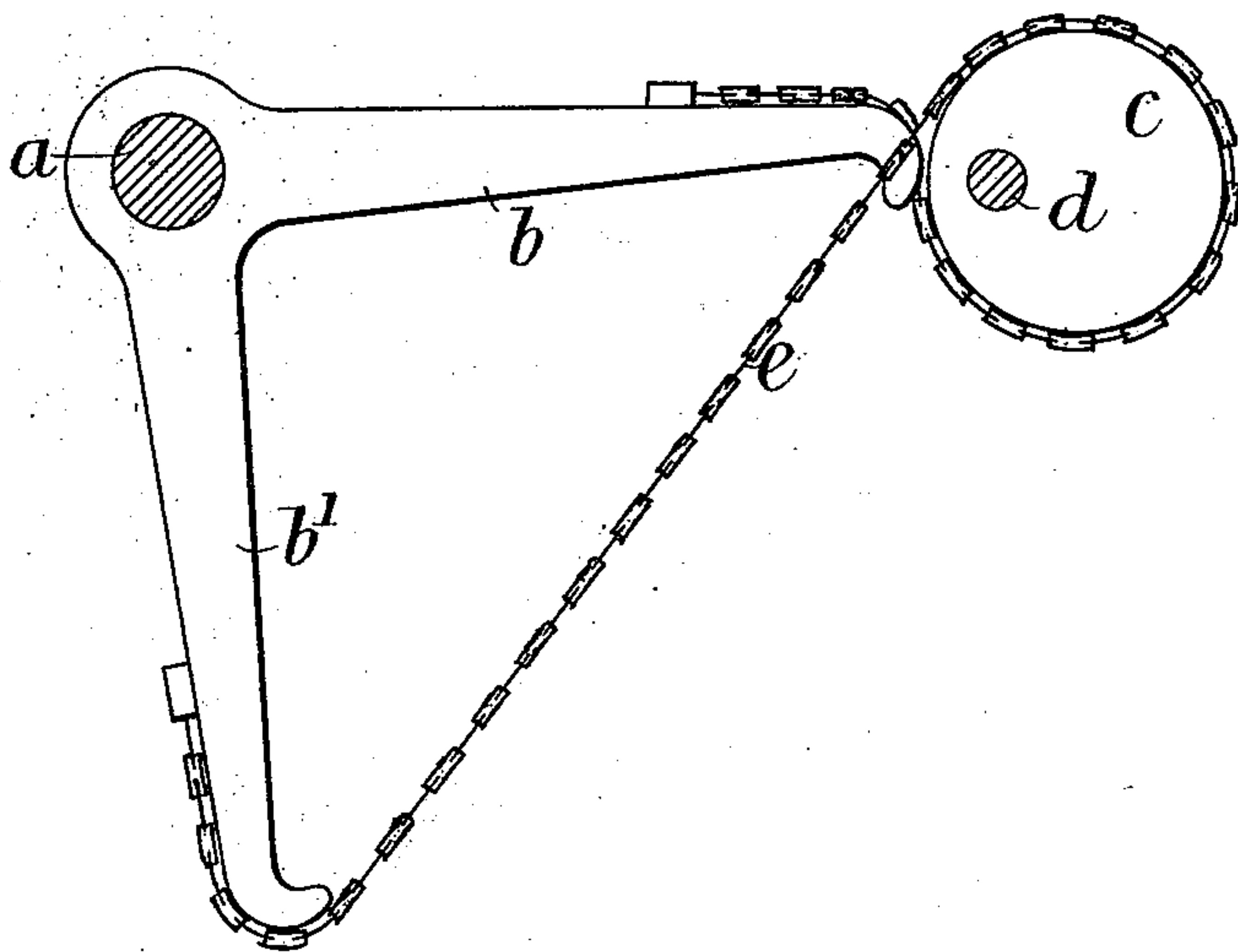
No. 550,001.

Patented Nov. 19, 1895.

*Fig. 1.*



*Fig. 2.*



*Witnesses.*

*J. D. Kingsbury.*

*G. A. Fahrenschmidt.*

*Inventor.*

*By William H. Harfield*

*Whitaker & Treworth. Atty.*

# UNITED STATES PATENT OFFICE.

WILLIAM HORATIO HARFIELD, OF LONDON, ENGLAND.

## STEERING-GEAR FOR SHIPS.

SPECIFICATION forming part of Letters Patent No. 550,001, dated November 19, 1895.

Application filed July 13, 1895. Serial No. 555,836. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HORATIO HARFIELD, a subject of the Queen of Great Britain, residing at London, England, have invented new and useful Improvements in Steering-Gear for Ships and Boats, of which the following is a specification.

This invention relates to further improvements in steering-gear for ships and boats of the kind described in the specification of my former patent, No. 428,249, dated May 20, 1890—that is to say, wherein the available operating-power is proportioned or distributed according to the work to be done or the resistance to be overcome.

Steering-gear constructed according to my former patent has given excellent results in practice; but in some cases gear which can be produced at less cost is required, and the object of my present improvements is to meet this requirement. For this purpose, instead of employing, as in my former patent, a toothed rack formed or curved to gear with the teeth of an eccentric or cam-shaped pinion, I employ a chain which is passed around an eccentric chain-wheel, the ends of the chain being connected, respectively, to the outer ends of arms on the rudder-post. The eccentric chain-wheel is carried on a spindle, and, like the eccentric or cam-shaped pinion described in the specification of my former patent, is so placed that when the tiller is amidships the side of the eccentric chain-wheel of the longer or larger radius pulls upon the chain, and when the tiller is being moved “to port” or to “starboard” the farther it is moved over to port or to starboard the shorter the radius of pull on the chain becomes, thereby obtaining similar results to those obtained by the use of my said former patent. It is essential that the chain-wheel should be so shaped that the chain is always taut in all positions.

In order to enable my invention to be fully understood, I will describe the same by reference to the accompanying drawings, in which—

Figure 1 is a plan of the steering-gear with the tiller in the amidship position, and Fig. 2 is a plan with the tiller “hard over.”

*a* indicates the rudder-post and *b b'* the tiller-arms fixed thereon.

*c* is the eccentric chain-wheel fixed upon the shaft *d*.

*e* is the chain which is passed around the eccentric chain-wheel *c*, and the ends of the chain being crossed are connected, respectively, to the tiller-arms *b b'*. By this arrangement it will be seen that when the tiller is amidships, as shown in Fig. 1, the side of the eccentric chain-wheel having the maximum radius will pull upon the chain, and when the tiller is being moved to the hard-over position, (shown in Fig. 2,) and whether to port or to starboard, the farther it is moved the shorter becomes the radius of the eccentric acting on the chain, thereby obtaining similar results to those obtained by the gear constructed according to my said former patent—viz., relatively-quick motion with small power when little work has to be done, as when the rudder is about in the mid position, as shown in Fig. 1, and slow motion with greater power when the resistance has increased, as when the rudder and tiller are in the hard-over position, as in Fig. 2.

In the drawings I have shown my eccentric chain-wheel as being circular in form. In practice, however, it has to be made slightly elliptical, in order that the chain shall be kept taut in all positions.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

Steering gear for ships or boats consisting of a tiller fixed to the rudder head, a chain wheel set eccentrically upon a driving shaft and a chain passing around the eccentric, the ends of the chain being connected respectively to arms on the tiller in the manner and for the purpose substantially as described.

WILLIAM HORATIO HARFIELD.

Witnesses:

ROBT. H. EAMES,  
E. CHURCHER.