

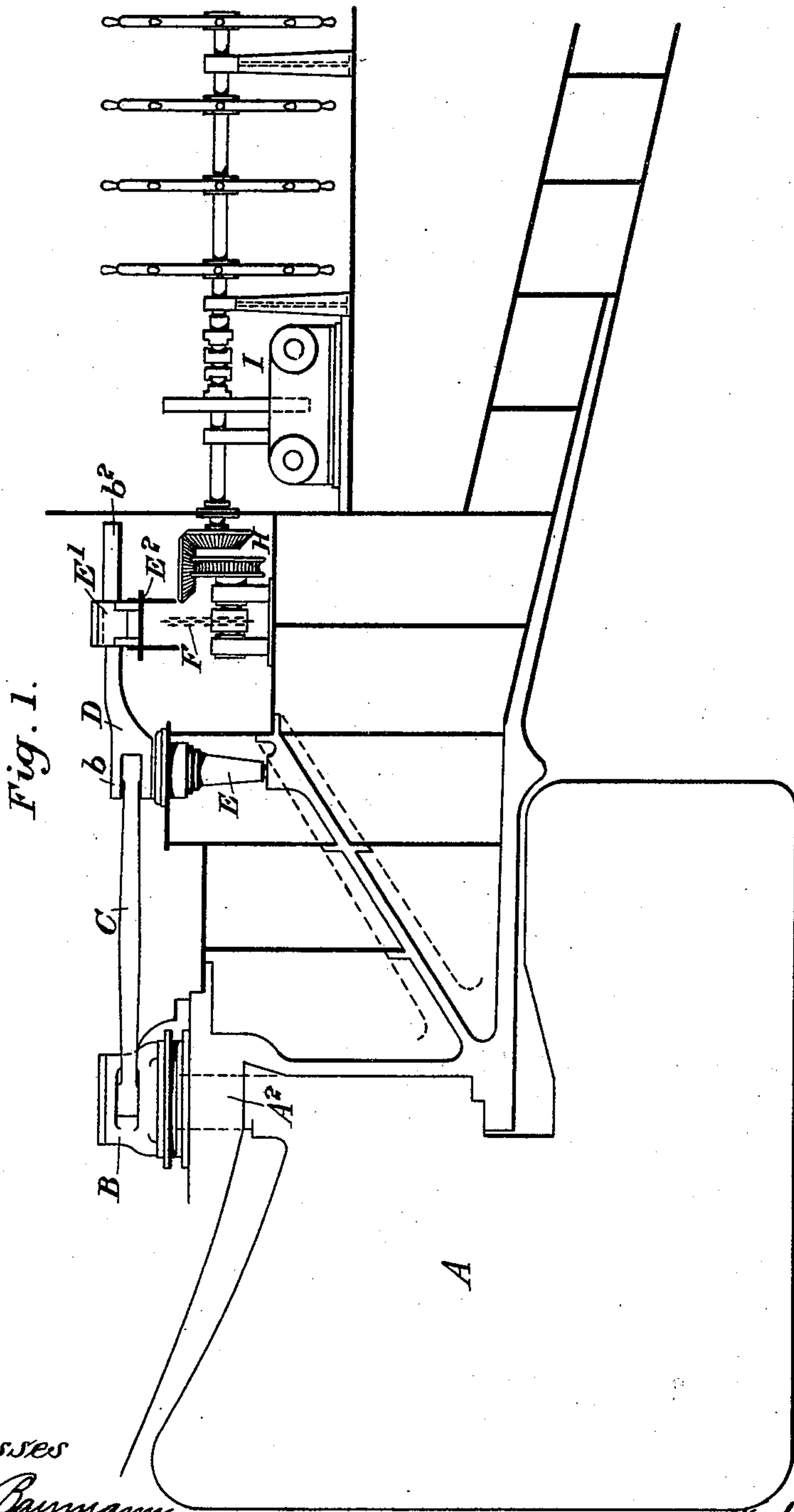
(No Model.)

3 Sheets—Sheet 1.

H. G. CAMERON.  
SHIP'S STEERING GEAR.

No. 564,471.

Patented July 21, 1896.



*Witnesses*

George Baumann

L. C. Connor

*Inventor*

Herbert G. Cameron  
By his Attorneys

Howson and Howson

(No Model.)

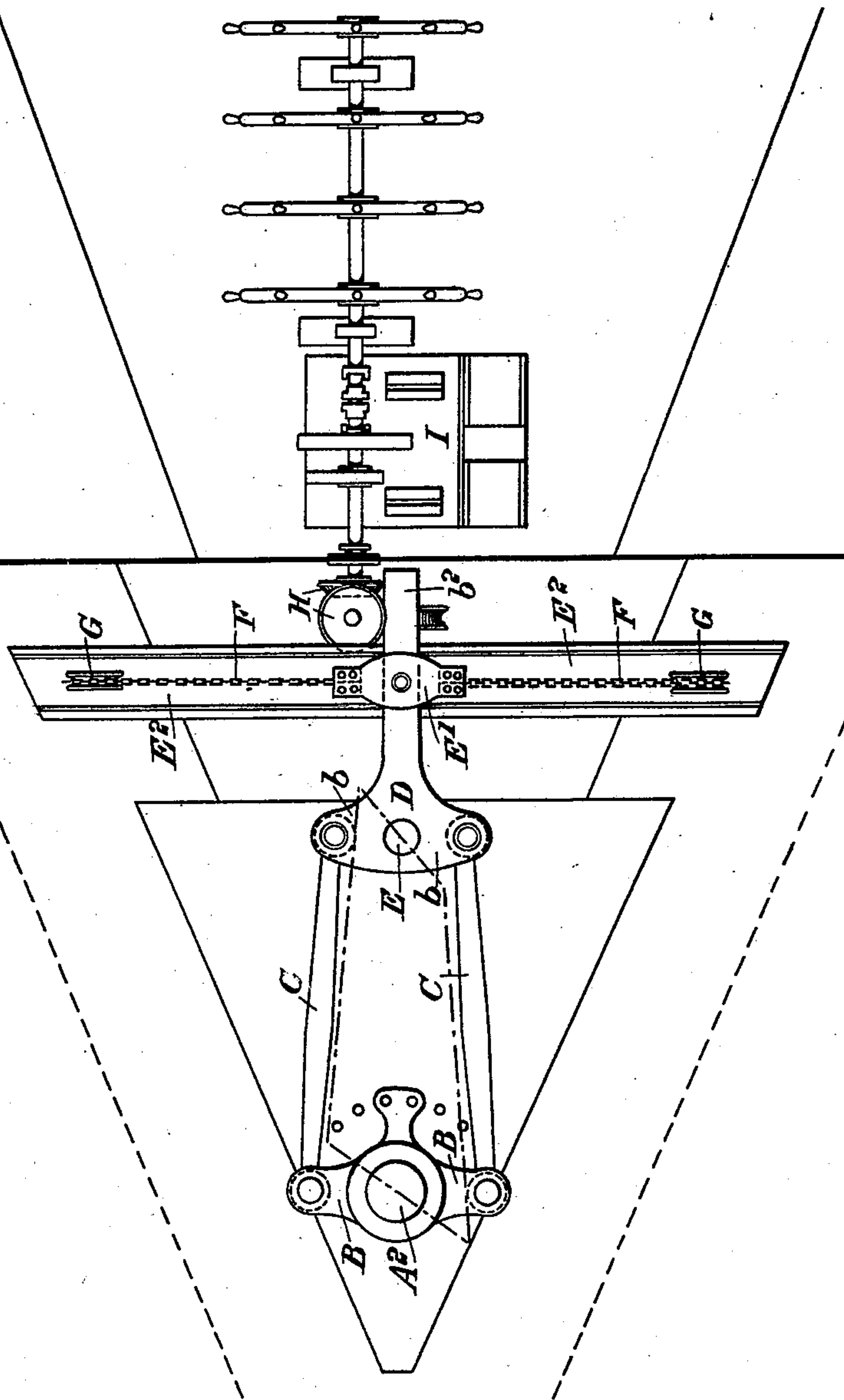
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Fig. 2.



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Fig. 3.

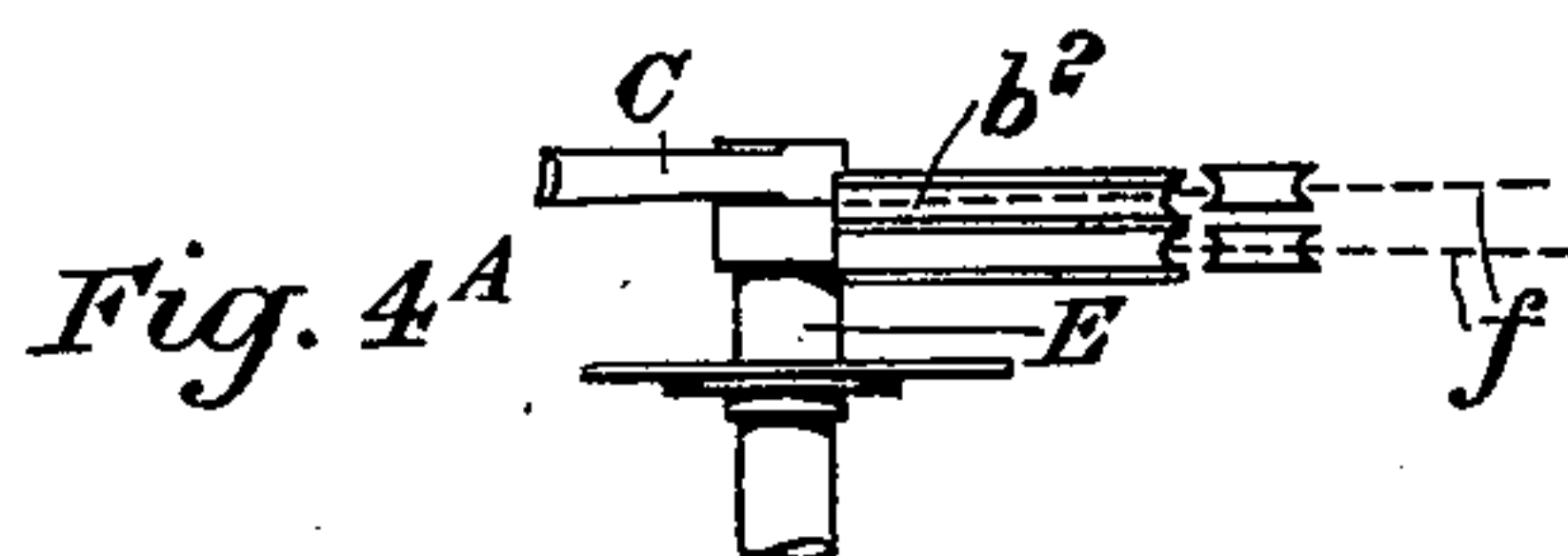
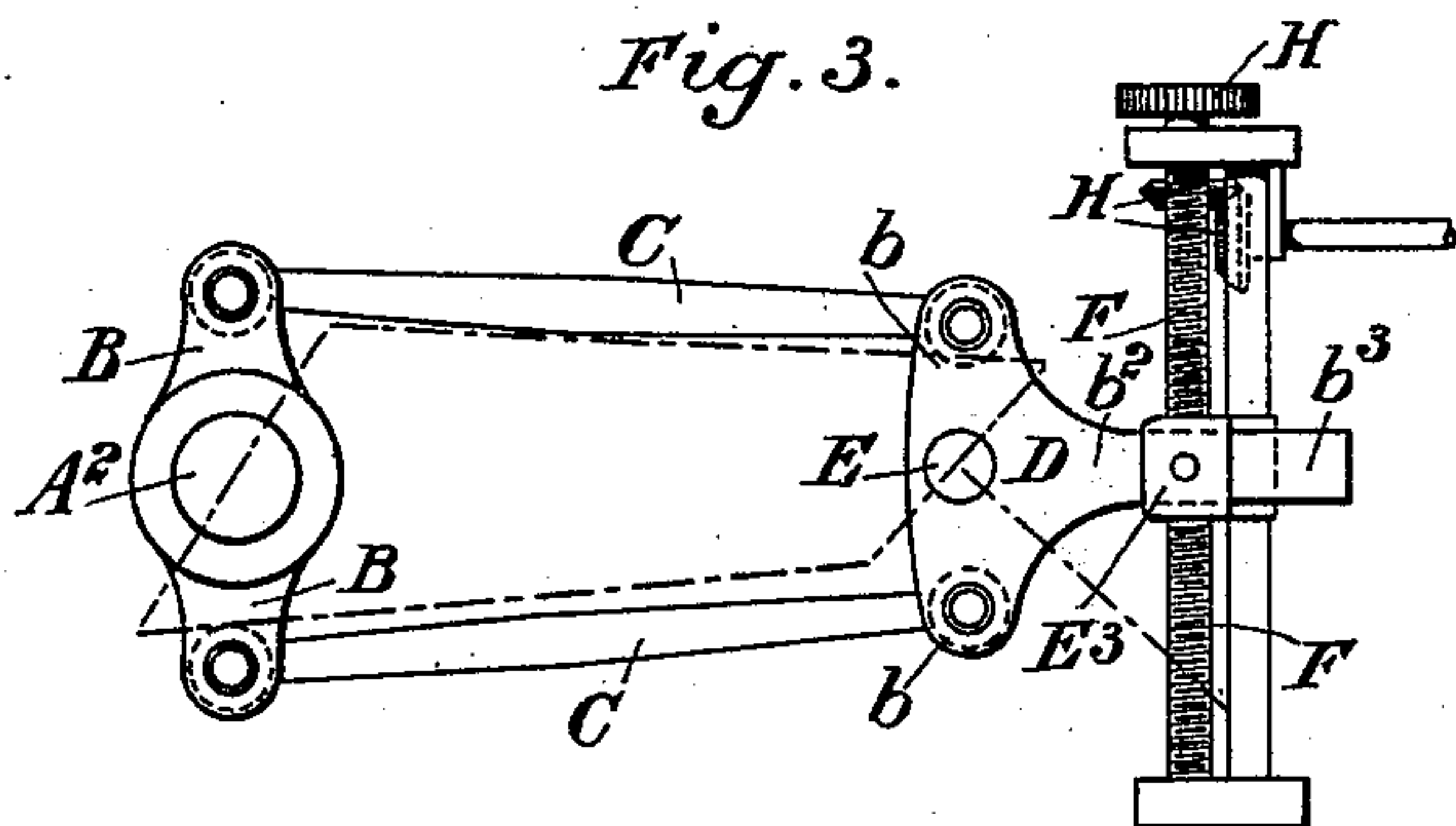


Fig. 4.

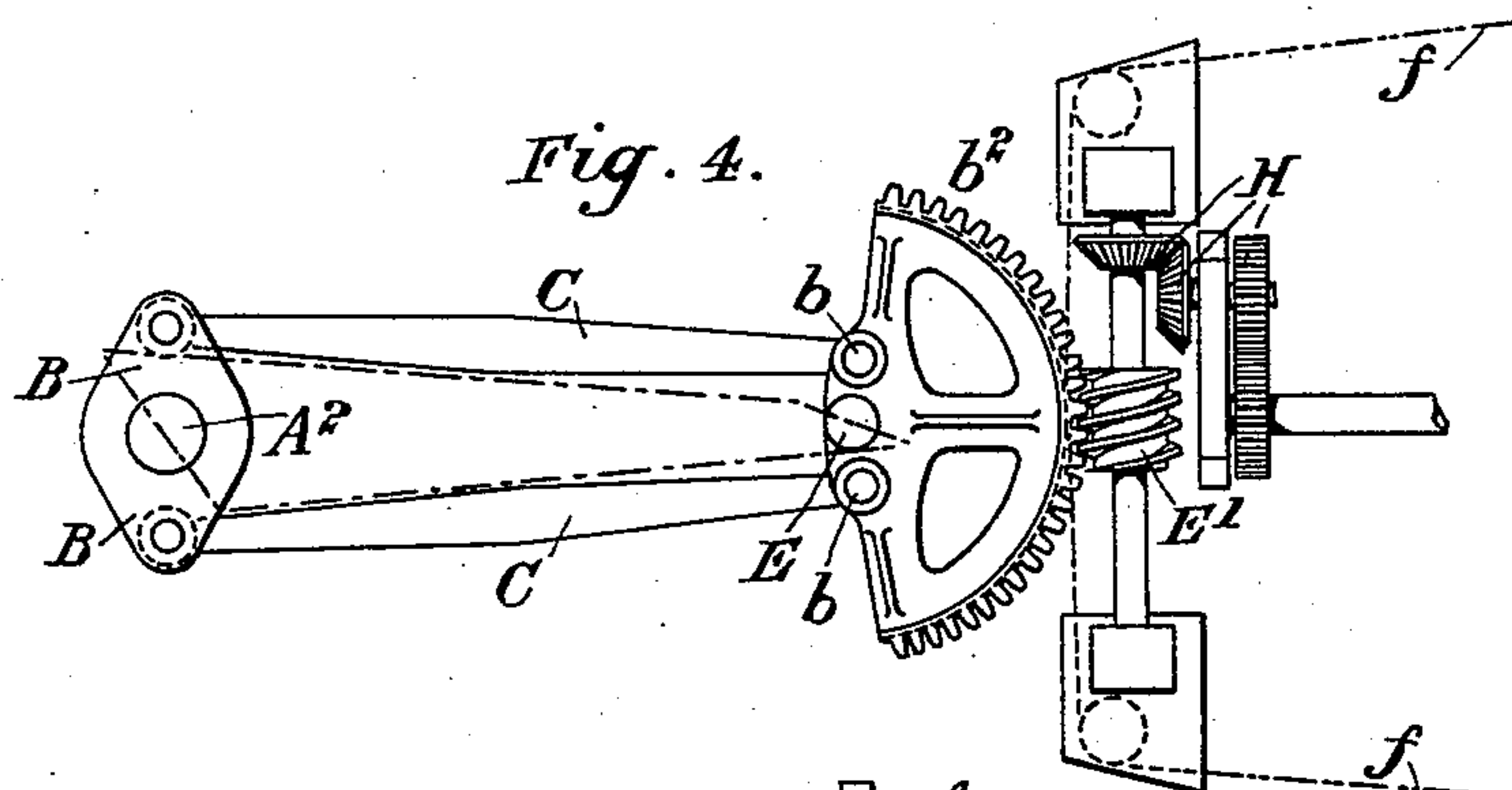
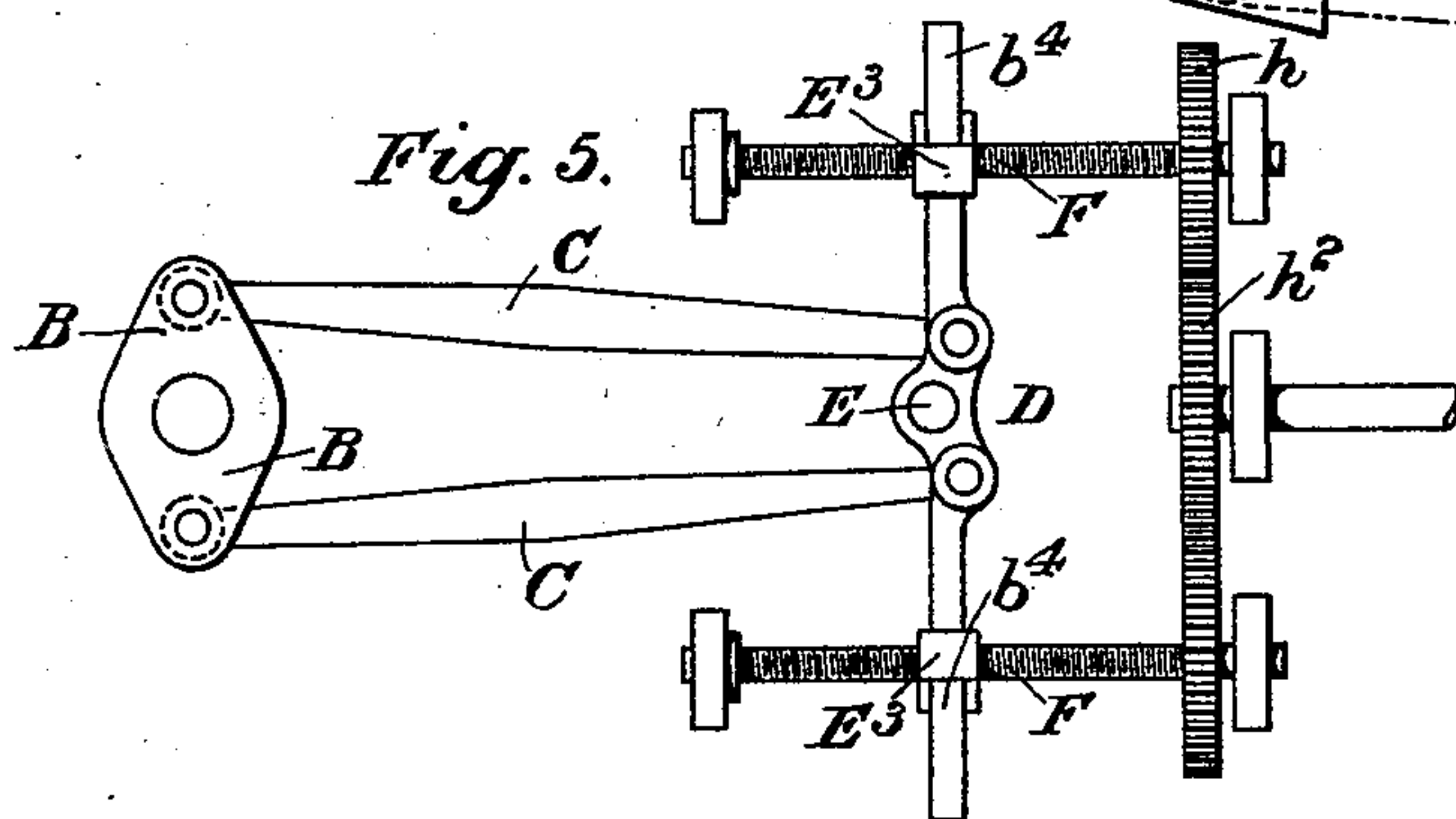


Fig. 5.



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# UNITED STATES PATENT OFFICE.

HERBERT G. CAMERON, OF LONDON, ENGLAND.

## SHIP'S STEERING-GEAR.

SPECIFICATION forming part of Letters Patent No. 564,471, dated July 21, 1896.

Application filed April 3, 1895. Serial No. 544,310. (No model.)

*To all whom it may concern:*

Be it known that I, HERBERT GEORGE CAMERON, engineer, a subject of the Queen of Great Britain and Ireland, residing at 3 Victoria Avenue, Upton Park, London, in the county of Essex, England, have invented certain Improvements in Ships' Steering-Gear, of which the following is a specification.

The object of my invention is to obtain by means of a combination of levers and rods a gradually-increasing leverage over the rudder as it passes from amidships to hard-over on either side of the vessel. For this purpose I fit on a vertical spindle, at a convenient distance from the rudder, a double bell-crank lever, and connect it to a cross-head on the rudder or on a transfer-spindle from the rudder by means of connecting-rods. The angle between the short arms of the aforesaid double bell-crank lever must be less than two right angles and the length of these arms be so proportioned to the length of cross-head on the rudder or transfer-spindle from the rudder as to give to the former the greater angular velocity, and so giving a gradually-increasing leverage as the rudder is put over on either side of the vessel. I propose to actuate this lever by means of a Rapson's slide and screw with suitable gearing from the hand steering-wheels or steering-engine. Generally this lever may be actuated from the steering-wheel by any suitable gearing for the purpose of turning it on its spindle.

In order that my invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure 1 represents in side elevation, and Fig. 2 in plan, a ship's steering-gear constructed and arranged according to my invention. Fig. 3 shows in plan a modification of the mechanism for actuating the double bell-crank lever, and Figs. 4, 4<sup>a</sup>, and 5 show further modifications of the said mechanism.

Referring to Figs. 1 and 2, A is the rudder, on the head A<sup>2</sup> of which there is secured, by any suitable means, a two-armed lever or cross-head B, the outer ends of which are connected by rods C to the arms b of the double

bell-crank lever D, mounted on a vertical spindle E, arranged at a distance from the rudder-head A<sup>2</sup>, and the angle between the arms b of the double bell-crank lever D being less than two right angles, so as to provide compensation for the varying fore and aft components of length of the connecting-rods C due to their angular movement. The exact angle of these arms will depend upon the maximum angle to which the rudder is to be put over, the length of the connecting-rods, and the proportional lengths of the arms b of the bell-crank lever D to the length of the arms of the cross-head B. The distance between the points of connection of the rods C with the two-armed lever or cross-head B is greater than the distance between the points of connection of the said rods C with the arms b of the double bell-crank lever D, by which arrangement the greater angular velocity is given to the double bell-crank lever D, and the relative angular velocity of this lever D to the two-armed lever or cross-head B gradually increases as the rudder passes from amidships to hard-over on either side of the vessel, and thus giving a gradually-increasing leverage and consequently greater power over the rudder as the resistance to its movement increases. By these means a comparatively small number of revolutions of the steering-engine are required when the rudder is moving (as it is generally) within a few degrees of the amidship position, and consequently greatly economizing the steam.

Instead of the cross-head being fixed on the rudder-head, as shown, it may be secured on a spindle which is geared to the rudder in any suitable manner so as to impart motion thereto.

The lever D, as shown in Figs. 1 and 2, is operated by means of what is known as a "Rapson's slide," which consists of a block E', caused to slide "thwartships" in a guide E<sup>2</sup>, the said block having connected to its opposite ends a chain F, passing round pulleys G, motion being imparted to the chain by means of gearing H, driven from a steering-motor I, or by other suitable means. The arm b<sup>2</sup> of the double bell-crank lever D passes through and slides in a swiveling piece in the block E', so that as the said block is moved in the guide E<sup>2</sup> the lever D will be turned on



its fulcrum and impart through the rods C and cross-head B motion to the rudder A, the leverage being increased more or less according to the extent of movement of the block E' from its central position in its guide E<sup>2</sup>.

Instead of operating the lever D by means of a chain, as hereinbefore described, the block E' may be operated by a screw F, as shown in Fig. 3, working in a screw-thread formed in the block, the said block being provided with pivoted pieces E<sup>3</sup>, in which prongs b<sup>3</sup>, formed on the arm b<sup>2</sup> of the double bell-crank lever D, are free to slide to admit of the varying position of the block on the screw F. The screw F may be rotated by means of gearing H, as shown, or in any other convenient manner. Or instead of operating the lever D by means of a sliding block the arm b<sup>2</sup> of the said lever may be in the form of or be provided with a segmental rack, as shown in Fig. 4, a worm E', operated by means of gearing H from the steering-motor, being arranged to gear with the rack, so as to turn the said lever on its fulcrum in the desired direction, or the worm E' and teeth on the segmental rack b<sup>2</sup> may be dispensed with and the lever be turned by means of chains f, attached to opposite ends of the segment b<sup>2</sup>, as shown by dotted lines in Fig. 4, the chains engaging in grooves in the periphery of the segment, as shown in Fig. 4<sup>a</sup>, or the double bell-crank may be in the form shown in Fig. 5, the projecting arms b<sup>4</sup> being arranged to slide in pivoted blocks E<sup>3</sup>, through which screws F work, so as to move the blocks E<sup>3</sup>, and thereby turn the lever D on its fulcrum E. The screws are one right-handed and the other left-

handed and carry toothed wheels h, in gear with a wheel h<sup>2</sup>, so that by turning the latter wheel h<sup>2</sup> rotation will be given to both screws F simultaneously and through the blocks E<sup>3</sup> turn the bell-crank lever D on its fulcrum and through the rods C and cross-head B move the rudder in the desired direction. I have shown and described these several means for operating the lever D as examples, but I do not restrict myself thereto, as other devices may be employed for the purpose; but,

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

In ship's steering-gear, a double-armed lever or cross-head connected to the rudder-head, in combination with a double bell-crank lever working on a center situated at a convenient distance from the said rudder-head or spindle and rods connecting the arms of the double-armed lever or cross-head to two arms of the double bell-crank lever, the angle between these arms being less than two right angles and the points of connection of the said rods with the said double bell-crank lever being closer together than are the points of connection of the said rods with the double-armed lever or cross-head, substantially as and for the purpose hereinbefore described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

H. G. CAMERON.

Witnesses:

JNO. H. WORSFOLD,  
WILFRED W. GILES.