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C. E. ONGLEY.

ELECTRICALLY CONTROLLED STEERING DEVICE.

No. 561,272. Patented June 2, 1896.

Fig. 1

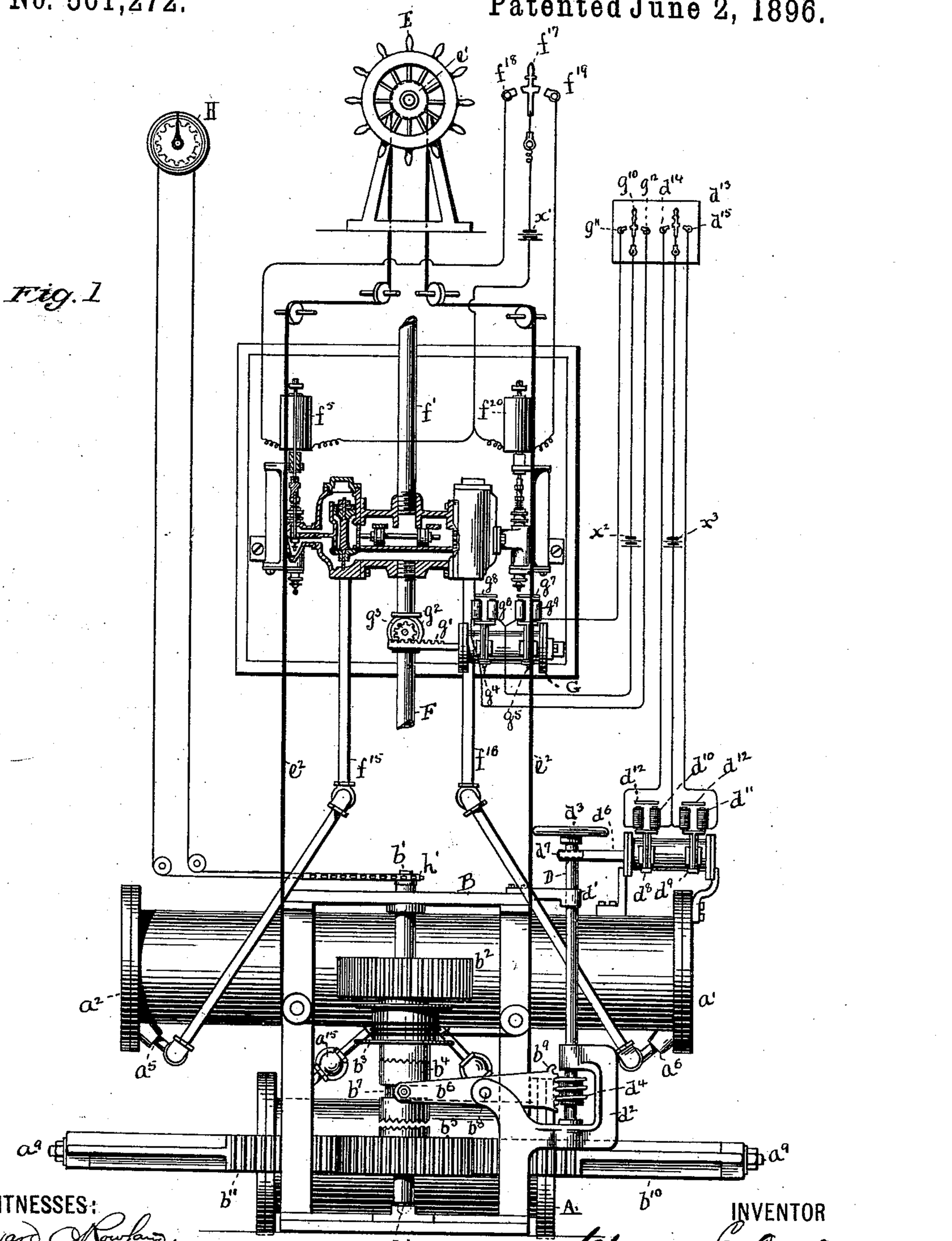

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Fig. 2.

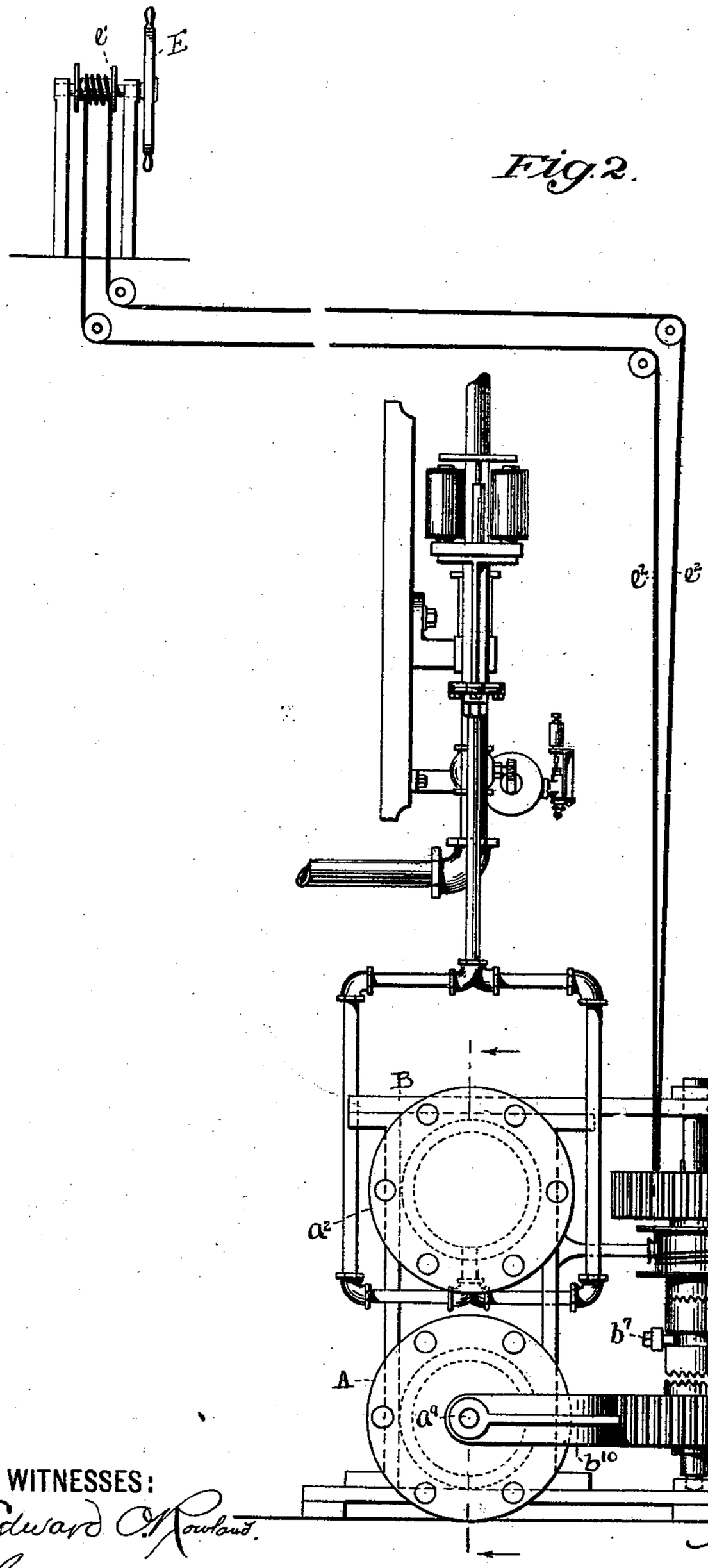

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Fig. 3

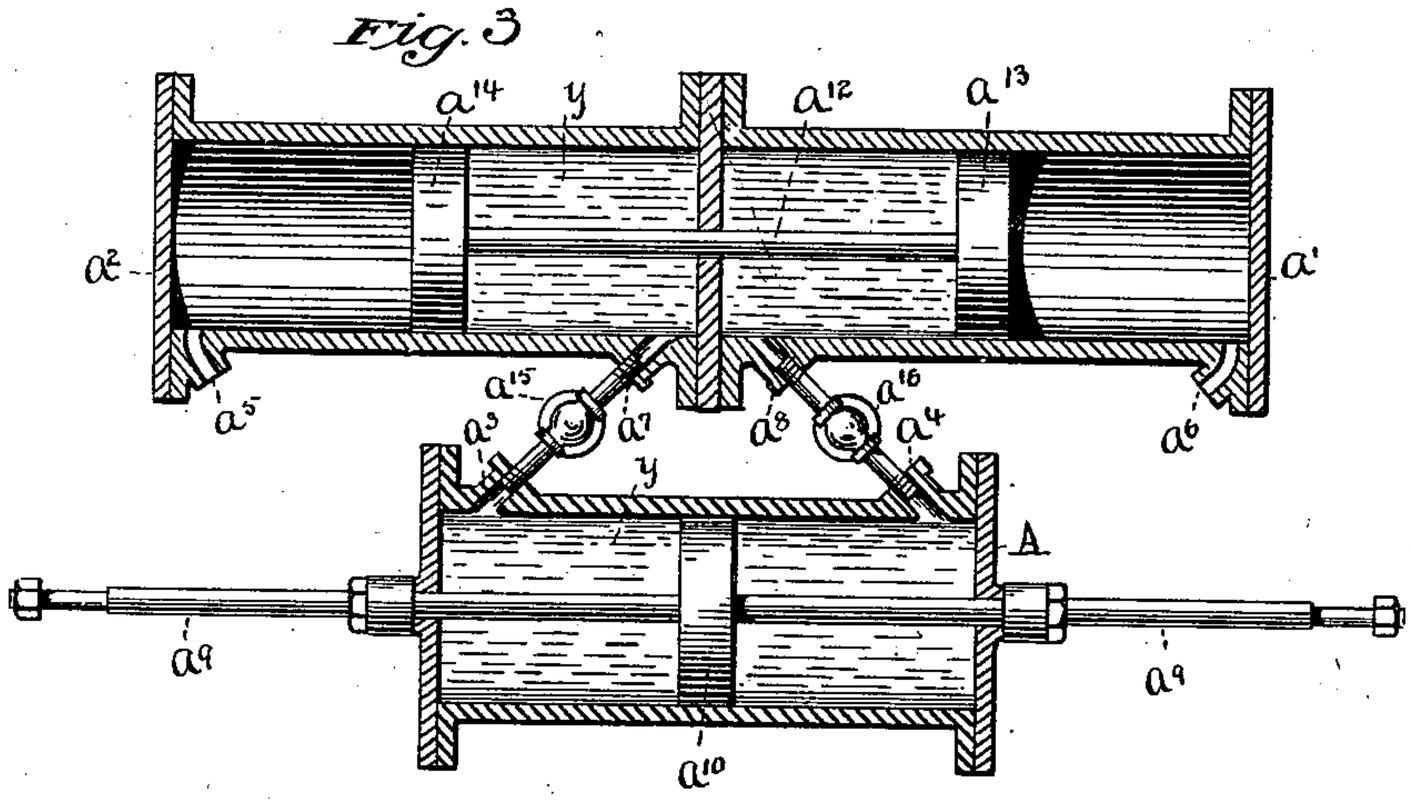

Fig. 4

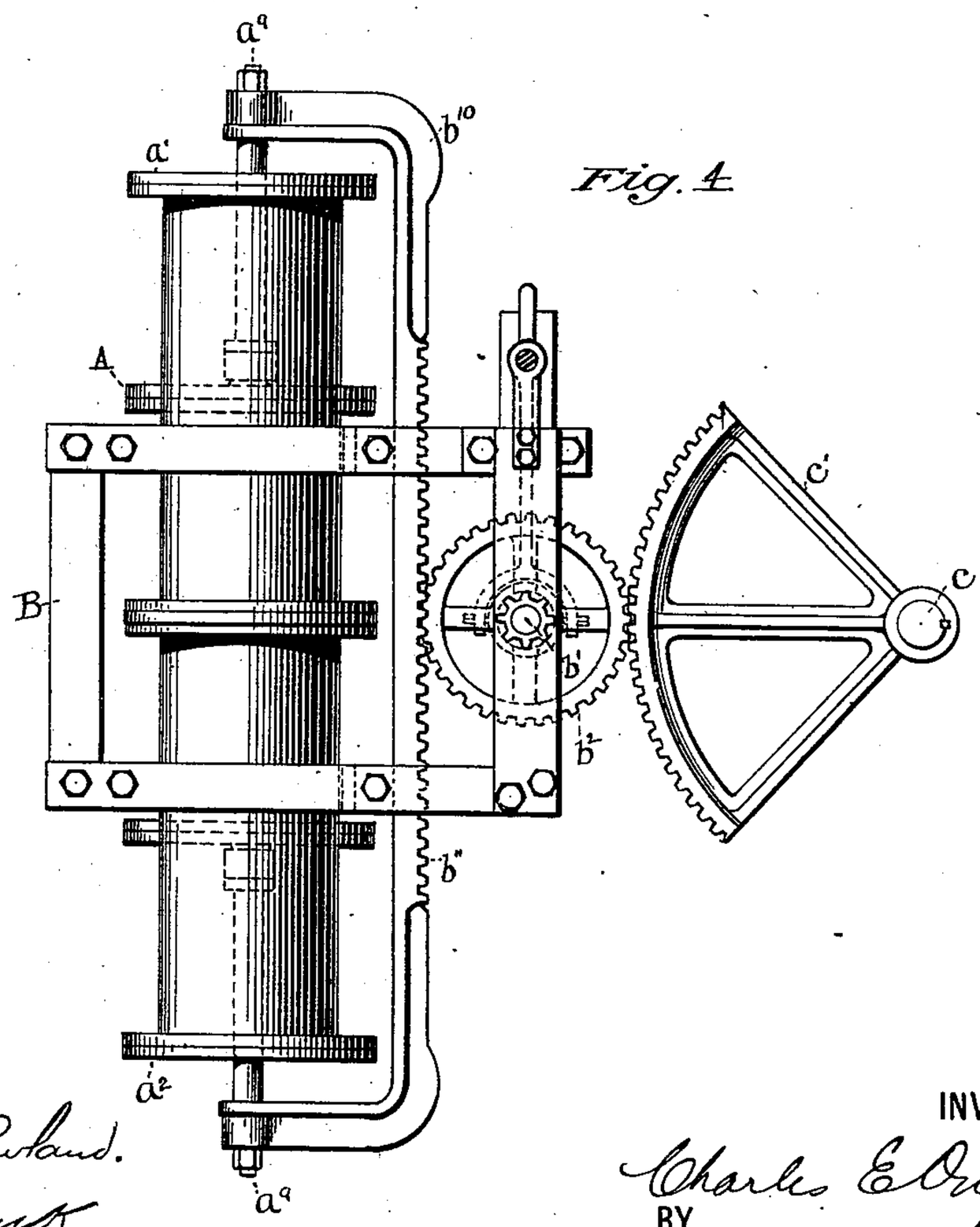

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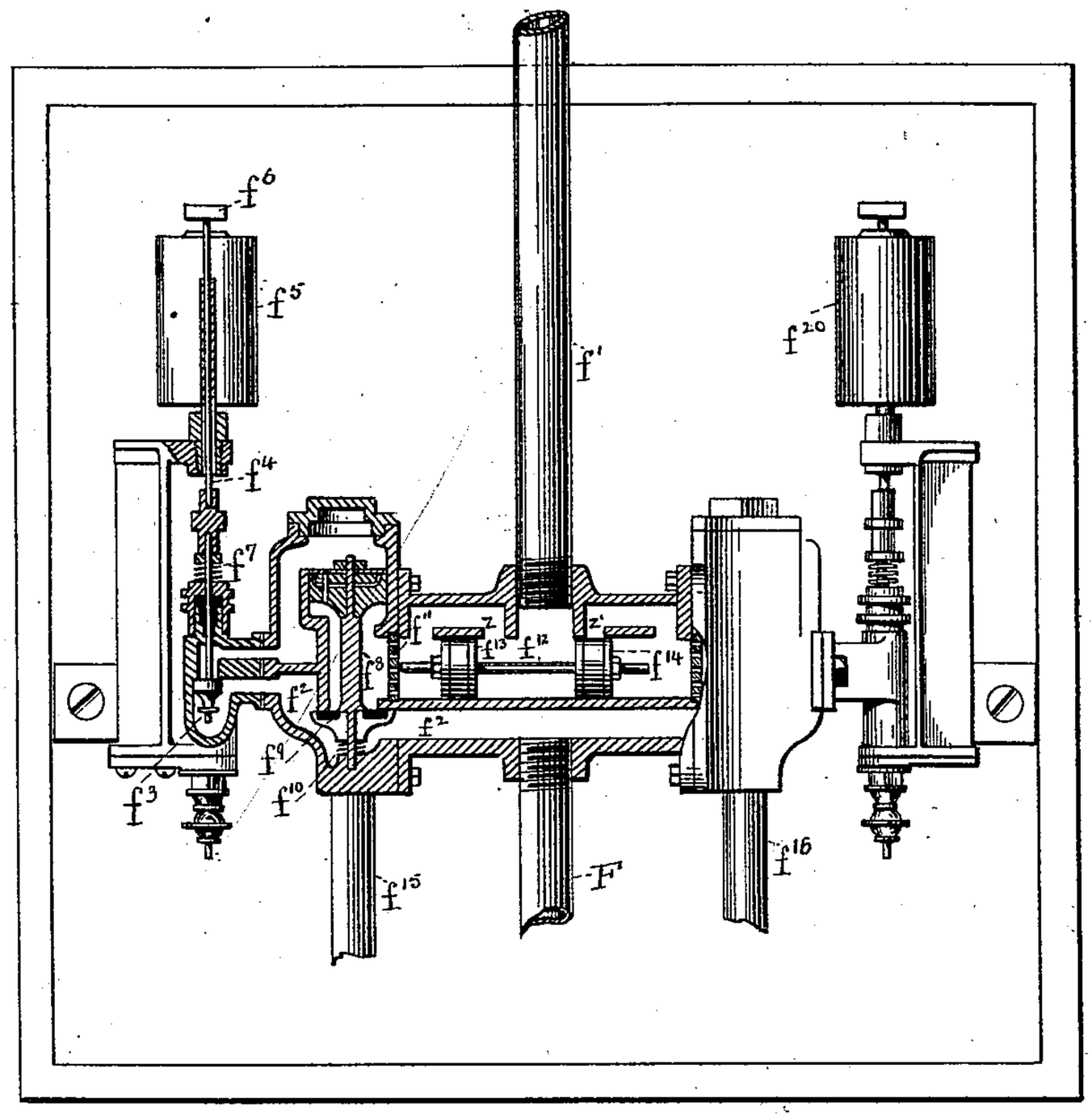
Fig. 5



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UNITED STATES PATENT OFFICE.

CHARLES E. ONGLEY, OF NEW YORK, N. Y., ASSIGNOR TO GEORGE J. SCHOEFFEL, OF SAME PLACE.

ELECTRICALLY-CONTROLLED STEERING DEVICE.

SPECIFICATION forming part of Letters Patent No. 561,272, dated June 2, 1896.

Application filed December 8, 1893. Serial No. 493,149. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. ONGLEY, a citizen of the United States, residing at New York city, in the county and State of New York, have invented a certain new and useful Improvement in Steering Devices Controlled Electrically, of which the following is a specification.

My invention relates to the steering apparatus of a ship, and particularly to a motor for the operation of the rudder and means to control the same electrically, together with means to arrest the movement of the rudder and hold the same in one position when the motor is inoperative, and means controlled electrically to shift the operative connection with the rudder, so that it may be operated either by hand or otherwise at will.

I have illustrated my device in the accompanying drawings, in which like letters refer to like parts throughout.

Figure 1 is a vew in elevation showing the valve partially in section and the circuit connections. Fig. 2 is a side view of the same in elevation. Fig. 3 is a sectional view of the motor. Fig. 4 is a top view of the same, showing its connection with the rudder. Fig. 5 is a view showing the supply and exhaust valves, together with the magnets, the same being partially in section.

In operating my device I prefer to use steam-pressure to operate the motor, but I may employ hydraulic or other pressure. The steering-wheel and electric switches and dial, hereinafter to be described, are intended to be in the pilot-house, conveniently arranged to be operated by the hand of the pilot, while the motor and all of the operative parts, hereinafter to be described, are located in the stern of the ship in convenient proximity to the rudder.

The motor that I employ preferably is shown in section in Fig. 3. It consists of three cylinders A, a', and a^2. These cylinders are provided with ports a^3, a^4, a^5, a^6, a^7, and a^8. The ports a^3 and a^7 are connected together by the pipe a^{15}, having a valve therein. The ports a^4 and a^8 are connected by the pipe a^{16}, also having a valve therein. The cylinder A is provided with a piston-rod a^9 with a centrally-located head a^{10}. The cylinders a' and a^2 are provided with the piston-rod a^{12}, having two heads a^{13} and a^{14}. The space within the cylinders a' and a^2 and between the heads a^{13} and a^{14} and also the cylinder A is filled with water or equivalent liquid, (indicated at y y.)

B is a frame sustaining the above-described cylinders and having journaled between its arms the shaft b'. Secured to this shaft is the pinion b^2, and the sleeve or clutch-wheel b^4 is also secured to revolve with said shaft, but free to have a vertical movement upon the same. It is provided with teeth on both sides. The pulley b^3 and the pinion b^5 are loosely mounted upon the shaft b' and provided with teeth to mesh with the teeth of the sleeve or clutch-wheel b^4.

b^6 is a lever pivoted at b^8 and provided at one end with a fork, between which the sleeve or clutch-wheel b^4 is pivoted at b^7 and b^7 and provided at the other end with the teeth b^9.

b^{10} is a rack secured to the ends of the piston-rod a^9 and provided with the teeth b^{11}, engaging the pinion b^5.

C represents the rudder-post, and c' is a quadrant engaging the pinion b^2.

D is a shaft journaled in the brackets d' and d^2 and provided with the hand-wheel d^3 and the screw d^4, which is secured thereto and arranged to engage the teeth d^9 of lever d^6.

d^5 is a cylinder suitably mounted, having a piston-rod d^6, which is provided with teeth in the form of a rack to engage the pinion d^7, which is secured to the shaft D. The cylinder d^5 is provided with valves d^8 and d^9.

d^{10} and d^{11} are electromagnets in circuit, having their armatures d^{12} and d^{12} secured to the valves d^8 and d^9.

d^{13} is an electric switch-handle, and d^{14} and d^{15} are contact-points for said handle.

x^3 is a battery of the source of electrical supply located in the circuits to the magnets d^{10} and d^{11}, and the switch-lever d^{13} controls the circuit to said magnets.

E is a steering-wheel controlling the pulley e' and having a rope or chain passing around the same and over suitable pulleys to the pulley b^3.

F is a supply-pipe, and f' is an exhaust-pipe. The valve to which this supply and exhaust lead is shown in Fig. 5. The pressure lies in the space f^2 and against the valves f^9 and f^3.

f^8 is a plunger provided at one end with the valve-head f^9 and at the other with a head arranged to oscillate in a cylinder, the spring f^{10} holding the valve f^9 in position.

f^4 is a valve-stem controlling the valve f^3, and f^7 is a spring holding the same in the closed position.

f^5 is an electromagnet in circuit, and f^6 is an armature for said magnet, secured to the valve-stem f^4.

f^{11} are a series of ports or perforations.

f^{12} is a plunger provided with two heads f^{13} and f^{14}. I have described half of this valve. The other side being the duplicate thereof it will be unnecessary to enumerate its parts.

f^{15} is a pipe leading from said valve, thus described, into the cylinder a^2, and f^{16} is a pipe leading into the cylinder a'. The electromagnets f^5 and f^{20} are in circuit with the battery or other source of electrical supply x', and said circuit is controlled to either of said magnets by the electric switch f^{17}, having contact-points f^{18} and f^{19}.

G is a cylinder having a piston-rod g' in the form of a rack. g^2 is a stop-cock, and g^3 is a pinion controlling said stop-cock engaging the rack g'. g^4 and g^5 are valves for said cylinder G.

g^6 and g^7 are electromagnets in circuit, having armatures g^8 and g^9 connected with the valves g^4 and g^5.

g^{10} is an electric switch having the contact-points g^{11} and g^{12}.

x^2 is a battery or other source of electrical supply in the circuit to the magnets g^6 and g^7, said circuit being controlled by the electric switch g^{10}.

H is a dial carrying a pulley, over which passes a cord, the movement of which is controlled by the sprocket-wheel h', which is mounted on the shaft b'.

I will now describe the operation of my device and relate first the operation of the means by which I shift the operative connections between the rudder and the steering devices, so that the same may be used either with my apparatus or otherwise. I can either do this by means controlled electrically or by hand.

Should I desire to perform the operation by hand, I do so by moving the hand-wheel d^3. This operates to throw the clutch wheel or sleeve b^4 into or out of engagement with the pulley b^3 or the pinion b^5. When the same is thrown into engagement with the pulley b^3, I can control the rudder with the steering-wheel E without interfering with any of the other apparatus. Should I desire to control this operation electrically, I do so by means of the switch d^{13}—that is to say, by bringing the same into contact with either of the contact-points d^{14} or d^{15}—thus energizing either one or the other of the electromagnets d^{10} or d^{11}, and operating the valves d^8 or d^9 to admit pressure into the cylinder d^5 either to throw the piston-rod d^6 backward or forward, as the case may be, to perform the operation last described by the hand movement. These valve-controlling devices being so well known in the art I deem it unnecessary to describe them further. In the drawings the clutch wheel or sleeve b^4 is shown in engagement with the pulley b^3—that is, in position to be operated by hand. When the same is shifted to be in engagement with the pinion b^5, the rudder is thrown into the control of the motor, the operation of which will now be described. In the first place, should I desire to operate the same to admit or cut off steam, I move the switch g^{10} to either of the contact-points g^{11} or g^{12}, thus making the circuit to either the magnet g^6 or g^7, as the case may be, and thus operating the valves of the cylinder G, admitting steam to operate the piston-rod g' to move the pinion g^3 to open or close the valve or stop-cock g^2. The pressure being admitted, as last described, the steam lies in the space in said valve f^2 and f^2 against the valve-heads f^9 and f^3. Should I desire to admit pressure to the cylinders a' or a^2, I operate the electric switch f^{17}, bringing the same either onto the contact-point f^{18} or f^{19}, thus energizing, according to such movement, either the magnet f^5 or f^{20}. Suppose that I energize the magnet f^5. This will attract the armature f^6 and operate to open the valve f^3, admitting pressure through the same to bear upon the head of the plunger f^8 against the tension of the spring f^{10} and open the valve f^9 and admit the pressure through the ports f^{11} and operate to drive the plunger f^{12} into a position in which the head f^{13} will close the port z and prevent the escape of the pressure through the exhaust f'. The pressure will then pass into the pipe f^{15} and thence into the cylinder a^2. It will be noted that with the movement of the plunger f^{12} the head f^{14} is moved away from the position in which it closes the port z, thus permitting an exhaust of any steam lying in the pipe f^{16} through the exhaust f'. The reverse movement of course permits an exhaust from the pipe f^{15}.

Referring now to Fig. 3, it will be seen that I employ water or equivalent liquid to fill the cylinder A and the cylinders a' and a^2 between the heads a^{14} and a^{15}, and indicate the same by y y. With the introduction of the steam through the pipe f^{15} and port a^5 into the cylinder a^2 the head a^{14} will be moved by said pressure, thus forcing the liquid from before said head into the cylinder A by the pipe a^{15} and thus moving the head a^{10} and in like manner forcing the water from before said head through the pipe a^{16} into the cylinder a', and any steam lying in the cylinder a' will be driven through the pipe f^{16} and port z' out through the exhaust f'. I interpose this hydraulic resistance or tension into the motor for the purpose of establishing a check or lock on the movement of the rudder to hold it in a position into which it may have been moved by the operative power, the tension or resistance being the amount of power necessary to displace the water or other liquid by forcing it through the pipes connecting the

cylinders. This tension may be increased or diminished by the operation of the valves in the pipes connecting the cylinders. This will be manifest, as the smaller the channel the greater the resistance. I have shown this resistance interposed in the motor. It will be manifest, however, that I may employ the same in any convenient manner and with any form of motor, or the resistance may be applied directly to the rudder. With the movement of the head a^{10}, as last described, the piston-rod a^9 will move the rack b^{10}, and through the pinion b^5 and clutch-wheel b^4 the shaft b', the pinion b^2, the quadrant c', and the rudder-post C. The reverse movement hereof is, of course, identical with that last described, being controlled by the switch f^{17} to admit pressure into either the cylinder a' or a^2.

The dial or index H operates, as heretofore described, with the shaft b' through the sprocket-wheel h' to indicate the position of the rudder.

What I claim is—

1. In a steering device, the combination of a hydraulic cylinder, a piston movable in said cylinder and connected with and operating the rudder, two steam-cylinders mounted adjacent to said hydraulic cylinder, pistons in said steam-cylinders connected together, a supply-pipe connecting one end of each steam-cylinder with one of the ends of the hydraulic cylinder and a liquid filling said hydraulic cylinder, and the spaces behind or in front of the pistons in the respective steam-cylinders to which said supply-pipes are connected, substantially as set forth.

2. In a steering device, the combination of a hydraulic cylinder, a piston movable in said cylinder and connected with and operating the rudder, two steam-cylinders mounted adjacent to said hydraulic cylinder, pistons in said steam-cylinders connected together, a contracted supply-pipe connecting one end of each steam-cylinder with one of the ends of the hydraulic cylinder and a liquid filling said hydraulic cylinder, and the spaces behind or in front of the pistons in the respective steam-cylinders to which said contracted supply-pipes are connected, substantially as set forth.

3. In a steering device, the combination of a hydraulic cylinder, a piston movable in said cylinder and connected with and operating the rudder, two steam-cylinders mounted adjacent to said hydraulic cylinder, pistons in said steam-cylinders connected together, a supply-pipe connecting one end of each steam-cylinder with one of the ends of the hydraulic cylinder, a liquid filling said hydraulic cylinder, and the spaces behind or in front of the pistons in the respective steam-cylinders to which said supply-pipes are connected, and valves in said supply-pipes for reducing the passage of the liquid through the same, substantially as set forth.

4. In a steering device, the combination of a hydraulic cylinder A, a piston therein connected with and operating the rudder, two steam-cylinders a', a^2, mounted adjacent to said hydraulic cylinder, pistons in said steam-cylinders connected together, supply-pipes connecting the forward ends of the steam-cylinders with both ends of said hydraulic cylinder, the spaces in front of the piston of each steam-cylinder and the hydraulic cylinder being filled with a liquid, steam-pipes connecting with the steam-cylinders behind the pistons therein, and means for controlling the entrance of steam to said steam-cylinders, substantially as set forth.

5. In a steering device, the combination of a hydraulic cylinder A, a piston therein connected with and operating the rudder, two steam-cylinders a', a^2, mounted adjacent to said hydraulic cylinder, pistons in said steam-cylinders connected together, supply-pipes connecting the forward ends of the steam-cylinders with both ends of said hydraulic cylinder, the spaces in front of the pistons of the steam-cylinders and the hydraulic cylinder being filled with a liquid, steam-pipes connecting with the steam-cylinders behind the pistons therein, and means for electrically controlling the entrance of steam to said cylinders, substantially as set forth.

6. In a steering device, the combination with means for operating the rudder mechanically and means for operating said rudder through an engine controlled electrically, of clutch mechanism so constituted and arranged, relatively to said rudder, as to permit either one of said mechanisms for operating the rudder to be employed, a motor for operating said clutch mechanism and means for controlling said motor electrically, substantially as described.

7. In an electric steering-gear, the combination of the rudder, a main shaft for controlling the same, a clutch on said main shaft, a motor adapted to be connected with said main shaft through said clutch, means for controlling said motor electrically, a hand steering device adapted also to be connected to said main shaft by said clutch, and means controlled electrically from the bow of the vessel for throwing said clutch into engagement with said motor, or with the said hand steering-gear, substantially as set forth.

This specification signed and witnessed this 22d day of November, 1893.

CHARLES E. ONGLEY.

Witnesses:
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GEORGE J. SCHOEFFEL.