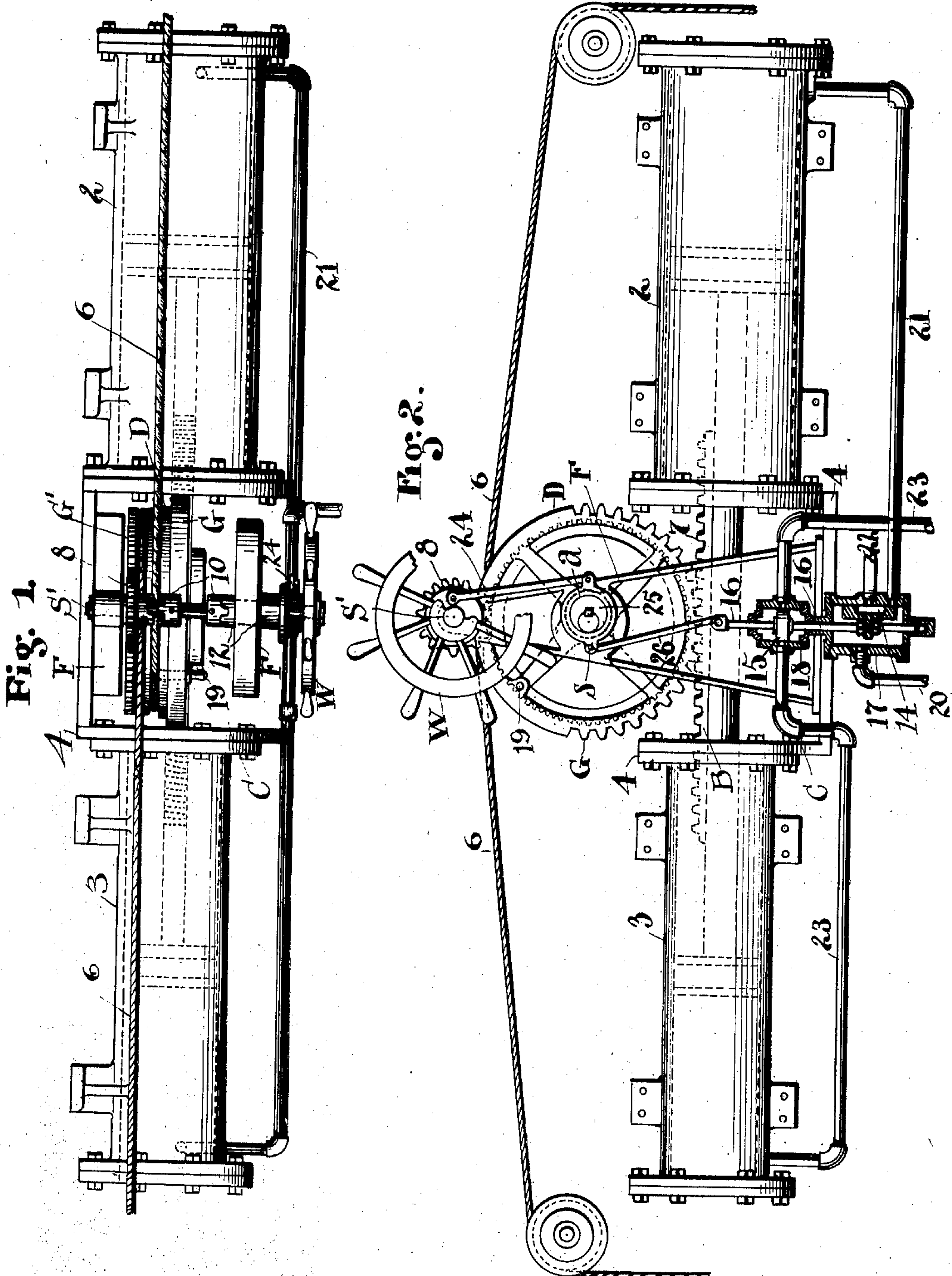


S. E. LEONARD.
STEERING APPARATUS FOR BOATS AND THE LIKE.
APPLICATION FILED MAY 11, 1908.

907,252.

Patented Dec. 22, 1908.
2 SHEETS—SHEET 1.



ATTEST
E. M. Fisher
F. C. Moore

INVENTOR
Samuel E. Leonard.
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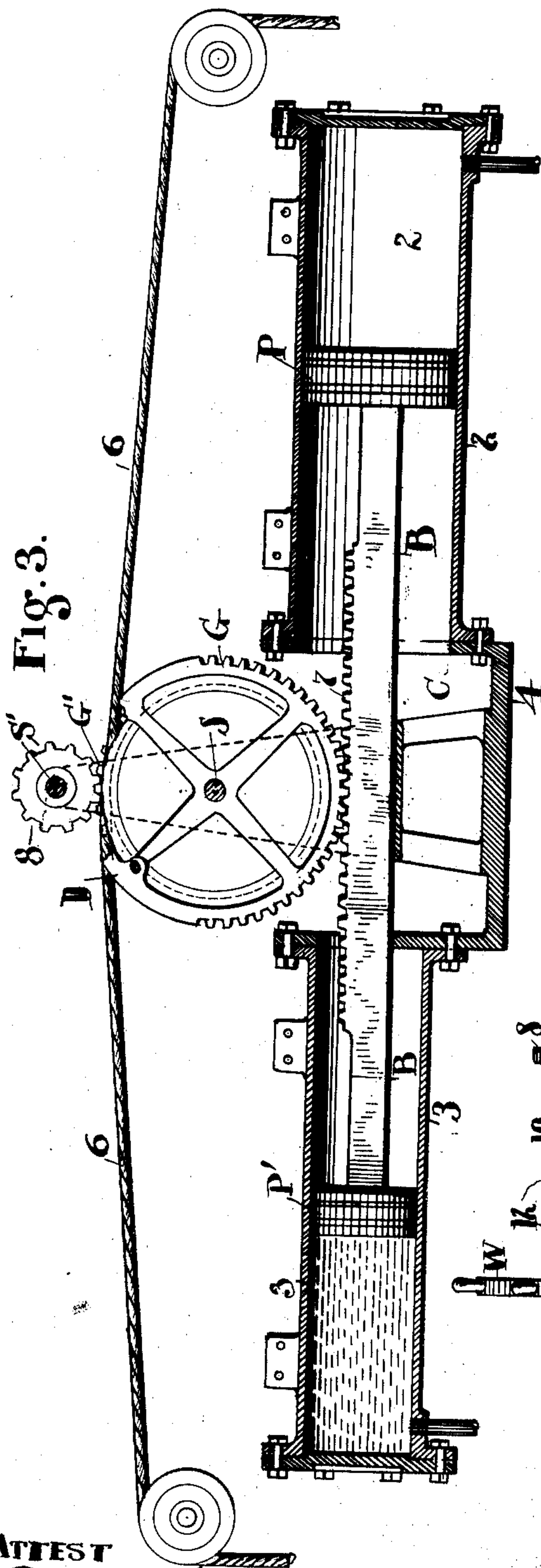


Fig. 3.

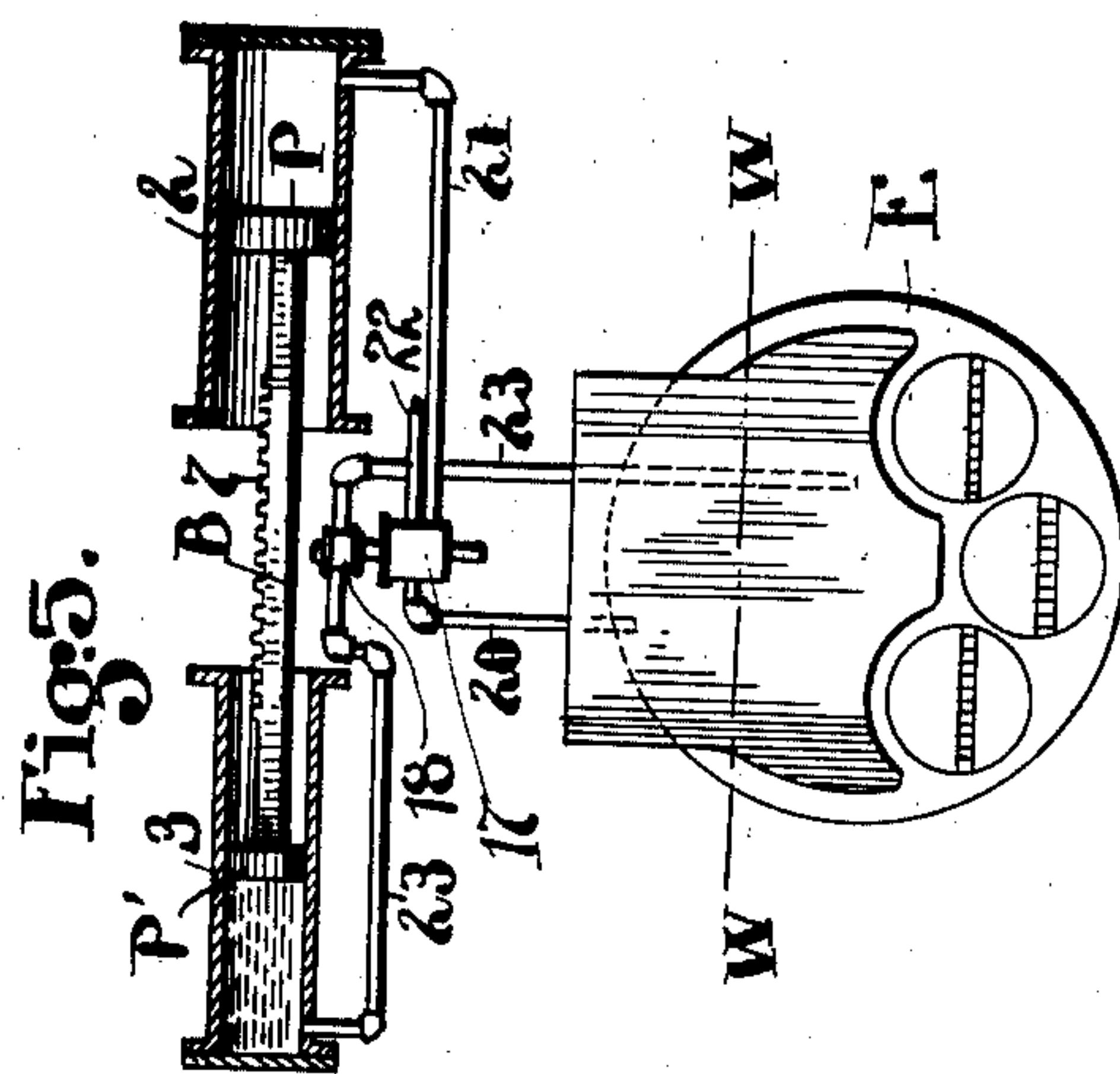


Fig. 5.

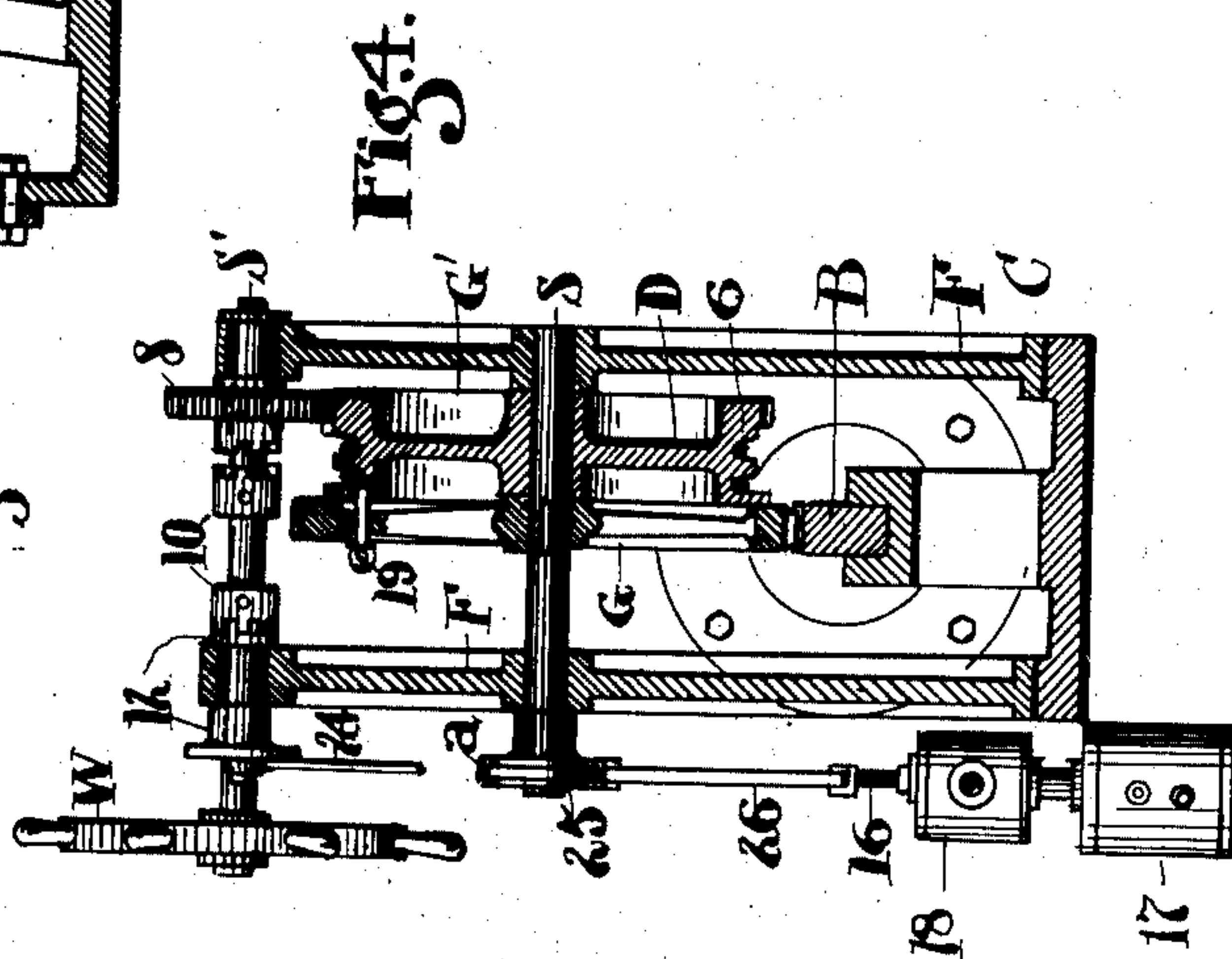


Fig. 4.

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UNITED STATES PATENT OFFICE.

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STEERING APPARATUS FOR BOATS AND THE LIKE.

No. 907,252.

Specification of Letters Patent.

Patented Dec. 22, 1908.

Application filed May 11, 1908. Serial No. 432,121.

To all whom it may concern:

Be it known that I, SAMUEL E. LEONARD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steering Apparatus for Boats and the Like, and do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to steering apparatus for boats and the like, and the invention consists in an apparatus wherein both water and steam pressure from the same pressure source are utilized for power to control the steering mechanism, as hereinafter fully described.

In the accompanying drawings, Figure 1 is a plan view of the apparatus, and Fig. 2 is a side elevation thereof, partly in section. Fig. 3 is a vertical longitudinal sectional elevation of the apparatus, and Fig. 4 is a cross section substantially on the line of the transverse shafts at the middle. Fig. 5 is a reduced view of the parts, showing a marine boiler in connection therewith.

The novelty herein lies primarily in the idea of utilizing both water and steam pressure from the same boiler or source of pressure, so as to have equilibrium in the pressure itself, with differential cylinders and pistons, and transmitting mechanism therefrom as will be now described. Thus, the apparatus comprises a main or central casing C of approximately box shape, or its equivalent, and a steam cylinder 2 open thereto at one end and a water cylinder 3 open thereto at the other end, and which are bolted at their inner ends to said box or casing. The said cylinders are differential or of different sizes in cross section, the steam cylinder being of approximately twice the size of the water cylinder 3 in cross sectional area and, as represented also by the working areas of their respective pistons P and P', so that in any event when pressure comes onto both pistons at the same time from an otherwise equalized source, the steam piston P will prevail and correspondingly control and operate or actuate the steering mechanism, which when followed to its end is a rudder, not shown. However, I do show cables or ropes 6, which are engaged about or upon winding drum D and with which the steering gears or parts are usually attached, as now well known. Said drum is in operating connection with

the pistons P and P' through the rack-bar B, which rigidly connects said pistons and conveys power therefrom to segmental gear G on transverse shaft S. This gear is in mesh with the teeth 7 on said rack-bar. Thus the said winding drum D is brought into direct operating connections with said pistons and the action on cables 6 is positive. Then as a means of hand control another gear, G', is mounted on this shaft at the side of drum D and integral therewith in this instance, but smaller in size than gear G, as shown herein. This gear meshes with pinion 8 on another shaft, S', mounted in or on the top of supporting frame F. This latter shaft has a hand wheel W for controlling the apparatus when hand control is desirable, and a double ended clutch sleeve 10 is fixed on shaft S' while the shaft itself is slidable axially within limits so as to engage said clutch either with pinion 8, or rotatable sleeve 12 both of which parts are constructed with clutching teeth. Said sleeve 12 is mounted in the top of frame F and has the shaft S' passing through the same, affording a bearing for said shaft as well as serving to make operating connections from the said shaft with the valve mechanism beneath. For example, there are two valves 14 and 15, mounted on a valve stem or rod 16 and controlling the inlets and outlets to and from cylinders 2 and 3. So there also are two valve boxes or chambers, 17 and 18, respectively, for said valves 14 and 15, and the operation of valve stem 16 actuates both valves simultaneously and equally and opens and closes the same for all passages. Valve box 17 has inlet pipe 20 which runs to live steam in boiler E, and thence by box 17 and pipe 21 into steam cylinder 2. The exhaust from said cylinder is back through pipe 21 and box 14 and out by exhaust pipe 22.

Cylinder 3 has a water pipe connection with the boiler, and the valve box 18 is set therein and there is no exhaust on this line. On the contrary, the water plays back and forth as between the boiler or a chamber or the like in communication therewith and cylinder 3, subject only to control by valve 15. That is if steam pressure be open to piston P the water before the smaller piston, P', will be driven back into the boiler according to the movement of said piston, and on the other hand, if the valves be in such position that there is exhaust from cylinder 2 the water pressure on piston P' will drive the

parts in the opposite direction and cylinder 3 will receive supply under pressure from the boiler. Of course, as shown in Fig. 2, the valves and passages are closed and everything is stationary. In fact neither piston can move under these conditions, and the steering rudder would be held definitely to a fixed position, whatever that might be. This would occur even if steam in cylinder 2 were to condense more or less before a shift were made because the water in cylinder 3 would not permit such movement when locked as shown as a vacuum would be necessary to effect a movement, and such vacuum is physically impossible in this construction. I can, therefore, lock the steering parts at any time and in any desired position, and they must inevitably hold that position until purposely released or changed.

Now, reverting to sleeve 12, it will be seen that connection is made by a link 24 between a flange thereon and a ring *a* on eccentric 25, splined on the end of shaft S, and which ring is connected by a link or rod 26 with valve stem 16. Said ring is independently rotatable on the eccentric through sleeve 12 when wheel W is turned to open or set the valves.

It is to be noticed, also, that segment gear G is splined on shaft S, while drum D is free thereon, and the two are operatively connected by a bolt or pin 19, through which the drum is engaged with said gear and the two rotate together. Now, when the parts are in position as seen in Fig. 4, power is on as to all the parts and the hand controlling mechanism is thrown out. In this case the valves are controlled through shaft S and the eccentric thereon operating ring *a* and link 26. But if hand control is to be resumed, the clutch 10 is thrown into engagement with pinion 8, and pin 19 connecting gear 9 and drum D withdrawn. This gives the operator direct control of the drum through pinion 8 and the valves remain closed and the pistons locked and gear G and shaft S disconnected. This eliminates the power control from the boiler for the time being and the operator works as if no power operation were provided for. However he has free control at all times over the valves independently of the power, to open and close them at his will without interfering with the automatic action upon the valves through the power mechanism.

It is of course understood that the amount of water used at any time in cylinder 3 is relatively very small, so that in no case is it noticeable in the boiler nor such as to in any wise affect the water supply for the boiler.

Now reverting again to the use of water and steam herein rather than steam alone, it will be noticed that by these means I overcome the vital objection of steam condensation and the consequent movement or shift-

ing of the pistons where steam is used alone. Experience has shown that all or only steam cannot be relied upon, but by the use of water on one piston I am enabled to water-lock and hold both pistons regardless of steam condensation, and this constitutes an important improvement in the art, as I understand the art at this time.

As shown, the cylinders are arranged end to end for horizontal placement on a vessel, but if greater economy of room or other circumstances require different disposition and relation of the parts, this can be done without departing from the spirit of the invention as embodied in the differential cylinders and pistons and their steam and water connections with the boiler.

What I claim is:—

1. In steering apparatus for vessels, a pair of differential cylinders, a steam boiler and water connections therefrom to the smaller of said cylinders and steam connections to the larger, pistons in said cylinders and steering mechanism operatively connected with said pistons.

2. A steering apparatus comprising two cylinders arranged end to end and of different sizes in cross section, connected pistons in said cylinders, a boiler and pipes connecting the said cylinders therewith, the pipe to the larger cylinder open to live steam in the boiler and the pipe to the smaller cylinder open to the water, and jointly operated valves for both pipes.

3. Steering apparatus for vessels comprising a pair of cylinders of different sizes in cross section and connected pistons therein, in combination with a boiler and steam and water pipe connections respectively between said boiler and cylinders, separate valves for said connections, and means to operate said valves operatively connected with said pistons.

4. In steering apparatus for vessels, a pair of cylinders of different sizes in cross section, connected pistons in said cylinders and valve controlled fluid passages to both cylinders, one of said passages having a water connection and the other a steam connection, said water connection adapted to play the water between the water cylinder and the boiler.

5. A steering apparatus for vessels having pipe connection with both the steam and the water in a boiler, comprising differential cylinders arranged end to end, the smaller cylinder having water connections and the larger steam connections, pistons in said cylinders, a rack-bar connecting the same, and mechanism controlled by said rack-bar adapted to operate the steering mechanism and control the flow of water and steam.

6. In steering devices, cylinders arranged end to end and pistons of differential area therein, a bar rigidly connecting said pistons and steering devices operatively connected

therewith, in combination with a water passage to one of said cylinders and a steam passage to the other cylinder, and means to jointly open and close said passages, comprising a valve for each passage, a rotatable shaft and connections therefrom to said valves and to the pistons in said cylinders.

10 7. In steering apparatus the cylinders and the water and steam pressure connections
15 therewith, pistons in said cylinders and a bar connecting the same, in combination with a rotatable shaft and a cable drum loosely mounted thereon, a gear fixed on said shaft and adapted to be engaged with said drum,
20 a valve for each said water and steam connections, and operating connections between said valves and said shaft.

8. In steering apparatus the differential cylinders and the connected pistons therein,
20 and valves to control the flow of fluid to said cylinders, in combination with a rotatable shaft, a gear fixed to rotate therewith, a cable drum loose on said shaft and means to connect and disconnect said drum and gear,
25 a stem uniting said valves, an eccentric on said shaft and link connection therefrom to said valve stem.

9. In steering apparatus the combination
30 of the differential cylinders and the connected pistons therein, a shaft and a drum therein operatively engaged with said pistons, a

boiler and water and steam passages therefrom to said cylinders respectively, and valves for said passages, a hand controlled shaft axially movable and a clutch fixed
35 thereon, and connected means engaged by said clutch and with said valves to open the valves by hand power.

10. In steering apparatus the combination of the differential cylinders and pistons, a
40 shaft and an eccentric on said shaft, valve mechanism operatively engaged upon said eccentric, a drum on said shaft adapted to carry the steering cables a rack bar connecting said pistons and operating connections
45 between said rack-bar and said drum.

11. In steering apparatus the differential cylinders and pistons and a rotatable shaft operatively connected therewith, in combination with valves to control the entrances
50 to said cylinders, in combination with an eccentric on said shaft and connections therefrom to said valve, a hand wheel and shaft and means engaged with said shaft to operate said valves through the connections with
55 said eccentric.

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

SAMUEL E. LEONARD.

Witnesses:

E. M. FISHER,
F. C. MUSSUN.