

(No Model.)

2 Sheets—Sheet 1.

W. T. JOHNSTON.
STEERING APPARATUS.

No. 491,212.

Patented Feb. 7, 1893.

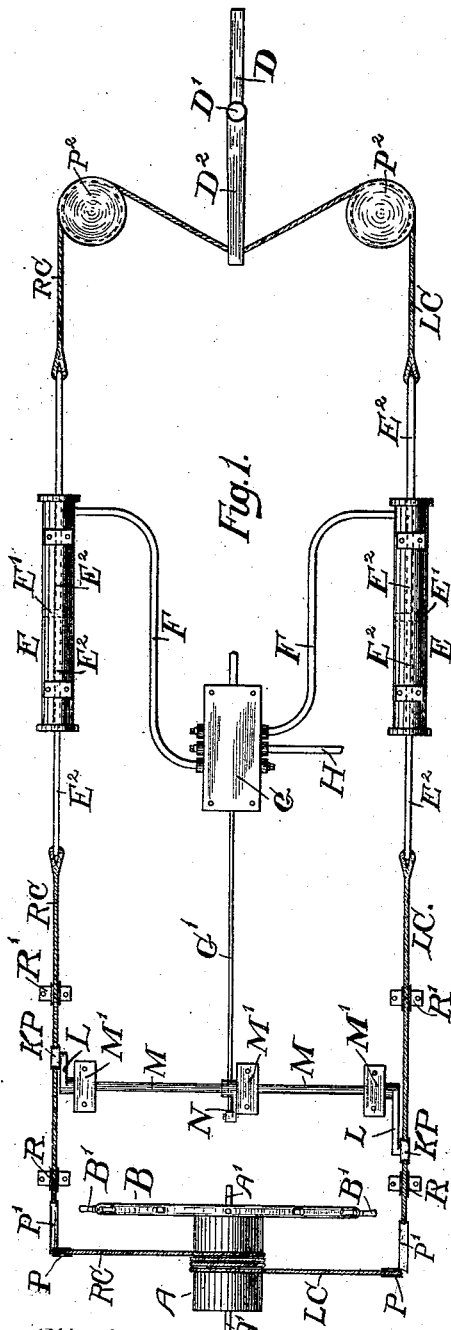


Fig. 1.

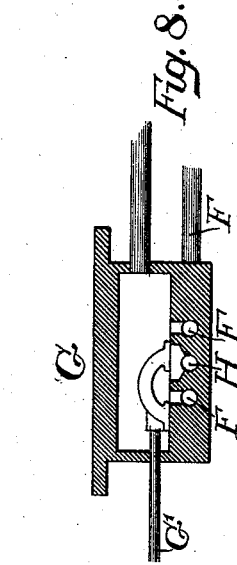


Fig. 8.

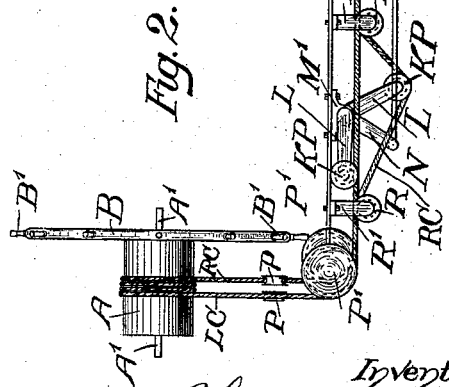


Fig. 2.

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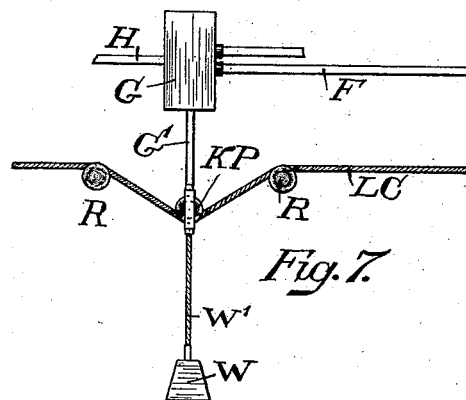
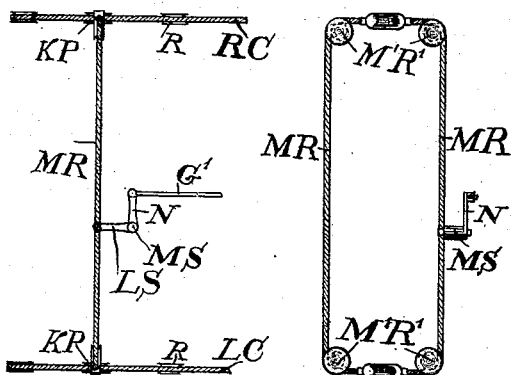
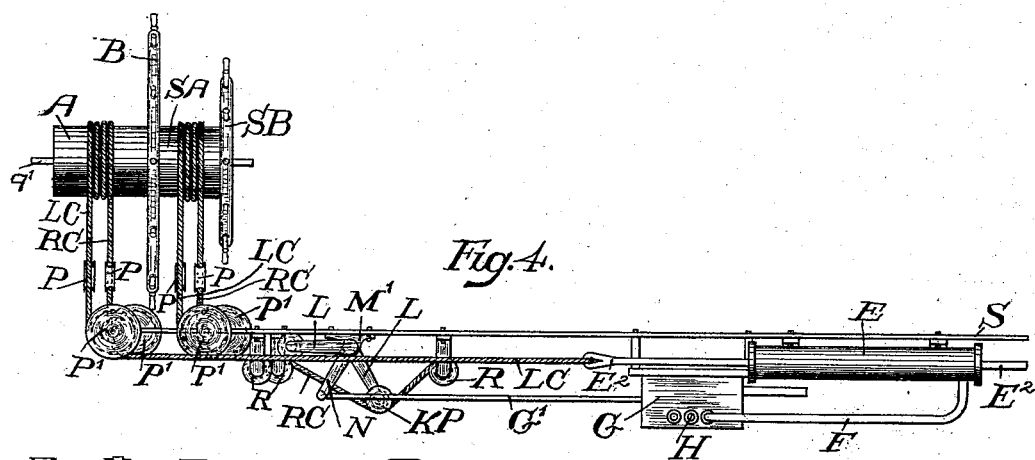
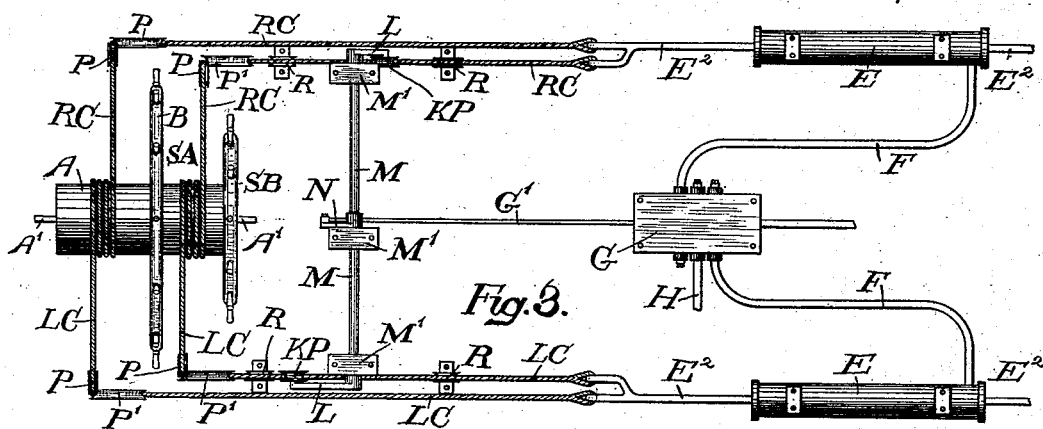
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

WILLIAM T. JOHNSTON, OF NEWPORT, KENTUCKY.

STEERING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 491,212, dated February 7, 1893.

Application filed May 26, 1892. Serial No. 434,413. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. JOHNSTON, a citizen of the United States of America, and a resident of the city of Newport, in the county of Campbell and State of Kentucky, have invented certain new and useful Improvements in Steering Apparatus, of which the following is a specification.

The several features of my invention and the various advantages resulting from their use, conjointly or otherwise, will be apparent from the following description and claims.

In the accompanying drawings, making a part of this specification, and to which reference is hereby made,—Figure 1 is a plan view of a steering apparatus illustrating certain features of my invention. Fig. 2 is a side elevation of the apparatus shown in Fig. 1. Figs. 3 and 4 respectively indicate a top or plan view and a side elevation of apparatus embodying certain features of my invention. Fig. 5 represents a top view of a modified construction of one portion of my invention. Fig. 6 is a transverse vertical section taken in the plane of the dotted line 6, 6, of Fig. 5, and looking toward that side of said section which faces toward the right in Fig. 5. Fig. 7 is a side elevation of a modified construction of a certain feature of my invention. Fig. 8 is a vertical, central, longitudinal section of a slide valve having an inside lap and working in connection with a three port valve seat. This valve can be utilized in my invention as hereinafter specified.

A indicates the drum on which the steering rope, cord, or chain is wound.

B indicates the steering wheel, provided with the usual handles B' to enable it to be the better handled and operated during the work of steering.

The drum A is suitably upheld axially. In the present instance, the drum A is provided with journals A', A', and these are suitably supported in bearings, not shown.

At the rear end of the boat is located the rudder or rudders, as D.

An operating lever or levers (technically known as the tiller) substantially as D² is connected to the rudder, usually as shown to the rudder head D', a name applied to that part of the upper cylindrical end of the rudder which passes up through the rudder port

and projects above the latter. The rudder will be swung on suitable pivotal devices connected to the stern port of the vessel and not shown on the drawings.

That part of the steering rope, cord or chain wound on the drum and extending to the right of the latter will be denominated RC, and that part of said steering rope, cord or chain extending from the drum to the left is indicated by LC. Both of the ropes RC and LC, on leaving the drum, respectively pass over or upon pulleys whereby the ropes are caused to run toward the stern of the vessel. Thus in the present illustrative instance, the rope RC passes against and partly around a fixed pulley P, and thence against and under fixed pulley P'. In like manner, the rope LC passes against and partly around adjacent similar pulleys P, P'.

Where the tiller D² is constructed and located as in Figs. 1 and 2 of the drawings, the rope RC at its rear portion passes partly around the pulley P² and thence to the tiller, to which latter it is connected. Similarly the rope LC passes partly around a corresponding pulley P² and thence to the tiller and there is connected to the latter.

E, E are cylinders, each of which contains its own piston E', (shown by dotted lines in Figs. 1 and 2.) Each piston E' has a piston rod E² which extends from said piston both forward and backward and passes through both ends of the cylinder, and is within the cylinder indicated by dotted lines, and outside of the cylinder by solid lines. As to the cylinder E on the right, the forward end of its piston rod is connected to rope RC, in front of the cylinder, and the rear piston end is connected behind this cylinder to that portion of the rope RC which connects directly to the tiller. Similarly the front portion of the rope LC is connected to the front end of the piston rod of the left hand cylinder E, while the rear end of this piston rod and the rear portion of the rope LC are connected. One end of each cylinder is connected by suitable conduits as F with valve mechanism, one form of which will be hereinafter described.

Upon the vessel is a steam generator or boiler, not herein shown, and intermediate between this generator and cylinder is a suitable valve which regulates the admission of

steam to the cylinder and its exit therefrom. Thus G is a three port valve, having a slide valve, one port of which connects with the conduit F leading to the right cylinder E and another port connects with the conduit F connected to the left cylinder E, while the middle port connects with an exhaust conduit as H. The slide valve of the usual form covers at a time the middle (exhaust) port H, and either one of the other ports.

When the valve is in its forward position it covers the exhaust and the port for the right hand conduit F and leaves the port for the left hand conduit F uncovered and open. Steam passing through this conduit F and into the left hand cylinder E to the rear of the piston E' advances the piston, and draws forward the rear portion of the left steering rope LC, and moves the tiller toward the left, and the rudder toward the right. In the meantime, any steam in the right hand cylinder E behind the piston of said cylinder is exhausted. When the slide valve is moved rearward the aforesaid operation is reversed. The steam in the left hand cylinder is exhausted, and the right hand cylinder E takes steam behind its piston, and draws forward the rear portion of its rope RC, and moves the rudder toward the left.

The slide valve has preferably an inside lap on it, (see Fig. 8,) so that steam shall be admitted into one cylinder somewhat in advance of the time when the steam is exhausted from the other cylinder. The object of this arrangement is as follows,—Suppose by means of said inside lap on the valve, that in each of the two cylinders E, E, steam is present at a pressure of say sixty pounds, and steam in the boiler is at a pressure of one hundred and sixty pounds. Now if it be desired to turn the rudder a little way from its central position, say to the left, it can readily be done without loss of time and also by taking advantage of the steam still in the right hand cylinder and not exhausted, by means of operating the steering wheel and the valve so as to let steam from the boiler into the right hand cylinder. The pressure of the steam in said cylinder then becomes greater than that in the left hand cylinder, and the rudder will be turned toward the left. Another advantage of thus having steam in both cylinders is that the rudder is held as it were more rigidly in any given position, there being no chance for it to rapidly turn from side to side, as would be the case if all the steam were exhausted from one cylinder while the other was full of steam. Of course, when the rudder is turned a considerable distance from the plane which is an extension of the longitudinal axial plane of the vessel, the valve is turned so far enough that the steam in one cylinder will be exhausted while the other is full of steam. This lap in the valve is especially advantageous when the rudder is to be turned a small distance to the right or the left

of its central position, for the reason set forth. Steam is also thus economized.

I will now proceed to explain the prominent features of my invention in connection with the mechanism already described. Upon the left hand rope LC rests a bearing K, preferably a pulley KP, for the reason that the bearing should be non-frictional. This bearing is connected with the lever arm L, fixed on a shaft M connected with the mechanism for working the valve G. In like manner, a similar bearing KP rests upon the right hand rope, and is a part of a lever L, fixed to a shaft as M, connected to the mechanism for working the valve. In the present instance, both shafts M are integral, and are journaled in bearings M', M', M', fixed to a stationary portion of the vessel. A lever N fixed on said shaft M is connected to the valve rod G' of valve G and operates the latter. On each of the right and left hand ropes are two pulley or non-frictional bearings R, R, each journaled in fixed bearings R', R'. For the purposes of illustration there appears (in Fig. 2 and not shown in Fig. 1) a support S which may stand for the vessel or a part thereof. To this support the cylinders and pulley bearings, the bearings of pulleys P', the valve box and the bearings M' of shaft M are fixed. Where both of the levers L operate one lever N and that in different directions, the levers L will lie on opposite sides of a vertical plane passing through the axis of the shaft M, and these levers L will preferably make an obtuse angle with one another, as shown in Fig. 2.

I will now proceed to describe the operation of my invention. A requisite amount of slack in the cords or rope LC is present. When the rudder is to be turned to the right, the wheel B is rotated over from left to right, winding up the rope LC, and tightening it. Such tightening of the rope lifts that bearing KP which rests on it, and elevates the free end of the crank L thereby turning its shaft M, and operating the crank N into the position shown in Figs. 1 and 2, and throwing the valve. In this way, steam is given to the rear end of the left cylinder E, and the piston thereof is with great power moved forward and forcibly draws the rear rope LC forward, and turns the rudder to the right. At the same time the above described operation is going on, the rope RC is slackened, and its bearing KP with lever L falls, and its (the right) cylinder E by the operation of the valve mechanism is exhausted behind the piston, allowing the latter to move rearward in the cylinder. To turn the rudder toward the left, the above operations are reversed.

An additional, and at first sight not appreciated, advantage is the following:—Suppose the rudder is turned toward the right, the pressure against the rudder being against its right side, the steam of the left cylinder holding it there: suddenly by a change of current or other cause, as not unfrequently happens,

the pressure of the water on the rudder is changed and transferred to the opposite side of the rudder, and will then assist the steam in pushing it toward the right. Under these
 5 circumstances, the rudder would make what is called a run, were it not that the mechanism I have provided automatically counteracts and prevents such tendency to run. For example, in the instance first cited, when the
 10 rudder after being partially moved toward the right, starts to run toward the right, such movement tightens rope RC, and causes the right cylinder to take steam, and holds the rudder in position while the left hand cylinder is exhausting. When the rudder is turned
 15 toward the left, a run in that direction is prevented by the rudder tightening the left hand cord and using steam in the left hand cylinder to stop the run. It will be observed that
 20 the tight rope gives steam on the tight rope side, and steers the vessel and prevents the rudder running.

My invention is exceedingly efficacious in use, easy to operate, not liable to get out of
 25 order, and is very simple of construction and economical of manufacture.

The large wheel can more easily be held steady. Where, however, the vessel is in a narrow river and needs to be quickly maneuvered to
 70 avoid dangerous places therein, or is threading her way amidst many other craft, she must necessarily be handled quickly. To do this necessitates a rapid manipulation of the rudder. In such cases, the smaller wheel be-
 75 comes specially desirable. This wheel being of less circumference is more quickly turned and handled than a larger wheel. The larger wheel gives more leverage than a smaller one, but when the power of steam is called into aid,
 80 this seeming advantage is more than overcome by the increased facility of manipulation of the small wheel.

One mode of combining both a large and small wheel with my invention is shown in
 85 Figs. 3 and 4. In this case, the small independent wheel SB with drum or windlass SA is rotatable on the shaft A' and can rotate independently of the wheel B and drum A. A second set of ropes RC and LC are provided,
 90 attached at front to the drum SA, and at rear respectively to the right and left piston rods E², substantially as shown. The mechanism
 KP, KP¹, I, I¹, M, M¹, N for enabling the tight-

anism, the motor engine or engines, according as one or two are employed, the latter in turn operating or assisting to operate the rudder.

- 5 In the foregoing description, the term "rope" has, for conciseness been employed. I do not, however, wish to be understood as limiting the invention to cases where ropes are employed, as other descriptions of connections, as
10 cords, chains, &c., may properly be employed with my improvements instead of ropes.

While the various features of my invention are preferably employed together, one or more of the said features may be used without the remainder, and in so far as applica-
15 ble, one or more of the said features may be used in connection with steering apparatus of descriptions other than the ones herein specifically described.

- 20 What I claim as new, and of my invention and desire to secure by Letters Patent, is:—

1. In a steering apparatus, the steering ropes, and a device for tightening one or the other, as desired, one of the ropes being slack,
25 and a motor mechanism employing a motor fluid, and a valve mechanism connected by suitable connections to the rudder, and the right and left bearings KP, respectively located upon the left and right ropes, and
30 mechanism connecting the said bearings with said valve mechanism, for enabling the drawing taut of one of the ropes to cause the valve device to admit the motor fluid to the motor mechanism, for operating the rudder in a
35 given direction, substantially as and for the purposes specified.

2. In a steering apparatus, the steering ropes, and a device for pulling one or the other, as desired, one of the ropes being slack
40 while the other is tight, and cylinders, and valve mechanism for regulating the admission of operating fluid to them, and the exit of fluid therefrom, and mechanism substantially as described for enabling the drawing
45 taut of one of the ropes to cause the valve device to admit steam to the cylinder operating the rudder in a given direction, substantially as and for the purposes specified.

3. In a steering apparatus, the steering
50 ropes, and a device for pulling one or the other as desired, one of the ropes being slack, and motor cylinders, for being operated by a motor fluid, and connected by suitable connections with the rudder and valve mechanism, adapted, when moved slightly to admit
55 steam into one cylinder while the other has steam, and when moved a greater distance to exhaust the steam from one cylinder while the other takes steam, and mechanism substantially as described for enabling the draw-
60 ing taut or approximately taut of one of the ropes, to operate the said valve mechanism, substantially as and for the purposes specified.

4. In a steering apparatus, the steering ropes
65 and a device for pulling on one or the other of said ropes as desired, one of the ropes being slack, and motor cylinders for being

operated by a motor fluid, and connected by suitable connections to a rudder and a three
70 port valve and a slide valve having an inside lap, and mechanism substantially as described for enabling the drawing taut or approximately taut of one of the ropes to operate the said valve, substantially as and
75 for the purposes specified.

5. In a steering apparatus, the steering ropes
and a device for pulling one or the other as desired, one of the cords being slack while the other is tight, and cylinders having pistons, and piston rods, the latter extending
80 through both ends of their respective cylinders, and in front connected to the forward portion of the adjacent steering rope and at rear connected to the rear portion of the said rope, and valve mechanism for operating these
85 cylinders alternately, and mechanism for enabling the drawing tight of either rope to cause, through the agency of the valve mechanism, the cylinder connected with said taut
90 rope, to pull the rear portion of said rope and turn the rudder, and hold it when turned, substantially as and for the purposes specified.

6. In a steering apparatus, the steering rope
and a device for pulling one or the other as desired, one of the cords being slack while the
95 other is tight, and cylinders having pistons, and piston rods, the latter extending through both ends of their respective cylinders, and in front connected to the forward portion of the adjacent steering rope and at rear con-
100 nected to the rear portion of the said rope, and a valve having three ports and slide valve, and mechanism for enabling the drawing tight of either rope to cause through the agency of the operated valve, the said piston connected
105 with the said taut rope to pull the rear portion of said rope and turn the rudder and hold it when turned, substantially as and for the purposes specified.

7. In a steering apparatus, the steering ropes
110 having slack and the bearings KP, one against one rope and the other against the other rope, and the levers L, L, respectively connected to the said bearings, and having a shaft connection, in combination with a motor operated
115 by a motor fluid, and connected with means for operating the rudder, and valve mechanism for operating the motor, and in turn operated through the agency of the shaft connection, substantially as and for the purposes
120 specified.

8. In a steering apparatus, the steering ropes
having slack, and the bearings K, P, one against one rope and the other against the other rope, and the levers L, L, respectively
125 connected to the said bearings and to a common shaft M, and lever or crank N, fixed to the shaft, and having rod G' fixed to the free end of the lever, and the valve G operated by the rod G', and a motor mechanism con-
130 nected to the rudder, and operated by said valve, by means of a motor fluid, substantially as and for the purposes specified.

9. In a steering apparatus, the steering ropes

having slack and the bearings K, P, one against one rope and the other against the other rope, and the levers L, L, respectively connected to the said bearings and to a common shaft M, the levers L, L, lying in planes making an angle with each other, and lever or crank N fixed to the shaft, and having rod G' fixed to the free end of the lever, and the valve G operated by the rod G', and a motor mechanism connected to the rudder, and operated by said valve, by means of a motor fluid, substantially as and for the purposes specified.

10. In a steering apparatus, the steering ropes having slack and the bearings K, P, one against one rope and the other against the other rope, and the levers L, L, respectively connected to the said bearings and to a common shaft M, and lever or crank N, fixed to the shaft, and having rod G' fixed to the free end of the lever, and the valve G operated by the rod G', and the cylinders E, E, each having piston rod E extending through both ends of the cylinder, and connected at front and rear to the steering ropes on their respective sides of the vessel, and conduits F, F, respectively connected to their respective cylinders, substantially as and for the purposes specified.

11. In a steering apparatus, the steering ropes having slack, and the bearings K, P, one against one rope and the other against the other rope, and the levers L, L, respectively connected to the said bearings and to a common shaft M, and the lever or crank N, fixed to the shaft, and having rod G' fixed to the free end of the lever, and the valve G on the three port valve seat and operated by said rod, and having an inside lap, and two cylinders one for operating the right rear rope R, C, and one for operating the left rear rope L, C, and connections between said valve and said cylinders, substantially as and for the purposes specified.

12. In a steering apparatus, the steering ropes having slack and the bearings K, P, one against one rope and the other against the other rope, and the levers L, L, respectively

connected to the said bearings and to a common shaft, and the lever or crank N, fixed to the shaft, and having rod G' fixed to the free end of the lever, and the valve G on the three port valve and operated by said rod, and having an inside lap, and the cylinders E, E, each having a piston rod E extending through both ends of the cylinder and connected at front and rear to the steering ropes at their respective sides of the vessel, and conduits F, F, respectively connected to their respective cylinders, substantially as and for the purposes specified.

13. In a steering apparatus, the first or usual steering wheel and its ropes R, C, and L, C, in combination with the rudder, and a second steering wheel, and its ropes R, C, and L, C, having slack, and a motor mechanism using a fluid motor, and a valve for operating the same and bearings in combination with the said ropes, the said bearings being respectively adapted as their respective ropes are tightened to operate the said valve, so as to set the motor mechanism in action, and operate the rudder, substantially as and for the purposes specified.

14. In a steering apparatus, the first or usual steering wheel and its ropes R, C, and L, C, in combination with the rudder, and a second steering wheel and its ropes R, C, and L, C, having slack, and the cylinders E, E, each having a piston extending through both ends of it, and at rear attached by connections to the rudder and in front connected to both the ropes which on that side are respectively connected to the first steering wheel and the second steering wheel, and a valve for operating the pistons of said cylinders through the agency of a motor fluid, and the bearings K, P, respectively resting upon the ropes of the second wheel, and connected to levers L, L, adapted by means substantially as described to reciprocate the valve, substantially as and for the purposes specified.

WM. T. JOHNSTON.

Attest:

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