No. 868,160. PATENTED OCT. 15, 1907.

H. S. DE PUY.

HYDRAULIC STEERING APPARATUS.

APPLICATION FILED DEC. 20, 1906.

2 SHEETS—SHEET 1.

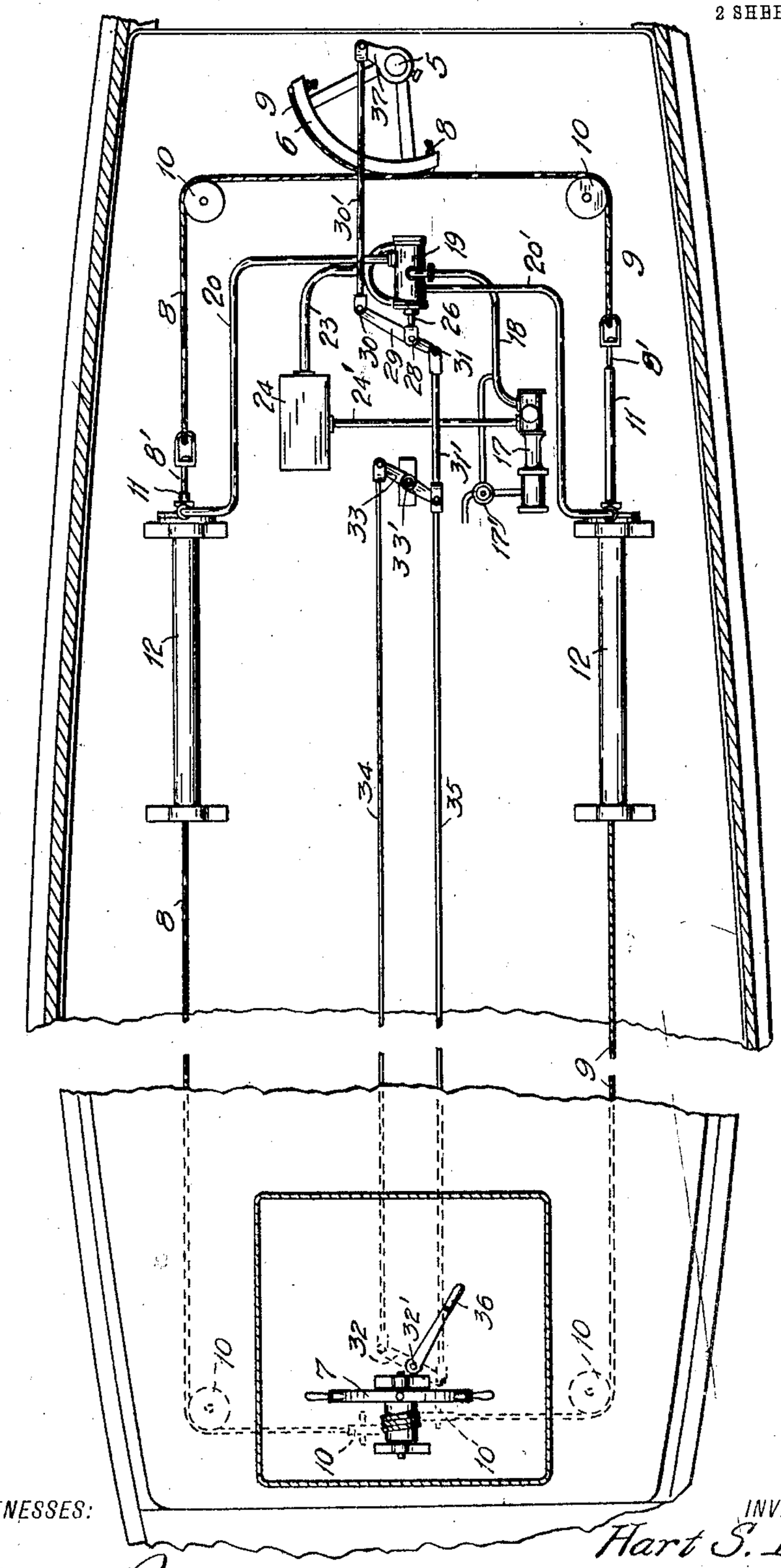

FIG. 1.

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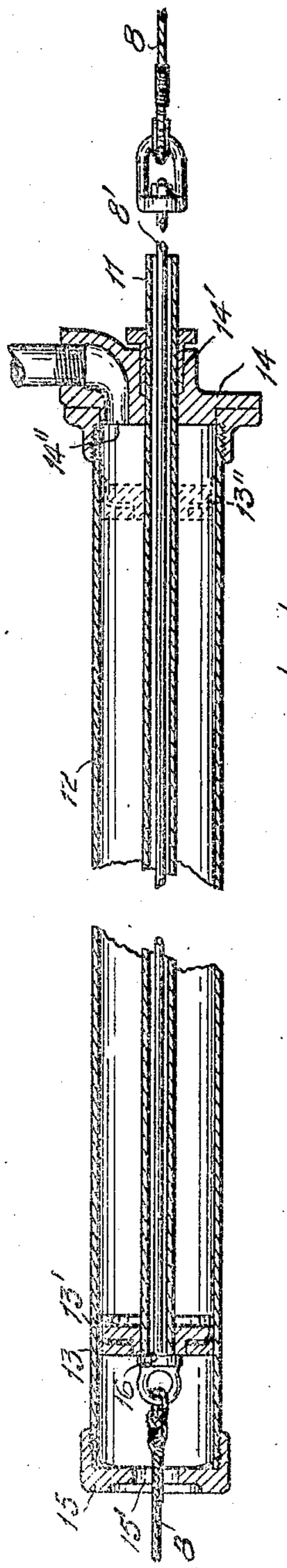

FIG. 2.

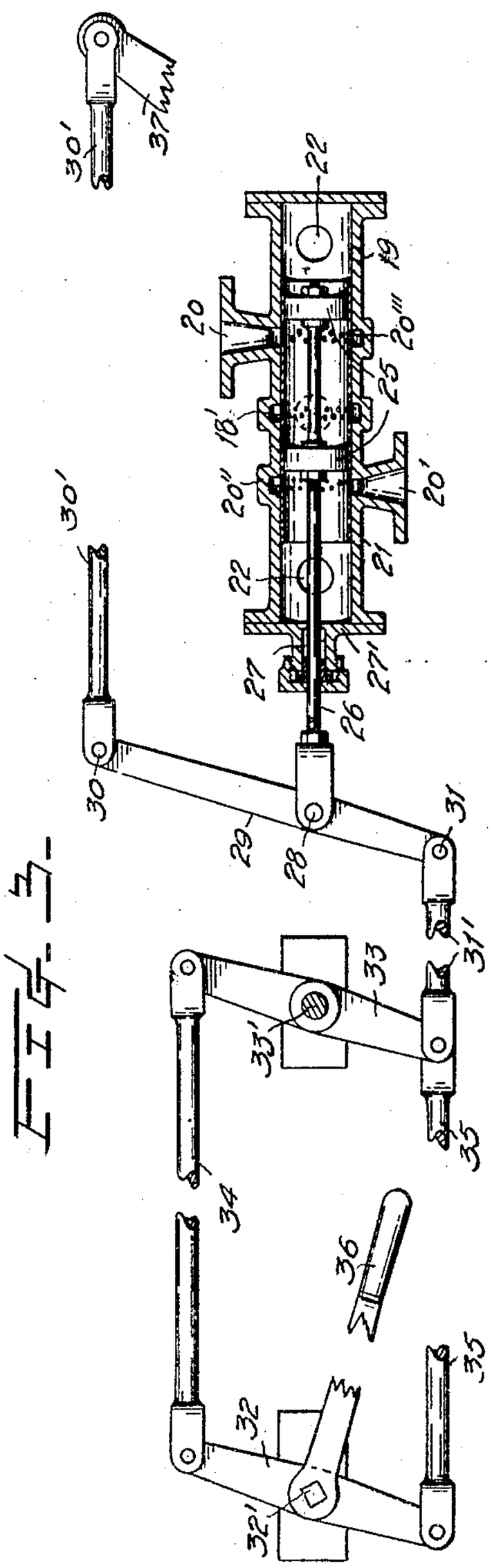

FIG. 4.

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HYDRAULIC STEERING APPARATUS.

No. 868,160. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed December 20, 1906. Serial No. 348,668.

To all whom it may concern:

Be it known that I, HART S. DE PUY, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Hydraulic Steering Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a plan view of portions of a marine vessel provided with steering apparatus constructed in accordance with my invention; Fig. 2, a longitudinal section view of one of the power cylinders illustrated in the foregoing view; and Fig. 3, a fragmentary plan view of the valve and its controlling mechanism with the valve cylinder shown in section.

The object of this invention is the provision of a simple and effective steering gear which is reliable in operation, and which can be interchangeably employed either for operating the rudder by tiller-ropes from a wheel as ordinary or by power means which is likewise controlled from the pilot house.

With these ends in view the invention consists in the novel construction, adaptation and combination of parts which will be hereinafter particularly described and claimed.

In the drawings, the reference numeral 5 designates a rudder-stock to which is fixedly connected a quadrant 6, as ordinary. 7 is a steering wheel located within the pilot house, or at any other suitable place upon the vessel, and is connected with said quadrant by tiller lines 8 and 9 which are guided by pulleys 10, so that the lines will be led downwardly from the wheel, thence transversely, thence longitudinally and finally transversely to their connection with the quadrant. Included within the fore-and-aft portions of said lines are rods 8′ and 9′ which respectively extend axially and loosely through tubular piston-rods 11 of hydraulic power cylinders 12 which are rigidly secured to the vessel structure. These piston rods have fixedly connected to one end of each a piston 13, see Fig. 2, which are suitably packed as by annular cup-leathers 13′ to make a non-leakable fit with the cylinders. One head 14 of each cylinder is provided with a stuffing box 14′ through which the tubular piston-rods pass, and the opposite heads 15 are centrally apertured, as at 15′, to allow the cable portions of the steering lines unobstructedly passing therethrough in the operations of the apparatus.

In practice the cylinders are desirably constructed of wrought iron pipe having screw threaded ends which register with internal threads of the two heads. At the ends of each of rods 8′ and 9′ which are adjacent of said apertured heads is a collar 16 adapted to be engaged by the respective pistons and move these rods therewith, together with the connected steering parts of the lines, when the piston is propelled thereagainst by the force of the power medium acting upon the opposite sides of the pistons. 17 represents a pump actuated desirably by steam which is admitted or throttled, desirably, by any of the well known regulating valves, indicated by 17′, which is controlled by the pressure had within the water supply pipe 18 leading from the pump and whereby the water is continuously maintained at a suitable pressure to meet the service required. This supply pipe leads to a valve cylinder 19 and from thence by pipes 20 and 20′ to said power cylinders whereinto they communicate as by a port 14″ in the head 14 of each. The valve-cylinder, see Fig. 3, is provided desirably with a liner 21 to furnish a renewable smooth wearing surface for the valve and is perforated as at 21′, 21″ and 21‴ positioned opposite the respective said pipe connections with the cylinder and serve as water ports therefor. The valve cylinder is likewise provided with water outlet openings 22 through which and the pipe 23 communication is had with a water reservoir 24, which, in turn, is connected with the cylinder of the pump by a pipe 24′. The valve employed in the illustrated embodiment of the invention is of the double-piston type, whereof 25 are the pistons spaced to operatively conform with the disposition of the ports, as will be understood from an inspection of Fig. 3, and are provided with a common rod 26 which extends through a stuffing-box 27 in the cylinder head 27′.

Pivotally connected by a pin 28 with the outer end of the valve rod is a lever 29 having its opposite ends similarly connected by pins 30 and 31 with links 30′ and 31′. The latter of these links make pivoted connection with an arm of the adjacent of two levers 32 and 33 mounted upon rotatable, but otherwise nonmovable fulcrums 32′ and 33′ and are connected by reach rods 34 and 35 so that they will vibrate in unison.

Fulcrum 32′ is comprised of a vertical spindle extended upwardly through suitable journal boxes and is provided with a handle bar 36 within easy reach of the steersman and whereby the latter can manipulate the valve to admit the power medium to either of the hydraulic cylinders and release it from the other and thus swing the rudder to either side predeterminately. The link 30′, aforesaid, operatively connects the arm of the lever 29, opposite to that connected with the lever 33, with a crank-arm 37 secured to the rudder-stock, or through other intermediate connections which will impart an equivalent motion to this lever. The purpose of the mechanical connection between the rudder stock and the valve is to allow the latter being operated by said lever handle when movement is to be imparted thereto by the steersman and thus control the flow of the power medium to swing the rudder through the thrusting of the pistons of one or the other of the hydraulic cylinders acting against the opposing collar 16. When the rudder is swerved, however, the arm 37 comes into play and moves the lever 29, about the pin

31 as its axis, to cause the valve being brought into such position as to intercept the further flow of the power medium into or from the respective power cylinders and thus reliably hold the rudder in its set position, with the handle-bar indicating to the steersman the angle at which the same is held. When it is desired, the aforedescribed power devices may be disengaged from the steering gear by making the pump inoperative and successively moving the pistons 12 of each power cylinder into proximity of the heads 14, as indicated by broken lines 13″ in Fig. 2, whereupon the rods 8′ and 9′ may be moved with the tiller lines from the steering wheel and independently of the power pistons and still, retain the benefits derived from the handle-bar 36 as an indicator to disclose the angular position of the rudder.

While this invention may advantageously be used with any class of vessels driven by power it is notably useful upon river boats having to contend with swift currents and under such conditions the aforedescribed apparatus has been successfully used upon the Yukon river through an entire season of navigation, and has demonstrated itself to be efficient and easy to control.

Having described my invention, what I claim, is

1. In steering apparatus, the combination with the rudder post and a tiller line, of a power cylinder, a piston within the cylinder, devices upon the said line whereby the line is operatively engaged by the piston when the latter is actuated by a power medium to move in one direction and to engage the piston and move the same when the tiller line is moved in the opposite direction, and means to control the admission or escape of said power medium.

2. In steering apparatus, the combination with the steering wheel, a rudder stock, and two tiller lines making connection between the wheel and the stock, of a power cylinder for each said line, a piston in each cylinder, a tubular piston rod for each piston and extending through one head only of the respective cylinders and inclosing a portion of the respective tiller lines, devices carried by the latter which are adapted to be engaged by the respective pistons when the same are moved in one direction by a power medium, a pump, communicative connections between the pump and one end of each of said cylinders, a valve adapted to admit said medium to either of said cylinders, manually actuated devices for controlling the action of said valve, and devices actuated by the movement of the rudder stock whereby the action of the valve is affected to restrain the action of the power medium within said cylinders.

3. In a steering apparatus, the combination with the steering wheel, the tiller lines, and connections between the latter and the rudder stock, of two power cylinders each provided with a piston having a tubular piston-rod protruding through one head of the respective cylinders, said pistons, said rods, a rod forming part of said lines extending through each of said piston-rods and adapted to be engaged by the respective pistons when the latter are moved in a single direction only, a pump, communicative connections between the pump and one end of each said cylinders, a valve interposed within said connections, and means for actuating said valve whereby the power medium may be predeterminately admitted through the proper of said connections into either cylinder.

4. In steering apparatus, the combination with a rudder stock operatively connected to two tiller lines, and said tiller lines, of two power cylinders, a piston in each of said cylinders, means to introduce a power medium into said cylinders upon one side only of their respective piston, a valve, a steering handle-bar, operative connections between said valve and handle-bar, connections between the above named connections and said rudder stock whereby the valve and the handle-bar are affected by the movements of the rudder stock, means whereby either of said tiller lines are engaged by the respective pistons when acted upon by the power medium, and means for predeterminately controlling the supply of said medium to either of said cylinders.

In testimony whereof I affix my signature in presence of two witnesses.

HART S. DE PUY.

Witnesses:
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E. H. ALVORD.