R. JANNEY.

TELEMOTOR.

APPLICATION FILED MAY 27, 1910.

986,065. Patented Mar. 7, 1911.

5 SHEETS—SHEET 1.

Fig. 1.

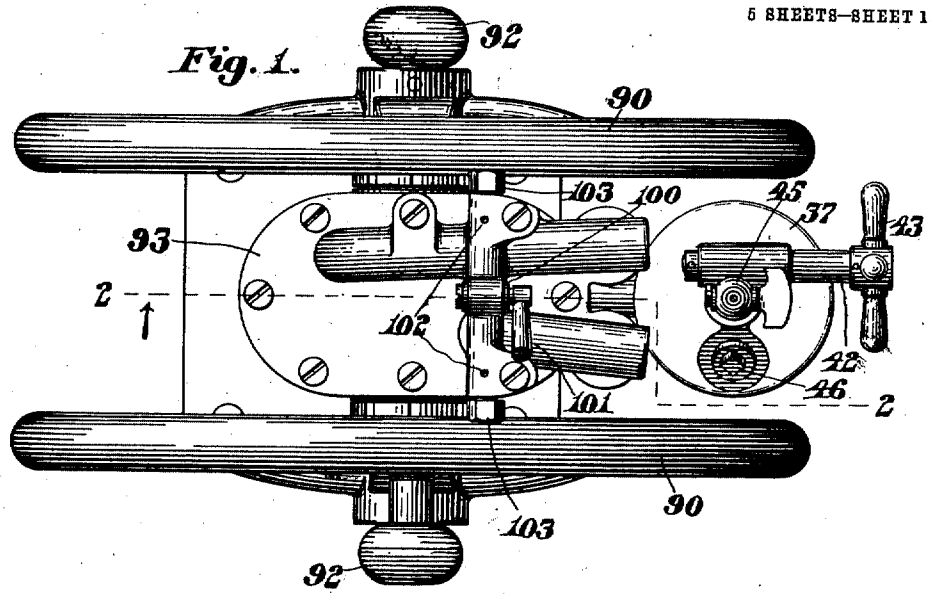
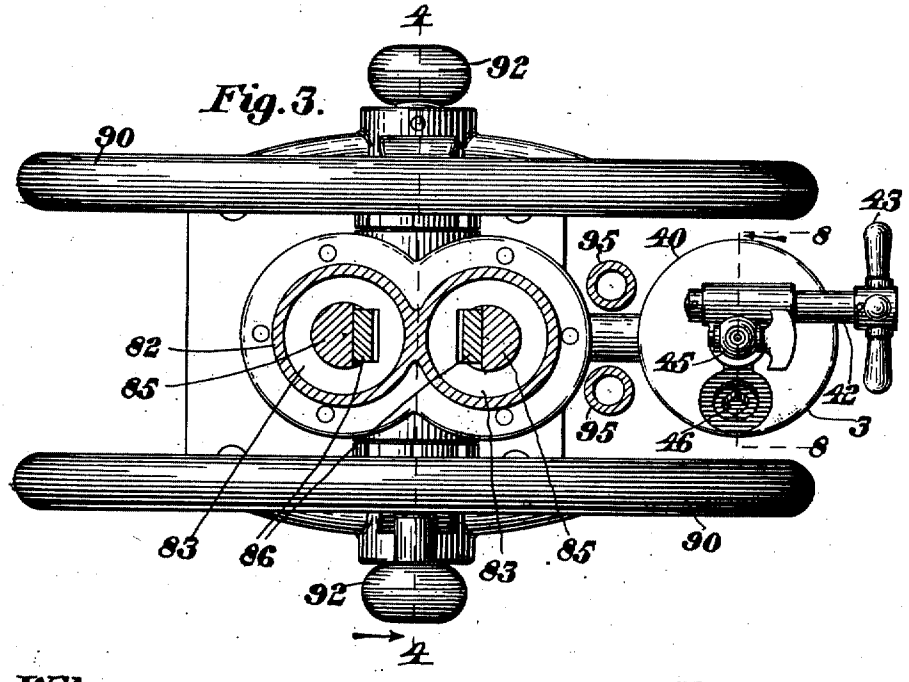


Fig. 3.



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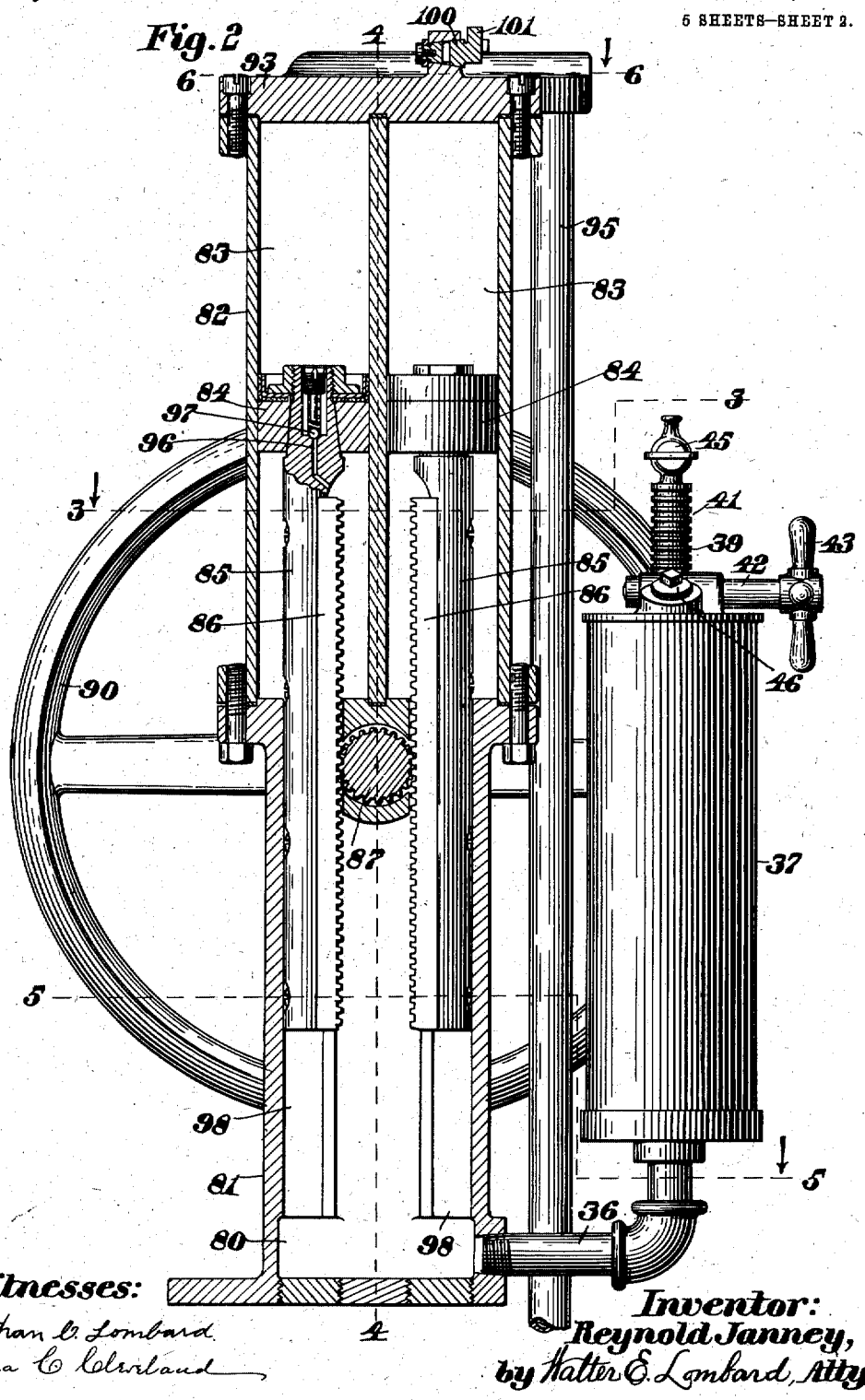
5 SHEETS—SHEET 2.

Fig. 2



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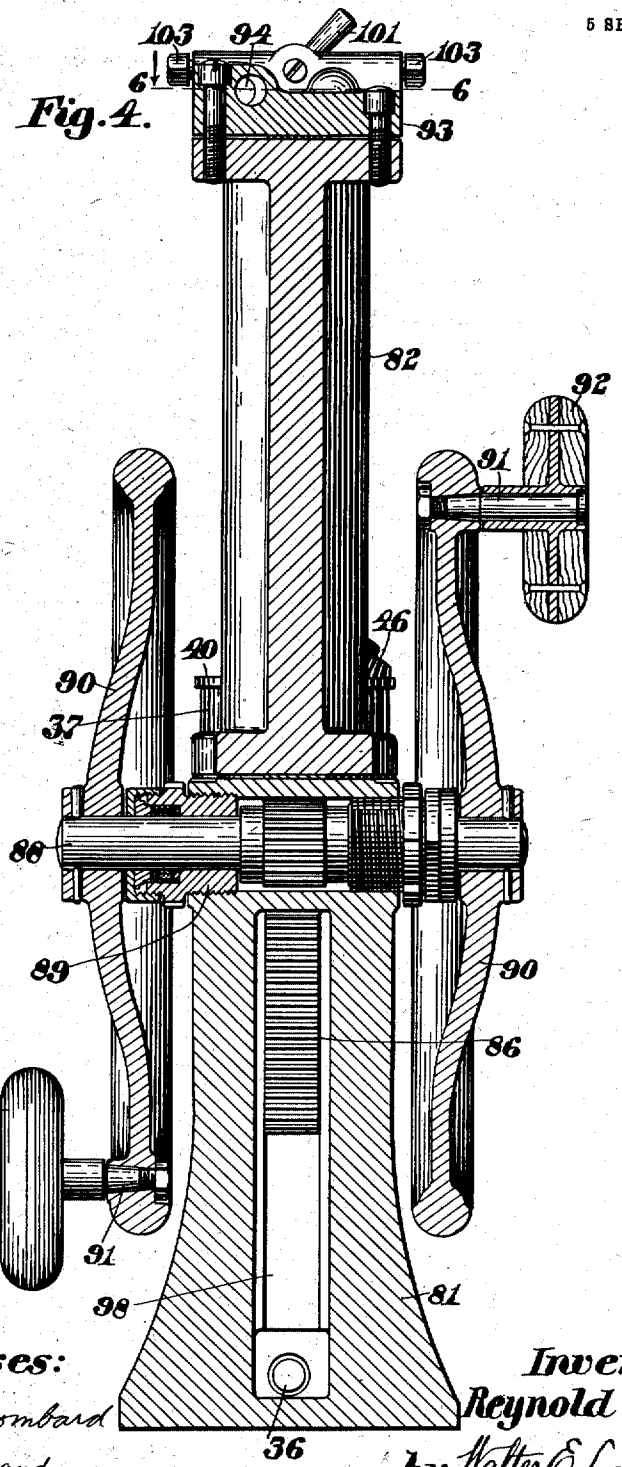
5 SHEETS—SHEET 3.

Fig. 4.



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5 SHEETS—SHEET 4.

Fig. 5.

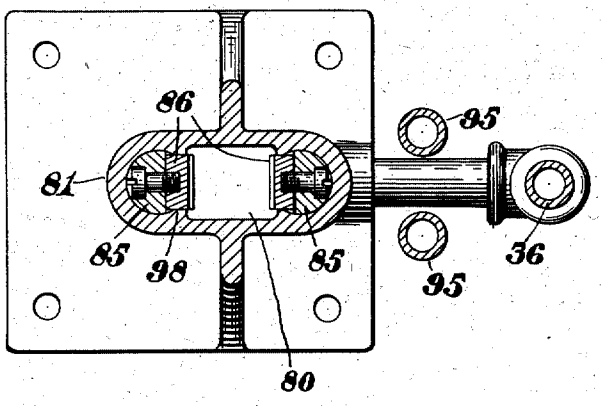


Fig. 8.

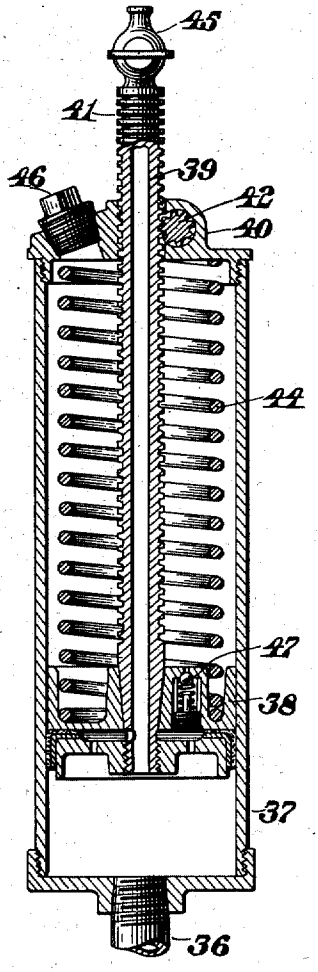


Fig. 6.

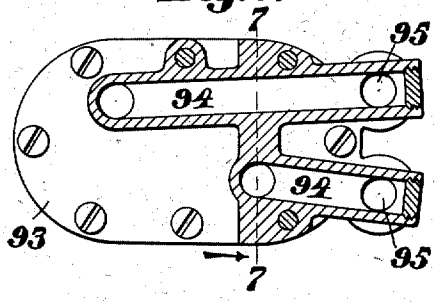
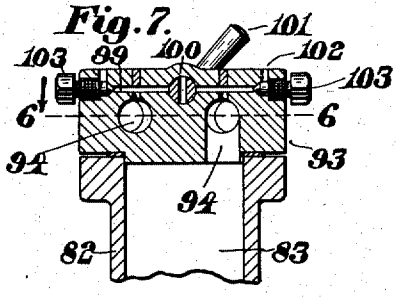


Fig. 7.



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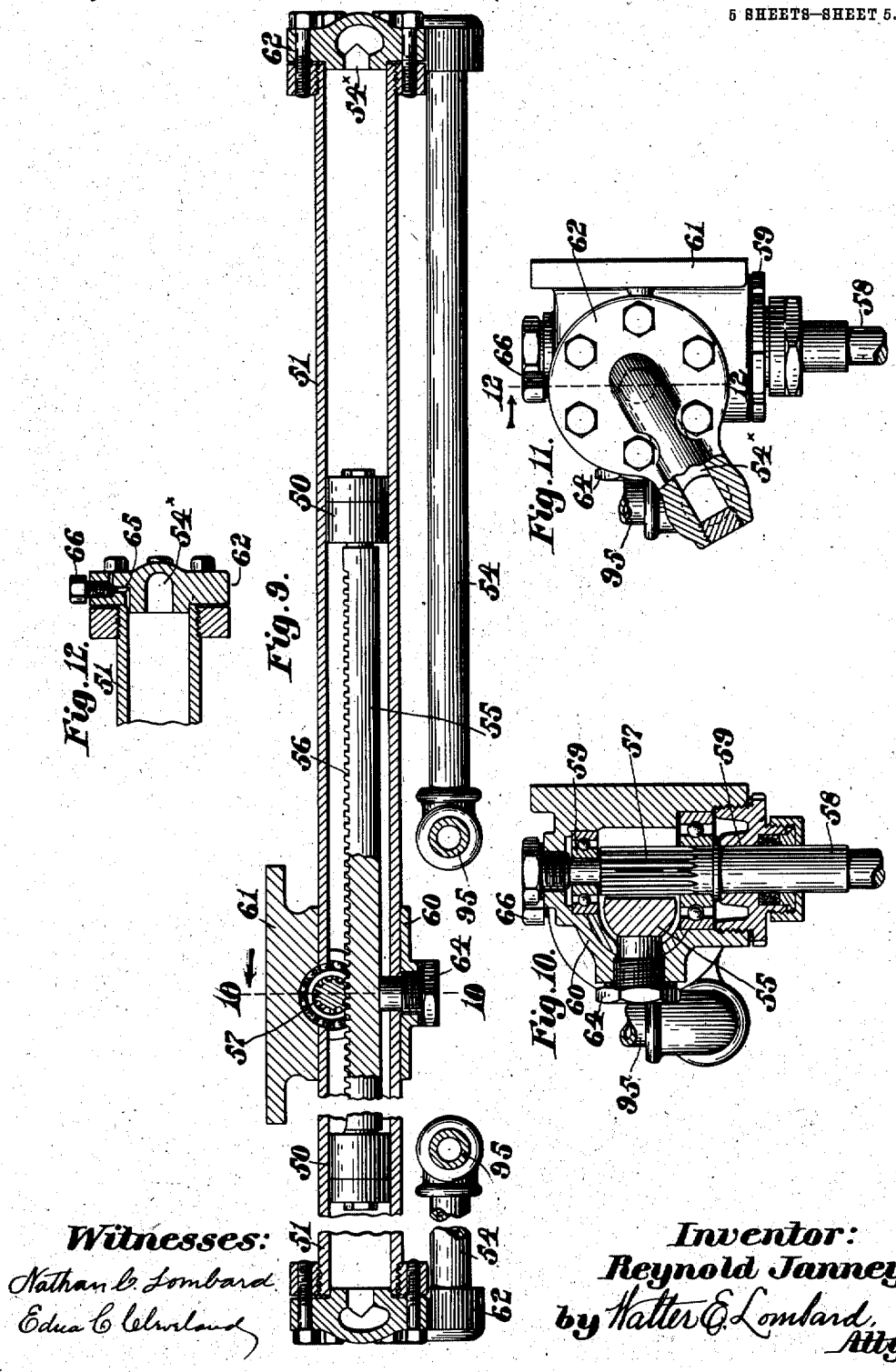
5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

REYNOLD JANNEY, OF NEW YORK, N. Y.

TELEMOTOR.

986,065. Specification of Letters Patent. Patented Mar. 7, 1911.

Original application filed January 14, 1910, Serial No. 538,547. Divided and this application filed May 27, 1910. Serial No. 563,831.

To all whom it may concern:

Be it known that I, REYNOLD JANNEY, a citizen of the United States of America, and a resident of New York city, in the county and State of New York, have invented certain new and useful Improvements in Telemotors, (said improvements being a division of application Serial No. 538,547, filed January 14, 1910,) of which the following is a specification.

This invention relates to telemotors and particularly to that type of telemotors in which hydraulic pressure is utilized to control the operation of an actuating device by a manually operated controlling device located remotely from said actuating device.

Heretofore hydraulic telemotors have been used in which rotary motion could be transmitted indefinitely in one direction or the other by a pump which was adapted to keep up a circulation of fluid through a suitable hydraulic engine or other actuating device. In all such telemotors either a fixed inclosed quantity of fluid is caused to circulate throughout the system and is used over and over, or the fluid used therein may be drawn from an indefinite or inexhaustible source of supply and exhausted, from the engine or actuating device, as used.

In the present invention, a fixed and unchanging quantity of fluid is used, one-half of which is confined to each half of the telemotor system and is subjected alternately to pressure and suction as the direction of motion is reversed.

In the operation of a device embodying the features of the present invention, one of the greatest difficulties to be contended with is the leakage from the system, this leakage tending to make the apparatus unbalanced and imperfect in its operation.

One of the principal objects of the present invention is to overcome this objection and provide a system in which the movable member or members in the actuating device will operate synchronously and positively with any movement of the movable member or members forming a part of the controller. This positive action and simultaneous operation of the two ends of the system is effected by providing a fluid supply reservoir in which fluid is confined under pressure and is permitted to flow into the system to replenish any deficiency therein due to leakage of the fluid therefrom.

The invention consists in certain novel features of construction and arrangement of parts which will be readily understood by reference to the description of the drawings and to the claims hereinafter given.

Of the drawings: Figure 1 represents a plan of a controlling device embodying the features of the present invention. Fig. 2 represents a vertical section of the same, the cutting plane being on line 2—2 on Fig. 1. Fig. 3 represents a horizontal section of the same, the cutting plane being on line 3—3 on Fig. 2. Fig. 4 represents a vertical transverse section of the same, the cutting plane being on line 4—4 on Figs. 2 and 3. Fig. 5 represents a horizontal section of the same, the cutting plane being on line 5—5 on Fig. 2. Fig. 6 represents a horizontal section through the cylinder head, the cutting plane being on line 6—6 on Figs. 2, 4, and 7. Fig. 7 represents a transverse section of the same, the cutting plane being on line 7—7 on Fig. 6. Fig. 8 represents a vertical section of the supply reservoir. Fig. 9 represents a horizontal section of the actuating device or hydraulic engine operated by said controlling device. Fig. 10 represents a transverse section of the same, the cutting plane being on line 10—10 on Fig. 9 looking in the direction of the arrow. Fig. 11 represents an end elevation of the same, a portion of the same being broken in section, and Fig. 12 represents a section of one end of the actuating device cylinder and the closure therefor, the cutting plane being on line 12—12 on Fig. 11 looking in the direction of the arrow. Figs. 10 and 11 are drawn to an enlarged scale.

Similar characters designate like parts throughout the several figures of the drawings.

In the drawings, 80 represents a chamber formed in the base 81 of a controlling device, said base having secured to its upper end the casing 82 provided with two parallel cylindrical chambers 83, in each of which is mounted a reciprocating piston 84 provided with a stem or rod 85. A supply of fluid to this chamber 80 is admitted through the pipe 36 communicating therewith, and having secured to its opposite end

a reservoir 37 adapted to contain a supplemental supply of fluid. The reservoir 37 is preferably cylindrical and has mounted therein a plunger 38, secured to a tubular stem 39 extending upwardly through the closure 40 for said reservoir. This stem 39 is provided with a plurality of annular teeth 41 with which mesh the teeth of a revoluble member 42 mounted in a bearing in the closure 40 and provided with a hand wheel 43 by which it may be turned to raise the plunger 38 in the reservoir 37 against the tension of a spring 44, normally tending to force the plunger 38 downwardly against any fluid beneath it. The upper end of the stem 39 is provided with a valve 45 normally closed. This valve provides a means whereby, when open, the air beneath the plunger or piston 38 may be wholly removed from the reservoir 37 whenever the removal of this air becomes necessary. It is obvious that the spring 44 acting upon the plunger 38 will force any fluid beneath it through the pipe 36 into the chamber 80. The plunger 38 has a passage therethrough which is normally closed by a spring-pressed check valve 47 which prevents any fluid beneath the plunger from passing upwardly through said plunger into the chamber above, while the fluid beneath said plunger may be replenished at any time by moving the plunger upwardly against the tension of the spring 44, this upward movement of the plunger being effected by means of the revoluble toothed member 42 engaging with the teeth 41 of the tubular stem 39. The fluid passing through the pipe 36 into the chamber 80 is therefore supplied thereto under pressure. The piston rods 85 have secured thereto or formed thereon, rack members 86, the teeth of which face one another and are separated sufficiently to admit between them a pinion 87 secured to or formed upon a shaft 88 revoluble in bearings 89, secured to or formed in said base 81. The ends of the shaft 88 extend through said bearings 89 and to each outer end is secured a wheel 90, each wheel being provided with a stud 91 oppositely disposed relative to the other, upon which is mounted a suitable revoluble handle 92 adapted to be gripped by the hand of the operator. It is obvious that when the operator grips the handles 92, one in each hand, and revolves the shaft 88, the pinion 87 thereon will cause one of the pistons 84 to be moved in one direction and the other piston to be moved an equal distance in the opposite direction.

The cylinders 83 are provided at their upper ends with a cylinder head 93 provided with passages 94 from said cylinders to pipes 95 communicating with the opposite ends of the actuating cylinder 51. It is obvious therefore, as the pistons 84 move in opposite directions, that the fluid will be forced through one of the pipes 95 into one end of the actuating cylinder 51, while a suction will be created in the other cylinder into which will pass the fluid from the pipe 95 communicating with the opposite end of said actuating cylinder 51. The ends of the cylinders 83 are in communication with the corresponding ends of the cylinder 51 through the tubes or pipes 95 and 54. It is obvious that any one or more of these pipes 95 and 54 may be either flexible or rigid without altering the principles of the present invention. It is self evident from an inspection of the drawings that by connecting the ends of the cylinders 83 and 51 by means of this system of piping 95 and 54, the fluid is wholly confined within the system and requires no renewal except that which is needed to replenish the deficiency due to leakage. The piston heads 50 are connected together by means of a rod or bar 55 provided with a plurality of rack teeth 56 with which mesh the teeth of a pinion 57 formed upon or secured to an actuating shaft 58 mounted in suitable bearings 59 formed in or secured to an enlargement 60 of said cylindrical casing 51, intermediate its ends. This enlargement 60 may be formed integrally with the cylindrical portions 51 of said casings, or be a separate member as shown in the drawings with the cylindrical member 51 passing therethrough. In either case the enlargement 60 is provided with suitable flanged members 61 by which the actuating device may be secured in any desired position.

It is obvious that as the piston reciprocates in the bore of the cylinder 51, the teeth 56 formed upon or secured to the connecting member 55 will cause a rotation of the actuating shaft 58 which may be utilized for any desired purpose.

The pipes 54 leading to the actuating device connect directly to the cylinder heads 62, secured to the ends of the cylindrical casing 51 by bolts or other suitable securing devices, and communicate with the passage 54* therein. Preferably the connecting member 55 is provided with a flat side against which the end of the member 64, threaded into a hub on the enlargement 60, is adapted to bear to prevent the turning of said member 55.

Each cylinder head 62 is provided with an air outlet 65 normally closed by means of a valve 66. When the system is being filled with fluid preparatory to its use, the valve 66 is opened to permit the escape of any air from the cylinder 51 and is again closed as soon as the cylinder is completely filled with fluid.

The filling of the system is most readily accomplished by removing the closure cap 40 and the piston or plunger 38 of the reservoir 37. Then with all the air valves open

the liquid is poured into the reservoir 37. The check valves 97 usually offer sufficient resistance to the flow of the liquid to cause the chamber 80 to become full before the remainder of the system. The filling of the remainder of the system is facilitated by inserting the plunger or piston 38 after each filling of the reservoir 37 and forcing the liquid through the check valves 97, repeating this operation as many times as may be necessary to completely fill the system. The air valves 103 and 66 should be watched during the process and each one closed as soon as the fluid appears. When the system is entirely filled, the plunger or piston 38 is inserted and the closure cap 40 secured in place. Thereafter additional supplies of oil may be poured in through the opening plugged by 46. The operator by means of the handle 43 may then raise the plunger 38 into any desired position to secure the proper tension upon the spring 44, and in so doing, the valve 47 in said plunger will operate to permit the passage of the fluid above the plunger to the space below the same. All of the fluid then beneath the plunger 38, in the pipe 36 and in the chamber 80 will be subjected to the pressure of said spring.

As the chambers of the cylinders 83 and 51 and the pipes 95 and 54 are completely filled with fluid, it is obvious that any movement of the controlling pistons 84 in either direction will act through the medium of said fluid to immediately cause similar movement of the actuating piston 50, and the rotation of the actuating shaft 58.

It is self evident that as one of the pistons 84 is moved in one direction, it pushes the fluid in advance thereof through one set of pipes 95 or 54 against the end of the actuating piston 50, and the suction created by the movement of the other piston 84 causes the fluid from the opposite end of the piston 50 to pass through the other set of pipes 54 or 95 into the other cylinder 83.

When the pistons 84 and 50 are centered in their cylinders 83 and 51, the whole system is equally balanced and there is an equal amount of fluid on either side of said pistons. As soon as there is any leakage from any of the cylinders from any cause, the reduced pressure in the cylinders and pipes will permit the greater pressure of the fluid in the chamber 80 to actuate the check valves 97 to permit sufficient fluid under pressure to pass through the openings 96 into the cylinders 83 to replenish any deficiency there may be in either side of the system, due to the leakage of fluid therefrom. By this construction, the apparatus is automatically replenished at any time when any deficiency in the fluid occurs, and the simultaneous operation of the actuating piston 50 and the controller pistons 84 is effected whenever the operator rotates the shaft 81 by means of the hand wheel 90. It is quite evident that by this means the slightest movement of this hand wheel will be immediately transmitted through the actuating piston 50 to the actuating shaft 58 and operate any other device to which it may be connected, no matter how remotely situated the device to be operated may be from the controlling device.

Whenever the pressure in the reservoir becomes decreased, it may be readily increased by the raising of the plunger 38, permitting a fresh amount of fluid to pass from that portion of the reservoir above the plunger into the space below said plunger, the lifting of the plunger 38 compressing the spring 44 and increasing the pressure upon the fluid beneath said plunger.

When any leakage occurs in the system, the fluid under pressure in the chamber 80, constantly replenished by the additional supply in the reservoir 37, will pass through the opening 96 opening the valve 97 therein and replenish any deficiency that may be due to leakage from the system, thus keeping the two sides of the system properly balanced at all times and the system completely filled with fluid so that any movement of the shaft 88 will immediately transmit a similar rotary movement to the actuating shaft 58.

Each rod 85 and rack 86 is mounted in a suitable guide 98 formed upon or secured to the inner wall of the chamber 80, said guides being so constructed as to prevent the turning of these rods about their axes. The cylinder head 93 is provided with a by-pass 99 between the passages 94, this by-pass being provided with a valve 100 manipulated by a handle 101. When it is desired to register the pistons 84 with the piston 50 in the actuating cylinder, the valve 100 is opened, and when the various pistons have been brought into register with one another, the valve 100 is closed and remains closed throughout the operation of the apparatus. An air outlet 102 communicates with either end of said by-pass 99, and is normally closed by the valves 103 which may be opened during the process of filling the system with fluid to permit the escape of any air that there may be in the cylinders, the valves 103 being again closed as soon as the cylinders have been filled.

An apparatus constructed as hereinbefore described, with the fluid which operates the actuating shaft equally distributed in either side of the system and communicating with a reservoir containing fluid under pressure adapted to automatically replenish any deficiency in the fluid in the system due to any leakage therefrom, permits the actuating shaft to be under the immediate control of the operator manipulating the hand wheels so that the slightest movement of said wheels will immediately cause a similar movement

of the actuating shaft. This is of great importance in the manipulation of the steering mechanism of a vessel and in the manipulation of the turret of a battleship, it being quite obvious that it is absolutely necessary that the operator should know just what result each movement of the controller has effected on the actuating shaft which he is endeavoring to control from a distance. This, as far as is known, has heretofore been impossible as the leakages occurring in various systems which have been in use have always caused an imperfect operation of the actuating device, considerable movement of the controller being necessary before the actuating device begins to operate, and as the leakage increases and the variation in the movements of these two members becomes greater, the operator has no means of knowing just what this variation may be at any given time. Should, however, any leakage occur in the system, thereby reducing the pressure in either of the cylinders 83, the excessive pressure of the fluid contained within the chamber 80 will automatically open the check valve 97 and permit sufficient fluid to pass through the passage 96 to replenish any deficiency due to this leakage. This leakage may be from the system as a whole, causing a vacuum in one or both sides of the system unless some provision is made to replenish any deficiency caused thereby, or there will be a quantity of air sucked into the system equal to the amount of liquid leaked out. When such a leakage occurs and the deficiency caused thereby is not replenished, the movement of the actuating piston by means of the controlling piston is inaccurate and does not positively operate as soon as the controlling piston commences to move, as it is quite essential should be the case.

It is quite obvious that, by means of the reservoir 37 herein described containing an additional quantity of fluid under pressure and separated from the fluid in the main portion of the system only by the check valves 97, any leakage from the system will be immediately and automatically replenished therefrom. In some cases the leakage may be across from one side of the system to the other, thus causing the two ends of the system to be out of register with each other. When this leakage occurs, the actuating device will become out of register with the controlling device, thereby making the apparatus practically useless. This necessitates providing as far as possible against any leakage past the pistons and providing a means for quickly and positively re-adjusting the register should there be any leakage, without any delay and without interfering with the operation of the device. This is accomplished by means of a valved by-pass 99 in the manner heretofore described.

It is believed that the operation and many advantages of the invention will be fully understood without further description.

Having thus described my invention, I claim:

1. In an apparatus of the class described, the combination of a casing having three fluid-filled compartments therein; two piston heads therein separating each end compartment from the intermediate compartment; means for automatically filling the intermediate compartment with fluid under pressure; check valves in said piston heads permitting the passage of the fluid from said intermediate compartment to each end compartment; a revoluble member for moving simultaneously said piston heads, the ends of which extend through said casing; and a hand wheel on each end thereof.

2. In an apparatus of the class described, the combination of a casing having three fluid-filled compartments therein; two piston heads therein separating each end compartment from the intermediate compartment; means for automatically filling the intermediate compartment with fluid under pressure; check valves in said piston heads permitting the passage of the fluid from said intermediate compartment to each end compartment; a revoluble member for moving simultaneously said piston heads, the ends of which extend through said casing; a wheel on each end thereof; a stud in each wheel oppositely disposed relative to the other; and a revoluble hand-gripping member on each stud.

3. In an apparatus of the class described, the combination of a casing provided with two parallel fluid cylinders; a piston in each provided with a stem having a plurality of rack teeth; a chamber communicating with both cylinders; means for filling said chamber with fluid under pressure; and a valve in each piston permitting the passage of the fluid in said chamber through either piston into the outer end of either cylinder and preventing its return thereto.

4. In an apparatus of the class described, the combination of a casing provided with two parallel fluid cylinders; a piston in each provided with a stem having a plurality of rack teeth; a revoluble piston meshing with both racks; a chamber containing fluid under pressure communicating with both cylinders; a valved passage through each piston between said chamber and the outer ends of said cylinders; and a closure for said cylinders provided with a valved by-pass from one to the other.

5. In an apparatus of the class described, the combination of a casing provided with two parallel fluid cylinders; a piston in each provided with a stem having a plurality of

rack teeth; a revoluble pinion meshing with both racks; a chamber containing fluid under pressure communicating with both cylinders; a valved passage through each piston between said chamber and the outer ends of said cylinders; and a closure for said cylinders provided with a valved air outlet for each cylinder.

6. In an apparatus of the class described, the combination of a casing provided with two parallel fluid cylinders; a piston in each provided with a stem having a plurality of rack teeth; a revoluble pinion meshing with both racks; a chamber containing fluid under pressure communicating with both cylinders; a valved passage through each piston between said chamber and the outer ends of said cylinders; and a closure for said cylinders provided with a valved by-pass from one to the other and a valved air outlet at each end of said by-pass.

7. In an apparatus of the class described, the combination of a casing provided with two parallel fluid cylinders; a piston in each provided with a stem having a plurality of rack teeth; a revoluble pinion meshing with both racks; a chamber containing fluid under pressure communicating with both cylinders; a valved passage through each piston, through which the fluid in said chamber may pass into the outer end of each cylinder; and an outlet from each cylinder to the opposite ends of an actuating cylinder.

8. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder; means for filling said chamber with fluid under pressure; a valve in each piston permitting the passage of the fluid in said chamber through either piston into the outer end of either cylinder and preventing its return; and means for simultaneously moving said pistons in opposite directions.

9. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder; means for automatically filling said chamber with fluid under pressure; a valve in each piston permitting the passage of the fluid in said chamber through either piston into the outer end of either cylinder and preventing its return; and means for simultaneously moving said pistons in opposite directions.

10. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder; means for filling said chamber with fluid under pressure; a valve in each piston permitting the passage of the fluid in said chamber through either piston into the outer end of either cylinder and preventing its return; means for simultaneously moving said pistons in opposite directions; and means permitting the fluid in the outer ends of said cylinders to circulate during the movement of said pistons.

11. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder; means for filling said chamber with fluid under pressure; a valve in each piston permitting the passage of the fluid in said chamber through either piston into the outer end of either cylinder and preventing its return; means for simultaneously moving said pistons in opposite directions; and a valved passage in the end of each cylinder for the exit of air.

12. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder provided with a passage therethrough; means for filling said chamber with fluid under pressure; and check valves in said piston passages automatically operable to admit to the outer ends of said cylinders fluid from said chamber when the pressure in said outer ends is reduced by leakage.

13. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder provided with a passage therethrough; a supply reservoir connected with said chamber; means within said reservoir for forcing fluid therefrom into said chamber and preventing its return; and valves in said passages in the piston heads permitting the flow of fluid from said chamber into the outer ends of said cylinders and preventing its return.

14. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder provided with a passage therethrough; a supply reservoir connected with said chamber; means permitting the passage of a portion of the fluid therefrom into said chamber and preventing its return; and valves in said passages in the piston heads permitting the flow of fluid from said chamber into the outer ends of said cylinders and preventing its return.

15. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder; means preventing the fluid in said chamber from being subjected to the operative pressure in said cylinders but permitting it to pass from said cham-

ber into the ends of said cylinders to replenish leakage therefrom; and means for replenishing the fluid in said chamber.

16. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a piston in each cylinder; means preventing the fluid in said chamber from being subjected to the operative pressure in said cylinders but permitting it to pass from said chamber into the ends of said cylinders to replenish leakage therefrom; and means for automatically filling said chamber with fluid under pressure.

17. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a supply reservoir communicating with said chamber and adapted to fill said chamber with fluid under pressure; a check valve in each piston head adapted to permit the flow of the fluid in said space into the outer ends of said cylinders and prevent its return; and an actuating member positioned within said chamber and adapted to move said pistons in opposite directions.

18. In an apparatus of the class described, the combination of a casing provided with two fluid cylinders and a fluid chamber communicating with both cylinders; a supply reservoir communicating with said chamber and adapted to fill said chamber with fluid under pressure; a check valve in each piston head adapted to permit the flow of the fluid in said space into the outer ends of said cylinders and prevent its return; and an actuating member positioned within said chamber and adapted to move said pistons in directions that will decrease the volume of the outer end of one cylinder while correspondingly increasing the volume of the outer end of the other cylinder.

Signed by me at New Britain, Conn., this 25 day of May, 1910.

REYNOLD JANNEY.

Witnesses:

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