

(No Model.)

3 Sheets—Sheet 1.

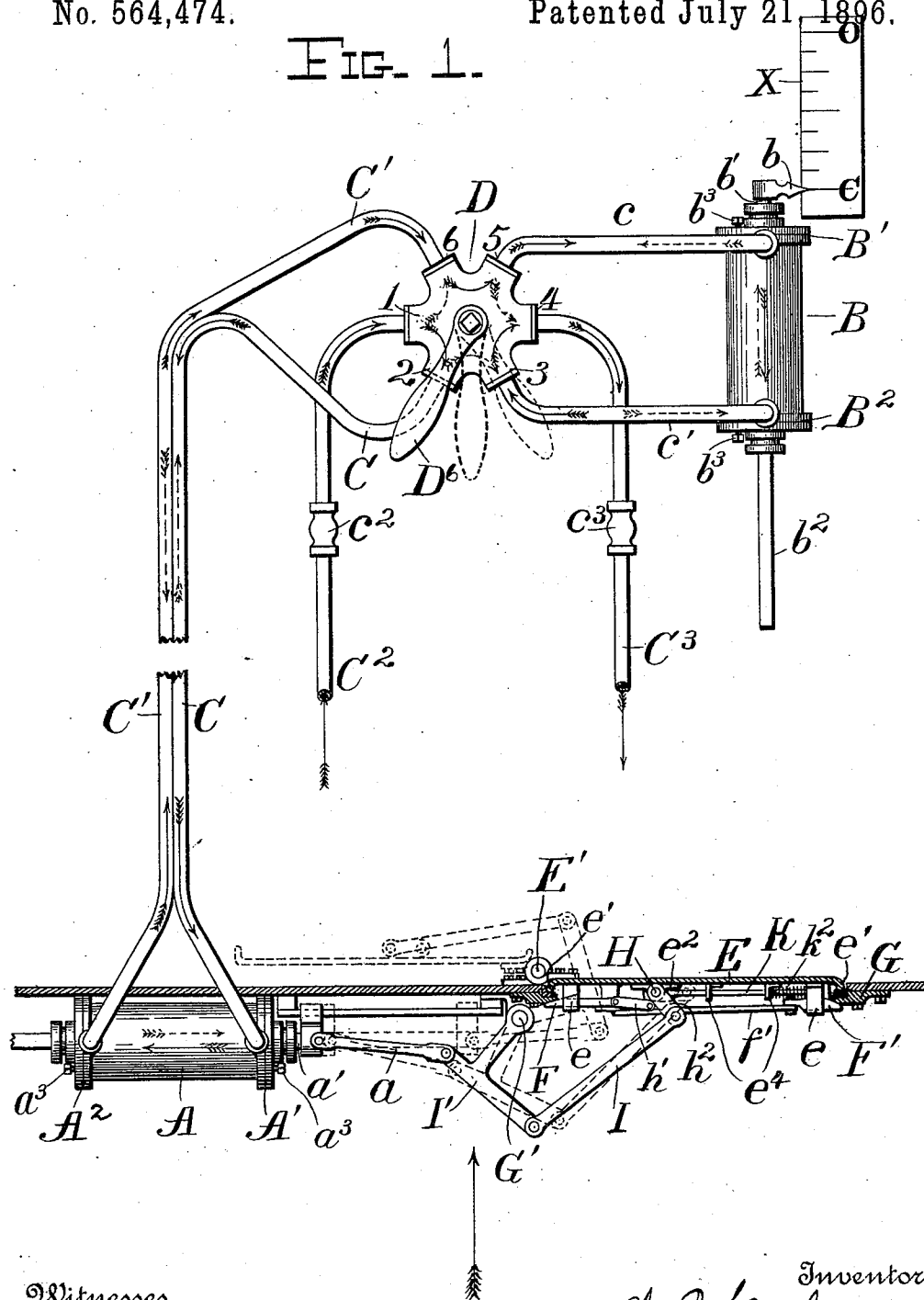
W. B. COWLES.

HYDRAULIC SYSTEM FOR CLOSING WATER TIGHT BULKHEADS ON BOARD SHIPS.

No. 564,474.

Patented July 21, 1896.

FIG. 1.



Witnesses

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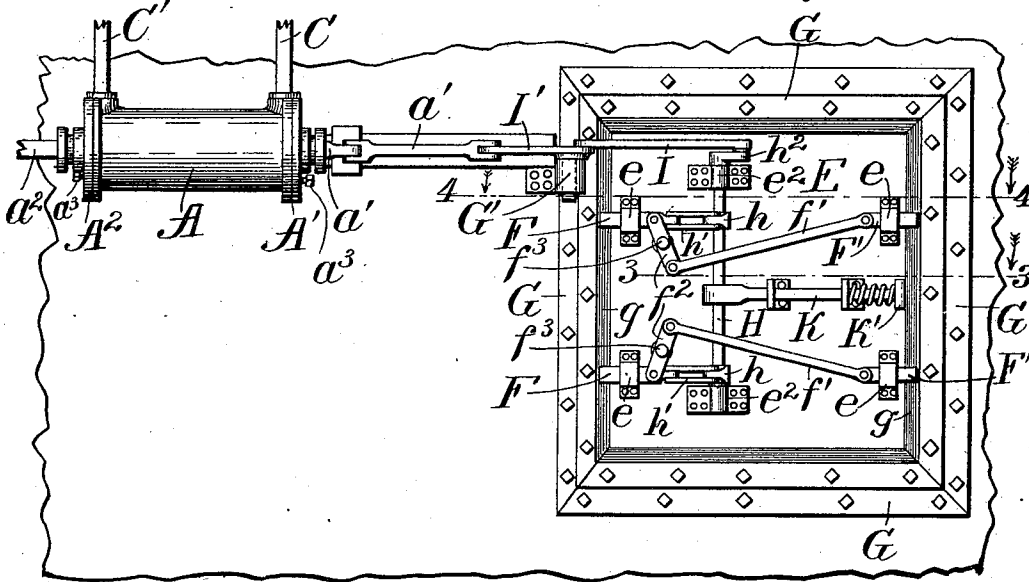


FIG. 2.

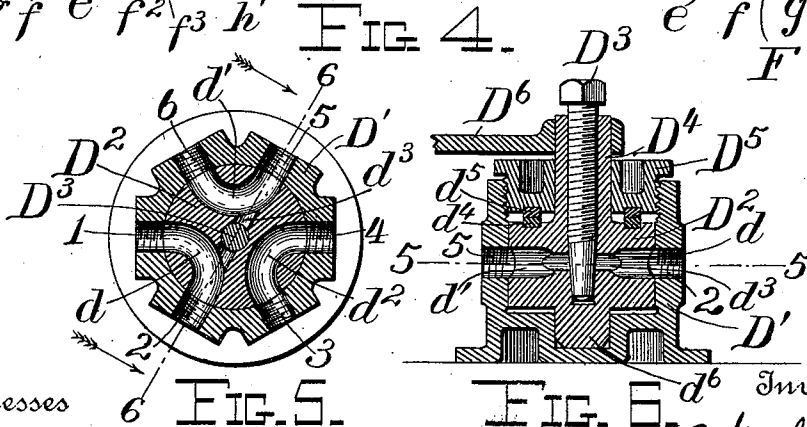
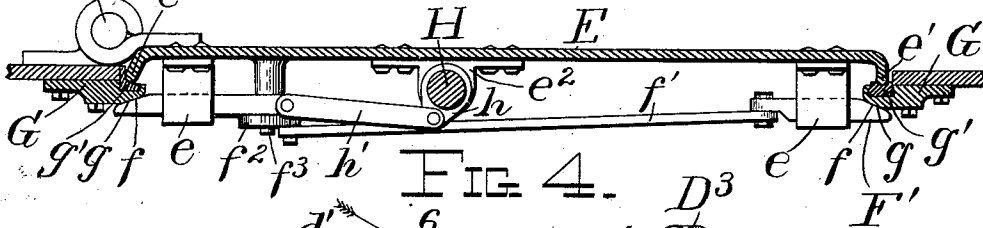
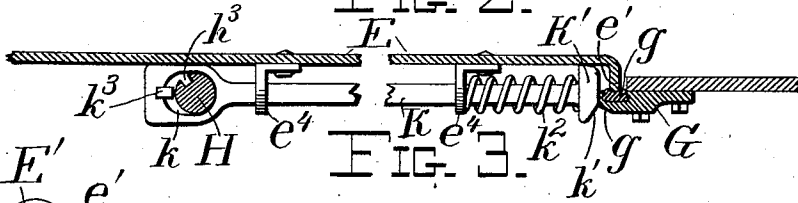


FIG. 5.

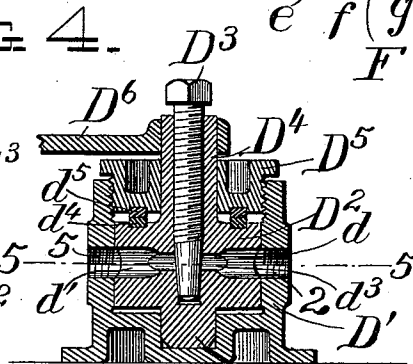


FIG. 6.

Witnesses

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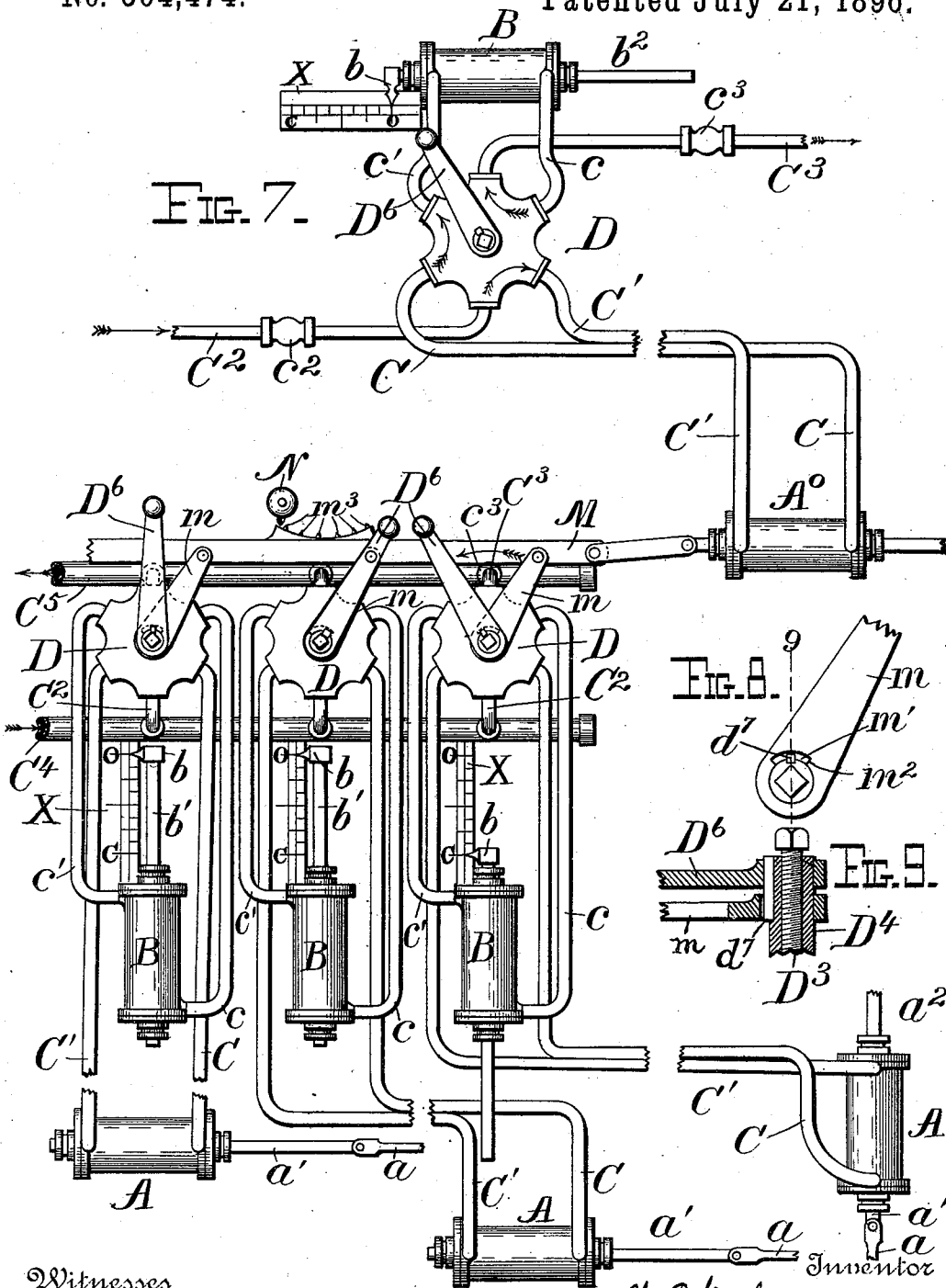
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UNITED STATES PATENT OFFICE.

WILLIAM BARNUM COWLES, OF CLEVELAND, OHIO.

HYDRAULIC SYSTEM FOR CLOSING WATER-TIGHT BULKHEADS ON BOARD SHIPS.

SPECIFICATION forming part of Letters Patent No. 564,474, dated July 21, 1896.

Application filed April 15, 1896. Serial No. 587,660. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BARNUM COWLES, 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 Hydraulic Systems for Closing Water-Tight Bulkheads on Board Ships and for other Purposes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates especially to improvements in apparatus for opening and closing doors, hatches, ports, valves, cocks, gates, operating semaphores, tripping anchors, dropping life-buoys, and indicating and automatically registering the movements of mechanical devices aboard ship or elsewhere, but it is especially intended for use on board ship.

The objects of my invention are, first, to construct an apparatus which shall be simple, durable, positive in its action, reliable, and not likely to get out of order, by means of which a mechanical device situated at a distance from the operating-point may be moved with a continuously-registered and perfectly-controlled motion, and by methods which enable said motion to be reversed or locked in any part of its travel; second, to construct a combination of such apparatus whereby two or more independent mechanical devices, which may be widely separated and of varying types, may be independently and systematically operated, controlled, continuously registered, and locked, all from the same point, "central station," or operating-board, and by one operator; third, to construct a combination of such apparatus whereby in cases of emergency any number of the devices so connected to an operating-board may be simultaneously operated, controlled, registered, and locked from a point at a distance from said board by a second operator and by means entirely independent of the first operator; fourth, to construct a combination of such apparatus with mechanism for swinging a door through a half-circle and clamping it on a water-tight or fireproof seat, so that the combination thereby obtained may be used by the first operator at the operat-

ing-board for the ordinary working of the water-tight doors, &c., on a ship, or in other places, and may be used by a second operator, in cases of emergency, to simultaneously close all of said doors, &c.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 represents a diagrammatic view of a primary system connected to a swinging door for a water-tight compartment, showing in full lines the door in its closed position and in dotted lines the door in its open position. Fig. 2 represents an elevation of the swinging door and the mechanism for operating the same, looking in the direction of the arrow in Fig. 1. Fig. 3 represents a horizontal sectional view taken on the line 3 3 of Fig. 2, looking in the direction of the arrow. Fig. 4 represents a similar sectional view taken on the line 4 4 of Fig. 2, looking in the direction of the arrows. Fig. 5 represents a sectional view of the six-way controlling-valve, taken on the line 5 5 of Fig. 6; and Fig. 6 represents a vertical sectional view of the same on the line 6 6 of Fig. 5 and looking in the direction of the arrows. Fig. 7 represents a diagrammatic view of the complete system, showing three operating and three indicating cylinders connected up in pairs, with a controlling-valve between each operating-cylinder and the corresponding indicating-cylinder, and a separate pair of cylinders connected by an emergency or controlling valve, whereby all of the cylinders may be simultaneously operated.

My invention in its most simple form consists of two cylinders A and B, both filled with fluid under pressure, and of equal piston displacement, the piston of the cylinder A being connected with a door, valve, signal, or other device to be operated, and the other cylinder B being connected to the cylinder A by pipes C c' and C' c, which are also filled with fluid under pressure, and the fluid forced out of one end of the cylinder A by the motion of its piston will cause a corresponding travel of the piston in the cylinder B, which travel may be indicated by a pointer b, attached to the piston-rod b' and moving over the scale X.

The pipes C c' and C' c connect with a six-

way valve D, placed between the cylinders A and B, to which valve are also connected the supply-pipe C² and the exhaust-pipe C³, so that fluid passing into or from the system, or from one cylinder to the other, must pass through the six-way valve D.

The six-way valve D consists of a cylindrical or conical casing D', having the six equidistant vents 1, 2, 3, 4, 5, and 6, each adapted to receive one of the pipes C, c, C', c', C², or C³ and a cylindrical valve-plug D², adapted to fit snugly and turn in the valve-casing D'. This valve-plug has three curved passages d, d', and d², each adapted to connect two adjacent vents in the casing D', as shown in Fig. 5. A smaller passage d³ through the center of the plug connects the two passages d and d', but is normally closed by the screw-plug D³, which passes down through the valve-stem D⁴ across the passage d³. The valve-plug D² is held in position in the casing by the cap D⁵, which is screwed down or suitably adjusted inside of the upper end of the casing D'. This cap is provided with a friction packing-ring d⁵, which bears upon a similar packing-ring d⁴ on the top of the valve-plug D², and the said valve-plug may be journaled in the base of the casing D, as at d⁶. The stem D⁴ of the valve-plug D² passes through the cap D⁵ and has secured to its upper end a handle D⁶, by means of which the valve-plug may be turned.

In Figs. 1 and 2 I have shown the operating-cylinder A connected to the door of a water-tight compartment, such as are used on modern ships, but it will be evident that such a cylinder might be employed to operate various kinds of devices, such as valves, signals, or the like.

Referring to Figs. 1 to 4, E indicates the door of the water-tight compartment, which is provided with the locking-bolts F F', arranged to slide in suitable guide-brackets e on the inside of the door near its edges. The bolts F F' are beveled, as at f, at their outer ends to press on the beveled edges g of the door-frame G, when the bolts are forced outwardly from the middle of the door, and thus to draw the edges e' of the door closely against the gaskets g' in the frame. Near the middle of the door is journaled in suitable bearings, as e², a vertical shaft H, having crank-arms h, which are connected by links h' with the inner ends of the bolts F at the edge of the door nearest the hinges E'. The bolts F' at the outer or opening edge of the door are connected to the levers f², pivoted to the door, as at f³, by connecting-rods f', which are pivotally connected to the levers f², operating the bolts F. Thus the turning of the shaft H will cause the links h' to slide the bolts F inwardly or outwardly to disengage or engage the sides of the door-frame, and through the levers f² and connecting-rods f' will move the bolts E' in a corresponding direction.

A crank-arm h² on the upper end of the shaft H is connected by a rod I with the longer arm of a T-lever I', pivoted in a journal-

box G', secured to the inside of the frame of the door a little back of and on the opposite side from the hinges E'. The short arm of the T-lever I' is connected by a rod a with the end of the piston-rod a' of the cylinder A.

To prevent the possibility of the bolts F F' being thrown out when the door is open, a locking device is provided which will lock the shaft H when the said bolts are withdrawn. This locking device consists of a rod K, having at its outer end a head K', beveled, as at k', and having its inner end enlarged and provided with a short slot k, through which passes the vertical shaft H. This shaft is provided with a keyway h³, and the rod K is provided with a lug or key k³, projecting into the slot k at its end farthest from the head K'. The rod K is supported in guide-brackets e⁴, and is provided with a spring k², interposed between one of the guide-brackets and the head K', which serves to keep the key k³ in engagement with the keyway h³ in the shaft H, thus locking the same and preventing it from turning while the door is open. When the door is closed, the bevel k' of the head K' rides up on the edge of the door-frame G and forces the rod K back against the tension of the spring k² and pushes the key k³ out of the keyway h³ in the vertical shaft H, leaving the latter free to turn in its bearings, as shown most clearly in Fig. 3.

The operation of the foregoing part of my invention is as follows: The parts being filled with fluid under pressure and in the closed position, as shown in Figs. 1 to 6, suppose additional fluid-pressure to be admitted through the pipe C² and thence through the passage d of the valve D to the pipe C, then to the end A' of the cylinder A, forcing or holding the end a' of the piston-rod to the left within the cylinder A. The pressure from the opposite side of the piston will be transmitted through the pipe C', as indicated by the arrows, and passage d' of the valve D to the pipe c, then to the end B' of the indicating or telltale cylinder B, forcing or holding the end b' of the piston-rod down within the cylinder B. The pressure from the other end of the cylinder B will be transmitted through the pipe c' and the passage d² of the valve D to the exhaust-pipe C³. Thus the pressure in the cylinder A will hold the piston in its rearward position, tending to pull upon the rod a the T-lever I', the rod I, and the vertical shaft H, holding the door closed and locked, while the pressure in the cylinder B will hold the piston in its inner position, causing the pointer b on the end of the piston-rod to indicate the closed position, (marked C on the scale X.) Should the handle D⁶ of the valve D be turned to the central position shown in heavy dotted lines, it would turn the valve-plug D² to close all the openings and passages in the valve D and no movement of the fluid or pistons could take place. This would practically lock the system in either an open or closed

position, or in any intermediate position. Should the handle D^6 be turned to the position shown in fine dotted lines, the valve-plug D^2 would be turned so that its passage d would connect the vents 2 and 3, its passage d' would connect the vents 1 and 6, and its passage d^2 would connect the vents 4 and 5. The fluid from the pressure-pipe C^2 would then pass through the passage d' to the pipe C' , as indicated by the dotted arrows, and enter the end A^2 of the cylinder A, forcing the piston toward the end A' , and forcing the fluid from that end of the cylinder through the pipe C and the passage d of the valve, as indicated by the dotted arrows, through the pipe C' to the end B^2 of the indicating or tell-tale cylinder B, forcing its piston toward the end B' , and forcing the fluid from that end of the cylinder through the pipe c and passage d^2 of the valve D to the exhaust-pipe C^3 . This will cause the pistons in the two cylinders A and B to move in unison and the pointer b on the end b' of the piston-rod to indicate on the scale X the position of both pistons, whether they are in the open or closed position or any intermediate position. The pressure-pipe C^2 is provided with a check-valve c^2 , which is arranged to prevent the fluid from passing backward through the said pipe, and the exhaust-pipe C^3 is provided with a relief-valve c^3 , arranged to exert a slight back pressure upon the fluid to prevent its escape from the system except when forced out by the movement of the pistons. This pressure-pipe C^2 is connected to any suitable source of fluid pressure, (not shown,) while the exhaust-pipe is connected to any suitable receptacle adapted to permit the discharge of fluid thereinto. The outward movement of the end a' of the piston-rod of the cylinder A will move the rod a , T-lever I', rod I, and turn the shaft H to the first position. (Shown in dotted lines.) This will slide the bolts F and F' inwardly and unlock the door. Further pressure upon the rod a will swing the door open and move the several parts to the open position, as shown in dotted lines in Fig. 1. As the door swings open the head K' of the rod K moves off from the edge of the frame, and the spring k^2 will throw the said rod outwardly, causing the key k^3 to engage the keyway h^3 in the shaft H, which is then in position to receive it. Thus the said shaft H is locked from turning until released when the door is closed, as will now be described.

When the handle D^6 is thrown to the position shown in Fig. 1, the fluid is admitted to the end A' of the cylinder A, drawing the end a' of the piston-rod in and pulling on the rod a , which in turn pulls on the T-lever I' and by means of the rod I swings the door closed. As the door closes the bevel edge of the head K' rides up on the edge of the door-frame and forces the rod K inward, releasing the key k^3 from the keyway h^3 and allowing the last part of the pull on the crank h^2 to turn

the shaft H and slide the locking-bolts over the beveled edge of the door-frame, thus locking the door tightly upon the gaskets g' . 70

My invention also contemplates placing a number of six-way valves D in a group, as shown in Fig. 7, which may be termed a "switchboard," in some convenient place for handling the same, and connecting each one 75 by the pipes C C' with an operating-cylinder A, placed at a distant point where it may be desirable to operate a door, valve, signal, or other device, so that one operator at the group of valves D will be able to control a large 80 number of doors or other devices. Each valve is provided with an indicating-cylinder B, so connected as to indicate the position of the piston in the corresponding cylinder A, so that the operator can see if each of the cyl- 85 inders A is doing its work properly. In this instance all the valves D are connected with a common pressure-main C^4 , leading from a suitable supply-tank, (not shown in the drawings,) and they all discharge into a common 90 exhaust-main C^5 , as will be seen by reference to Fig. 7.

I also contemplate placing a primary or emergency system with its valve D and indicating-cylinder B at some point, as, for instance, on the bridge or in the conning-tower of a man-of-war, or several such emergency attachments may be each connected to the main system and each independently operated to control the entire system. This emergency system may be caused to simultane- 95 ously operate all the various units or part of such units in the main system in a great variety of ways, one of which I have shown in Fig. 7, where the piston-rod of the emer- 100 gency operating-cylinder A^0 of such primary system is connected with a bar M, to which are pivoted auxiliary levers m on the stems of all the valves D of the group of valves and indicators constituting the switchboard 105 just described. By this means the operator, on the discovery of impending danger, can, by turning the handle D^6 of the emergency system, throw all of the valves of the group into the safety position, which in case of collision or the like would be to close all the compartment-doors. In this latter instance, the stems D^4 of the valves D are made long enough to receive the two levers D^6 and m , and the key d' is long enough to extend 120 through both levers. The lever D^6 is keyed on the stem in the usual manner to turn the valve in either direction by hand; but the lever m is slotted, as at m' , to receive the key d' , so as to have a limited movement on the 125 valve-stem before communicating motion thereto. The levers m are so arranged that when in the open position, as shown in Fig. 7, the slots m' will be so placed that the valve-stems may be turned as far as necessary to 130 operate the devices either way without moving the levers m , but when the levers m are moved in the direction of the arrow the end m^2 of the slot m' will strike the key d' and

carry the valve-stem around with it to the closing position, no matter in what position the valve may be at the time. The return movement of the levers m will not affect the valves, as the slot m' will move over the key d' without moving the latter. A signal-bell N may be placed so as to be rung by teeth m^3 on the bar M when the latter is moved, or other means for noting the movement of the bar M may be used in addition to the telltale-cylinder of the emergency system. Thus when the emergency system is operated, the operator at the group of valves or switchboard will be warned of the danger, so that he may observe, by the indicating-cylinders, if all of the operating-cylinders are doing their work properly and take such steps as may be necessary for safety.

It will be obvious that registering-meters or other like indicators may be adopted in place of the telltale-cylinders, the function of said cylinders being merely to indicate the position of the pistons in the cylinders A, as determined by the flow of fluid therefrom or thereto. Moreover, it will be evident that the mechanism operated by the pistons in the various cylinders A may be varied at will without departing from the general idea of my improved hydraulic operating and indicating system. Again, one emergency system may operate one set of valves, doors, or other devices located in, say, one part of the ship; another emergency system may operate a similar set of devices located elsewhere, &c. I also provide drain-vents in each end of the cylinders, which are normally closed by screw-plugs a^3 and b^3 , and when the system is to remain idle for some time, or when for any reason it is desirable to remove the fluid from the system, these screw-plugs are loosened, which will allow the fluid to escape therefrom.

To fill the system, the screw-plug D³ is loosened and the fluid introduced through the pressure-pipe C², from whence, if the handle D⁶ is in the position shown in Fig. 1, the fluid will pass through the passage d' , through the pipe C to the end A' of the cylinder A, and also through the passage d^3 to the passage d' , from whence it will pass through the pipe C' to the end A² of the cylinder A, and through the pipe C to the end B' of the cylinder B, thus filling both ends of the cylinder A and the end B' of the cylinder B. The handle D⁶ is then turned to the position shown in fine dotted lines, and the fluid will pass through the passage d' , the passage d^3 , the passage d , and the pipe c to the end B² of the cylinder B, thus filling the whole system.

To set the pistons in the two cylinders so that they will move in unison after the system has been filled, or after they have become disarranged from any cause whatever, the handle D⁶ is turned to the position shown in full lines in Fig. 1, when, the screw-plug D³ being loosened to allow the fluid to pass through the passage d^3 , the piston in the cylinder A may be moved to correspond with the

position of the piston in the cylinder B, the fluid passing freely from one end of cylinder A to the other through the pipes C C', the passages d d' , and the passage d^3 , but not affecting the cylinder B. When the two cylinders are in the proper relative positions, the screw-plug D³ is screwed down to close the passage d^3 , which places the system in operative condition.

In order that the doors, signals, and other devices may be operated by hand as well as by the cylinders A, the connecting-rods a are preferably detachably connected either to the piston-rods or to the T-lever or other device to be operated, and thus the said devices may be uncoupled from the operating-cylinders when desired.

While I have described my invention particularly with reference to its use aboard ship, it will be evident that it may be used on shore, as in factories, or in other relations needless to be specifically enumerated.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a hydraulic system of the character described, the combination with a plurality of fluid-circuits, of an operating-cylinder in each of said circuits, a piston in each of said cylinders, valves for controlling the admission of fluid-pressure to said cylinders, with mechanism operated by one of said pistons for controlling the valves of a plurality of the other cylinders, substantially as described.

2. In a hydraulic system of the character described, the combination with a plurality of fluid-circuits, of an operating-cylinder and an indicating device in each of said circuits, a piston in each of said cylinders, a valve in each circuit for controlling the admission of fluid-pressure to the cylinder in that circuit, with mechanism operated by one of said pistons for controlling the valves of a plurality of the other cylinders, substantially as described.

3. In a hydraulic system of the character described, the combination with a plurality of fluid-circuits, of an operating-cylinder in each of said circuits, a door and mechanism for moving the same operated by said cylinders, valves for controlling the admission of fluid-pressure to said cylinders, with mechanism operated by one of said cylinders for controlling the valves of a plurality of the other cylinders, substantially as described.

4. In a hydraulic system of the character described, the combination with a plurality of fluid-circuits, of an operating-cylinder and an indicating device in each of said circuits, a swinging door and mechanism for swinging the same operated by said cylinders, a valve in each circuit for controlling the admission of fluid-pressure to the cylinder in that circuit, with mechanism operated by one of said cylinders for controlling the valves of a plurality of the other cylinders, substantially as described.

5. In a hydraulic system of the character described, the combination with a plurality of fluid-circuits, of an operating-cylinder in each of said circuits, valves independently controlled for regulating the admission of fluid-pressure to said cylinders, with mechanism operated by one of said cylinders for simultaneously controlling the valves of a plurality of the other cylinders, substantially as described.

6. In a hydraulic system of the character described, the combination with a plurality of fluid-circuits, of an operating-cylinder and an indicating device in each of said circuits, a valve in each circuit independently controlled for regulating the admission of fluid-pressure to the cylinder in that circuit, with mechanism operated by one of said cylinders for simultaneously controlling the valves of a plurality of the other cylinders, substantially as described.

7. In a hydraulic system of the character described, the combination with a plurality of fluid-circuits, of an operating-cylinder in each of said circuits, a door and mechanism for moving the same operated by said cylinder, valves independently controlled for regulating the admission of fluid-pressure to said cylinders, with mechanism operated by one of said cylinders for simultaneously controlling the valves of a plurality of the other cylinders, substantially as described.

8. The mechanism for swinging a hinged door through approximately one hundred and eighty degrees about its hinges, comprising a T-lever pivoted on the opposite side of the door-frame from said hinges, a reciprocating rod pivotally connected to one arm of said T-lever, a crank and crank-shaft journaled on said door, and a connecting-rod between the other arm of said T-lever and the said crank, substantially as described.

9. The mechanism for swinging a hinged door through approximately one hundred and eighty degrees about its hinges and for automatically locking and unlocking said door comprising a reciprocating part, a T-lever pivoted on the opposite side of the door-frame from said hinges and connected to said reciprocating part, a crank and crank-shaft journaled on said door, means for automatically locking said crank-shaft against revolution and for releasing the same when the door is in approximately the closed position, bolts carried by said door, and mechanism operated by said crank-shaft when released for reciprocating said bolts, substantially as described.

10. The mechanism for swinging a hinged door through approximately one hundred and eighty degrees about its hinges and for automatically locking and unlocking said door, comprising a reciprocating part, a T-lever pivoted on the opposite side of the door-frame from said hinges and connected to said reciprocating part, a crank and crank-shaft

journaled on said door, a spring-operated rod normally locking said crank-shaft and provided with a wedge-shaped head adapted to engage the door-frame when the door is in the closed position and to release said crank-shaft, bolts carried by said door, and mechanism operated by said crank-shaft when released for reciprocating said bolts, substantially as described.

11. The mechanism for swinging a hinged door through approximately one hundred and eighty degrees about its hinges and for automatically locking and unlocking said door comprising a reciprocating part, a T-lever pivoted on the opposite side of the door-frame from said hinges and connected to said reciprocating part, a crank and crank-shaft journaled on said door, means for automatically locking said crank-shaft against revolution and for releasing the same when the door is in approximately the closed position, wedge-shaped bolts sliding in guides carried by the door, crank-arms on said crank-shaft, and links connecting said bolts with said crank-arms, substantially as described.

12. The mechanism for swinging a hinged door through approximately one hundred and eighty degrees about its hinges and for automatically locking and unlocking said door, comprising a reciprocating part, a T-lever pivoted on the opposite side of the door-frame from said hinges and connected to said reciprocating part, a crank and crank-shaft journaled on said door, a spring-operated rod normally locking said crank-shaft and provided with a wedge-shaped head adapted to engage the door-frame when the door is in the closed position and to release said crank-shaft, wedge-shaped bolts sliding in guides carried by the door, crank-arms on said crank-shaft, and links connecting said bolts with said crank-arms, substantially as described.

13. In an apparatus of the character described, the combination with a rotary valve and valve-stem of a hand-crank rigidly connected to said valve-stem, and an auxiliary crank loose on said valve-stem and provided with a curved slot, a lug or key on said valve-stem engaging in said slot and allowing the valve-stem a limited rotary motion independent of said auxiliary crank, with means for turning said auxiliary crank through the desired angle in either direction, substantially as described.

14. In a hydraulic system of the character described, the combination with a cylinder and an operating-piston of a door, and mechanism operated by said piston for moving said door, an indicating-cylinder, a double system of pipes connected thereto, a pipe for supplying fluid-pressure and an exhaust-pipe, and a six-way valve located between said cylinders and adapted to connect said supply-pipe with either end of said operating-cylinder, to connect the opposite end of the operating-cylinder with one end of the indicating-

cylinder, and to connect the opposite end of the indicating-cylinder with the exhaust-pipe, substantially as described.

15 In a hydraulic system of the character described, the combination with an operating-cylinder and mechanism operated thereby, and a reciprocating indicating device, of a double system of pipes connecting the two, a
10 pipe for supplying fluid-pressure and an exhaust-pipe, and a six-way valve placed between said cylinder and said device adapted to connect said supply-pipe with either end

of said operating-cylinder, to connect the opposite end of the operating-cylinder with one end of the indicating device, and to connect 15 the opposite end of the indicating device with the exhaust-pipe, substantially as described.

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

WILLIAM BARNUM COWLES.

Witnesses:

CHARLES H. CAWOOD,
EMILIE H. BELSHAN.