No. 817,691. PATENTED APR. 10, 1906.

H. O. BRANDT.

HYDRAULIC APPARATUS FOR OPENING AND SHUTTING BULKHEAD DOORS.

APPLICATION FILED NOV. 9, 1903.

5 SHEETS—SHEET 1.

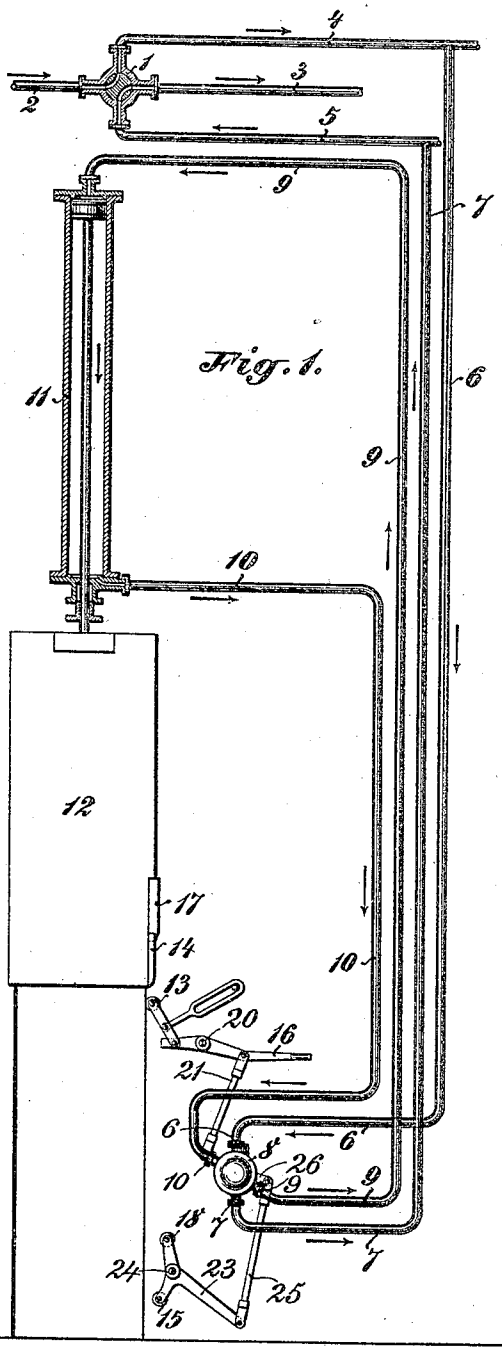


Fig. 1.

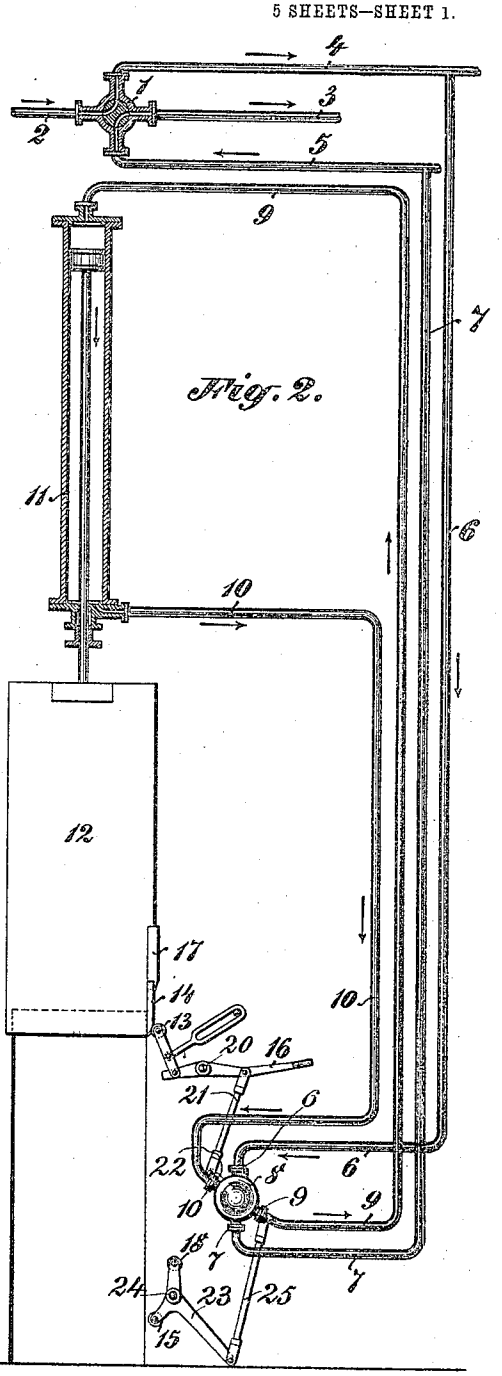


Fig. 2.

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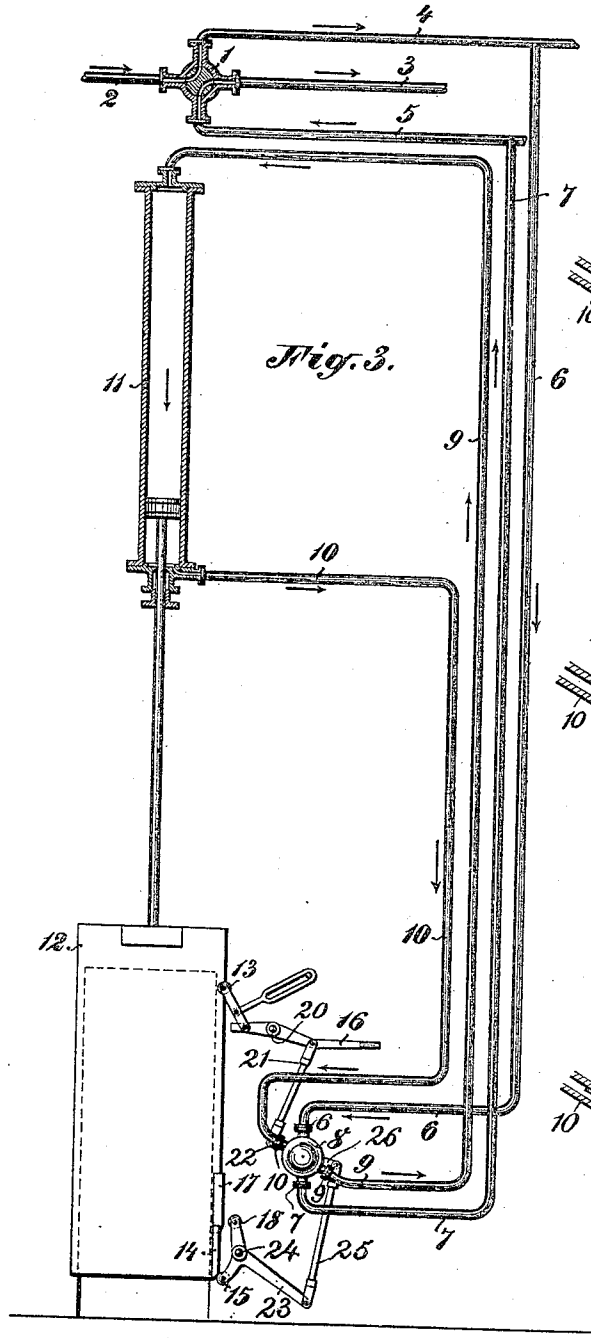


Fig. 3.

Fig. 5.

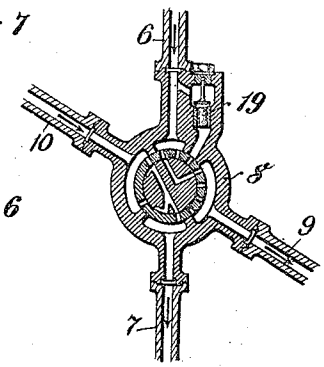


Fig. 6.

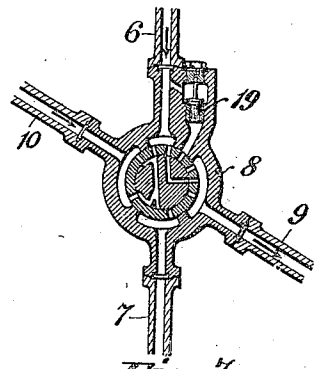
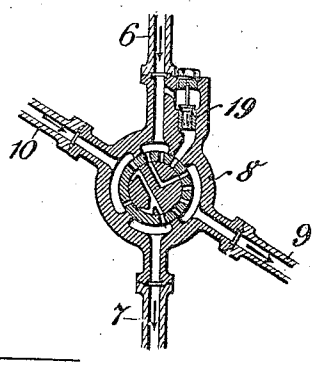


Fig. 7.



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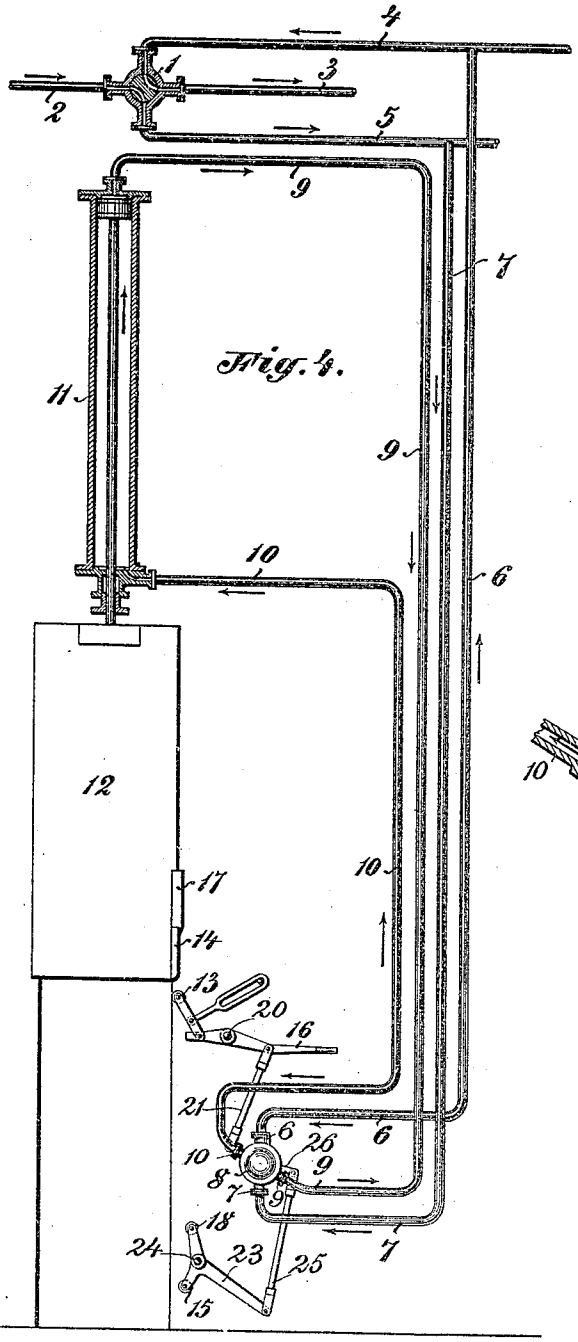
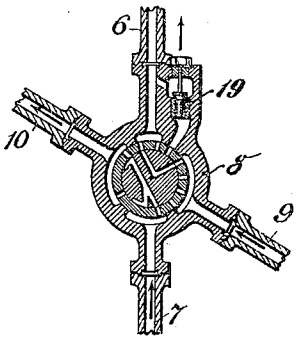


Fig. 4.

Fig. 8.



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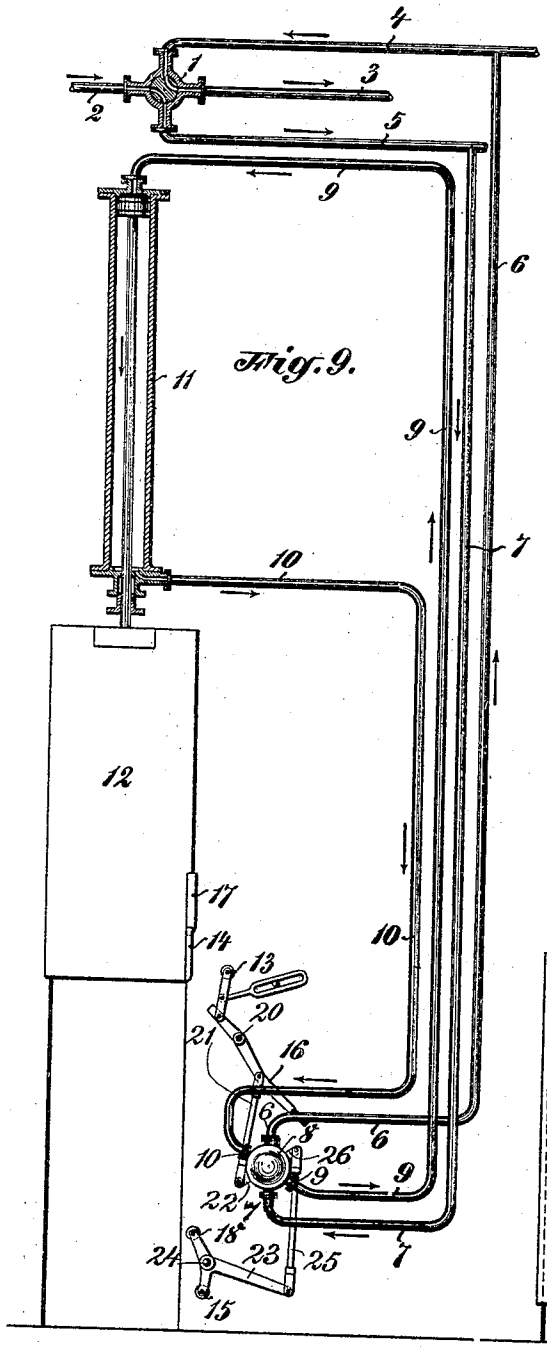
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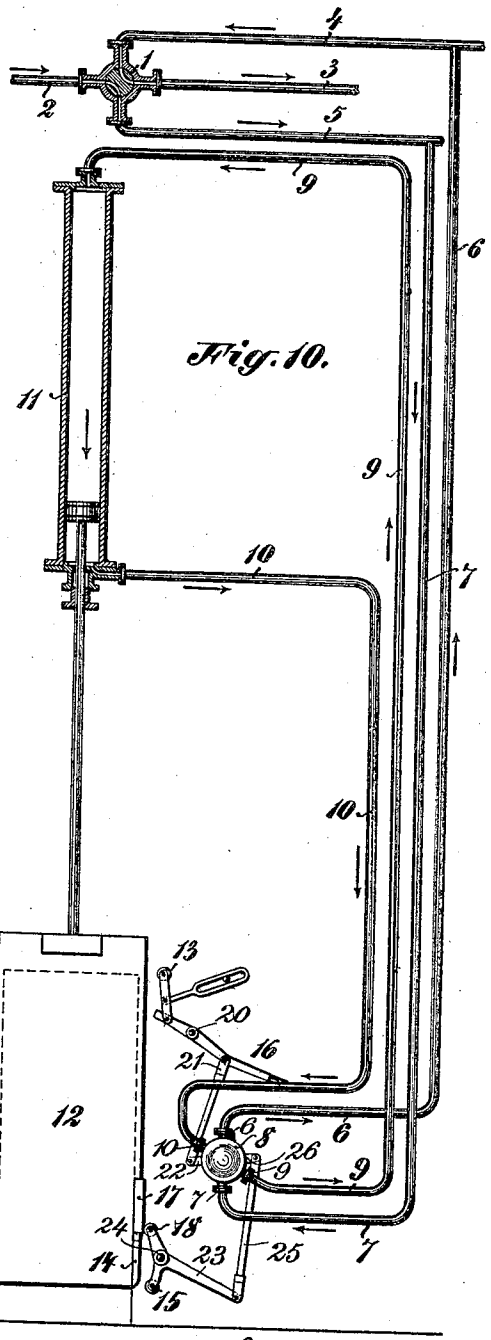
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APPLICATION FILED NOV. 9, 1903.

5 SHEETS—SHEET 4.





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No. 817,691.

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5 SHEETS—SHEET 5.

Fig. 11.

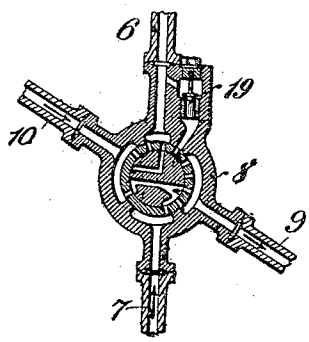


Fig. 12.

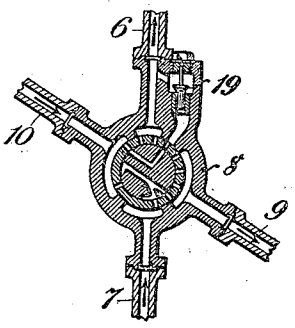
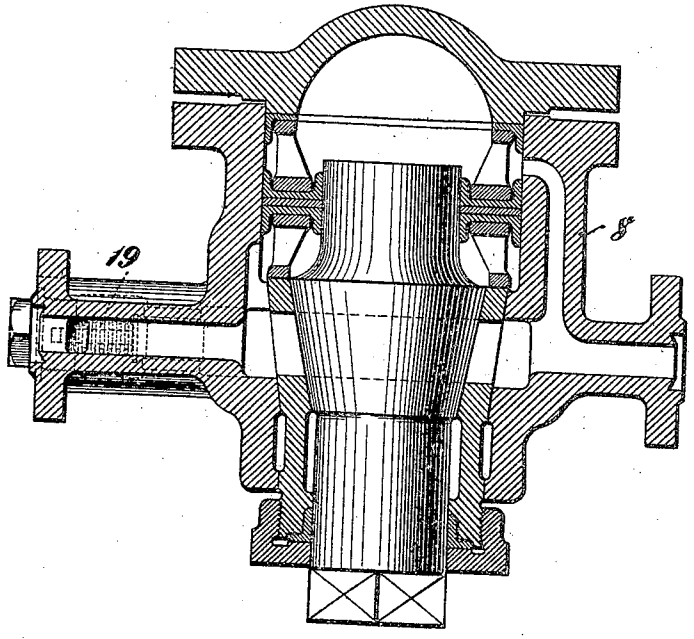


Fig. 13.



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UNITED STATES PATENT OFFICE.

HEINRICH OTTO BRANDT, OF MANCHESTER, ENGLAND.

HYDRAULIC APPARATUS FOR OPENING AND SHUTTING BULKHEAD-DOORS.

No. 817,691. Specification of Letters Patent. Patented April 10, 1906.

Application filed November 9, 1903. Serial No. 180,297.

To all whom it may concern:

Be it known that I, HEINRICH OTTO BRANDT, a subject of the King of Prussia, German Emperor, (and whose post-office address is No. 66 Sackville street, Manchester, England,) have invented a new and useful Hydraulic Apparatus for Opening and Shutting Bulkhead-Doors, of which the following is a specification.

The mode of operation in the arrangements hitherto employed when doors of the bulkhead are to be shut and opened by hydraulic means merely consisted in employing a vertical cylinder and in causing the piston, to which a piston-rod and the door itself were attached, to be moved in a downward direction, the press-water entering the cylinder above the said piston, thus shutting the door as soon as the downward stroke of the piston reached its end. The opening of the door, on the other hand, was effected by causing the press-water to enter the cylinder underneath the piston, thus compelling the latter and the door attached to it to be lifted, wherewith the water contained in the cylinder above the piston was caused to run off as waste water. The quantity of the press-water used during the operations of shutting and opening the doors was therefore in each case equal to the space in the cylinder between the two ends of the stroke of the piston. If now, as is generally the case on board ships, several such doors are to be worked by one and the same press-water central station, it will be necessary if all the doors are to be shut simultaneously that the piping should have a considerable diameter, so that the door may be shut quickly and that the press-water central station should be of considerable dimensions in order to supply the great mass of water required. The cost of such a plant must therefore be very high.

This invention has for its object to do away with all these disadvantages. By means of it the shutting of a single door requires only a very small quantity of press-water, and consequently the diameter of the piping may be of such small size as the required speed for shutting the door will allow; but besides the fact of requiring much less cost for the establishment of the whole apparatus the press-water central station may also be of smaller dimensions, and therefore the whole arrangement of the hydraulic means can be of greater simplicity.

The improved arrangement for shutting and opening the doors of the bulkhead is based on the following principle: During the greater part of the shutting operation—that is to say, for causing the stroke of the piston—the press-water is admitted on both sides of the piston-plate. Consequently to the piston-surface on the side where the piston-rod is connected to it being smaller than the top surface of the piston, the latter surface receives a higher pressure than the bottom surface of the same. This higher pressure, together with the weight of the door, causes the latter to be shut; but shortly before the stroke of the piston is completed the top surface of the piston-plate alone receives press-water by distributing-cock placed near the door, which, by means of a guiding-bar and a system of levers, is reversed by the downward movement of the door. The bottom surface of the piston-plate, however, receives no press-water any longer, so that the door is shut by the total pressure of the piston. This is effected in order to reduce to small pieces all the obstructing matter sometimes found at the bottom of the door—as, for instance, fragments of coal and the like—and in order to cause at all events the door to shut as tightly as possible. As long as both surfaces of the piston-plate receive press-water it is evident that during the downward stroke of the piston the press-water underneath the latter takes the way through the distributing-cock toward the part of the cylinder above the piston, and it will therefore be required, for the time being, to make use of so much press-water only as is indicated by the difference between the two capacities of the cylinder-space above the piston, which by degrees becomes empty, and of that underneath the piston from where the water runs off—that is to say, the capacity of matter being represented by the capacity of the cylinder minus that of the piston-rod. The opening of the door is effected by reversing the direction of the press-water by means of the reversing-cock placed upon the captain's bridge. The press-water is now caused to enter the space underneath the piston, while the water above it is made to run off.

The improved arrangement is illustrated by the accompanying drawings, of which—

Figure 1 is a cross-section through and a partial view of the arrangement when the door is open, the distributing-cock being shut; Fig. 2, a cross-section and partial view of the arrangement shown in Fig. 1 when the

piston has already gone down to a small extent; Fig. 3, a view and partial cross-section of the improved arrangement when the piston has nearly reached the end of its stroke; Fig. 4, a view and partial cross-section of the arrangement when the door is open; Fig. 5, a vertical section through cock 8, the arrangement assuming the position of Fig. 1; Fig. 6, a vertical section through cock 8, the arrangement assuming the position of Fig. 2; Fig. 7, a vertical section through cock 8, the arrangement assuming the position of Fig. 3; Fig. 8, a vertical section through the cock, the arrangement assuming the position of Fig. 4; Fig. 9, a section and partial view of the arrangement when only one door is to be closed; Fig. 10, a section and partial view of the arrangement when the piston shown in Fig. 9 reached a position not far from the end of its stroke; Fig. 11, a section through cock 8, the arrangement assuming the position of Fig. 9; Fig. 12, a section through cock 8, the arrangement assuming the position of Fig. 10; Fig. 13, a section through the distributing-cock 8.

To the reversing-cock 1, placed on the captain's bridge, are attached four pipings 2, 3, 4, and 5. The piping 2 conveys the press-water coming from the hydraulic central station. The piping 3 serves for leading the waste water away which arrives from the different cylinders. The two other pipings 4 and 5 run around the whole ship and alternately contain press-water or waste water, according to the requirements of shutting or opening the doors of the bulkhead. From the other pipings 4 and 5 pipes 6 and 7 branch off, leading to the distributing-cocks 8, belonging each to a door 12. These cocks are connected with the hydraulic cylinders 11 by means of pipings 9 and 10, which meet these cylinders at their tops and bottoms.

In Figs. 1 to 8 the distribution of the press-water and the waste water is illustrated when a door is shut and opened by an operator on the captain's bridge, and by these figures it is also indicated in what manner all the other doors of the bulkhead to be operated by the same press-water central station may be worked. If the reversing-cock 1 on the captain's bridge be in the position for closing the door, this door 12, through the effect of the press-water running in the direction of the arrows, through pipings and valves 2, 1, 4, 6, 8, and 9, will start its downward movement, simultaneously causing the waste water underneath the piston to run off through the pipings and valves 10, 8, 7, 5, and 1 into the waste-water pipe 3, and in a short time afterward it will reach the position shown in Fig. 2. Before reaching this position, however, the door by coming into contact with the roll 13 has caused by the guiding-bar 14, attached to it, the whole system of levers to be displaced, thus reversing the distributing-cock 8, so that both sides of the piston will receive press-water. (See Fig. 6.) The piping 7, which first served for leading off the waste water, is now thrown out of work. The stroke of the piston (shown in Fig. 2) may be as small as possible, and the position of the piston differs only slightly from that in Fig. 1. By the higher pressure upon the top surface of the piston-plate the door 12 after the piston has displaced the press-water contained in the cylinder underneath the piston and caused it to run off through the pipings and valves 10 8 9 toward the cylinder-space above the piston which becomes empty assumes now the position of Fig. 3, whereby the distributing-cock 8 is again reversed by means of the sliding bar 14, the roll 15, and the system of levers in such a manner that the same distribution of the water is obtained as is indicated by Fig. 1—that is to say, the upper surface of the piston receives press-water and the water underneath the piston is caused to run off. By means of this circulation of the water the door 12 is now completely shut. For opening the same again and for opening all the other doors the reversing-cock 1 upon the captain's bridge, Fig. 4, is turned to the position "open," by which means the entire circulation of the water will be reversed. The press-water is caused to run through the pipings and valves 2, 1, 5, 7, 8, and 10, while the waste water is forced to run through the pipings and valves 9, 8, 6, 4, and 1 into the piping 3. All the doors are now kept open until the operator on the captain's bridge reverses the distributing-cock 1, causing the same to assume the position "shut," as it is indicated by Fig. 1.

Figs. 9 to 12 illustrate the case when only one door is to be operated while all the others are unaffected. If the reversing-cock 1 on the captain's bridge be in the position open, (shown in Fig. 4) and only one single door is to be shut, it is necessary, as shown in Fig. 9, to cause the system of levers by the help of lever 16, which is provided with a grip, to revolve in a direction opposite to that it had before. This revolution has the effect that, as it is shown in Fig. 11, both sides of the piston receive press-water, while the piping 6 is entirely thrown out of work. The press-water is now found in the pipings and valves 2, 1, 5, 7, 8, 9, and 10, and as soon as the door 12 starts its downward movement the press-water underneath the piston-plate runs again through the pipings and valve 10, 8, and 9 to the space above the piston. When now the system of levers is caused to turn by hand into position shown in Fig. 9, the roll 13 comes entirely out of contact with the sliding bar 14, so that the door 12 is enabled to go down without first causing the distributing-cock 8 to be reversed, and therefore it will assume the position of Fig. 10; but in this position the sliding bar 17, which is also attached

to the door 12, causes the roll 18 to move in a lateral direction and the cock 8 to take the position shown in Fig. 12, and the distribution of the water therefore takes place in such a manner that again only the upper surface of the piston receives press-water and the water underneath the piston is caused to run off. The door 12 in this case is shut by the same total power of the piston as has been shown in Fig. 3, and the tight closing of the door 12 is then effected. The roll 18 and the sliding bar 17 are not placed within the same plane as the roll 13 and the sliding bar 14. The former are never in the way of the latter devices. In order to open door 12, Fig. 4, again, a further backward turning of the distributing-cock 8 must be effected by means of lever 16, so that this cock 8 assumes again the position shown in Fig. 8, and this is done by the hand of the individual operator grasping lever 16.

One of the main conditions to be observed in arrangements for opening and shutting bulkhead-doors by power is to provide mechanism such that while doors may be both closed and opened simultaneously from the captain's bridge a door which has been previously shut by individual operation shall not be opened by the same flow of water under pressure which serves to close the other doors. The simultaneous operation of the doors both in opening and closing under control of the reversing-cock 1 on the captain's bridge has been previously explained. The means for preventing a door previously shut from being opened by the general operation of the system is provided in the check-valve 19. (Shown in Figs. 11 and 12.) If any door 12 has been closed by individual operation in the manner previously described with reference to Figs. 9 and 10, the waste water when the parts have assumed the position shown in Figs. 10 and 12 passes off through valve 19 and the pipes 6, 4, and 3. If an emergency should arise, requiring the closing of all the bulkhead doors from the bridge and the reversing-cock accordingly be turned into the position shown in Fig. 3, it is evident that in the absence of check-valve 19 the press-water would flow through the valve 1, pipes 4 and 6, and back through the valve 8, through the pipe 10 to the bottom of the cylinder 11 and open the door 12 by the same action which closes the remaining doors. The introduction of check-valve 19, however, prevents any flow whatever through the valve 8 in the case of a door which has been previously closed by individual action, and the turning of the reversing-cock 1 into the position to close doors simply results in closing all the doors which are open and does not disturb any door or doors which have been previously closed.

The lever 16 is pivoted at 20 and operates valve 8 through connecting-rod 21 and crank 22. Bell-crank 23, carrying rollers 15 and 18, is pivoted at 24 and operates valve 8 through connecting-rod 25 and crank 26.

The subject-matter of this invention allows a series of modifications without the essential feature of the invention being in any way affected.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In hydraulic apparatus for opening and closing bulkhead-doors, the combination with a door of a hydraulic cylinder with a hydraulic piston to which the door is attached, pipings connecting the ends of the cylinder with each other and with the water-supply and water-discharge pipes, a distributing cock or valve adapted to establish connection between the different pipings, and lever mechanism operated by the door for reversing the cock or valve, substantially as and for the purpose set forth.

2. In hydraulic apparatus for opening and closing bulkhead-doors, the combination with a door of a hydraulic cylinder with a hydraulic piston to which the door is attached, pipings connecting the ends of the cylinder with each other and with the water-supply and water-discharge pipes, a distributing-cock adapted to establish connection between the different pipings, and a lever system operated by the door for reversing the cock, said lever system being provided with a hand-lever adapted to reverse the cock independently of the movement of the door, substantially as and for the purpose set forth.

3. In hydraulic apparatus for opening and closing bulkhead-doors, the combination with a door of a hydraulic cylinder with a hydraulic piston, pipings connecting the ends of the cylinder with each other and with the water supply and discharge pipes, a distributing cock or valve adapted to establish connection between the different pipings, and a lever system operated by the door for reversing the cock, said lever system being provided with a hand-lever adapted to reverse the cock independently of the movement of the door, the distributing-cock being provided with a check-valve, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HEINRICH OTTO BRANDT.

Witnesses:
ALBERT EDWD. KAY,
SAMUEL GUEST.