

No. 718,973.

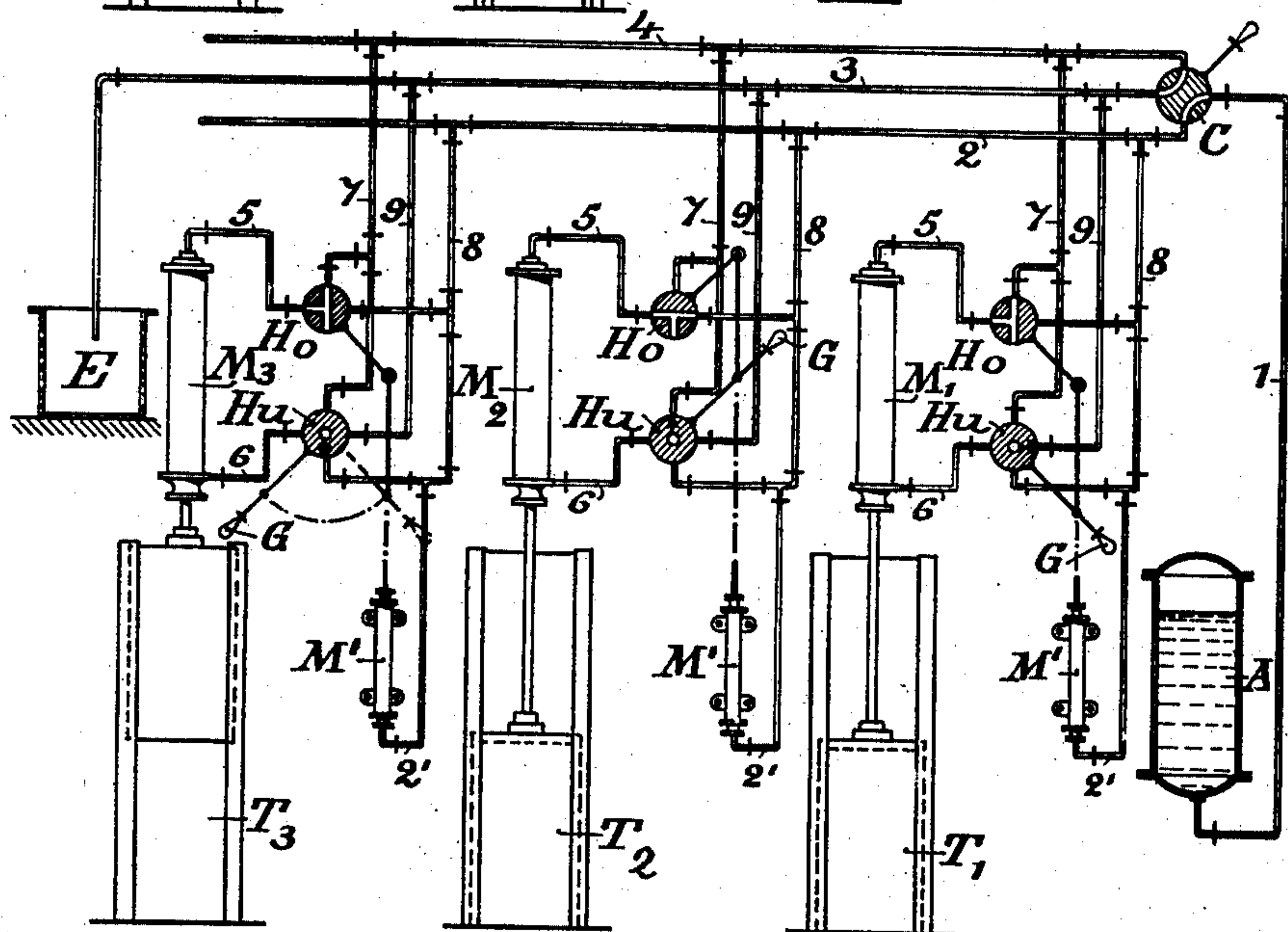
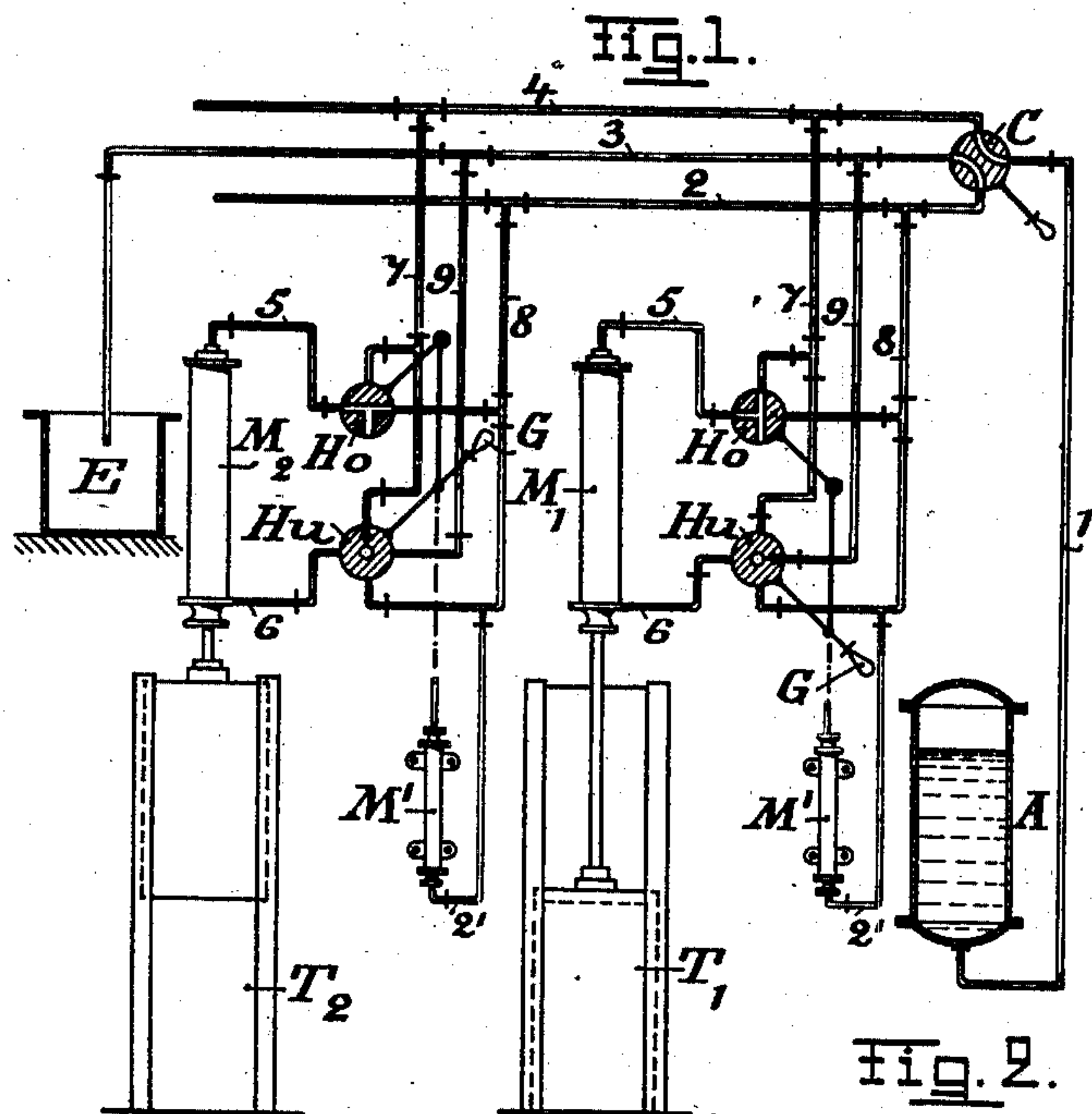
PATENTED JAN. 27, 1903.

A. DU BOIS-REYMOND.  
MEANS FOR OPERATING BULKHEAD DOORS.

APPLICATION FILED JUNE 20, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES

E. A. Petersen  
Florence M. Patrick

INVENTOR:

A. du Bois-Reymond  
by *Max Hergu*  
his ATTORNEY.

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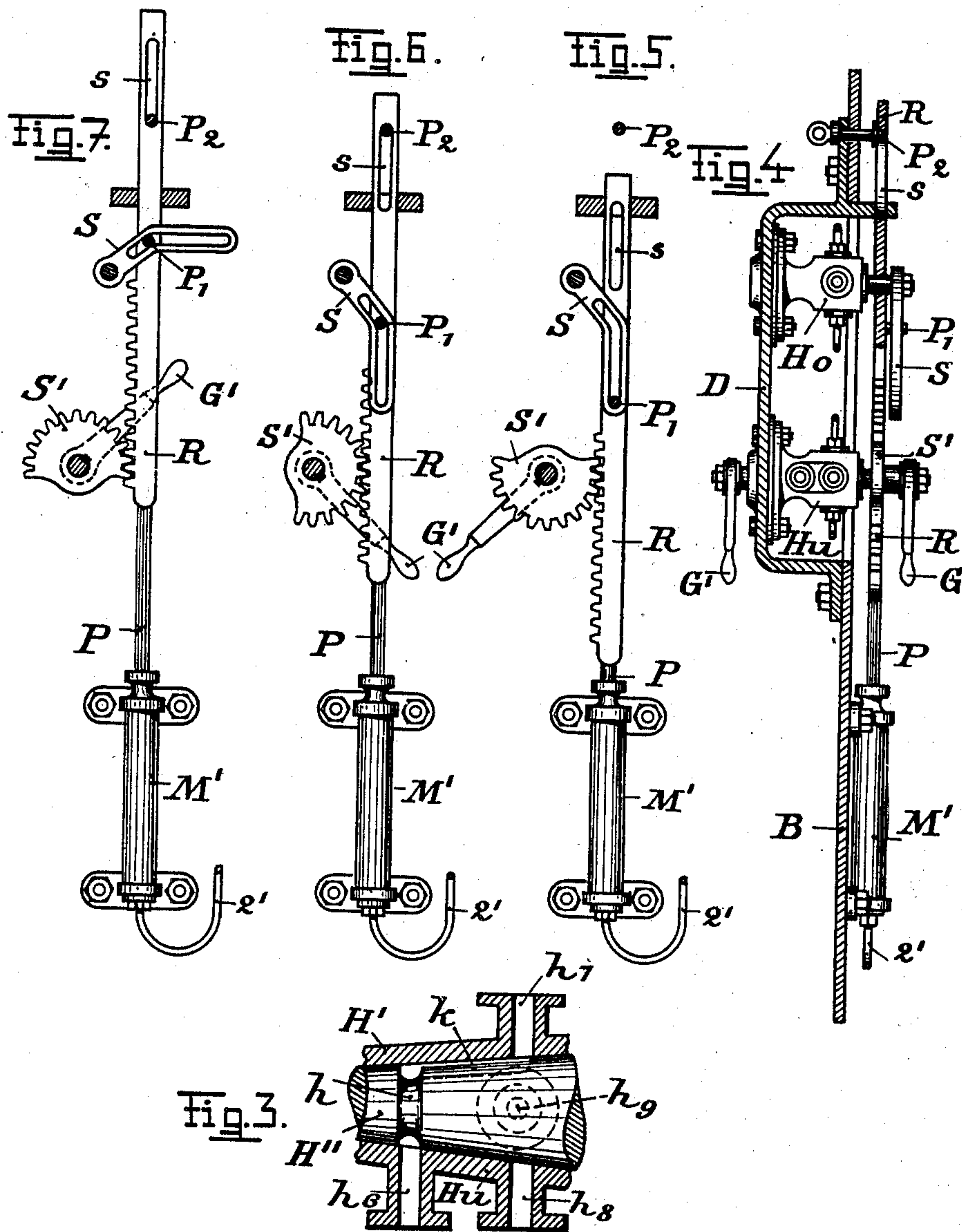
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*Thorne M. Patrick*

INVENTOR:

*A. du Bois-Reymond*

*Wm. J. ...*  
ATTORNEY



# UNITED STATES PATENT OFFICE.

ALARD DU BOIS-REYMOND, OF BERLIN, GERMANY, ASSIGNOR TO  
NORDDEUTSCHER LLOYD, OF BREMEN, GERMANY.

## MEANS FOR OPERATING BULKHEAD-DOORS.

SPECIFICATION forming part of Letters Patent No. 718,973, dated January 27, 1903.

Application filed June 20, 1902. Serial No. 112,459. (No model.)

*To all whom it may concern:*

Be it known that I, ALARD DU BOIS-REYMOND, engineer, a subject of the German Emperor, residing at 29 Luisenstrasse, Berlin, Germany, have invented certain new and useful Improvements in Means for Operating Bulkhead-Doors; 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.

In the art an arrangement for operating several bulkhead-doors from a common controlling-station is known. Such a system consists in one instance of hydraulic cylinders attached to the doors, an accumulator furnishing water-pressure, a pipe connecting the accumulator with the controlling-station, and three pipes connecting the controlling-station with the cylinders, one of which latter pipes being permanently connected to an exhaust-tank, and means being provided at the controlling-station for switching either of the remaining two pipes onto the accumulator or onto the said exhaust-pipe. By this means all the doors can be closed from the controlling-station, though no self-acting valves of any kind are provided at the doors themselves. This system, as above described, however, has the peculiar feature that when the controlling-valve at the central station is set to "Close" it is impossible to open any door by means of the local valves. This is in some cases regarded as an advantage; but in such ships in which by closing the bulkhead-doors persons can be entrapped—such as, for instance, when the bulkhead-doors form the only exit from the bunkers—it is thought necessary to provide means for locally opening the doors in any and every case—*i. e.*, whether or not the controlling-valve has been set to "Close."

My present invention consists in a special arrangement of the local valves in such a system by which this object is attained.

The invention also comprises means for automatically returning the doors into the closed position after they have been opened by hand for the purpose of escaping out of the bunkers or similar places.

My invention is illustrated in the accompanying drawings, of which—

Figures 1 and 2 are diagrams showing the pipe connections, and Figs. 3 to 7 are constructional details.

The same reference characters are used in all the figures for designating the same parts.

In Figs. 1 and 2, A is an accumulator, preferably a vessel closed on all sides and filled with compressed air and with water. E is an exhaust-tank. T', T<sup>2</sup>, and T<sup>3</sup> are bulkhead-doors of the ordinary well-known construction. M', M<sup>2</sup>, and M<sup>3</sup> are hydraulic cylinders, the pistons of which are attached to the corresponding bulkhead-doors, so that the latter will be closed or opened, accordingly as water-pressure is admitted to either end of the cylinders. H<sup>o</sup> and H<sup>u</sup> are a pair of valves or taps; but while H<sup>o</sup>, as in the prior constructions referred to is an ordinary three-way cock, according to my present invention H<sup>u</sup> is a four-way cock, the arrangement of which will be described hereinafter. The valves H<sup>o</sup> and H<sup>u</sup> are normally coupled by a suitable arrangement of levers or the like, and means are provided for uncoupling the valve H<sup>u</sup> and operating it independently of H<sup>o</sup> when it is desirable, as will appear hereinafter.

From the accumulator A a pipe 1 leads to the controlling-station, where it terminates in a four-way cock or an equivalent valve C, hereinafter to be called the "controlling-valve." From the controlling-valve C to the exhaust-tank E leads the pipe 3, passing every one of the cylinders M on its way. Besides this exhaust-pipe 3 two more pipes 2 and 4 also lead from the controlling-valve C to every one of the cylinders. Both pipes 2 and 4 are connected to each of the local valves H<sup>o</sup> and H<sup>u</sup> by branch pipes 7 and 8, and the exhaust-pipe 3 is connected to the valves H<sup>u</sup> by branch pipes 9. The upper ends of the cylinders are connected to the valve H<sup>o</sup> by pipes 5, and the lower ends to the valves H<sup>u</sup> by pipes 6.

The preferred arrangement of the valve H<sup>u</sup> is shown in detail in Fig. 3. The casing H' of the valve is provided with four studs h<sup>6</sup>, h<sup>7</sup>, h<sup>8</sup>, and h<sup>9</sup>, of which the three latter are



arranged in the same plane, while the former,  $h^6$ , is disposed nearer the thin end of the casing. The cone  $H''$  is provided with a concentric groove  $h$ , registering with the stud  $h^6$  and also with a longitudinal groove  $k$ , connecting either of the three other studs with the concentric groove  $h$ , and thereby with the stud  $h^6$ , according to the position of the cone  $H''$ . Referring now to Figs. 1 and 2, it should be understood that this valve is connected with the different pipes in the order indicated by the indices of the reference characters—*i. e.*, stud  $h^6$  is connected to pipe 6, stud  $h^7$  to pipe 7, &c. The small arrow issuing from the center of the valve in the diagrams is meant to indicate the position of the groove  $k$ .

The position of the controlling-valve C (indicated in Fig. 1) is the normal position given to this valve during the regular service. When the controlling-valve is in this position, the single bulkhead-doors can be opened or closed at will by the use of the local valves. Thus, in the example shown with reference to door  $T'$ , the local valves are set to "Close." The pressure is transmitted from pipe 4 through branch pipe 7 to local valve  $H^o$ , and thence through pipe 5 to the upper end of cylinder  $M'$ . The lower end of the cylinder is exhausted through pipe 6, valve  $H^u$ , branch pipe 9, and exhaust-pipe 3. When the local valves are set to "Open," as shown with reference to door  $T^2$  in Fig. 1, the pressure is admitted from pipe 4 through branch pipe 7, valve  $H^u$ , and pipe 6 to the lower end of the cylinder  $M^2$ , and the upper end is exhausted through pipe 5, valve  $H^o$ , branch pipe 8, main 2, controlling-valve C, and exhaust-pipe 3.

Referring now to Fig. 2, doors  $T'$  and  $T^2$ , it will be seen that the position of the local valves of the corresponding door has remained the same as in Fig. 1; but the controlling-valve has been shifted into the closing position, and thereby pipes 2 and 4 have changed parts, pipe 2 now being a pressure-pipe and pipe 4 being an exhaust-pipe. The result is that with regard to door  $T^2$  conditions are reversed, the upper end of the cylinder now receiving pressure and the lower end being exhausted, so that the door will be closed. In the case of the local valves being set to "Close" before the controlling-valve was set to "Close," which is illustrated with reference to door  $T'$ , both ends of the cylinder are now connected to the exhaust-tank and the door which was already closed remains closed. As hitherto described, this arrangement is substantially identical with the arrangement referred to as known in the art; but whereas heretofore it was impossible, in such case, to open any one of the doors by means of the local valves with the present arrangement it is only necessary to uncouple the handle G from the rod, connecting it with the lever-controlling valve  $H^o$ , and it is then free to be turned into the position shown in Fig. 2 with reference to door  $T^2$ . When in this position, it will be seen that the valve admits pressure to the

lower end of the cylinder  $H^3$ , and as the upper end is already connected to the exhaust-pipe the door will open.

Thus far this system provides for the safety of the person or persons casually entrapped in the bunkers or similar places; but it does not sufficiently warrant the safety of the ship, because it is to be assumed that the persons escaping from the bunkers will in most cases neglect to close the door again after passing it. My invention therefore also provides means for automatically closing the door after it has been opened by means of uncoupling the handle G. Moreover, in order that it be possible really to use the handle G in the manner herein described it is necessary that it should not only be accessible from one side of the bulkhead, but should be duplicated on the other side as well. For this purpose I prefer to add the arrangement which is shown in Figs. 4 to 7. The two valves or cocks  $H^o$  and  $H^u$  are mounted inside a casing D, secured to the inside of the bulkhead B. Valve  $H^u$  is provided with a handle  $G'$  at the inside of the bulkhead and with a gear-sector  $S'$  and a handle G on the outside. This gear-sector meshes with a rack R, mounted in guides, so as to move freely up and down. The lower end of the rack is formed by a plunger P, which works in a hydraulic cylinder  $M'$ . This cylinder, which I will call the "auxiliary" cylinder, is supposed to be permanently connected by a pipe  $2'$  with the branch pipe 8 and thereby with the main 2. It will be remembered that the main 2 is connected with the exhaust-pipe 3 when the controlling-valve is set to "Open." Therefore the auxiliary cylinder is normally exhausted and opposes no appreciable resistance to the free use of the handles G or  $G'$ . The valve  $H^o$  is provided with a crank or lever S, which is bent so as to form an angle of about one hundred and thirty-five degrees and is provided with a slot embracing a pin  $P'$ , fixed in a prolongation of the rack R. Above this pin a slot  $s$  is cut out in the prolongation of the rack, and a plug  $P^2$ , loosely inserted in a hole bored in the bulkhead, projects into this slot. It will be readily understood that the gear-sector  $S'$ , the rack R, and the crank S act as a positive coupling between the two valves  $H^o$  and  $H^u$  as long as this mechanism is kept between the two normal positions for opening or closing the door, which are illustrated in Figs. 6 and 7. Also as long as the plug  $P^2$  remains in its place it is impossible to turn the handle G or  $G'$  beyond the position shown in Fig. 6, which is the normal closing position. Now when the controlling-valve is set to "Close" and a man has been entrapped in a bunker he retracts the plug  $P^2$  and turns the handle  $G'$  into the position shown in Fig. 5. Since the main 2, which hitherto acted as an exhaust-pipe, becomes a pressure-pipe by setting the controlling-valve to "Close," the auxiliary cylinder  $M'$  now receives pressure and opposes the turning of



the handle G'; but the dimensions should be so chosen that though the force of the auxiliary cylinder is sufficient to return the valves H<sup>o</sup> and H<sup>u</sup> into their normal position it is nevertheless easily overcome by a man applying his strength to handle G'. The man can therefore depress the plunger in opposition to the hydraulic force tending to raise it, and can thereby admit pressure to the lower end of the main cylinder M<sup>3</sup>, (see Fig. 2;) but as soon as he has made his escape and releases the handle the plunger is forced upward again and returns the rack into its normal position. Since the outer part of the slot cut in crank S in the position of the crank shown in Fig. 6 is parallel with the rack R, the latter will be free to continue the downward movement, the pin P moving downward in the slot and locking the crank S in its position, and the valve H<sup>u</sup> will become independent of the valve H<sup>o</sup> for the time being; but when the rack returns the pin P' upon reaching the apex of the angle of the slot will commence to turn crank S and the normal state of things will be restored.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an arrangement for simultaneously operating several bulkhead-doors the combination with a common controlling-valve, of a hydraulic cylinder operatively fitted to each door, means for connecting one end of said cylinder with either of a pair of mains leading to the controlling-valve and the opposite end of said cylinder with either of the said pair of mains or with an exhaust-pipe.

2. In an arrangement for simultaneously operating several bulkhead-doors the combination with a common controlling-valve, of a hydraulic cylinder arranged to operate each door, pipes leading from either end of said cylinder, and a pair of valves connected to said pipes and adapted to switch one of said pipes onto either of a pair of mains leading to the controlling-valve and the other of said pipes onto either of the said mains or onto an exhaust-pipe.

3. In an arrangement for operating several bulkhead-doors from a common controlling-station, the combination with a cylinder arranged to operate each of said doors, pipes leading from each of said cylinders to local valves one of which is adapted to switch the corresponding end of the cylinder onto either of a pair of mains leading to the controlling-station and the other of which is adapted to switch the opposite end of the cylinder onto either of the said pair of mains or onto an exhaust-pipe, of means for positively coupling the said pair of valves and for disengaging said coupling and independently operating the latter valve.

4. In an arrangement for operating several bulkhead-doors from a common controlling-

station such as described, the combination with a cylinder arranged to operate each of said doors, pipes leading from each end of said cylinder to hand-operated valves one of which is adapted to switch the corresponding end of the cylinder onto either of a pair of mains leading to the controlling-station and the other of which is adapted to switch the opposite end of the cylinder onto either of the said pair of mains or onto an exhaust-pipe, of means for positively coupling the said pair of valves and for disengaging said coupling and independently operating the latter valve.

5. In an arrangement for operating several bulkhead-doors from a common controlling-station, the combination with a cylinder arranged to operate each door, pipes connecting each end of the cylinder with local valves connecting one end of the cylinder with either of a pair of mains leading to the controlling-valve and the opposite end of the cylinder with either of the said mains or with an exhaust-pipe, of means for positively coupling both valves during their normal operation but permitting independent movement to the latter valve if turned beyond the normal position, and means for automatically returning the valves into the normal position after they have been released.

6. In an arrangement for operating several bulkhead-doors from a common controlling-station such as described, the combination with a cylinder fitted to operate each door, pipes connecting each end of the cylinder with hand-operated valves connecting one end of the cylinder with either of a pair of mains leading to the controlling-valve and the opposite end of the cylinder with either of the said mains or with an exhaust-pipe, of means for positively coupling both valves during their normal operation but permitting independent movement to the latter valve if turned beyond the normal closing position, and means for automatically returning the valves into the normal position after they have been released.

7. In an arrangement for operating several bulkhead-doors from a common controlling-station such as described, the combination with a cylinder fitted to operate each door, pipes connecting the ends of the cylinder with local valves adapted to switch one end of the cylinder onto either of a pair of mains leading to the controlling-valve and the opposite end of the cylinder onto either of the said mains or an exhaust-pipe, of means for automatically returning said valves to the normal position when released, such means being inoperative when the controlling-valve is set to "Open" and being operative when the controlling-valve is set to "Close."

8. In an arrangement for operating several bulkhead-doors from a common controlling-station such as described, the combination with a cylinder adapted to operate each door, local valves adapted to switch one end of said cylinder onto either of a pair of mains leading to the controlling-station and the oppo-



site end of said cylinder onto either of the said mains or onto an exhaust-pipe, of an auxiliary cylinder connected to the main which is exhausted by setting the controlling-valve to "Open," such auxiliary cylinder being operatively connected to gear controlling the said valves.

9. In an arrangement for operating several bulkhead-doors from a common controlling-station such as described, the combination with a cylinder adapted to operate each door, a pipe leading from one end of the cylinder to a three-way cock fitted and adapted to switch said pipe onto either of a pair of mains leading to the controlling-station, a second pipe leading from the opposite end of said cylinder to a four-way cock fitted and adapt-

ed to switch said second pipe onto either of the said pair of mains or onto an exhaust-pipe, of a gear-sector fitted to said four-way cock, a rack meshing with said gear-sector, a slotted angular crank fitted to the said three-way cock and embracing a pin projecting from said rack, and an auxiliary cylinder connected to the main which is exhausted by setting the controlling-valve to "Open," said auxiliary cylinder being operatively connected to said rack.

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

ALARD DU BOIS-REYMOND.

Witnesses:

WOLDEMAR HAUPT,  
HENRY HASPER.