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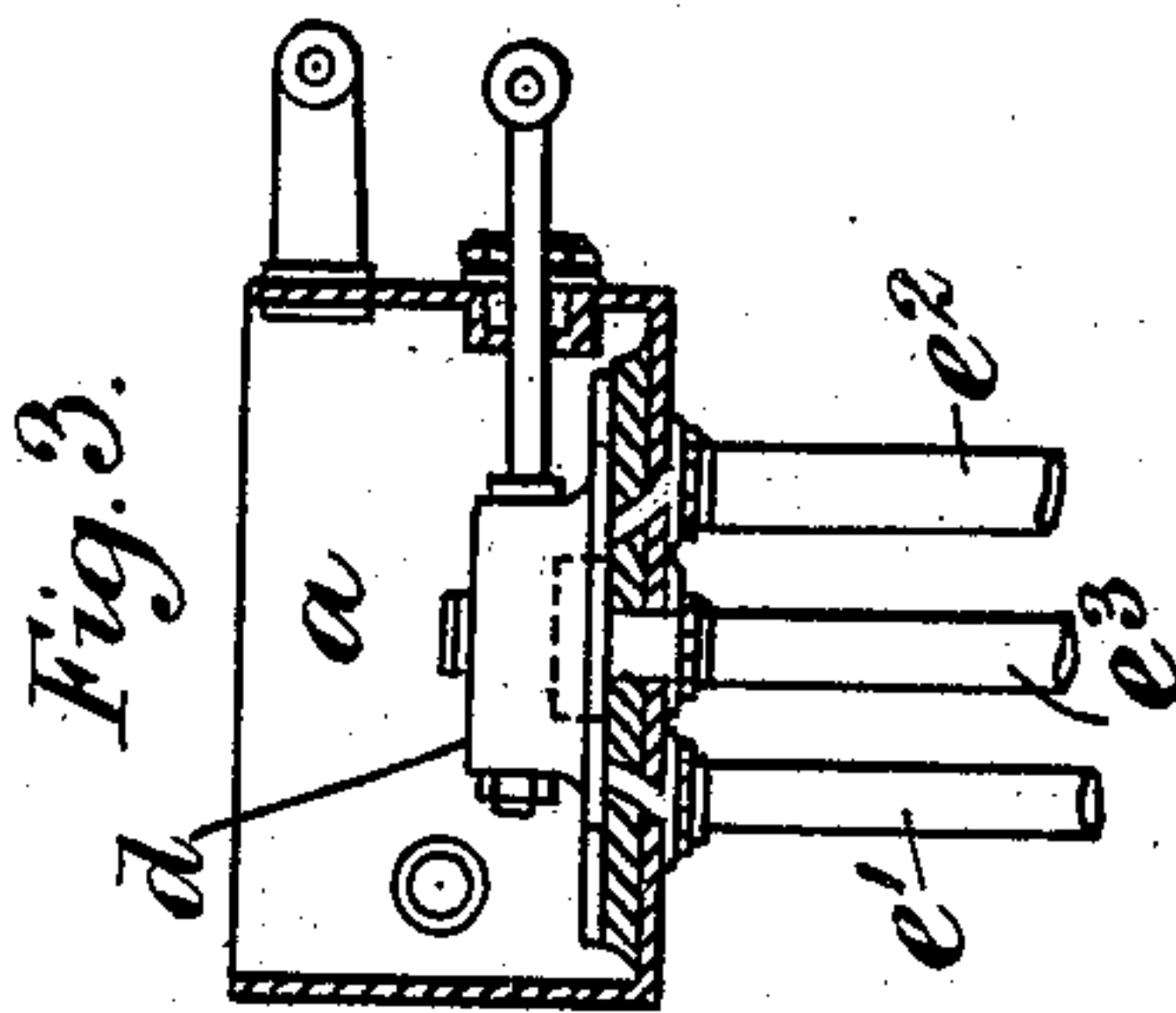
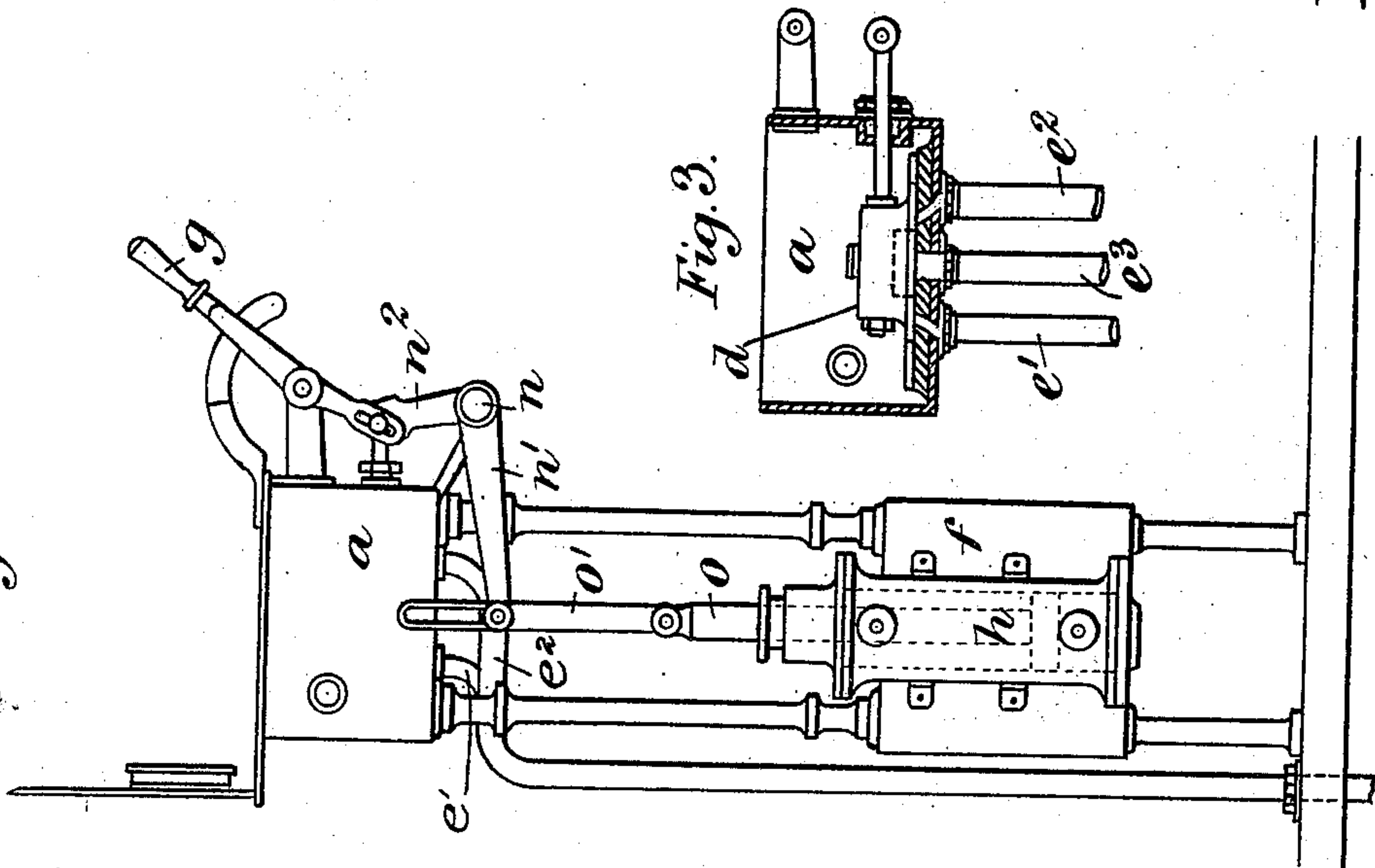
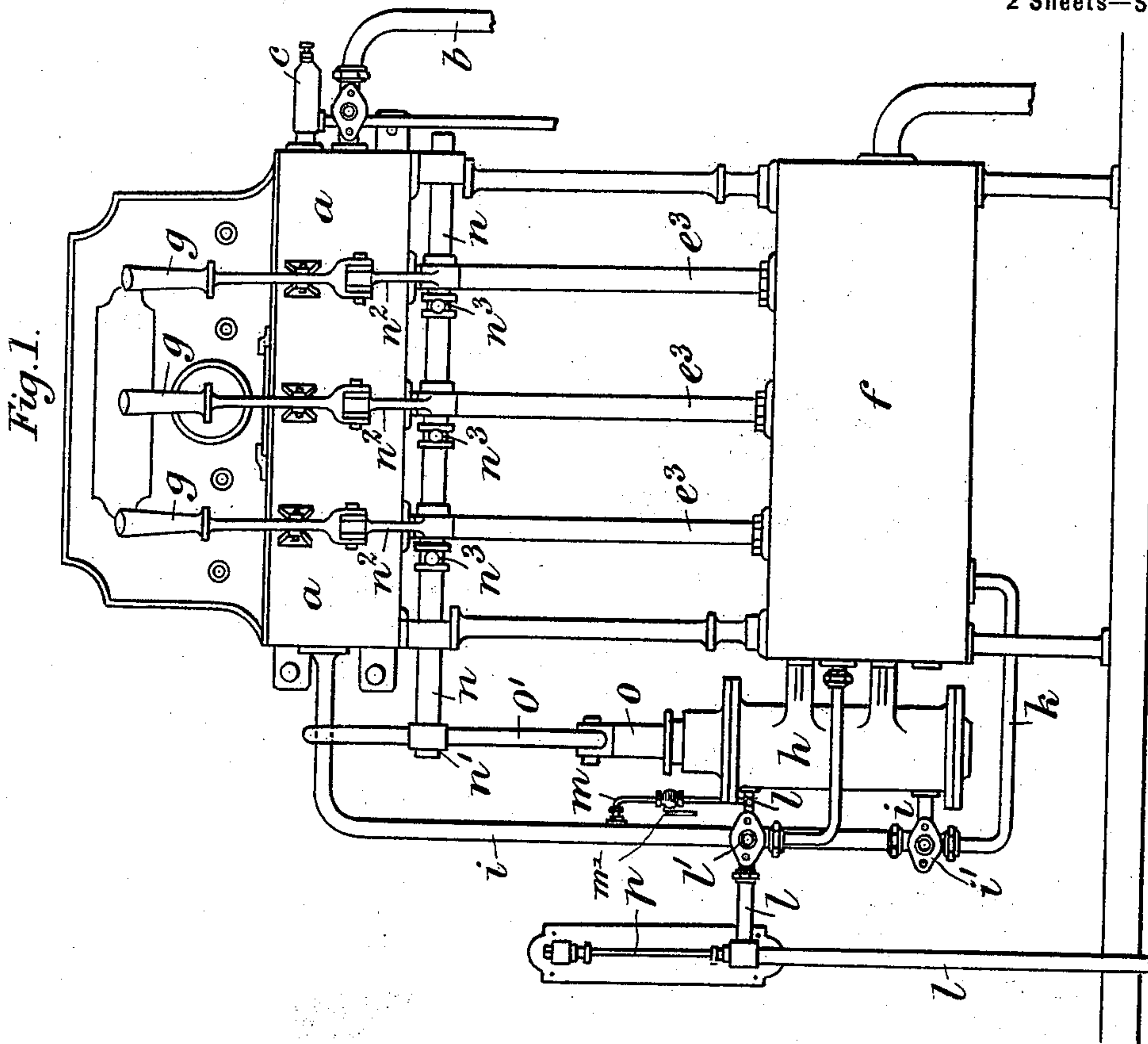
Patented Jan. 10, 1899.

A. W. MONTGOMERY-MOORE.
APPARATUS FOR CLOSING OR OPENING BULKHEAD DOORS.

(Application filed Jan. 11, 1898.)

(No Model.)

2 Sheets—Sheet 1



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Fig. 4.

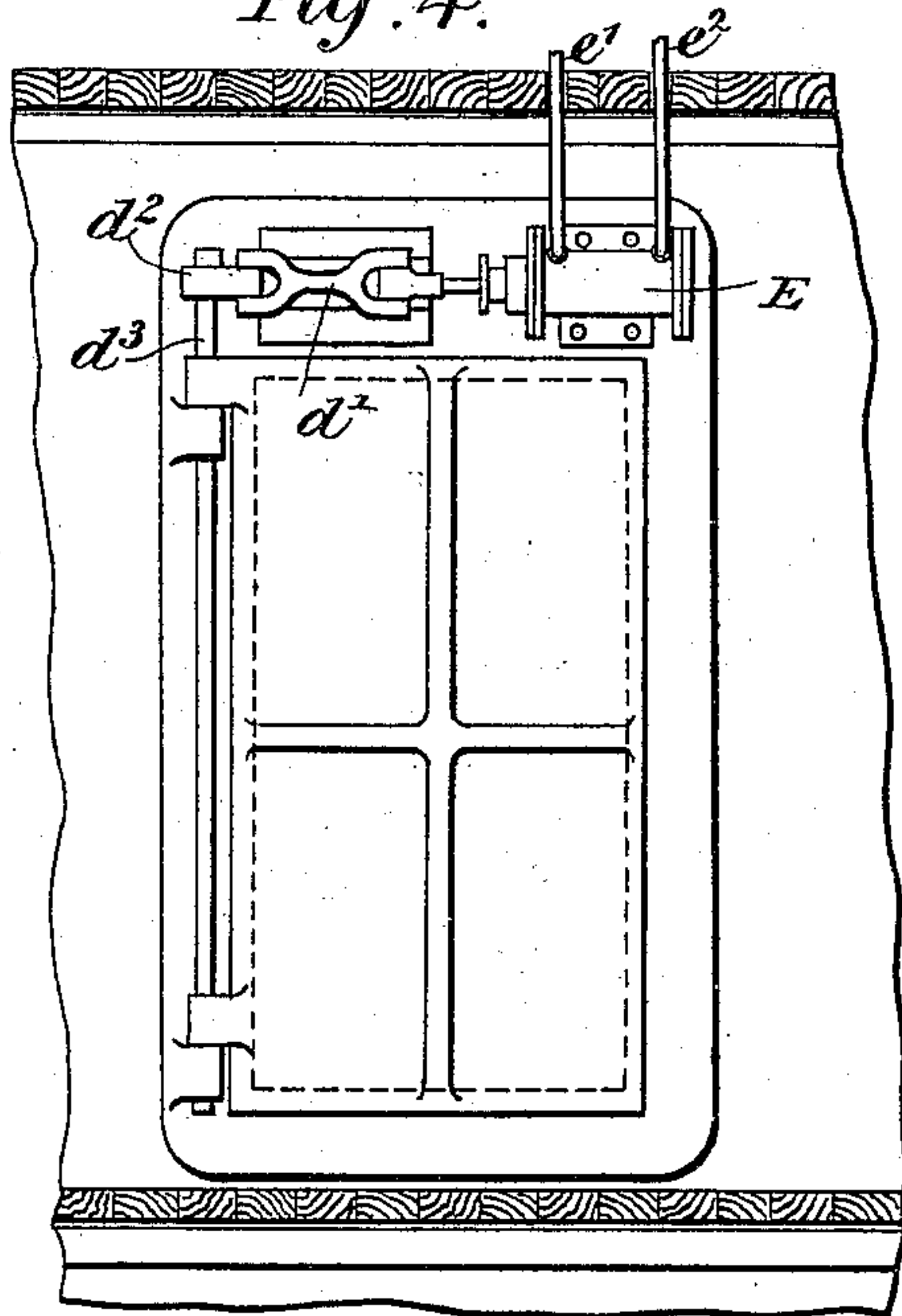


Fig. 5.

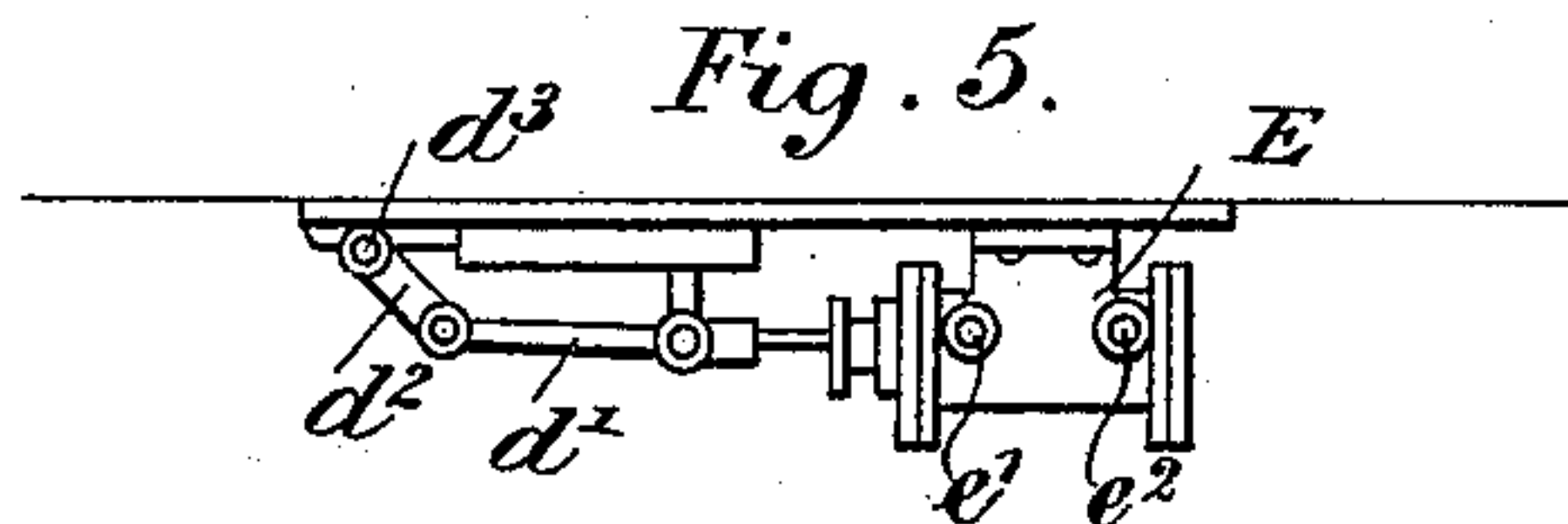


Fig. 6.

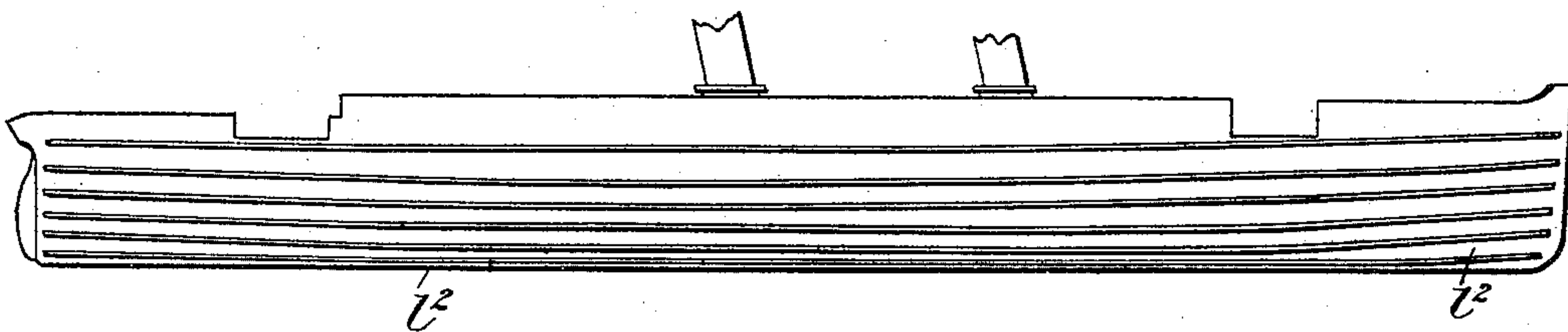
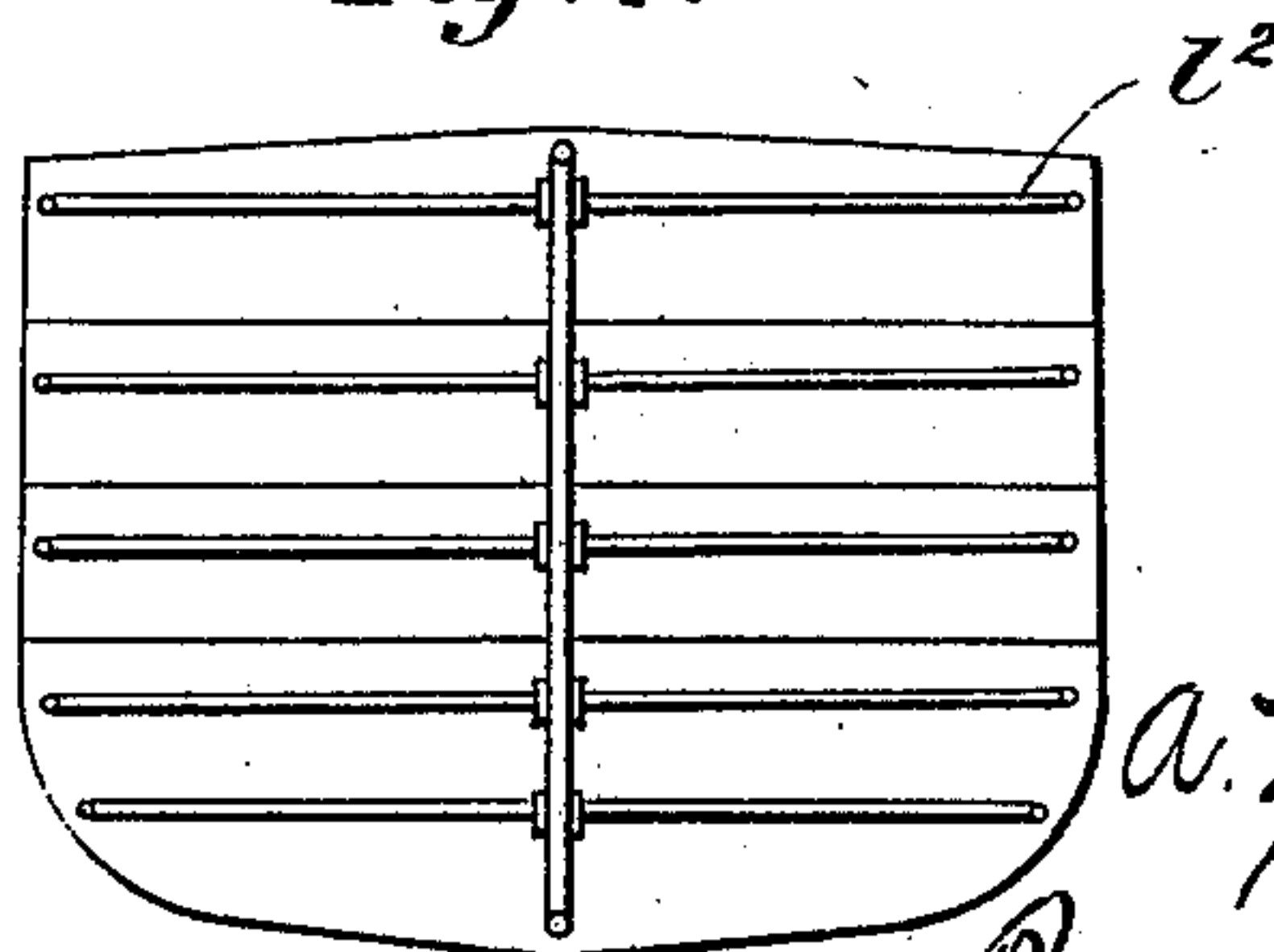


Fig. 7.



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UNITED STATES PATENT OFFICE.

ALEXANDER WILLOUGHBY MONTGOMERY-MOORE, OF LONDON, ENGLAND.

APPARATUS FOR CLOSING OR OPENING BULKHEAD-DOORS.

SPECIFICATION forming part of Letters Patent No. 617,593, dated January 10, 1899.

Application filed January 11, 1898. Serial No. 666,313. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER WILLOUGHBY MONTGOMERY-MOORE, a subject of the Queen of Great Britain, residing at Holland Lodge, Eltham road, Lee, London, in the county of Kent, England, have invented certain new and useful Improvements in Apparatus for Closing or Opening Bulkhead-Doors on Shipboard and for Such Like Purposes, of which the following is a specification.

For the purpose of closing and opening doors in bulkheads and elsewhere I provide in connection with each door a hydraulic cylinder and I connect the door with a piston in this cylinder. By the admission of water under pressure to one or the other end of the cylinder I give the requisite movement to the door, or I make other equivalent arrangements. I lead pipes from these cylinders to the apparatus which forms the subject of my present invention. In this apparatus there is a valve-chest which is kept constantly charged with water under pressure by connection with an accumulator. For each of the doors to be separately controlled a valve, preferably a slide-valve, is provided in the valve-chest. The valve is connected by a rod to a hand-lever, by means of which the valve can be placed so as to allow the fluid under pressure to pass from the valve-chest to one or the other end of the cylinder which controls the corresponding bulkhead-door, while the fluid is allowed to escape from the other end of the cylinder. Thus any door can at pleasure be separately closed or opened by a hand operation. In addition to this I so arrange that all or any desired number of doors can be simultaneously closed by mechanism which operates automatically in case of accident. In front of the range of hand-levers I mount a shaft with arms upon it—one for each of the hand-levers. These arms are capable of being clutched fast with the shaft, or they can be permitted to turn freely thereon. If it be desired that the hand-lever should be moved by the automatic mechanism, the corresponding clutch is made to engage with the arm, and then on turning the shaft the hand-lever is moved by the arm from one position to the other. The shaft itself receives its movement in the following manner: It has an arm upon it which is connected with a piston in a cylinder. This cylinder is kept charged with liq-

uid by a connection with the valve-chest. At one end this cylinder is coupled with a safety-pipe which traverses throughout the ship in such manner that if the ship should meet with any accident breakage of the safety-pipe ensues. The breakage of the safety-pipe releases the pressure upon one side of the actuating-piston, while the pressure still continues upon the other side. This unbalanced pressure causes the movement of the piston along the cylinder, and this movement by the connections described is transmitted to the hand-levers and the valves.

The accompanying drawings show so much of the apparatus embodying my improvements as is necessary to illustrate the subject-matter herein claimed.

Figure 1 is a front elevation of the apparatus; Fig. 2, a side elevation thereof, and Fig. 3 a vertical transverse section through the valve-chest on the line of one of the valves. Fig. 4 shows an elevation of a bulkhead-door and its actuating mechanism, the door being shown as closed; Fig. 5, a plan view of the door-actuating mechanism; and Figs. 6 and 7 show, diagrammatically, the ramifications of the safety-pipes.

Figs. 1, 2, and 3 of the drawings show a valve-chest *a*, which is normally kept charged with fluid under pressure by means of an accumulator, (not shown in the drawings,) with which the valve-chest is connected by an inlet-pipe *b*. A safety-valve *c* may be provided, if desired. The passage of fluid to the cylinder actuating the bulkhead door or doors is regulated by a slide-valve or slide-valves *d*, one only of which is shown in the drawings.

The door-actuating mechanism is clearly shown in Figs. 4 and 5, which show the door as closed. The door is shown as actuated by means of cylinder *E*, to which fluid under pressure is supplied by inlet-pipes *e'* *e''*, the former admitting the fluid when the door is to be closed and the latter when it is to be opened. The piston-rod of this cylinder is shown as provided with suitable guides and connected by a link *d'* with an arm *d''* on the hinge-pin *d'''* of the door, to which it is firmly secured and with which it turns. The door may be provided with locking-bolts, (not shown in the drawings,) which may automatically be operated, if desired.

When any valve is so placed that fluid is admitted to the corresponding inlet-pipe *e'*,

the bulkhead-door is closed by the action of the piston, the fluid at the same time returning through the valve by the return-pipe e^2 and passing by the escape-pipe e^3 to a waste-tank f . When, on the other hand, fluid is admitted by valve d to the pipe e^2 , the piston is actuated in the opposite direction and the bulkhead-door opens, the fluid at the same time returning by the pipe e' and passing to the waste-tank by the escape-pipe e^3 , as before.

A regulating-valve and inlet and outlet pipes, such as described, are provided for each door to be separately controlled. These valves can be separately manipulated by hand, if desired, by handles or levers g , connected with the valves by suitable links, as hereinafter described.

Figs. 1 and 2 show apparatus for working one or more of these valves automatically. An inlet-pipe i conducts fluid from the valve-chest a to one end of the valve-controlling cylinder h , shown in the drawings as arranged vertically and with the inlet-pipe i entering its lower end beneath the piston. This pipe, which is normally open, can be closed, when desired, by a stop-valve i' , so organized that the contents of the lower end of the cylinder simultaneously escape through the waste-pipe k to the tank f . A pipe l connects the upper end of the cylinder with safety-pipes l^2 , which ramify to the places needing protection, as shown in Figs. 6 and 7, the pipe shown in these figures being directly connected with the pipe l . (Shown in Fig. 1.) These safety-pipes are so constructed and arranged as to insure their breakage if damage to the ship to which they are shown as applied should occur below the water-line. Thus it will be seen that the pipe l is only closed at one end, while at the other it is in communication with the upper end of the valve-controlling cylinder h . The connection between this pipe and cylinder can be closed by a valve l' in the pipe when desired. A pipe m , branching from the inlet-pipe i , provided with a stop-cock m' , serves to fill the safety-pipes and the upper end of the cylinder h when required; also, to restore the automatic valve-controlling piston to its normal position at the bottom of the cylinder at the proper time.

The door-actuating inlet-valves d are automatically controlled as follows: The piston-rod o of the cylinder h carries a slotted link-rod o' , connected with the arm n' , fast on a rock or weigh shaft n , rocking in bearings near the valve-chest a and carrying a series of arms n^2 upon it, (one for each inlet-valve d), which arms are capable of turning independently around the shaft, but can at pleasure be fastened so as to be rendered fast thereon and enabled to turn therewith by suitable clutches n^3 . Each of these arms n^2 is shown as connected with its corresponding handle or lever g by a slot and pin, each handle and arm being connected at their point of inter-

section in line with the rod of the inlet-valve d .

When the apparatus is ready for automatic action, the cylinder h is full of water both above and below the piston. The safety-pipes are also full, and the piston is at the lower end of the cylinder. So long as the safety-pipes remain full the piston cannot rise; but immediately a breakage occurs in the system of safety-pipes the pressure below the piston becomes effective and causes it to travel upward. It then actuates the weigh-shaft, as already explained. The valves d are thus shifted, and the corresponding doors are closed through the action of the door-actuating cylinders E , above described. The link o' , which connects the piston-rod with the arm n' , is slotted to admit of the piston rising a short distance before it moves the valves, so that a slight leakage may take place in the system of safety-pipes without bringing the apparatus into operation. In order to bring the piston back to the lower end of the cylinder when it has risen in consequence of leakage or breakage, the valve at i' is closed to the pressure and open to the waste, and this having been done the loss is made good by opening the stop-cock m' in the small feed-pipe m . When the leakage or loss has been supplied, the feed-pipe is again closed and the valve at i' is opened to the lower end of the cylinder, and the apparatus is then again ready for action. p is a gage-glass. It shows if there be leakage from the safety-pipes. For testing and the purposes of drill the apparatus may be made to operate by manipulating the valves i' l' and the stop-cock m' in the pipe m .

It will be observed that this apparatus may be used in warehouses and other places to close doors automatically in case of fire. The safety-pipes would be of small dimensions and be made of some easily-fusible metal.

I have spoken of water as the liquid with which the hydraulic system is charged; but in the higher latitudes it will be necessary to take precautions against frost, either by mixing with the water salts or materials which lower the freezing-point or by substituting a suitable oil or other liquid.

It is obvious that under some conditions and in some parts of the apparatus air or gas might be employed in place of liquid; also, that the arrangement might be so modified as to require a partial vacuum to be maintained in the system of pipes. The use of air-pressure or vacuum is to be recommended in positions where fittings or cargo might be injured by leakage. The arrangements which I have described in detail are, however, simple and efficient.

Having thus fully described the construction and operation of my improved apparatus for closing and opening bulkhead-doors, what I claim herein as of my own invention, and desire to secure by Letters Patent, is—

1. The combination, substantially as here-

inbefore set forth, of a bulkhead-door, a fluid-pressure door-actuating cylinder, connections between the door and cylinder, valve mechanism regulating the flow of fluid through the cylinder, a fluid-pressure valve-controlling cylinder, a safety-pipe connected therewith, a fluid-pressure-supply pipe connected with the valve-controlling cylinder, and connections between the cylinder and valve mechanisms automatically to actuate the latter at proper times.

2. The combination, substantially as here-inbefore set forth, of a series of bulkhead-doors, a series of fluid-pressure door-actuating cylinders, connections between each door and its respective actuating-cylinder, a separate fluid-pressure valve-controlling cylinder, safety-pipes connected therewith, a fluid-pressure-supply pipe also connected therewith, and connections between the separate cylinder and door-actuating cylinders whereby a variation of pressure in the safety-pipes automatically regulates the door-actuating mechanism.

3. The combination, substantially as here-inbefore set forth, of a bulkhead-door, a fluid-pressure door-actuating cylinder, connections between the door and cylinder, mechanism regulating the flow of fluid through the door-actuating cylinder, a fluid-pressure valve-controlling cylinder, a pipe supplying fluid thereto on one side of its piston, a safety-pipe connected with the other end of the cylinder, a rock-shaft, connections between the valve-controlling cylinder and the rock-shaft whereby it is actuated, and similar connections between the rock-shaft and mechanism controlling the admission of fluid-pressure to the door-actuating cylinder.

4. The combination, substantially as here-inbefore set forth, of a bulkhead-door, a fluid-pressure door-actuating cylinder, connections between the door and cylinder, valve mechanism regulating the flow of fluid through the door-actuating cylinder, a fluid-pressure valve-controlling cylinder, its piston, a pipe supplying fluid thereto on one side of the piston, a safety-pipe connected with the other end of the cylinder, a rock-shaft, link connections between the rock-shaft and valve-controlling cylinder, and other link connections between the rock-shaft and valve mechanism automatically to regulate the door-actuating mechanism.

5. The combination, substantially as here-inbefore set forth, of a series of bulkhead-doors, a series of fluid-pressure door-actuating cylinders, connections between each door and its respective actuating-cylinder, a separate fluid-pressure valve-controlling cylinder, safety-pipes connected therewith, a fluid-pressure-supply pipe also connected therewith, a rock-shaft, and link connections between the rock-shaft and valve mechanism automatically to regulate the door-actuating mechanism.

6. The combination, substantially as here-

inbefore set forth, of a series of bulkhead-doors, a series of fluid-pressure door-actuating cylinders, connections between each door and its respective actuating-cylinder, a valve-chest, under fluid-pressure, common to all the door-actuating cylinders, a series of valve-regulating mechanisms in said chest, one for each cylinder, a fluid-pressure valve-controlling cylinder, its piston, a pipe supplying fluid thereto on one side of the piston, a safety-pipe connected with the other side of the cylinder, and link connections between the valve-controlling cylinder and the valve-regulating mechanisms of the door-actuating cylinders, whereby all of said last-named cylinders are automatically actuated by the single cylinder.

7. The combination of a bulkhead-door, fluid-pressure door-actuating mechanism connected therewith, a valve-chest, valves therein, pipe connections between the valve-chest and the fluid-pressure door-actuating mechanism, a cylinder and piston, a supply-pipe connected to one end of the cylinder, a safety-pipe connected to the other end of the cylinder, a shaft, connections between the shaft and the piston, arms on the shaft, connections between the arms and the valves and clutches for locking the arms fast to the shafts.

8. The combination of bulkhead-doors, fluid-pressure door-actuating mechanism connected therewith, a valve-chest, pipe connections between the valve-chest and the fluid-pressure door-actuating mechanism, a series of valves in the valve-chest, levers connected with the valves, a shaft for actuating the levers, fluid-pressure mechanism for operating the said shaft, arms, n^2 , loosely arranged upon the shaft and connected with the levers, and clutches, n^3 , on the shaft, for connecting the shaft with the arms so that the arms may be made fast upon the shaft when required.

9. The combination of the bulkhead-doors, fluid-pressure mechanism for operating them, a valve-chest, valves therein, pipes connecting the fluid-pressure door-actuating mechanism with the valve-chest, a cylinder and piston, a fluid-supply pipe connected to one end of the cylinder, a safety-pipe connected to the other end thereof, a shaft, an arm thereon, connections between said arm and the piston, other arms carried by the shaft, and clutches serving to lock said arms fast to the shaft.

10. The combination of the bulkhead-doors, fluid-pressure mechanism for operating them, a valve-chest, valves therein, connections between the valve-chest and the fluid-pressure door-actuating mechanism, levers connected with the valves for operating them, a shaft, connections between the shaft and the valves for operating them automatically, and fluid-pressure mechanism for operating the shaft automatically.

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