

No. 611,833.

Patented Oct. 4, 1898.

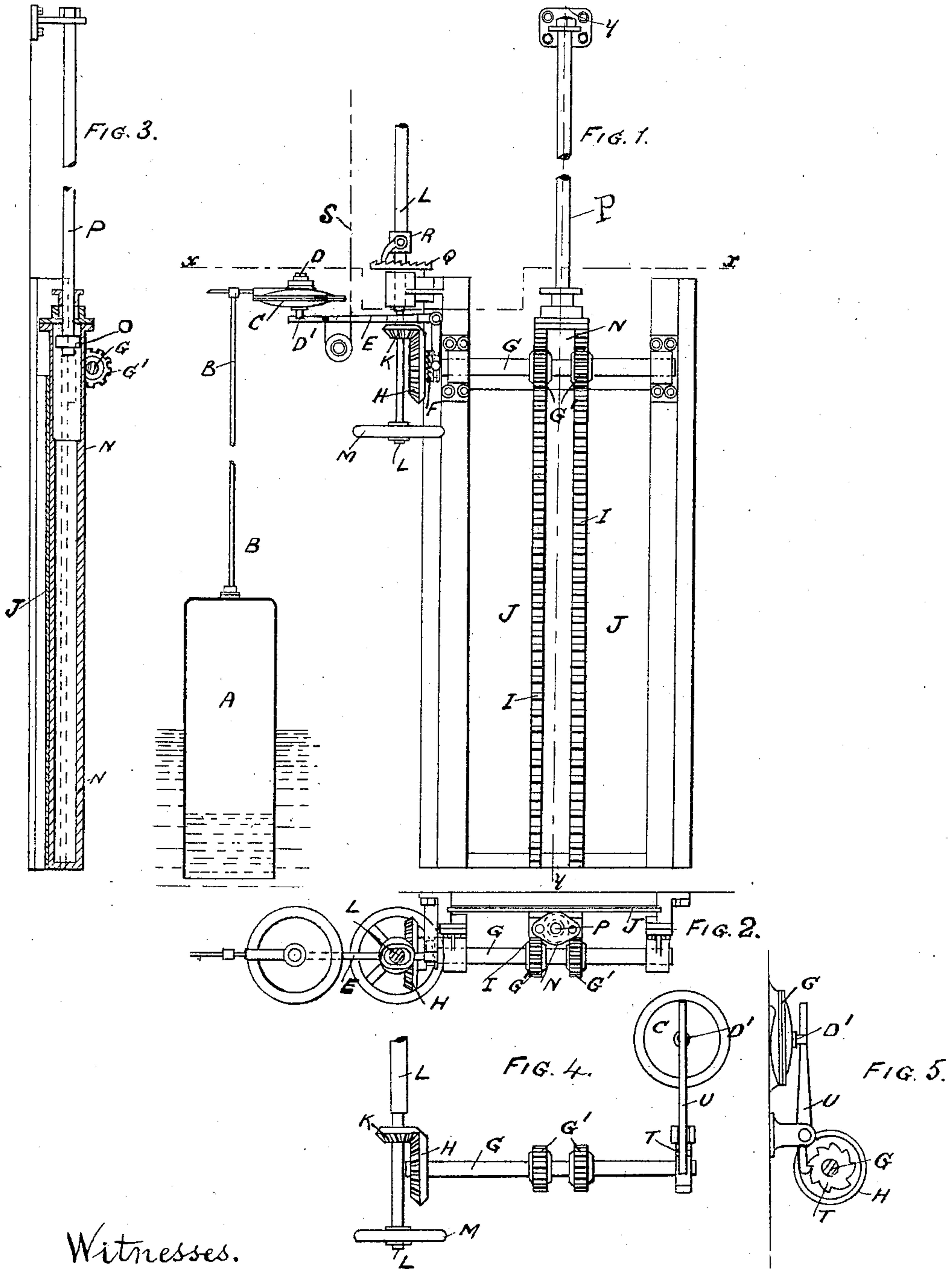
W. & A. R. CRAWFORD.

APPARATUS FOR AUTOMATICALLY CLOSING BULKHEAD DOORS.

(Application filed Mar. 21, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.  
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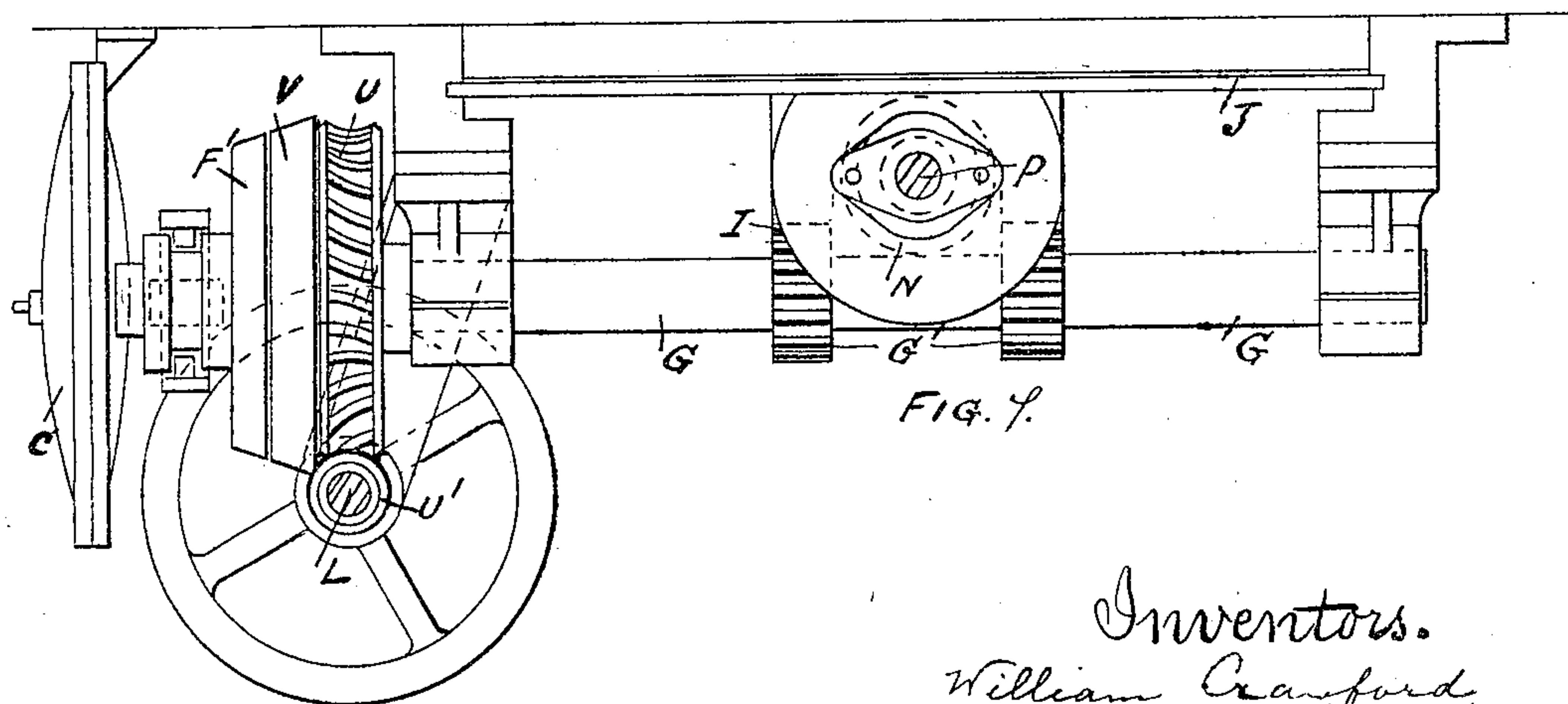
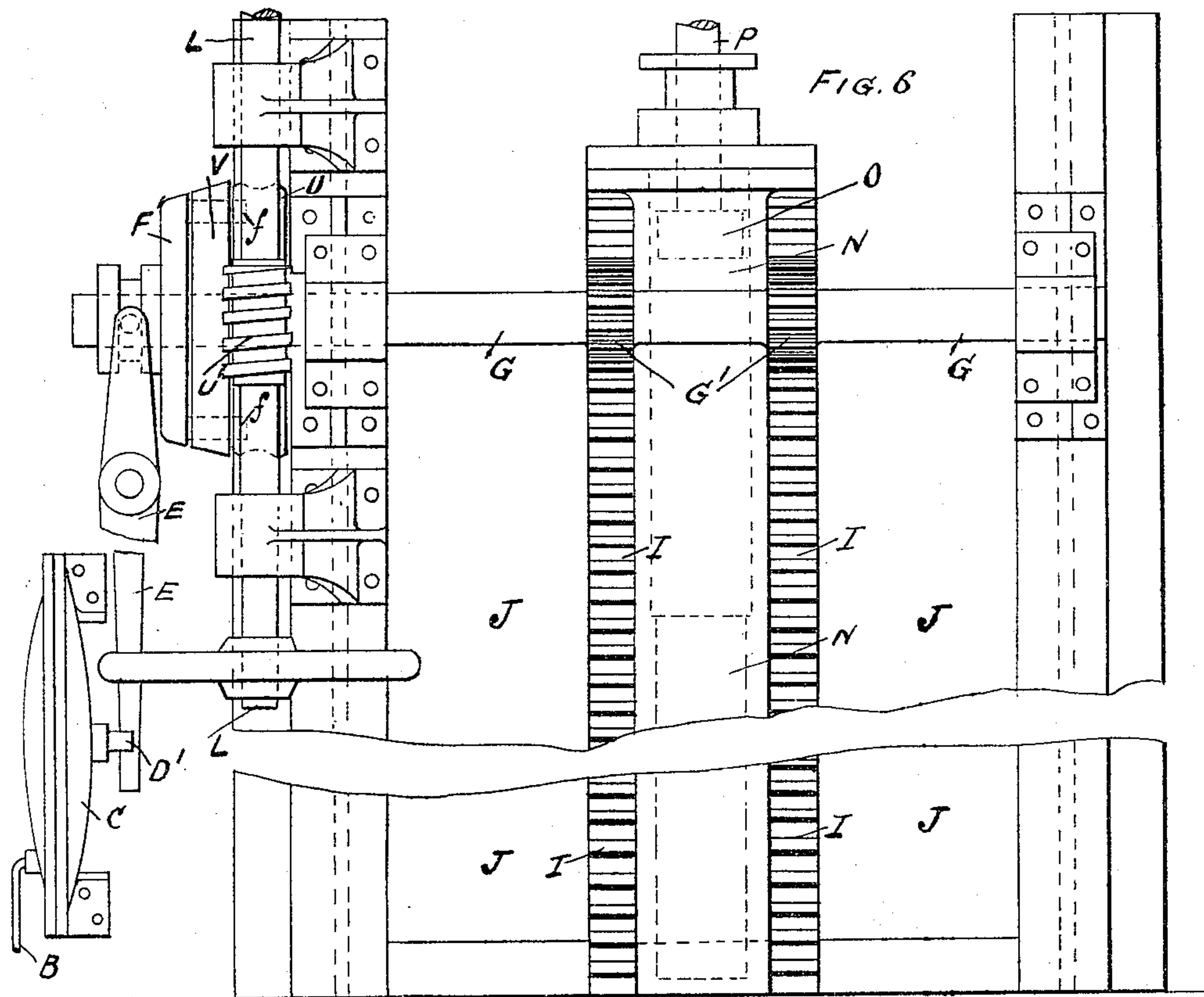
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# UNITED STATES PATENT OFFICE.

WILLIAM CRAWFORD AND ALEXANDER ROBINSON CRAWFORD, OF  
GLASGOW, SCOTLAND.

## APPARATUS FOR AUTOMATICALLY CLOSING BULKHEAD-DOORS.

SPECIFICATION forming part of Letters Patent No. 611,833, dated October 4, 1898.

Application filed March 21, 1898. Serial No. 674,590. (No model.)

*To all whom it may concern:*

Be it known that we, WILLIAM CRAWFORD and ALEXANDER ROBINSON CRAWFORD, tin-smiths, of 46 Muse lane, in the city of Glasgow, Scotland, have invented new and useful Improvements in Apparatus for Automatically Closing Bulkhead Water-Tight Doors, (for which application for patent in Great Britain, No. 5,330, dated March 4, 1898, has been made,) of which the following is a specification.

Our invention relates to water-tight doors for ships' bulkheads wherein air-pressure within an air-chamber produced by accumulation of water in the ship's bilges or other part of the ship is utilized to effect the release of the devices employed to retain the doors normally in the open position, so that the doors are closed automatically in case of accident to the ship.

The invention has for its objects to provide simple and improved means for retaining the doors in the open position, while permitting of their ready automatic release; also, to provide in conjunction with the automatic releasing devices means for opening and closing the doors from the deck or other part of the ship, and, further, to provide means whereby the speed of the door in the early part of its descent may be retarded and accelerated in the final closing.

In the accompanying drawings, Figure 1 is an elevation, Fig. 2 a horizontal section on the line  $xx$  of Fig. 1, and Fig. 3 a transverse vertical section on the line  $yy$  of Fig. 1, illustrating a water-tight door as operated by a modification of the apparatus constituting our invention. Figs. 4 and 5 are views at right angles to each other of a modified form of part of the apparatus, and Figs. 6 and 7 are respectively an elevation and plan showing a further modification.

As represented in Figs. 1, 2, and 3 of the drawings, the apparatus comprises a chamber A, placed in the lower part of the ship and within which air is confined and is subjected to compression in the event of accident to the ship by the rising of the water in the bilges, as is indicated at Fig. 1. From the upper end of this chamber A a pipe B of small bore is led to a metal casing C, within

which is secured a leather or other diaphragm provided with suitable plates and guiding-pins D D', one, D', of which when the air-pressure is sufficient to actuate the diaphragm acts upon a releasing-lever E. According to the present invention this lever E when actuated by the diaphragm acts on and withdraws a clutch F, keyed upon a horizontal shaft G and engaging normally with a bevel-wheel H, loosely centered on said shaft. On the shaft G a pair of spur-wheels G' are keyed, which engage with racks I on the bulkhead-door J. The bevel-wheel H is geared to a bevel-wheel K on a vertical shaft L, which extends to the deck and can be operated therefrom to raise the bulkhead-door, a hand-wheel M being also provided at the lower end of the shaft L and at the side of the door, so that the shaft can be there operated to raise the door. A cylinder N is provided on the door between the racks I, in which is a loosely-fitting piston O, the rod P of the piston being preferably hollow and secured to the bulkhead at its upper end. This cylinder is filled with glycerin or other liquid and is of larger diameter at its top end or has an enlargement or bypass formed on it, so as to permit of the easier passage of the glycerin to the other side of the piston at that end of the cylinder, and thus allow the door to fall sharply into its closed position by the acceleration due to gravity. The door is raised by rotating the vertical shaft L either from the deck or from below, as before described, the clutch being during this operation thrown into gear with the bevel-wheel H by a spring or weight. The door after being raised is prevented from falling by means of the ratchet-wheel Q and pawl R on the vertical shaft L. When it is desired to close the bulkhead-doors without employing the air-pressure in the air vessel or when the pressure in the air vessel is *nil*, the clutch F can be released from the bevel-wheel H from the deck by means of a rope S, as shown, or by other means. The air-chamber A may be of sufficient capacity to actuate any number of doors simultaneously and irrespective of position, a metal casing having a diaphragm being provided for each door.

Instead of employing a clutch to engage the bevel-wheel H a ratchet-wheel T may be



secured upon the horizontal shaft G, as shown at Figs. 4 and 5, the bevel H being in this case keyed on the shaft G. A beam-lever is provided, one end of which is acted upon by the pin D' of the diaphragm, the other end acting as a pawl to prevent the rotation of the ratchet-wheel T, and thus hold the door in its raised position. On the withdrawal of the pawl the door is free to fall by its own weight.

In the modification shown at Figs. 6 and 7 a worm-wheel U is fitted loose on the horizontal shaft G and engages with a worm U' on the vertical shaft L. On the shaft G is keyed a disk V in close proximity to the worm-wheel U, and the latter is prevented from turning on its shaft G by means of pins or prongs f on a sliding clutch F', fitted loose on the shaft G, the said prongs f being by sliding movement imparted to the clutch protruded through orifices in the fixed disk V and into like orifices in the worm-wheel U. The sliding clutch F' is actuated by the releasing-lever E from the diaphragm-pin D' in order to withdraw the prongs f from engagement with the loose worm-wheel U and fixed disk V, and thus allow the door to fall by its own weight. The raising of the door from the deck or elsewhere is effected by turning the shaft L so that the worm U' acts on the worm-wheel U, while the latter is held fast on the horizontal shaft G by means of the clutch F' and the fixed disk V.

A piston closely fitting a cylinder may be used in substitution for the diaphragm described, the piston being moved within the cylinder by the air-pressure and being formed with a short piston-rod projecting through one end of the cylinder to operate the catch-lever.

Having now described the invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination with a water-tight door of a rack or racks secured thereon and gear-

ing with pinions on a horizontal shaft which normally holds up the door said shaft being fitted with a sliding clutch operated to release the shaft and door by means of a lever acted on by a diaphragm actuated by rise of pressure of air confined in an air-chamber substantially as described.

2. In apparatus for automatically closing ships' bulkhead-doors, the combination with a diaphragm and releasing-lever operated by compression of air in an air-chamber of a horizontal shaft provided with toothed wheels engaging racks on the bulkhead-door, and a vertical shaft geared thereto and extending to the deck, said vertical shaft being adapted for operating the door from the deck while serving to prevent the falling of the door substantially as described.

3. In combination with a ship's bulkhead-door, a cylinder filled with oil, glycerin or other liquid having a loosely-fitting piston, the cylinder being formed or fitted with a by-pass so that the liquid serves to retard the speed of the falling door during the early part of its movement while allowing the door to fall sharply to its closed position substantially as described.

4. The combination with a water-tight door of a cylinder containing oil, glycerin or other liquid and formed with a by-pass and having a loosely-fitting piston, a rack on said door geared to a horizontal shaft which is held to normally retain the door in its open position and is freed by the action of a releasing-lever on a clutch-ratchet or like device the said releasing-lever being operated automatically by increase of air-pressure within an air-chamber substantially as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

WILLIAM CRAWFORD.

ALEXANDER ROBINSON CRAWFORD.

Witnesses:

WALLACE FAIRWEATHER,  
JNO. ARMSTRONG, Jr.