No. 887,033. PATENTED MAY 5, 1908.

J. L. DOHERTY.

RELIEF VALVE.

APPLICATION FILED DEC. 6, 1907.

3 SHEETS—SHEET 1.

Fig. 1.

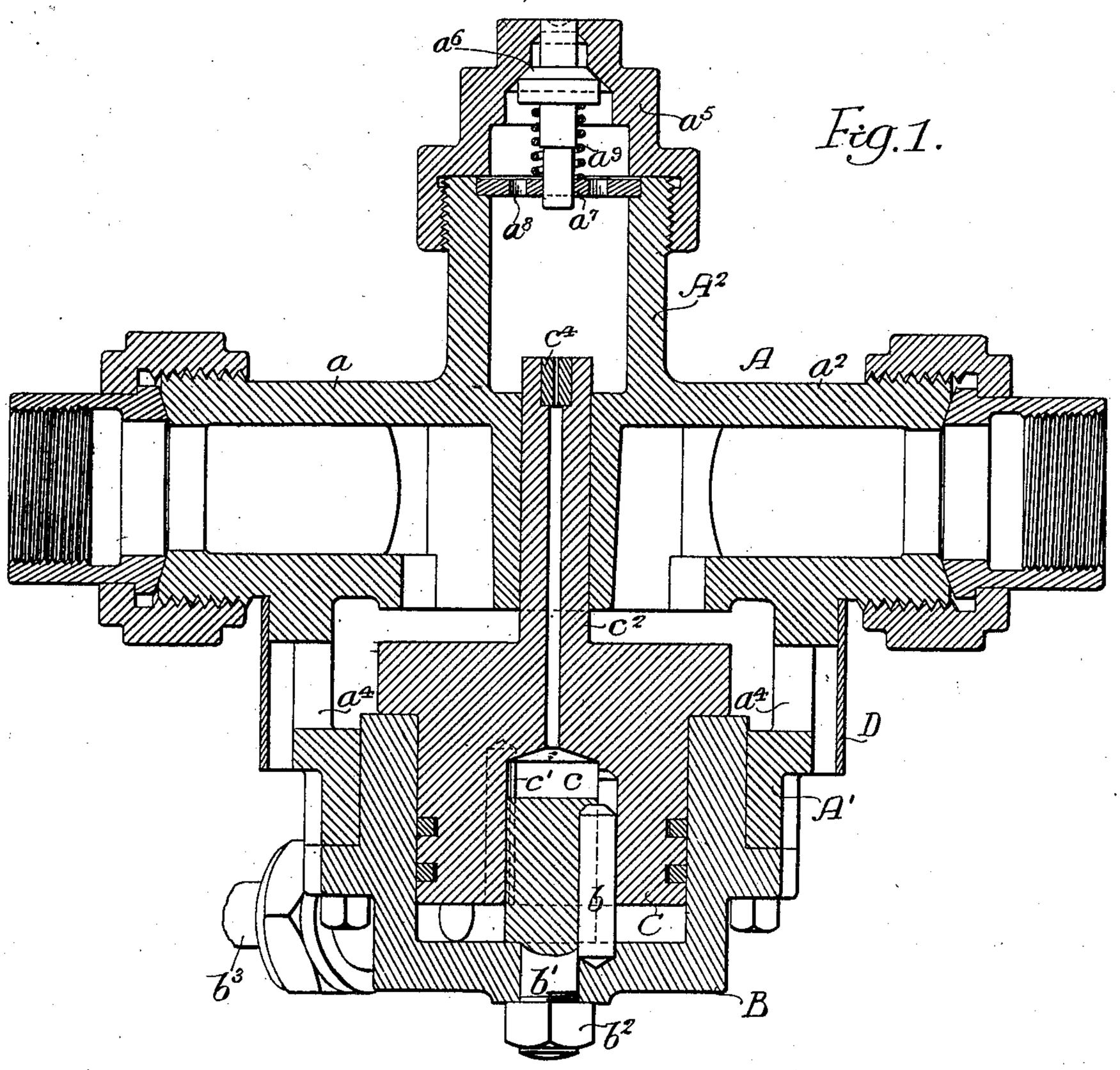
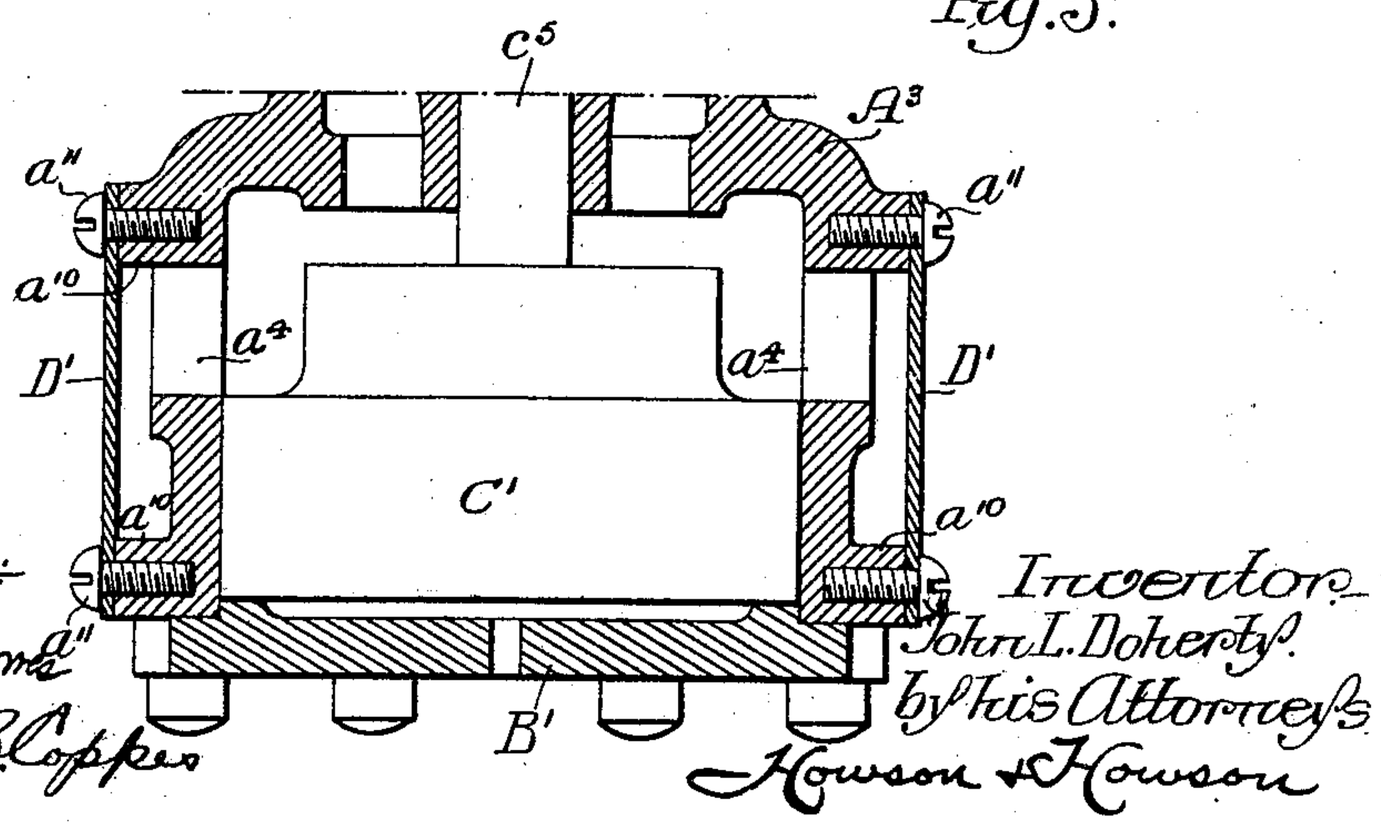


Fig. 5.



Witnesses:
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Augustus B. Coppers

Inventor:
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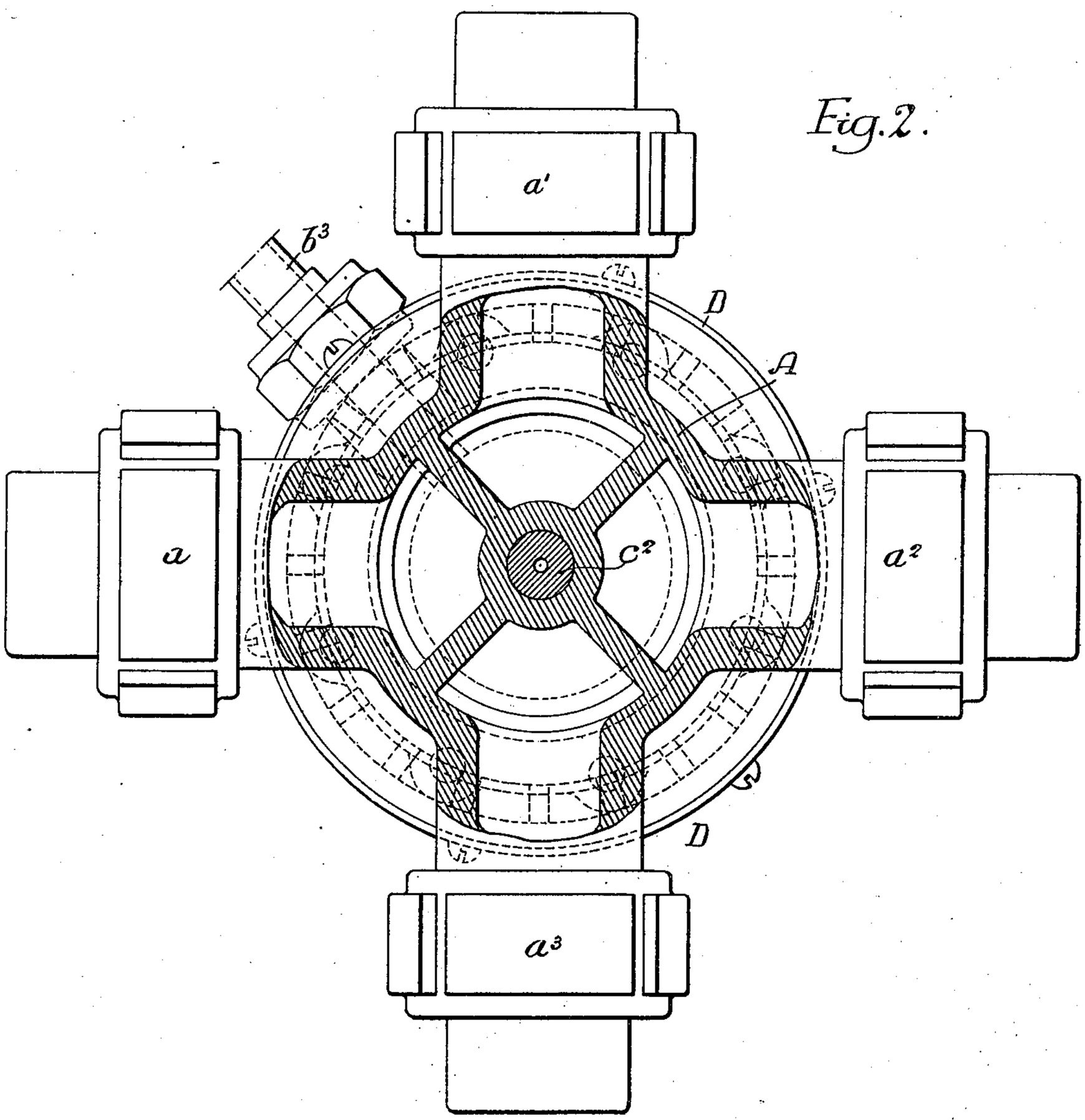
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 4.

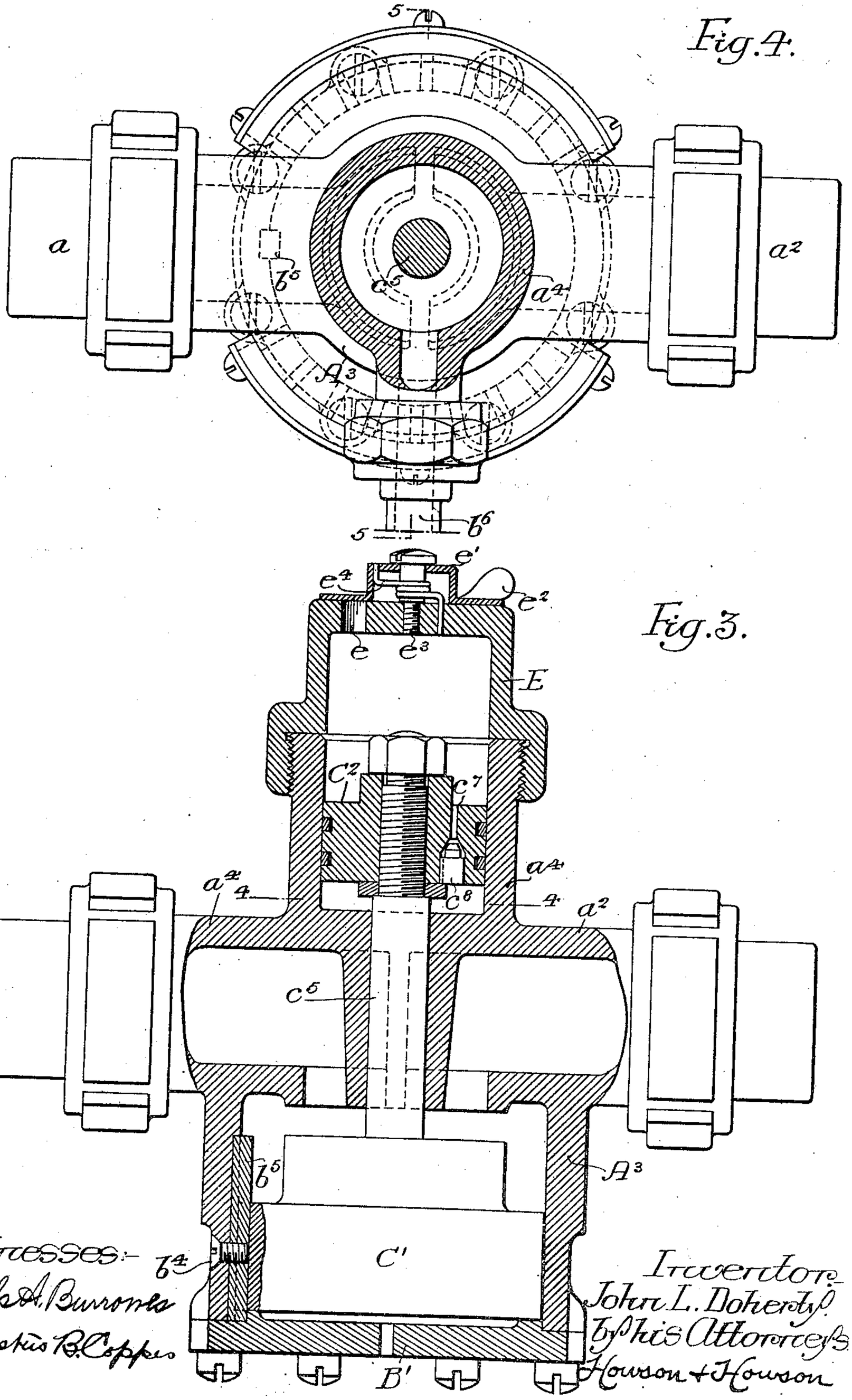

Fig. 3.

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UNITED STATES PATENT OFFICE.

JOHN L. DOHERTY, OF DENVER, COLORADO.

RELIEF-VALVE.

No. 887,033. Specification of Letters Patent. Patented May 5, 1908.

Application filed December 6, 1907. Serial No. 405,330.

To all whom it may concern:

Be it known that I, JOHN L. DOHERTY, a citizen of the United States, residing in Denver, Colorado, have invented certain Improvements in Relief-Valves, of which the following is a specification.

One object of my invention is to provide a valve for relieving excessive pressure in the cylinders of a compound or simple engine or for permitting entrance of air to such cylinder or cylinders in the event of a formation of a vacuum therein, which valve shall be of such a construction as to contain and gradually supply oil for lubricating the engine cylinder or cylinders to which it is connected.

Another object of the invention is to provide a relief valve of the general character above noted with a novel device for so directing the steam or hot water which escapes when the valve operates, that it shall not be likely to injure persons in the vicinity of the valve.

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which:—

Figure 1, is a vertical section of the preferred form of my improved relief valve, showing it as constructed for connection to the cylinders of a compound engine; Fig. 2, is a horizontal section on the line 2—2, Fig. 1; Fig. 3, is a vertical section of a modified form of my invention, illustrating it as constructed for use in connection with the cylinder of a simple engine; Fig. 4, is a horizontal section on the line 4—4, Fig. 3, and Fig. 5, is a vertical section on the line 5—5, Fig. 4.

Referring to Figs. 1 and 2 of the above drawings, A represents the valve casting, which in the case shown includes four tubular branches a, a', a^2 and a^3, radiating 90° apart from the central part of the structure and all in the same plane. Below these branches the central portion of the casting is extended downwardly as indicated at A′ to form a cylinder which has a head or cover B. This latter is extended upwardly within the part A′ and contains within it a piston C, whose upper end is constructed to serve as a valve coacting with suitably formed seats in such manner as to close openings from the interior of the cylinder A′ to the several branches a, a', etc.

It will be seen that the upper or valve portion of the piston is of greater diameter than the lower part thereof, and when the passages into the various branches are fully opened this upper part rests upon the upper edge of the inwardly projecting part of the cover B.

In the sides of the cylinder are a number of openings a^4 designed to permit the escape of water or steam from said cylinder, and in order that such fluid may be prevented from injuring any one in the vicinity of the valve, I provide a shield D, in the present instance having the shape of a ring extending completely around the cylinder but spaced some distance from the outside surface thereof, so that the fluid is directed downward.

In order to prevent revolution of the piston C within its cylinder, I provide its lower face with a central recess c into which extends a pin b'. This pin is threaded at its outer end and is held, preferably at the center of the head B, by a nut b^2. A key or spline b is also provided for this pin so that while the piston C is free to move up or down relatively to the pin, it cannot turn.

A conduit b^3, which under operating conditions is connected to the steam chest of the engine, leads into the lower portion of the cover B so as to deliver steam to the under side of the piston C.

It will be seen from Fig. 1, that the cavity c for the reception of the pin b' is longer than the said pin, and has a passage c' extending from its upper portion through the piston to the lower face thereof. In addition said piston is provided with a tubular extension c^2 projecting upwardly from its top or valve face into an oil chamber or container formed by a cylindrical projection A^2 from the top of the main casting. The upper end of this extension is counterbored for the reception of the bushing c^4 in which is a restricted passage whereby a relatively small flow of liquid is permitted from the container to the passage in the extension c^2 and to the cavity c. This oil container is provided with a cap or cover a^5 having through its top a seated passage for the reception of a valve a^6. For normally holding the valve to its seat I counterbore the top edge of the cylindrical portion A^2 and place therein a plate a^7 having openings a^8 for the passage of oil from the cap to the container. Between this plate and the valve a^6 I place a helical spring a^9, mounting it upon the stem of the valve and extending said

stem through the plate a^7 so that it is guided thereby.

Under operating conditions the various branches a, a', a^2 and a^3 of the casing A are connected to the ends of the high and low pressure cylinders of a compound engine, and as soon as steam is admitted to the engine valve chest, it passes through the conduit b^3 into the space under the piston C within the cover B.

Inasmuch as leakage past the piston C is prevented by suitable packing or piston rings as shown, said piston is moved upwardly so that the valve formed by its upper end completely closes the openings from the various branches a, a', etc., into the cylinder A'. If now, under operating conditions, an excessive amount of water should be delivered to or condensed in the cylinders, the excessive pressure caused on the succeeding stroke of the engine, acting upon the face of the valve, would force the piston C downwardly against the action of the steam underneath it, thereby permitting the water to escape from the branches of the valve casting through the cylinder A' and the openings a^4 in the sides thereof.

As above noted, the shield D serves to cause the water and steam to be discharged in a generally downward direction and prevents damage or personal injury therefrom. Similarly, when steam is shut off from the engine and pressure falls in the cylinders, the piston C drops under the action of gravity and establishes communication between the various branches a, a', etc., as well as permits the entrance of air to them.

When in use the container portion A^2 of the casing is filled with oil or other lubricant which is slowly delivered through the small channel of the bushing c^4 and the passage of the piston C to the recess c therein; from thence to the space under the piston within the cover B, and through the conduit b^3 to the valve chest of the engine, thereby assisting in the lubrication of the valve and pistons.

In filling the container portion A^2 with oil, the valve a^6 is depressed by the nozzle of an oil can so that the oil flowing from it passes said valve and flows through the openings in the plate a^7 into the container.

In Figs. 3, 4 and 5, I have illustrated my invention as applied to another form of relief valve, whose casing is provided with but two branches a and a^2 and which is primarily designed for use on simple engines. This casing A^3 has a downwardly projecting cylinder which, in this case, contains only a valve C', whose upper face as before, coacts with suitably formed seats to close the openings between the branches a and a^2 and said cylinder.

The cover of the cylinder in this instance consists of a plate B' having a drain hole, there being a key b^5 set in the side of the cylinder for preventing turning of the valve C', and held in position by a screw b^4. An extension c^5 from the valve C' projects upwardly as before, but in this instance it is not tubular. It has, however, fastened to its upper end a piston C^2 which operates within the cylindrical portion a^4 of the casting, whose lower portion is entered by the conduit b^6 from the valve chest of the engine.

The cap E is screwed on the cylinder portion a^4 and is designed to form within it a reservoir for oil above the piston C^2, it being possible to introduce the oil into this container through an opening e.

For closing said opening I provide a metal plate e' having a wing e^2 and provided with a series of notches of a size sufficient to receive the nozzle of an oil can. This plate is pivotally mounted upon a screw e^3 and has a spring e^4 which serves to normally hold it in such position as to close the opening e. By turning it upon its pivot against the action of said spring, either by hand or by pushing it by means of the nozzle of an oil can placed in one of the notches, said opening may be uncovered and oil may be introduced.

In order to permit of the passage of oil from the interior of the cap E to the lower portion of the cylinder structure a^4, I provide a passage c^7 through the piston C^2 and place therein a valve c^8 which is held closed as long as there is steam pressure under said piston. As soon, however, as this pressure is removed, the valve moves to its open position under the action of gravity and permits oil to pass into the lower part of the cylinder structure a^4, from whence it is free to flow to the valve chest of the engine.

The amount of possible opening of this valve, as well as the size of the opening through the bushing c^4, is such as to limit the oil flowing therethrough to the amount necessary or advisable under the operating conditions of the engine upon which the device is used.

As shown in Fig. 5, the water shield in this case is given the form indicated at D' and is supported some distance from the body of the casing by lugs a^{10} to which it is held by screws a^{11}. In any case, however, it is so arranged as to direct steam or water from the valve in such manner that it flows harmlessly away.

I claim:

1. A relief valve consisting of a casing having a plurality of branches connected to the cylinder or cylinders of an engine and provided with a cylindrical portion having openings into said branches, a valve in said cylindrical portion capable of closing said openings, a piston connected to said valve and operative in said casing, a connection for de-

livering live steam to said piston to normally maintain the valve on its seat, there being a discharge opening or openings in the sides of the cylindrical portion of the casing and a shield separate from the metal of the casing and extended to completely cover said opening or openings so as to direct downwardly all fluid escaping therefrom.

2. A relief valve consisting of a casing having a cylinder, a plurality of branches communicating with said cylinder, a piston operative in the cylinder, a conduit for delivering live steam to one face of the piston, a valve capable of cutting off communication between the branches and the cylinder, there being discharge openings in the side of the cylinder adjacent to the valve, and an annular shield extending around the cylinder in front of the openings in position to intercept water escaping therefrom, lugs on the casing for supporting the shield away from said casing, and means for holding the shield to said lugs.

3. A relief valve consisting of a casing provided with a plurality of branches and a cylinder having openings to the atmosphere and to said branches, a valve capable of closing the openings into the branches, a piston connected to the valve, a conduit for delivering live steam to said piston to normally maintain the valve in position to close the openings into the branches, an oil reservoir, with means for delivering oil from said reservior to said conduit.

4. A relief valve consisting of a casing provided with a plurality of branches and a cylinder having openings to the atmosphere and to said branches, a valve capable of closing the openings into the branches, a piston connected to the valve, a conduit for delivering live steam to said piston to normally maintain the valve in position to close the openings into the branches, an oil reservoir, with means for delivering oil from said reservoir to said conduit, and means for preventing rotation of the valve.

5. A relief valve consisting of a casing provided with a plurality of branches and a cylinder having openings to the atmosphere and to said branches, a valve capable of closing the said openings into the branches, a piston connected to the valve, a conduit for delivering live steam to said piston to normally maintain the valve in position to close the openings into the branches, an oil reservoir, and means for delivering oil from said reservoir to said conduit, said means including a device for restricting the flow of oil to a predetermined extent.

6. A relief valve including a casing having a plurality of branches for connection to the cylinder of an engine and provided with a cylinder, said branches having openings to the atmosphere, a piston in said cylinder, a valve connected to the piston for closing said openings, an oil reservoir arranged to deliver oil through the piston, with a conduit connecting the cylinder with the valve chest of an engine.

7. A relief valve consisting of a casing having branches for connection to the cylinder of an engine and provided with a cylinder communicating with said branches, a piston in said cylinder having a portion constructed to serve as a valve to cut off communication between the said cylinder and the branches, an oil reservoir, and a conduit connected to the cylinder so as to deliver live steam to one face of the piston therein, said piston having a passage in communication with the oil reservoir.

8. A relief valve consisting of a casing having branches for connection to the cylinder of an engine and provided with a cylinder communicating with said branches, a piston in said cylinder having a portion constructed to serve as a valve to cut off communication between the said cylinder and the branches, an oil reservoir, a conduit connected to the cylinder so as to deliver live steam to one face of the piston therein, there being a passage through said piston in communication with the oil reservoir, with a device in said passage for restricting the flow of oil from the reservoir.

9. A relief valve consisting of a casing having branches for connection to the cylinder of an engine and provided with a cylinder communicating with said branches, a piston in said cylinder having a portion constructed to serve as a valve to cut off communication between said cylinder and the branches, an oil reservoir, a conduit connected to the cylinder so as to deliver live steam to one face of the piston therein, there being a passage through said piston in communication with the oil reservoir, and a valve-closed opening for said reservoir.

10. The combination in a relief valve of a casing having a plurality of branches, an oil reservoir, a cylinder communicating with said branches and also with the atmosphere, a piston in said cylinder having its upper part constructed to cut off communication between the branches, a conduit for live steam opening into the lower portion of said cylinder, and an extension from the piston projecting into the oil reservoir.

11. The combination in a relief valve of a casing consisting of a plurality of branches, an oil reservoir, a cylinder communicating with said branches and also with the atmosphere, a piston in said cylinder having its upper part constructed to cut off communication of the branches therewith, a conduit for live steam opening into the lower part of said cylinder, and a tubular extension from the piston projecting into the oil reservoir,

with means for preventing rotation of the piston in its cylinder consisting of a pin entering a recess in said piston, said recess being connected through the tubular extension to the oil reservoir and also to the portion of the cylinder communicating with the steam conduit.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOHN L. DOHERTY.

Witnesses:
C. L. WILBUR,
J. W. McDOUGALL.