

(No Model.)

3 Sheets—Sheet 1.

J. RYAN.

DUPLEX SAFETY APPARATUS FOR STEAM CYLINDERS.

No. 304,757.

Patented Sept. 9, 1884.

Fig. 1.

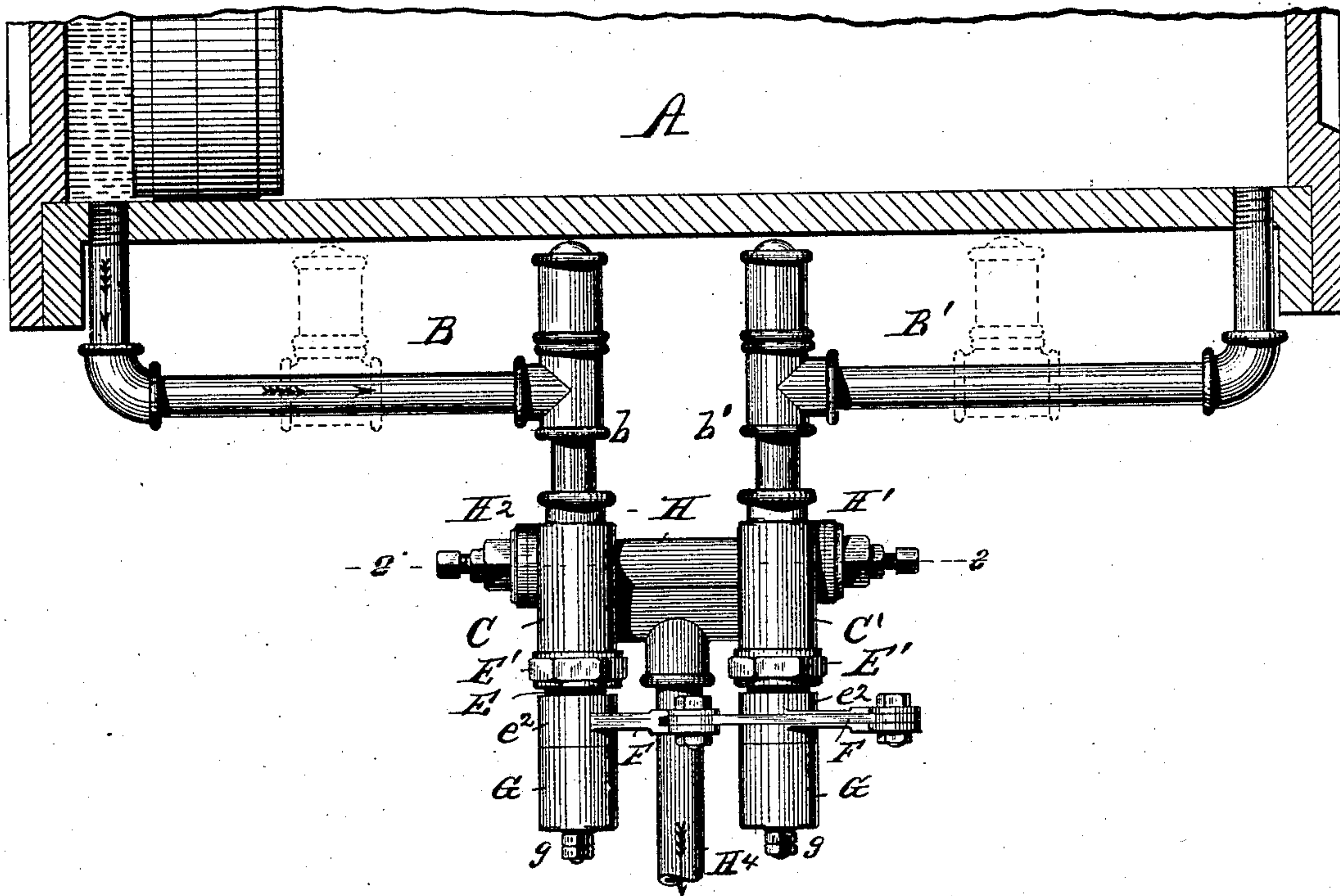
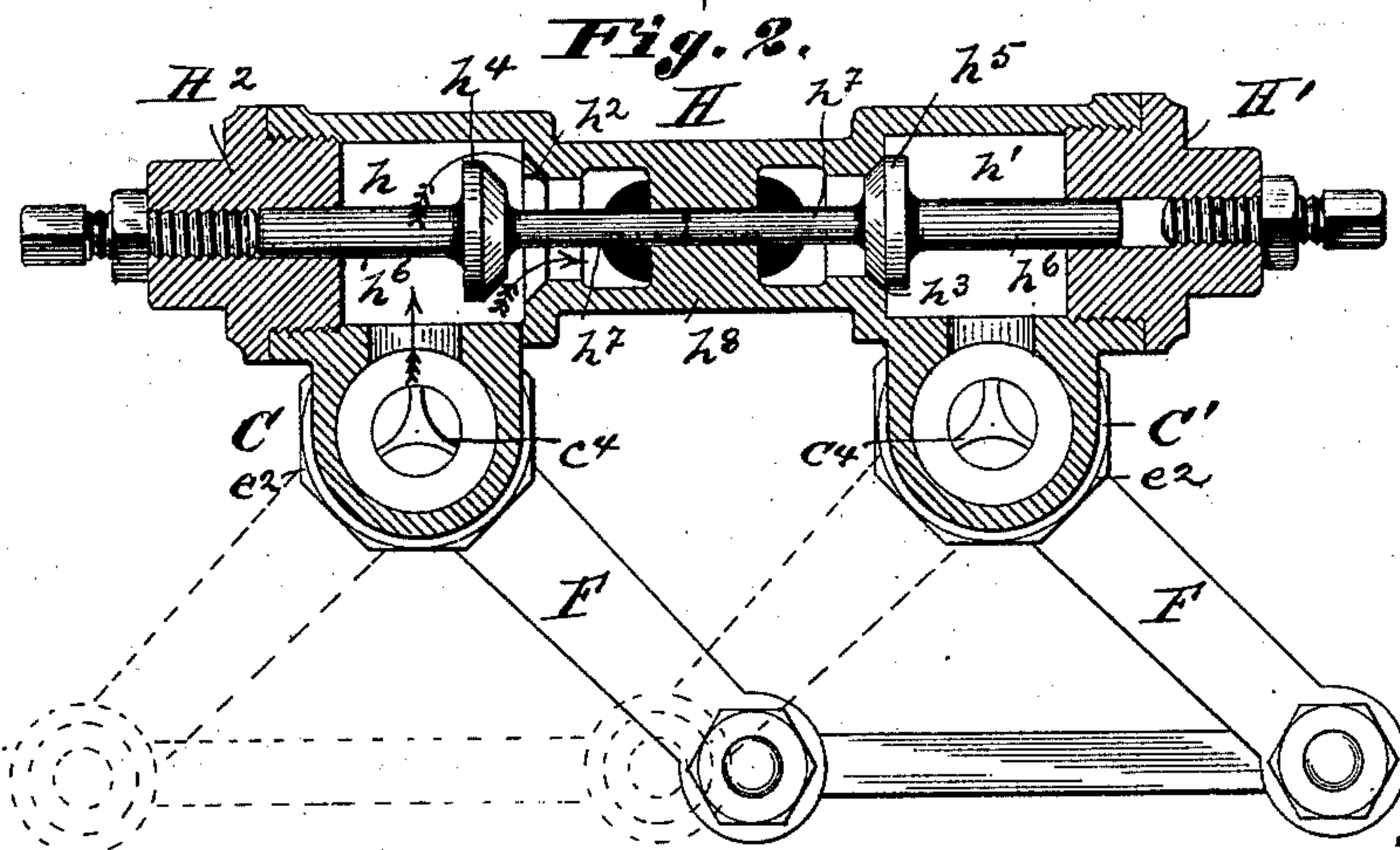


Fig. 2.



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(No Model.)

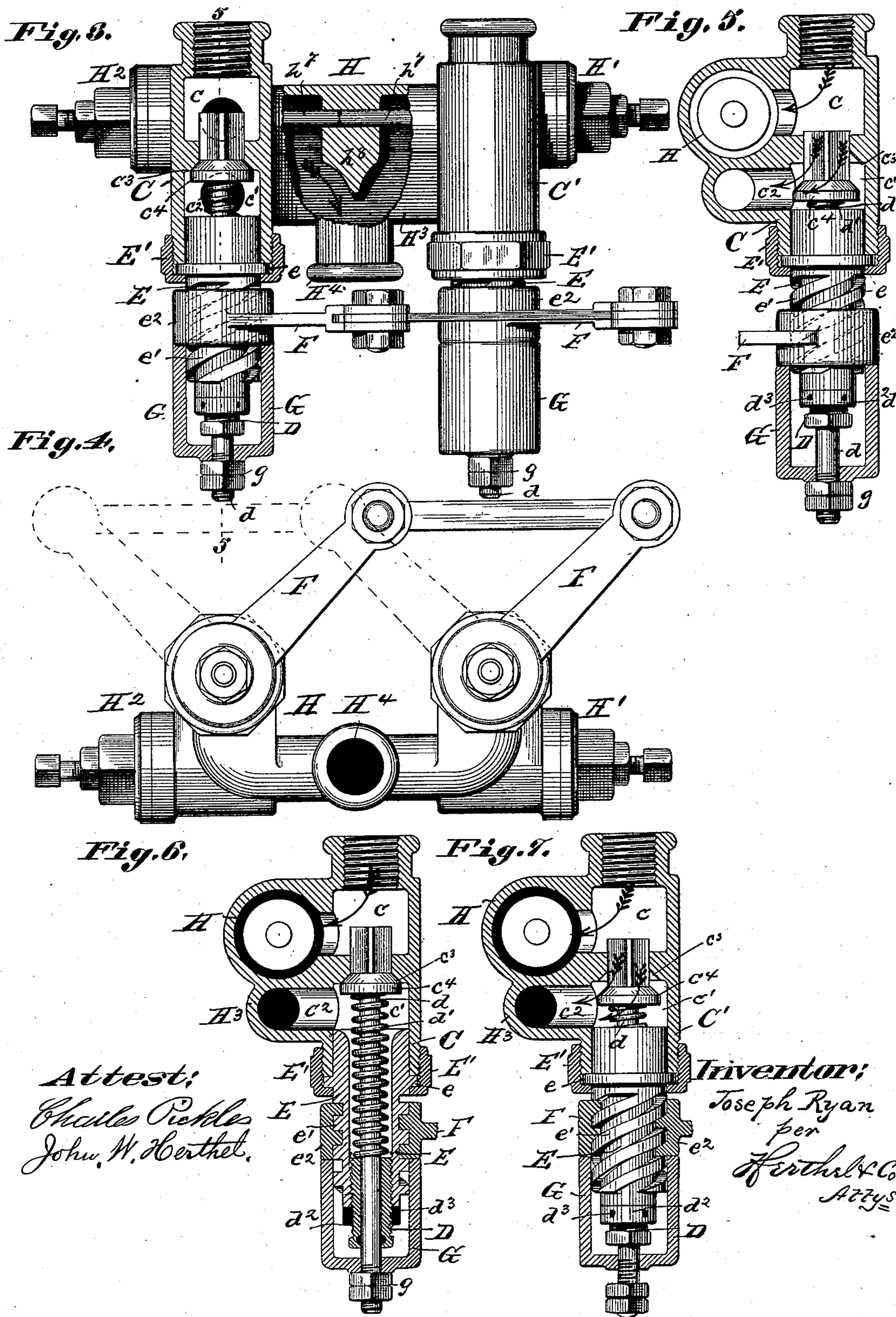
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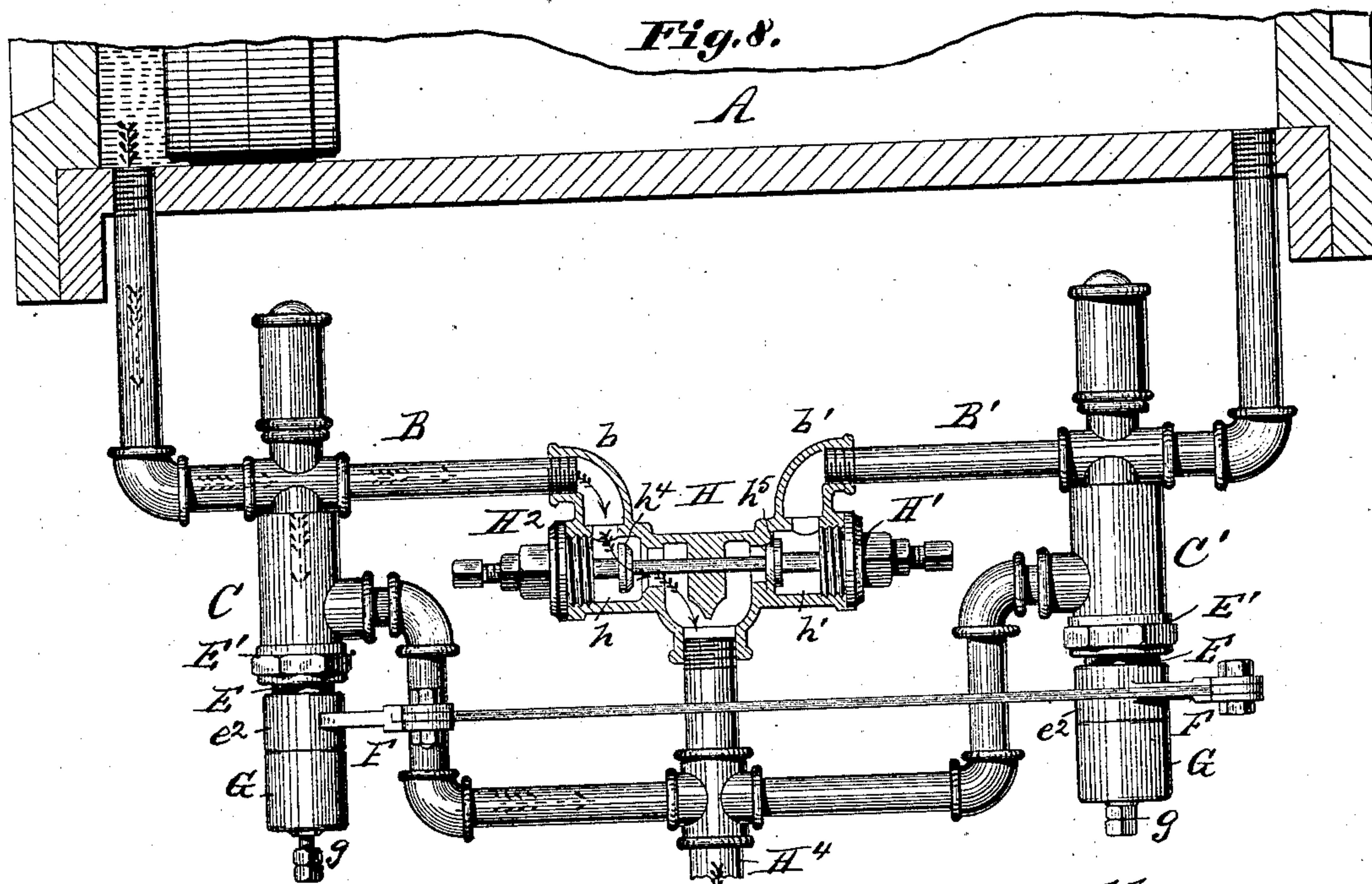


Fig. 9.

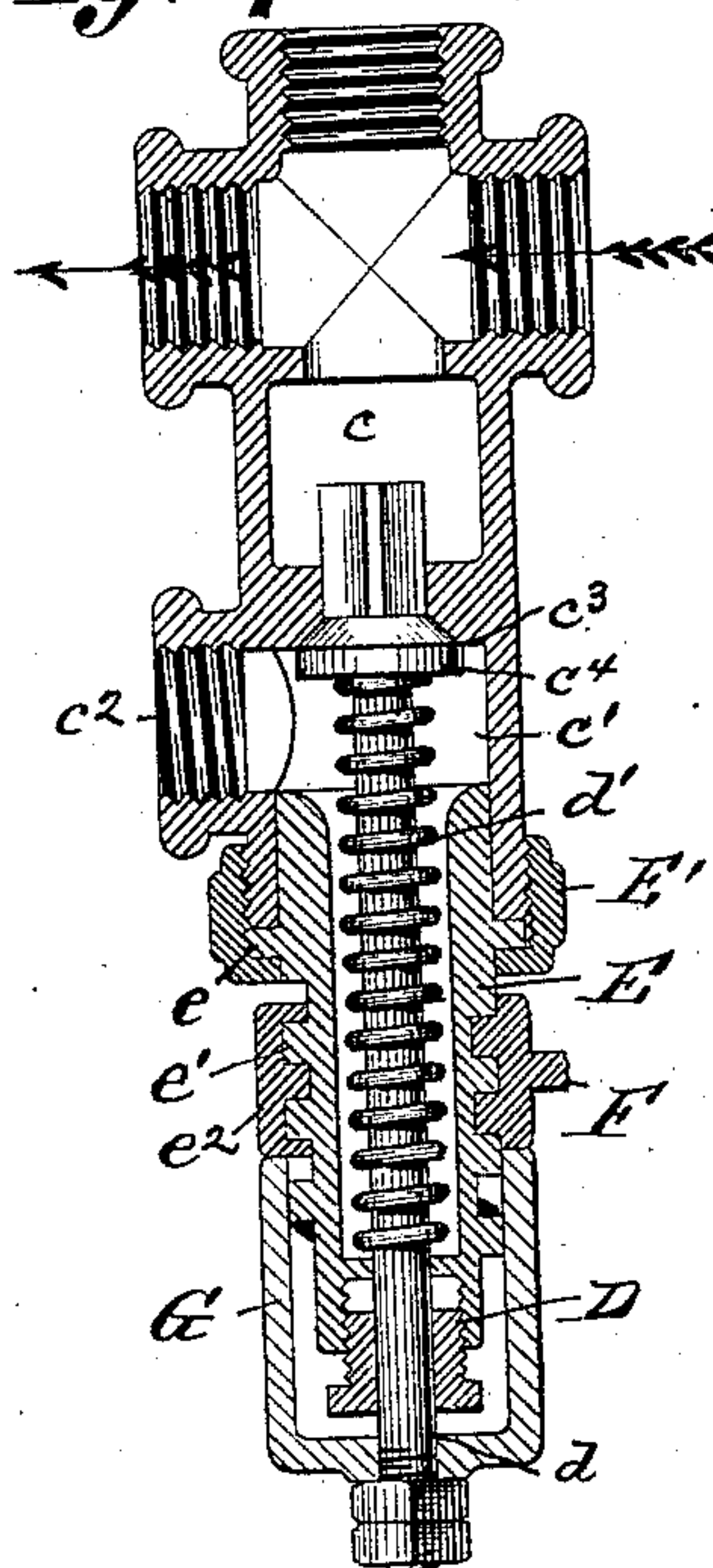


Fig. 10.

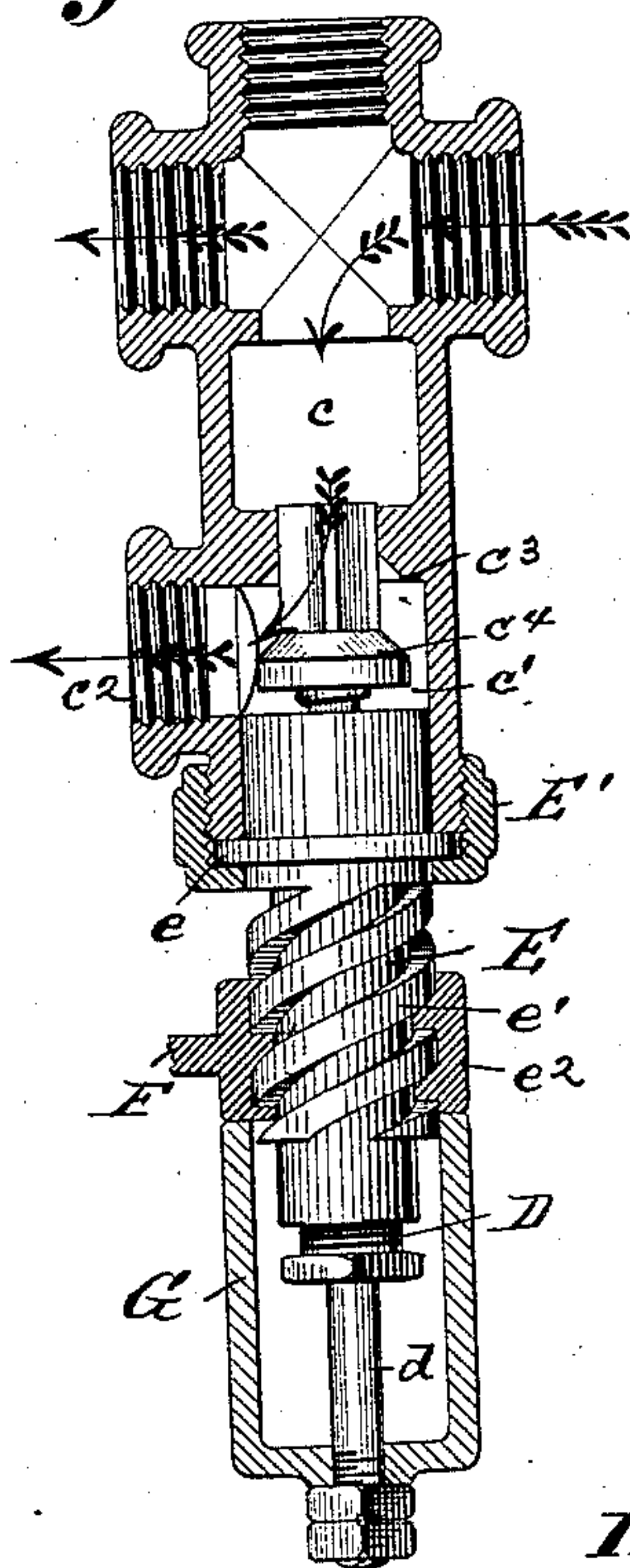
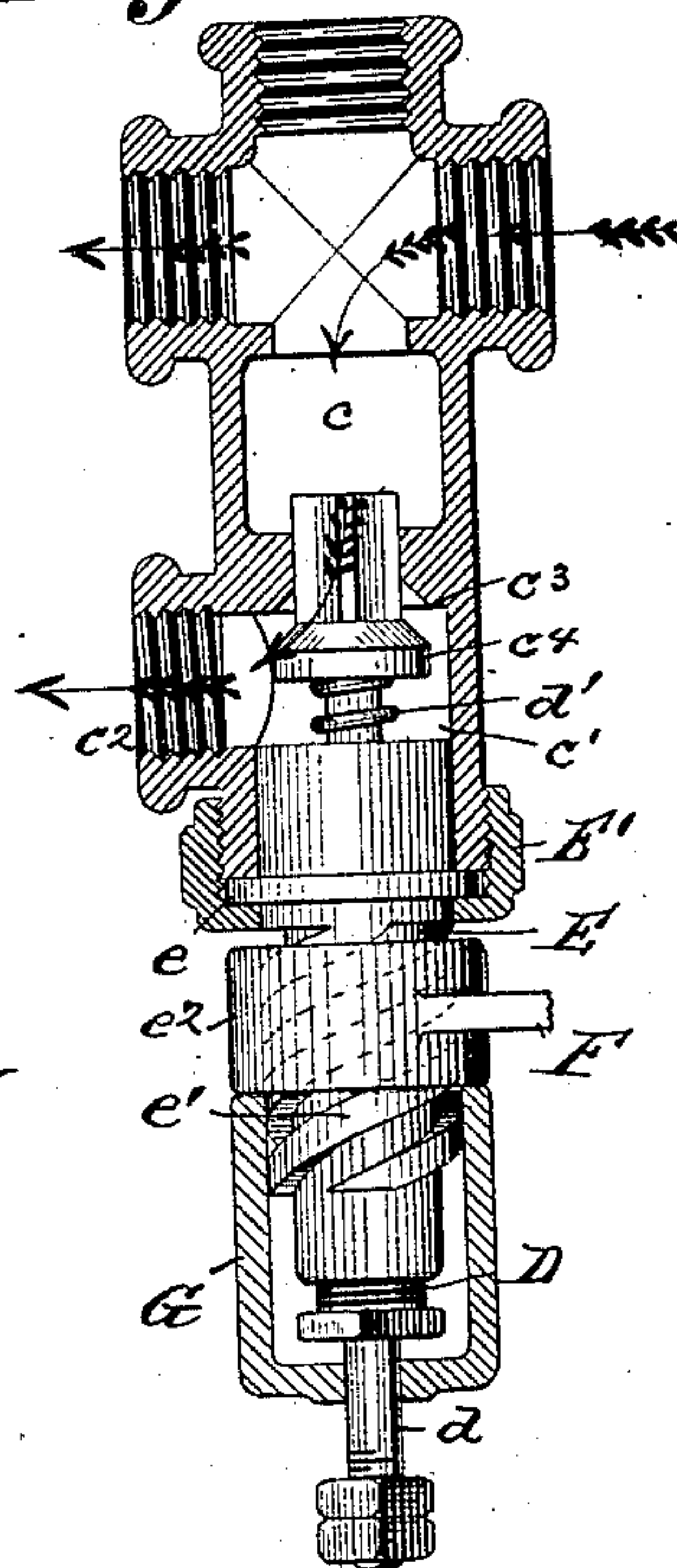


Fig. 11.



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UNITED STATES PATENT OFFICE.

JOSEPH RYAN, OF ST. LOUIS, MISSOURI.

DUPLEX SAFETY APPARATUS FOR STEAM-CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 304,757, dated September 9, 1884.

Application filed January 21, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH RYAN, a citizen of the United States, residing at St. Louis and State of Missouri, have invented a new and useful Improved Duplex Safety Apparatus for Relieving Steam-Cylinders, of which the following is a specification.

The special objects of my invention are to effect the complete discharge through the blow-off cocks of whatever water of condensation has not been previously discharged through the cylinder-cock, or to discharge the water left in the cylinder, owing to a premature closing of the valve in the cylinder-cock before the piston has fully completed its stroke, and otherwise by the duplex action of both cylinder and blow-off cocks (constituting the entire duplex safety apparatus) to prevent the piston crowding against a body of undischarged water, and so that the piston can complete its every stroke without "back-pressure" and with greater perfection and safety. I accomplish the said objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1, Sheet I, is a side elevation showing my duplex safety apparatus applied and used with an ordinary steam-cylinder. Fig. 2 is a horizontal section taken on line 2 2, to better show the internal construction of the cylinder-cock and the hand-lever mechanism to operate the blow-off cocks. Fig. 3, Sheet II, is an enlarged view of the apparatus, partly in section and side elevation, with the hand-levers arranged to close the blow-off cocks. Fig. 4 is a bottom plan of Fig. 3. Fig. 5 is a sectional elevation on line 5 5 of same parts shown in Fig. 3, but representing the blow-off cock as having been opened by a partial turn movement of the hand mechanism. Figs. 6 and 7 represent more especially the respective blow-off cocks when opened by the pressure in the cylinder and closed by spring-pressure, the former figure being a complete section through all the parts of the blow-off cock, the latter view having the outer parts only in section, while the arrows show the course of the discharge. Fig. 8, Sheet III, illustrates a modified way of connecting the blow-off cocks by separate pipe to the cylinder-cock, and all communicating to a common outlet. Figs. 9, 10, 11 are each similar sections of the same devices, Fig. 9 showing the valve kept seated by spring-pressure, Fig. 10 the valve opened by the

hand mechanism, and Fig. 11 the valve opened by the pressure in the steam-cylinder, and all said last-named figures belonging to the modification illustrated in Fig. 8.

A represents the steam-cylinder with piston as ordinary.

B B' represent the inlet-pipes, which join by T-branches *b b'* to the respective blow-off cocks C C', which are in communication with the cylinder-cock, and combinedly constitute the duplex safety apparatus, as will hereinafter appear. Both blow-off cocks C C' are duplicates, having the same parts and operating in the same way; hence in describing one of them the same letters of reference apply to the other. Each blow-off cock has the upper and lower chambers, *c c'*. Through the former free communication is had from steam-cylinder to the cylinder-cock or its valve-chambers and central outlet or discharge, while through the lower chamber, *c'*, and its port *c''* similar communication from steam-cylinder (through the blow-off cock) is had to the sub-barrel and central outlet of the cylinder-cock. (See Figs. 2, 3, 5, 6, 7.) Further, each blow-off cock has a valve-seat, *c''*, and valves *c''*, which control the discharge of water from steam-cylinder through the blow-off cocks—that is to say, it is these valves that are adapted to open automatically at a given pressure to allow only whatever water in the steam-cylinder has not been previously discharged through the cylinder-cock to pass through and out of the blow-off cocks and discharge from the central outlet of cylinder-cock.

Each valve *c''* has a long stem, *d*, with surrounding spring *d'*, the bearing of these springs being, respectively, on the under side of the valves and against a threaded follower, D, as more clearly shown in Figs. 6, 9. The valve-stems pass through these followers, and the latter can be screwed in or out from the threaded end of the central sleeves, E, for purposes of increasing or diminishing the tension of the springs. A collar, *d''*, surrounding a packing-ring, *d'''*, forms a water-tight joint between the threads or followers D and sleeve E. (See Figs. 6 and 7.) The central sleeves, E, add a vertical extension to the blow-off cocks; hence said sleeves, by their shoulders at *e* and couplings E', can be readily joined to the lower end of each main barrel, as indicated in Figs. 1, 3, 5, 6, 7. By means of the followers D, the tension of each spring can be graduated to suit the

required pressure necessary to automatically open each valve in the blow-off cocks. When the pressure in the steam-cylinder overcomes this "set" pressure, the valves open, and the discharge of water from steam-cylinder takes the course through the blow-off cocks, as per the arrows in Figs. 6, 7, 11. When the said pressure is inadequate to overcome the tension of the springs, the latter keep the valves in each blow-off cock closed, (see Figs. 6, 9,) and the discharge will only be through the cylinder-cock.

In connection with each blow-off cock C C', I have provided hand mechanism for purposes of a general drainage of the steam-cylinder or effect a general "blow-off" from same through the apparatus; hence each central sleeve E has a quick-screw, e' , in which engages the threaded hub or collar e^2 of a hand-lever, F, as shown in Figs. 3, 5, 6, 7. The hand-lever collar e^2 bears against a movable sleeve, G, which surrounds the lower end of the valve-stem, the latter having screw-nuts g , by means whereof, in case the hand-lever is partially turned, said sleeve G forces the valve-stem downward, opens its valve, and the position of the parts will be as shown in Figs. 5, 10, permitting a general blow-off to take place. By reversing the hand-levers the tension of the springs closes the valves, and the parts restored will be in the closed condition shown in Figs. 3, 6, 9. When in said condition, the blow-off cocks operate only subject to the pressure in the steam-cylinder being great enough to open the valves. For convenience, the hand-levers F can be connected together to operate simultaneously, as indicated in Figs. 1, 2, 3, 4, and 8.

H represents the cylinder-cock. (See Figs. 1, 2, 3, 4, 8.) The cylinder-cock consists of the valve-chambers $h h'$, valve-seats $h^2 h^3$, valves $h^4 h^5$, having stems $h^6 h^7$, projecting from each side, and guided, respectively, by the cored partition h^8 , and the screw-caps $H^1 H^2$, that close the ends of the cylinder-cock. (See Figs. 2, 3, 8.) H^3 is the sub-barrel in communication from each valve-chamber to the central outlet, H^4 , as shown.

The complete operation can be stated as follows: When the piston is moving toward the pipe B, (see Figs. 1 and 8,) the valve in cylinder-cock is open, and the discharge of water takes place as per the arrows in said figures, the opposite valve in cylinder-cock being closed by the pressure of the live steam, and at same time both valves in the blow-off cocks are kept closed by the tension of their springs. This automatic action on part the cylinder-cock is reversed on reversal of the stroke of the piston. The duplex action of both cylinder and blow-off cocks consists, however, in the following operation: Supposing the piston nears the "clearance" of the steam-cylinder, and preparatory to being "cushioned" for reversal of its stroke, (see Figs. 1 and 8,) the pressure of the live steam becomes reduced, and a consequent greater pressure upon the undischarged water taking place forces the

valve in the cylinder-cock to close prematurely, or before the piston has completed its stroke; hence, were there no provision for the escape of said water, it forms a solid resistance between the cylinder-head and piston, destroying the advantages of clearance and "cushion," and damaging the mechanism and its operation. It is at such a time of action that the blow-off cocks assist or coact with the cylinder-cock, the greater pressure upon the undischarged water overcoming the previously-set tension of the springs, open the valve in the blow-off cock, (see Figs. 7, 10,) and the piston can complete its full stroke, forcing before it all water through the open blow-off cock and out of final discharge. By this duplex action a more perfect removal of water, condensation, &c., before the moving piston is achieved, the blow-off cocks coacting with the cylinder-cock to produce a complete result, and the piston can reciprocate or at all times finish its stroke without encountering back-pressure, and with greater ease and safety.

What I claim is—

1. The improved blow-off cock consisting of the upper and lower chambers, $c c'$, port c^2 , valve-seat c^3 , valve c^4 , its stem d , surrounded with spring d' , the threaded follower D, its collar d^2 , packing d^3 , central sleeve, E, having shoulder e , and coupling E', by means whereof the tension of the spring can be set for the valve to open at a given pressure, as and for the purposes set forth.

2. In combination with a blow-off cock having valve-chamber c' , port c^2 , valve-seat c^3 , valve c^4 , its stem d , spring d' , threaded follower D, central sleeve, E, coupling E', the quick-screw e' on central sleeve, hand-lever F, having threaded collar e^2 , the lower sleeve, G, and nuts g , by means whereof said blow-off cock can be operated by said hand mechanism, substantially as and for the purposes set forth.

3. A duplex safety apparatus for relieving steam-cylinders of water, consisting of a duplicate arrangement of valves, one for each end of the cylinder, and adapted to open automatically at a given pressure, in combination with an automatic cylinder-cock, the parts being arranged to coact in the manner substantially as described, and for the purposes stated.

4. The combination, in a duplex safety apparatus for relieving steam-cylinders of water, of the following elements: first, a duplicate arrangement of valves, one for each end of the steam-cylinder, and adapted to open automatically at a given pressure; second, means for operating said valves by hand; and, third, an automatic cylinder-cock, substantially as herein described, and for the purposes set forth.

JOSEPH RYAN.

Witnesses:

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JOHN W. HERTHEL.