No. 784,354. PATENTED MAR. 7, 1905.

J. H. SEWALL.

MEANS FOR OPERATING CYLINDER COCKS.

APPLICATION FILED JULY 18, 1904.

2 SHEETS—SHEET 1.

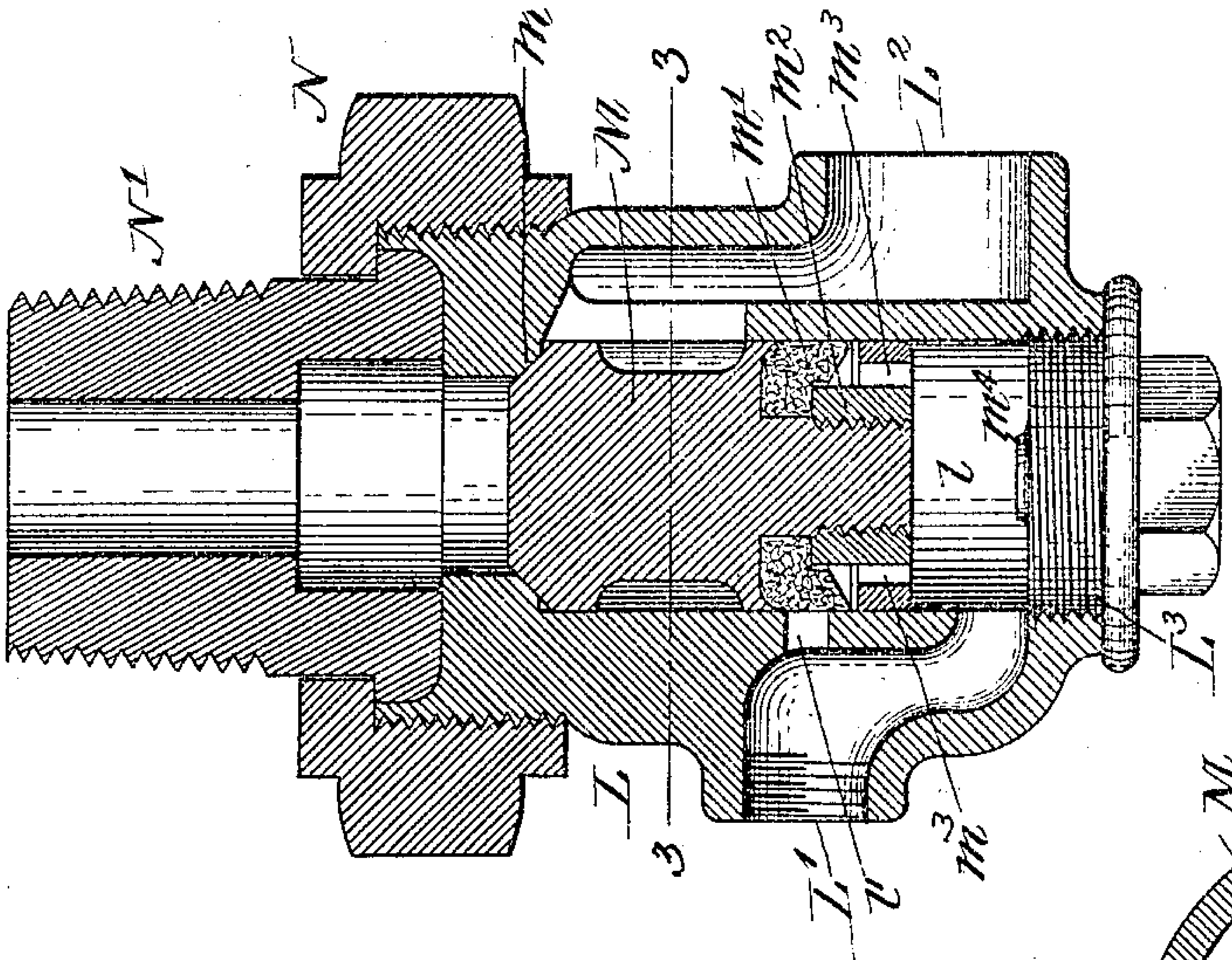

Fig. 2.

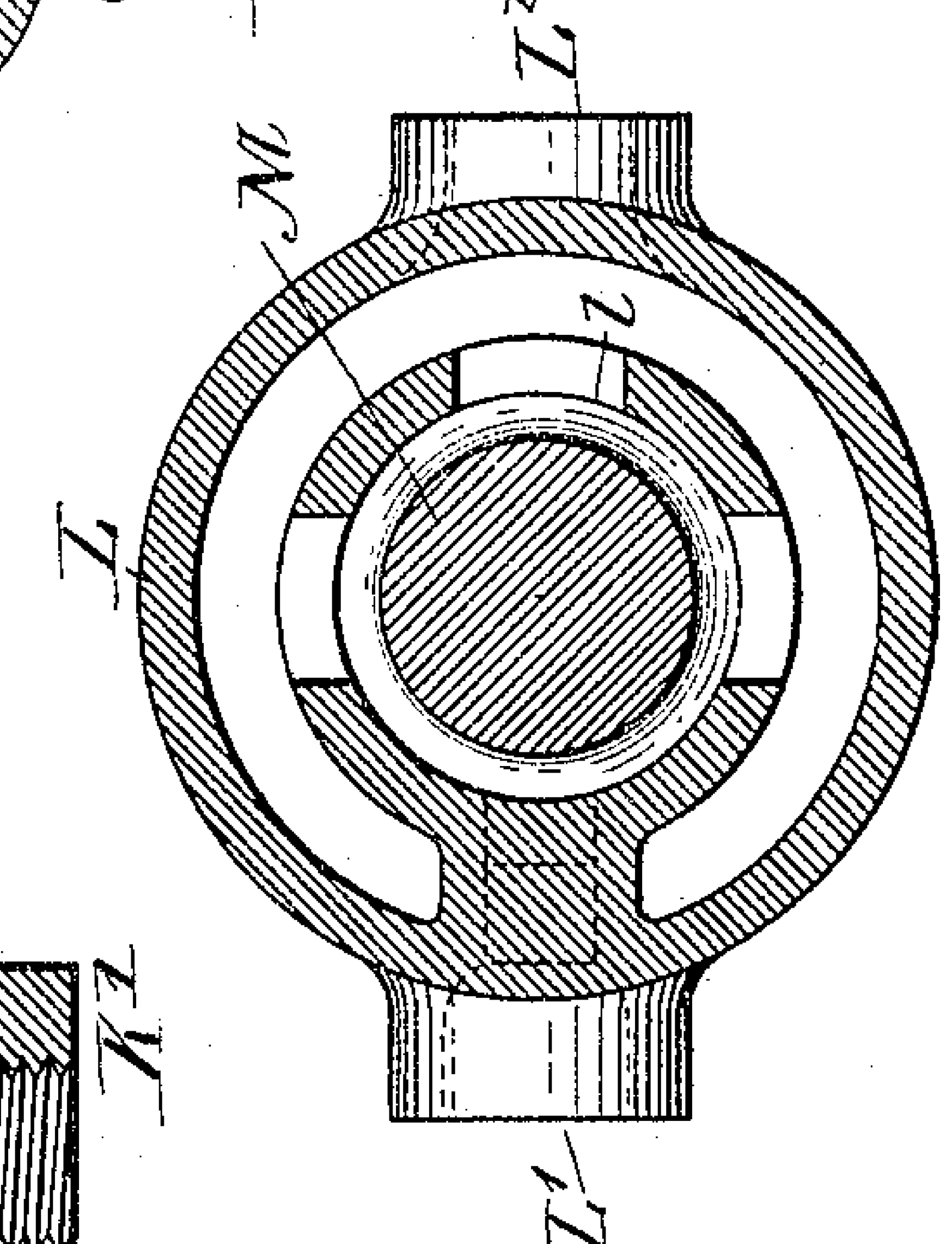

Fig. 3.

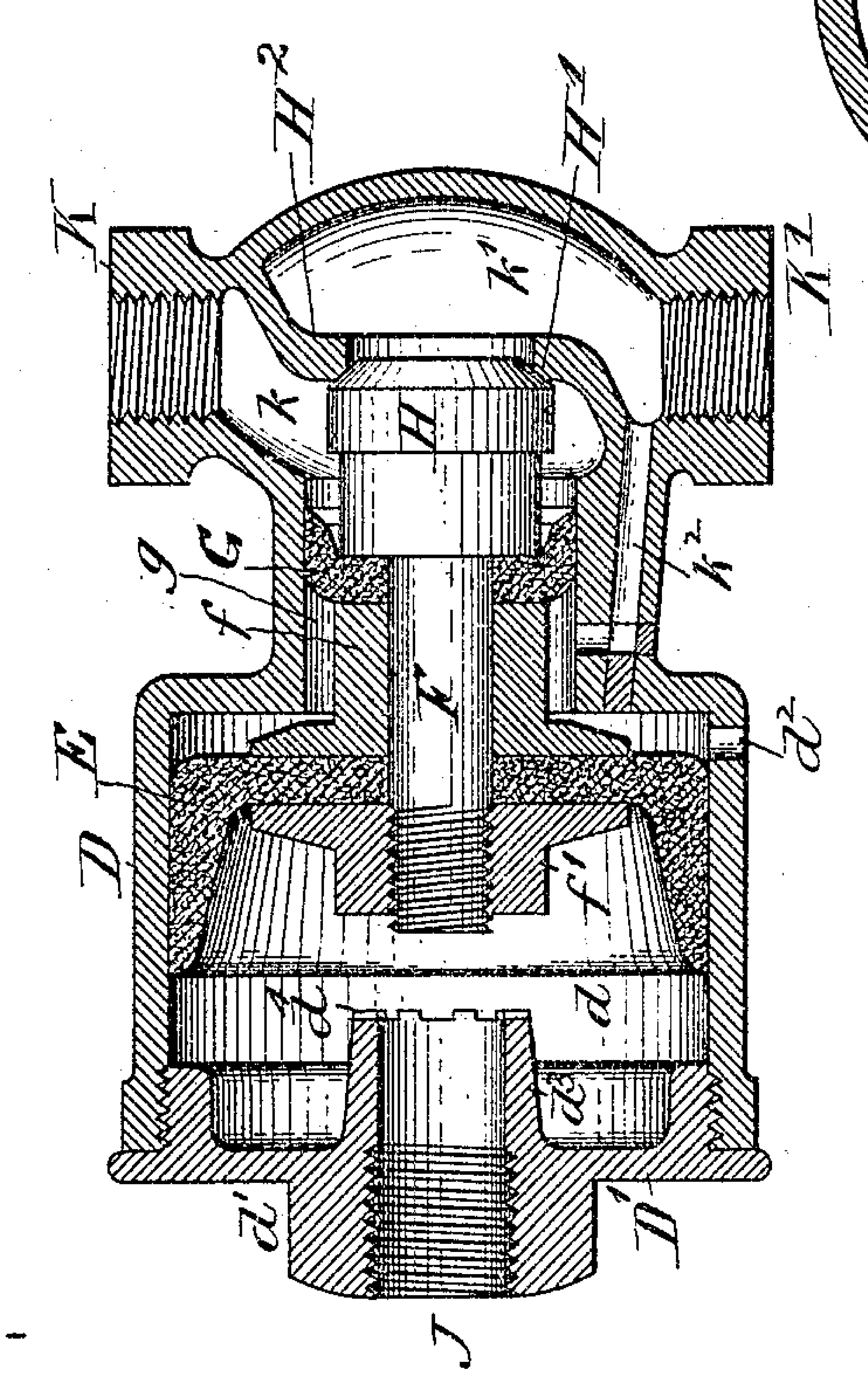

Fig. 1.

WITNESSES.

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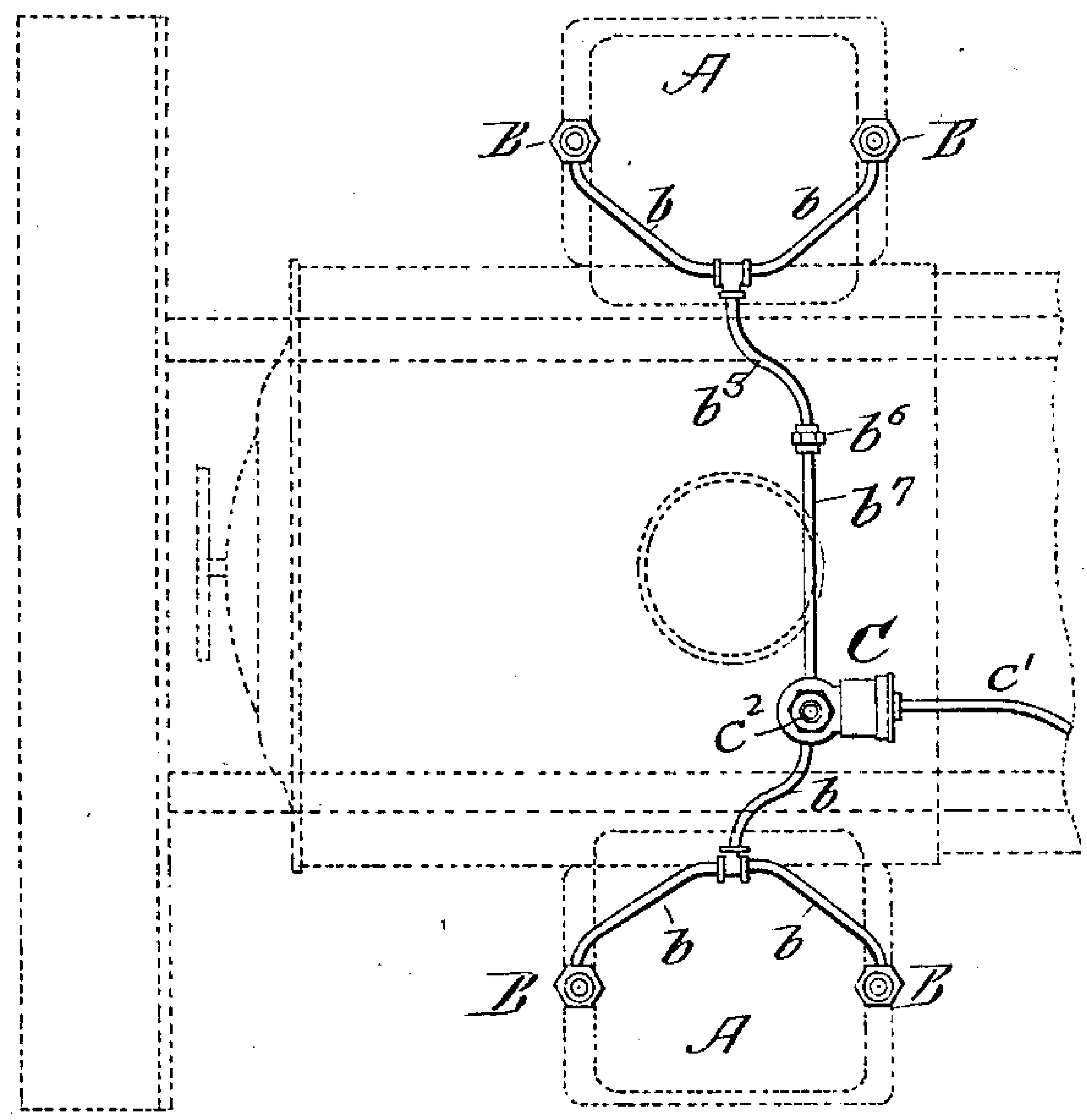

Fig. 4.

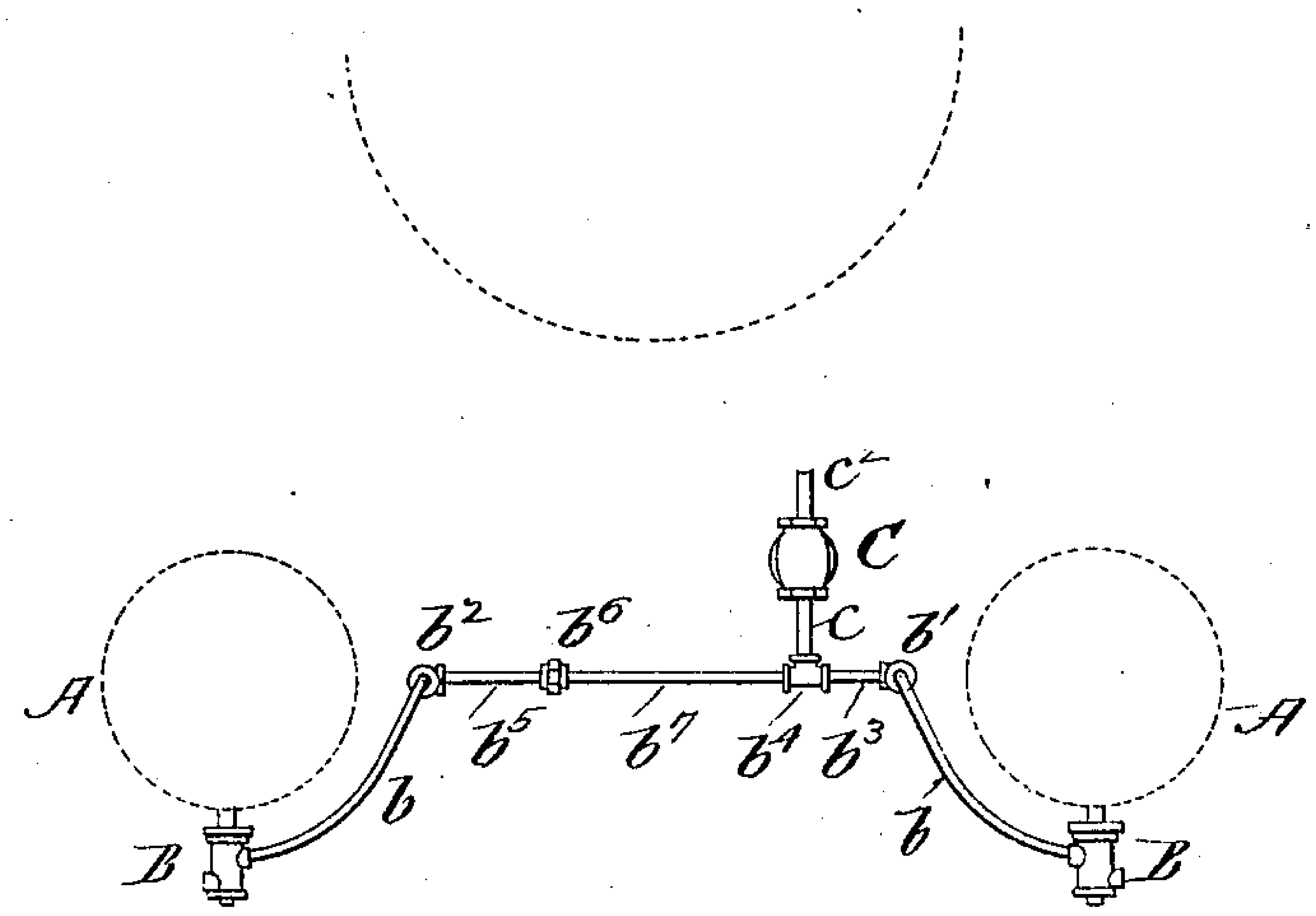

Fig. 5.

WITNESSES:

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No. 784,354. Patented March 7, 1905.

UNITED STATES PATENT OFFICE.

JAMES H. SEWALL, OF KEENE, NEW HAMPSHIRE, ASSIGNOR TO STAR BRASS MANUFACTURING COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

MEANS FOR OPERATING CYLINDER-COCKS.

SPECIFICATION forming part of Letters Patent No. 784,354, dated March 7, 1905.

Application filed July 18, 1904. Serial No. 217,103.

To all whom it may concern:

Be it known that I, JAMES H. SEWALL, a citizen of the United States, residing at Keene, in the county of Cheshire and State of New Hampshire, have invented a new and useful Improvement in Means for Operating Cylinder-Cocks, of which the following is a specification.

In Letters Patent No. 757,146, granted to Richard P. C. Sanderson April 12, 1904, there is described a differential automatic relief-valve for locomotive-engine cylinders. The purpose of this valve is to relieve the cylinder automatically when there is a sudden excess of pressure, two of these valves being used for each cylinder, one on each side of the piston, and each valve being maintained in position either open or closed and operated according to the relative pressure on the two sides of the valve. I have found that such a valve when slightly modified as to its connections and in its size is useful to take the place of the ordinary cylinder-cock. Such cocks are usually operated by means of levers and connecting-rods running from the cab of the locomotive to the cylinder; but by means of an operating-valve such as I shall hereinafter describe the opening of the cylinder-cocks may be controlled by air-pressure or in some similar way from a single point in the cab, the valves preferably being all connected to be operated by one such act of the engineer.

My invention will be understood by reference to the drawings, in which—

Figure 1 is a longitudinal section of an operating-valve embodying my invention; Fig. 2, a corresponding section of a cylinder-cock to be operated thereby; Fig. 3, a cross-section on the line 3 3 of Fig. 2; Fig. 4, a plan showing an arrangement of the operating-valve with relation to the cylinder-cocks; and Fig. 5, a front elevation showing the preferred arrangement of the operating-valve with relation to the cylinder-cocks, these last two figures being diagrammatic so far as the locomotive itself is concerned.

A A are the cylinders, B B are the cylinder-cocks, and C the operating-valve, all as shown in Figs. 4 and 5, b being pipes connecting each cylinder-cock with a coupling b' b^2. From the coupling b' a short pipe b^3 runs to the coupling b^4, and from the coupling b^2 a pipe b^5 runs to a coupling b^6, which is connected by a pipe b^7 with the coupling b^4. A pipe c connects the coupling b^4 with the controlling-valve, and a pipe c' connects the controlling-valve with the compressed-air supply in the cab when it is provided with a suitable relief-cock. (Not shown.) A pipe c^2 connects the operating-valve with any live-steam passage in the engine.

The cylinder-cock is a differential valve—that is, one side of the valve has a larger area than the other—and the position of the valve within its casing is dependent upon the relative pressures of the two sides of the valve. The operating-valve has two pistons arranged with differential areas to operate in a similar manner. The operating-valve comprises a casing D, having a passage partially through it. The diameter of one end of this passage is much larger than the other, and for convenience I shall call the end of the casing holding the larger chamber the "upper" end. It forms a chamber d, within which slides a piston formed by the packing E, which is clamped between the collar f and a nut f' on the valve-rod F. The lower end of this collar f rests upon a second packing G, which serves as a piston adapted to slide in the reduced chamber g, these two pistons by their difference in area enabling the valve H, which is carried by the valve-rod F, to be kept closed against a heavy pressure by a less pressure acting on the larger area of the piston E, as will be described below. The valve H is, as shown, an enlargement of the end of the rod F, and its lower end is beveled to fit a valve-seat H', surrounding the perforation in the diaphragm H^2. The upper end of the casing D is closed by a cap D', having means, such as a projection d', by which it may be screwed onto the casing, and it is perforated, as at J, to receive the air-pipe c'. The cap D' is also provided with a ring d^3, which projects inwardly therefrom. The lower end of this ring forms with the nut

f' a stop for the valve when moving in a direction away from the valve-seat H', and it is notched, as at d^4, so that when the valve is open and the nut f' engages the ring air under compression can pass from the pipe c' and opening J into the chamber d, so as to move the piston E and close the valve H. A diaphragm H^2 divides the lower chamber of the casing into two parts k k', from one of which is an outlet K, threaded to receive the end of the pipe c^2. An outlet K' from the other chamber is threaded to receive the end of the pipe c. A small passage k^2 connects the chamber k' with the upper portion of the chamber g, and a passage d^2 connects the chamber d with the diaphragm below the piston E.

The cylinder-cock in its preferred form is shown in Fig. 2, and it consists of a main casing L, having a seat at m for the valve M and providing a valve-chamber l, within which the valve moves. The casing L is provided with an opening L', which connects the lower end of the chamber l with one end of the pipe c, and an opening L^2, near the valve-seat m, which connects with the atmosphere. The lower end of the casing L is provided with a screw-plug L^3, by means of which it is closed, this plug being provided with a boss m^4 to allow a steam-space below the valve when it is open. The upper end of the casing is provided with a coupling N, by means of which it is connected to a threaded connection N', which screws into a suitable opening in the cylinder. The valve M is packed, as at m', the packing being held in place by means of a nut m^2, which is provided with passages m^3 therethrough, and a passage l' is provided, connecting the passage L' with the chamber l. It will be seen that this valve also is a differential valve, in that its packed or lower portion is of larger diameter than the seat m which it closed.

As shown, and as stated above, there are two of these cylinder-cocks to each cylinder, and when they are connected with the operating-valve in the manner indicated in Figs. 4 and 5 their operation is as follows: To illustrate the mode of operation of these various parts, we will assume that air-pressure of seventy pounds is available to control the operating-valve and that the steam-pressure is two hundred pounds and that steam at this pressure not only passes through the operating-valve to the under side of the cylinder-cock, but also acts upon the upper side of the valve when its end of the cylinder is filled with steam. The introduction of steam through the pipe c^2 to the operating-valve (there being no air-pressure on top of the piston E) will cause the valve H to be lifted, owing to the unbalanced steam-pressure under the piston G. This will open the passage through the diaphragm H^2, and steam continuing through the pipe c will enter the passage L' in the cylinder-cock. The steam will pass under the valve M, which is resting upon the boss m^4, and owing to the larger area of the packing m' the steam-pressure on that side of the valve will overcome any pressure coming from the cylinder through the connection N' and close the valve. This condition—viz., the operating valve being open and the cylinder-cock being closed—is the normal condition of these parts. The cylinder-cock will of course open automatically to relieve any undue pressure in the cylinder, and any water of condensation or other disturbing element will pass out through the outlet L^2, the valve M immediately closing when this pressure has been relieved. The air-pipe c' preferably connects the operating-valve with the air-brake supply, in which pressure is maintained at, say, seventy pounds. When the engineer wishes to open the cylinder-cock, he accomplishes his purpose by turning the air-cock in the pipe c', thus allowing air under pressure to pass in through the opening J and through the slots in the under edge of the ring d^3 into the chamber d and cause the piston to close the valve H against its seat H', and thus shut off the steam from the opening K. This operation opens the passage k^2, by means of which the steam already in the pipe c finds a vent through the chamber g and the chamber d and outlet d^2. The pressure on the under side of the valve M in the cylinder-cock is thus reduced below the pressure in the cylinder, and the valve M is opened, and the cylinder will then be blown out through the passage opened by the valve M and the opening L^2. When the cocks are to be closed, the air-pressure is cut off by means of any form of relief-cock which will at the same time reduce the pressure in c', and the steam passing from c^2 through the inlet K lifts the valve H by means of the piston G, there being no opposing pressure, the opening d^2 in this case serving to prevent a vacuum under the piston E. The steam-passage through the diaphragm H^2 is thus opened and the parts assume their original position.

I have described the operation of but one of the cylinder-cocks B; but it will be understood that all operate in the same manner, the increase or reduction of air-ppessure in the operating-valve causing the operation of all of the cylinder-cocks simultaneously, so that by the operation of a single air-cock in the cab the engineer has the operation of the cylinder-cocks entirely within his control. It is also evident that instead of automatic means for controlling the valve H any mechanical means may answer, in such case this single valve with the steam-pressure behind it controlling the cylinder-cocks of each cylinder and taking the place of the two or more lever connections now common.

The operating-valve above described is of simple construction. I do not herein mean to limit myself solely to this form of valve, although it is the best now known to me for the

purpose. It is evident that the structure comprising the rod F, with its pistons E and G, is, in fact, a single piston, the opposite faces of which being of different areas and working in chambers of different diameters enable the piston to be properly termed a "differential piston" by analogy to the term "differential valve" as applied to such a valve as the valve M.

What I claim as my invention is—

1. A cylinder-cock having a differential valve adapted to be normally closed by pressure on its larger area, in combination with a fluid-passage connected with the larger side of said valve, and means located in said fluid-passage adapted to cut off the pressure therefrom and allow said cylinder-cock to open, as set forth.

2. A series of cylinder-cocks each having a differential valve adapted to be normally closed by pressure on its larger area, in combination with a series of connecting fluid-passages all connected together and to a common fluid-supply pipe at one end, the other end of each fluid-passage being connected with the larger side of said valve in said cylinder-cock, and means located in said common fluid-passage adapted to cut off the pressure in said passage and allow all of said cylinder-cocks to open, as set forth.

3. An automatic operating-valve comprising a steam-passage, a perforated diaphragm dividing said passage, a valve adapted to close said perforation, and means to close said valve comprising a differential piston, whereby a pressure on the larger area of said piston will close said valve, as described.

4. In an automatic operating-valve for cylinder-cocks, a steam-passage, a perforated diaphragm crossing said passage, a valve adapted to close the perforations in said diaphragm and provided with a differential piston, whereby it may be opened by steam in said passage, and closed by pressure exerted on the opposite side of said piston from said steam-passage, as described.

5. In combination, a cylinder-cock, an automatic operating-valve therefor, a fluid connection between said cock and said valve, and a differential piston for operating said valve.

6. In an automatic operating-valve, a steam-passage, a perforated diaphragm crossing said passage, a stem having a differential piston mounted on one end thereof, a valve mounted on the other end of said stem, and adapted to close the perforation in said diaphragm, and suitable connections whereby pressure may be delivered to either face of the differential piston to operate the valve, as described.

7. An automatic operating-valve having a steam-passage, a valve to close said passage, a differential piston to operate said valve, and means to relieve the pressure on one side of said valve when said valve is closed, as described.

JAMES H. SEWALL.

In presence of—
JOHN E. ALLEN,
EDWARD L. GAY.