

(No Model.)

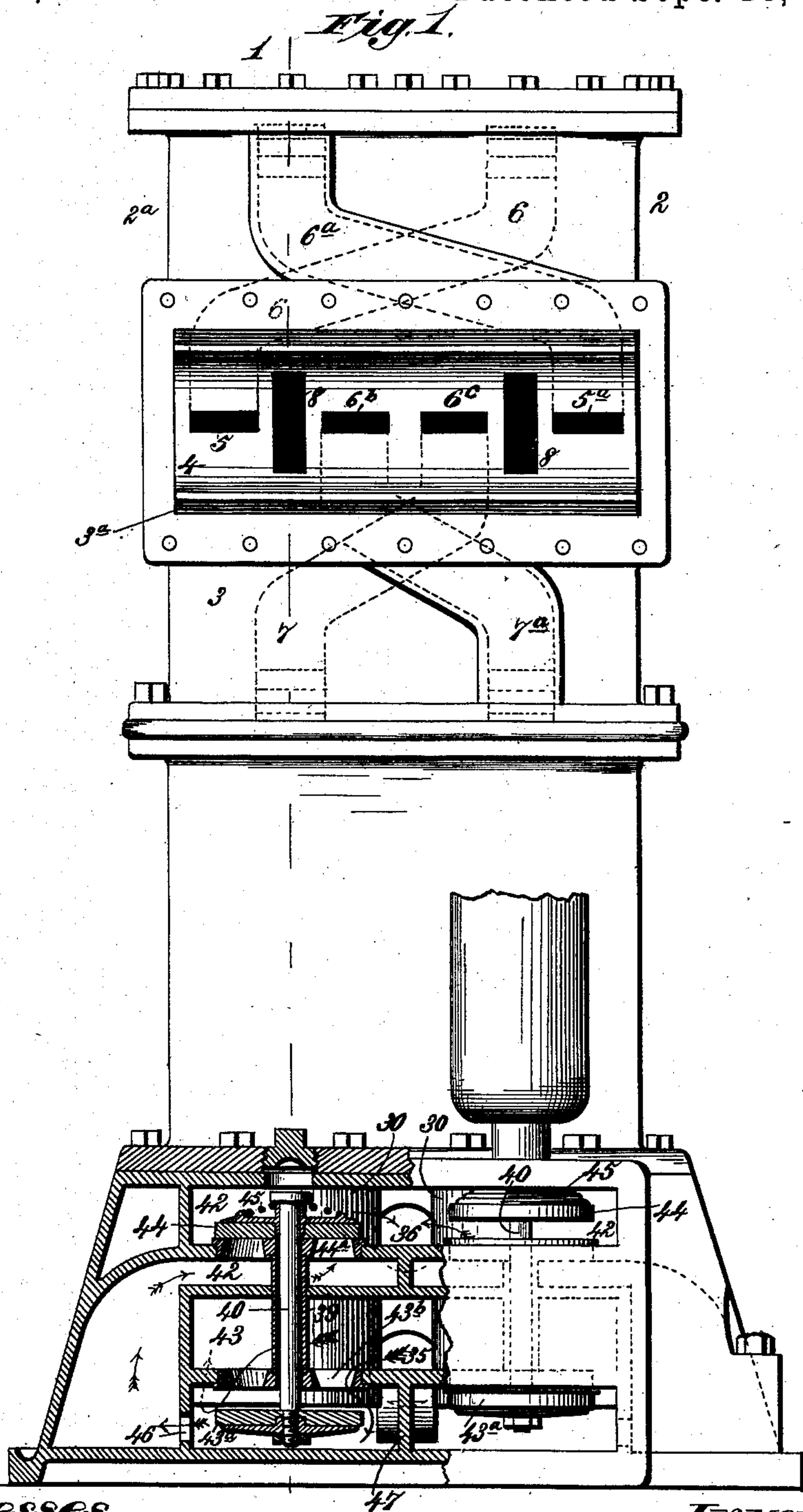
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E. G. SHORTT.

PUMPING ENGINE.

No. 389,769.

Patented Sept. 18, 1888.



Witnesses.
Robert Swett.
Lucy B. Hills.

Inventor:
Edward G. Shortt.
By *James L. Norris.*
Atty.

(No Model.)

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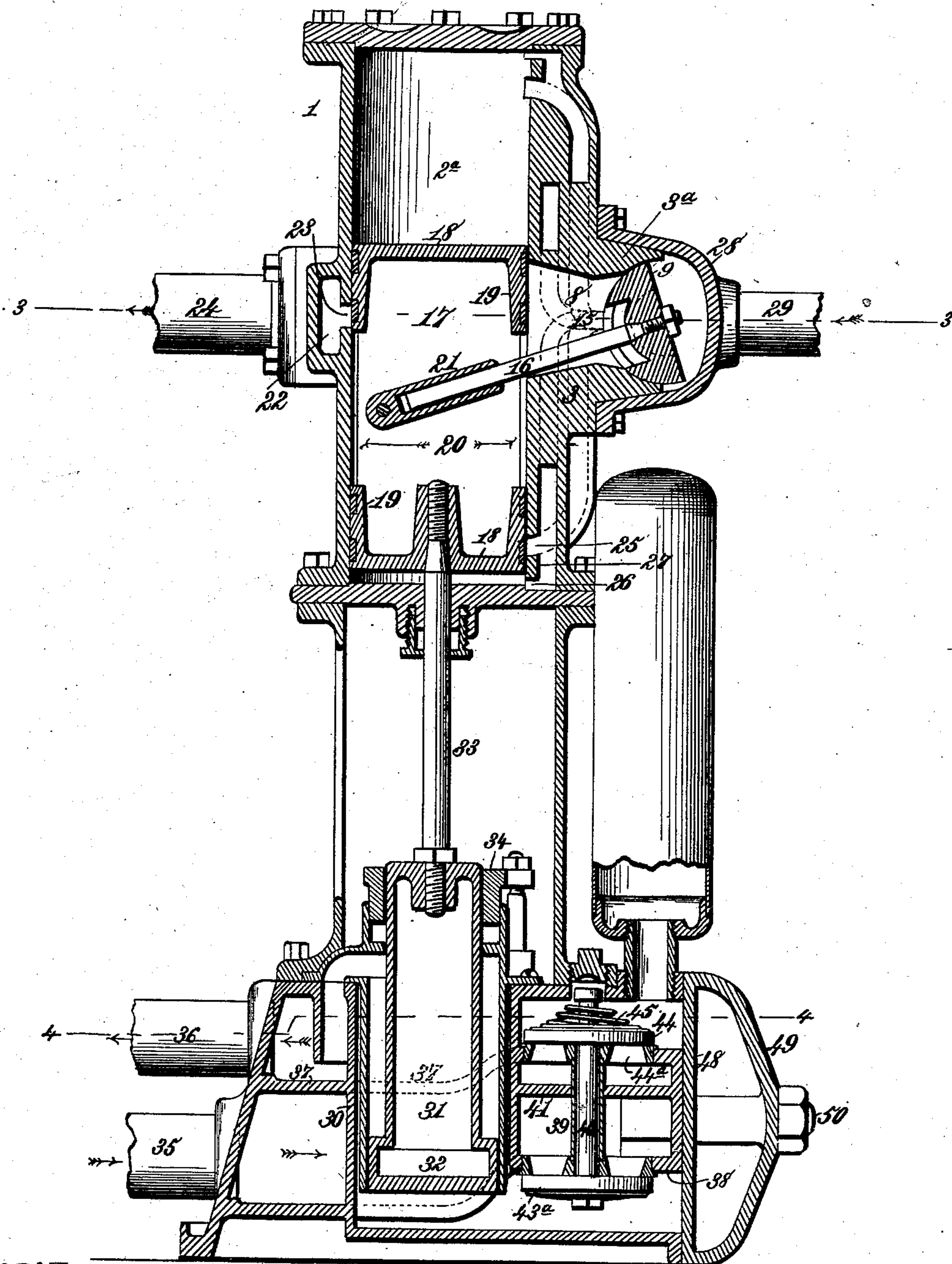
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Fig. 2.



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Fig. 3.

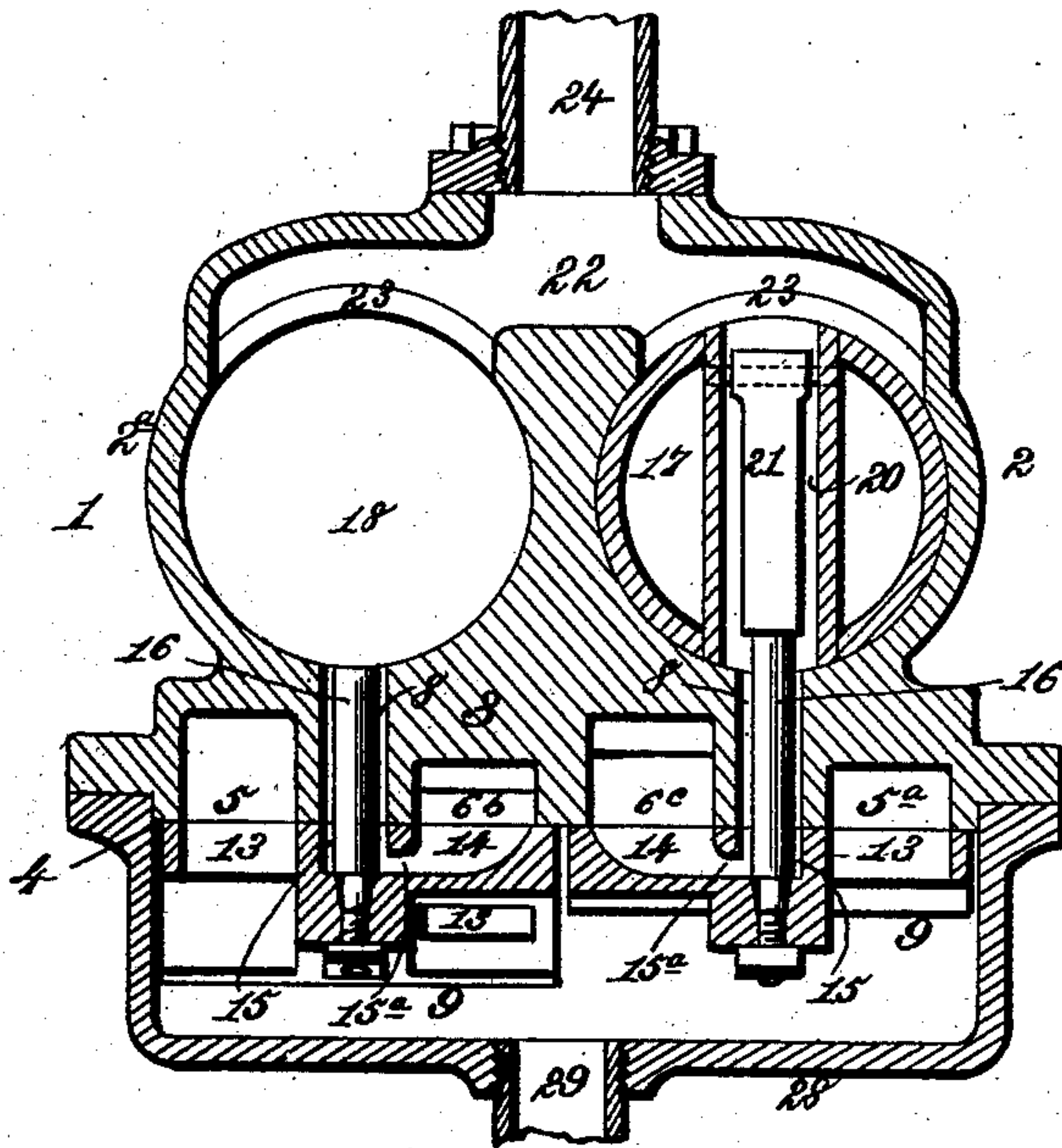
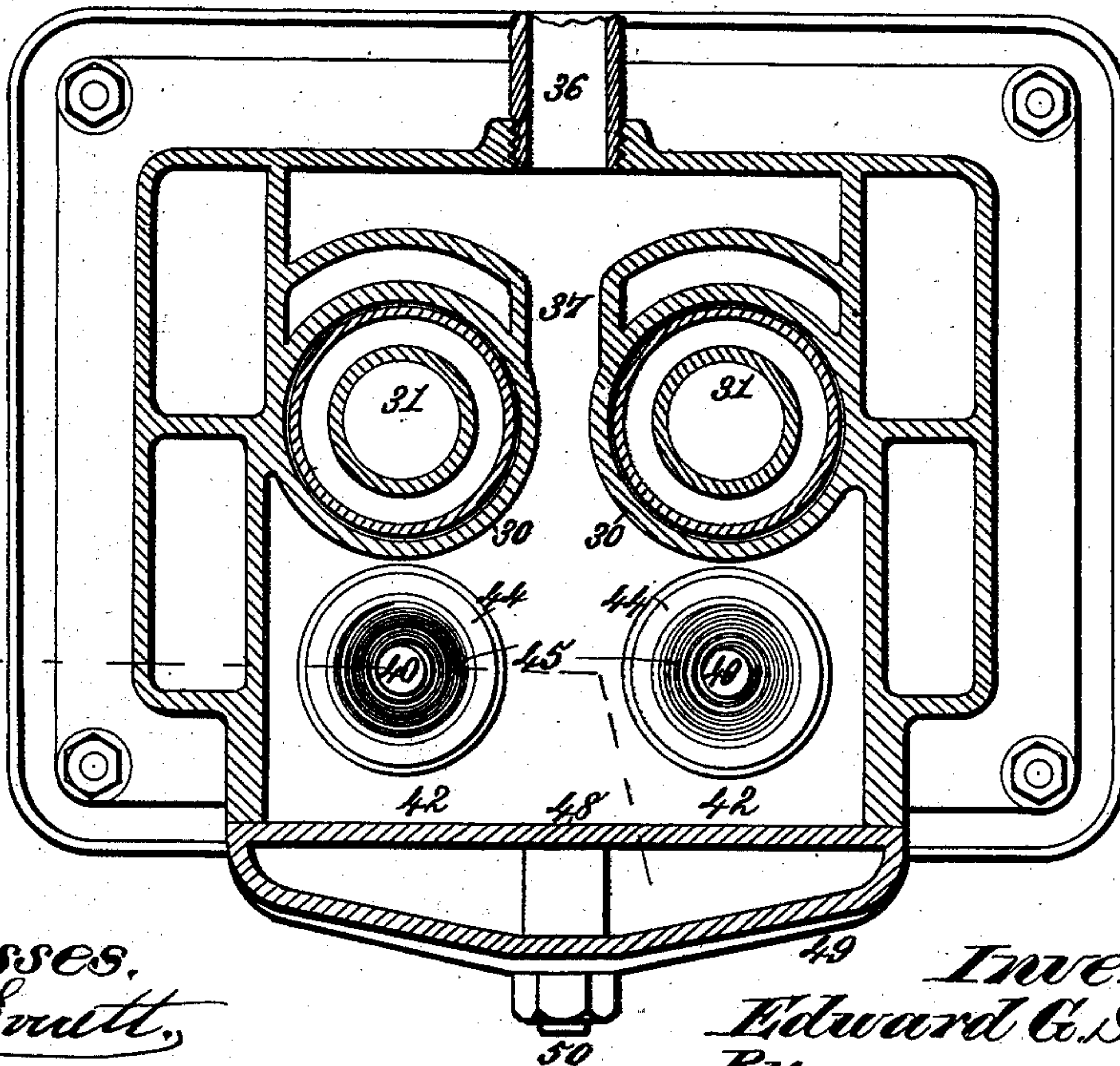


Fig. 4.



Witnesses.
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(No Model.)

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Fig. 5.

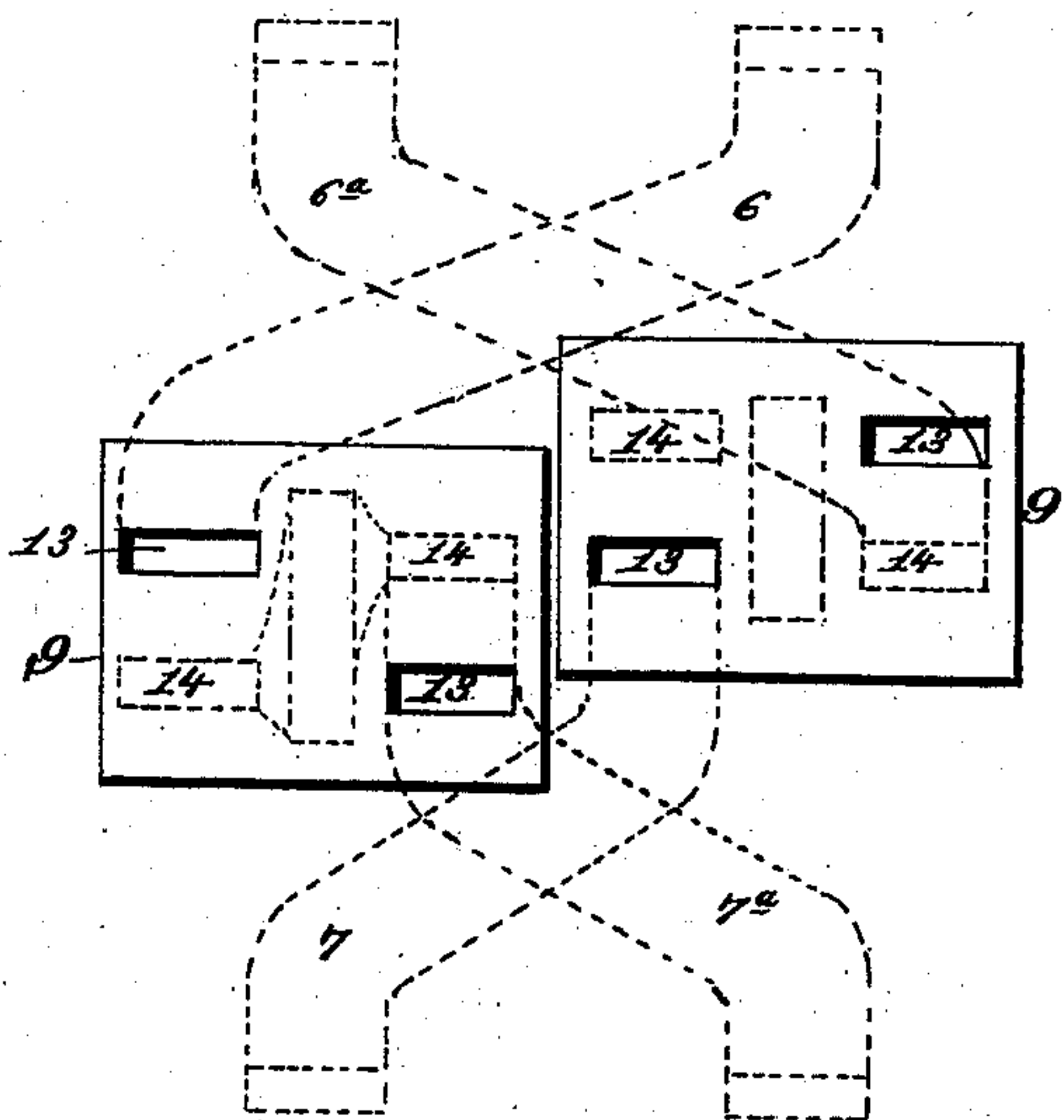


Fig. 6.

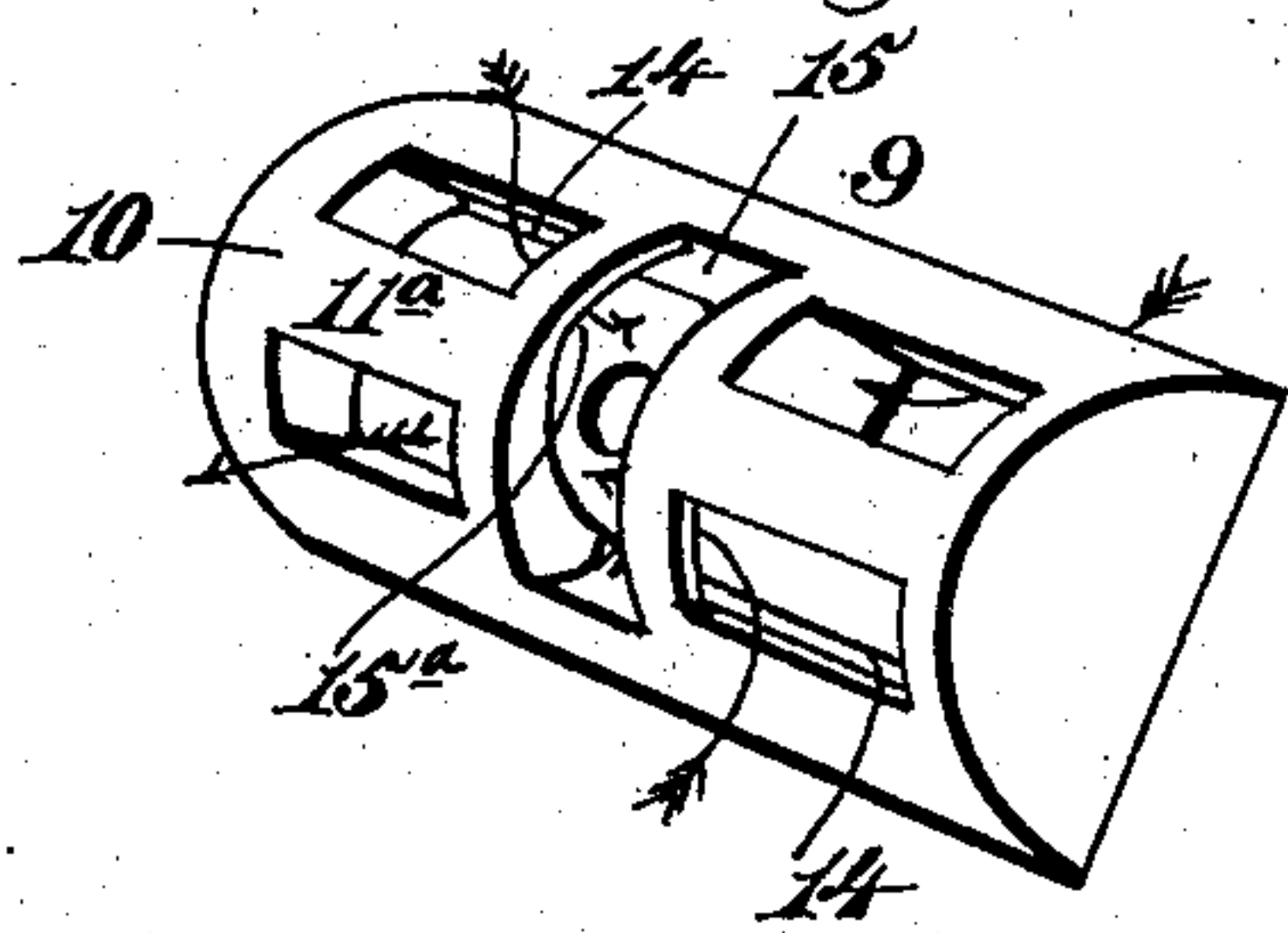
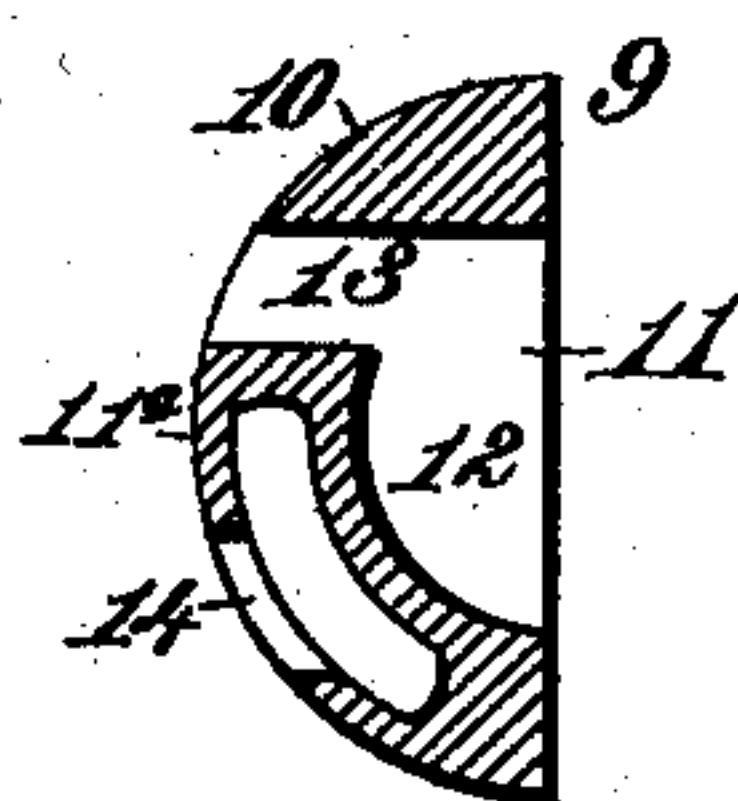


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWARD G. SHORTT, OF CARTHAGE, NEW YORK.

PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 389,769, dated September 18, 1888.

Application filed December 15, 1887. Serial No. 258,013. (No model.)

To all whom it may concern:

Be it known that I, EDWARD G. SHORTT, a citizen of the United States, residing at Carthage, in the county of Jefferson and State of New York, have invented new and useful Improvements in Pumping-Engines, of which the following is a specification.

My invention relates to pumping-engines of the class having duplex steam mechanism; and the purpose thereof is to provide a new and improved construction and arrangement of parts whereby the movement of the piston in one engine-cylinder shall supply and cut off the steam in the other adjacent cylinder, and vice versa.

It is also my purpose to provide a novel construction of valve for such engines, in which said valves are not packed upon their seats, but are held thereon by the pressure of the live steam in the steam-chest, thus producing a sufficient contact to avoid leakage.

It is my further purpose to so construct and arrange the cylinders, steam-ports, and pistons that each piston shall cushion upon a body of steam as it completes its stroke, steam being at the same instant thrown in beneath the piston by the valve, whereby the shock and jar of the mechanism are decreased and its operation improved.

It is my purpose, moreover, to simplify and improve the construction of the steam-valves, whereby they may be operated by valve-stems connected to the interior of the pistons and exhaust through the latter.

To these ends the invention consists in the several novel features of construction and new combinations of parts hereinafter fully set forth, and definitely pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation, partly in section, showing the arrangement of the steam-ports and the construction and arrangement of the pump-valves and the chambers in which they operate. Fig. 2 is a vertical section through the center of one of the cylinders. Fig. 3 is a horizontal section on the line 3 3 of Fig. 2. Fig. 4 is a similar section on the line 4 4 of Fig. 1. Fig. 5 is a diagram of the steam-ports, the valves being indicated as if their rearward or seating faces had been removed from the body of the

valve-bodies and spread out flat to show the proper relative positions of the valve-ports. Fig. 6 is a detail perspective of one of the rocking valves. Fig. 7 is a transverse section of the valve shown in Fig. 6.

In the said drawings, the reference-numeral 1 denotes the engine shell or casing, within which the operative parts of the duplex steam and pumping mechanism are arranged.

Within the upper part of the casing 1 are placed the duplex cylinders 2 and 2^a, each having a wall, 3, in which the steam-ports are arranged. These ports all open in the same horizontal line drawn centrally across the surface of a valve-seat, 4, formed transversely in the wall 3 in front of the central portion of the cylinders, said valve-seat being substantially a semicircular concave in cross section. It may be divided by a central vertical line into two independent valve-seats—one for one cylinder and the other for the remaining cylinder. In the seat I form two openings or steam-ports, 5 and 5^a, one of which—say 5—communicates with a channel, 6, directed upward and then diagonally and upwardly until it communicates with the upper end of cylinder 2. In like manner the port 6^a, opening from the passage 5^a, passes upward and then diagonally across the port to the upper end of the adjacent cylinder, 2^a. From the two remaining passages or openings, 6^b and 6^c, steam-ports 7 and 7^a pass downward and then diagonally cross each other until their ends communicate with the lower ends of cylinders 2 and 2^a, as shown by dotted lines in Figs. 1, 2, and 5.

The face of the duplex valve-seat 4 is shown in elevation in Fig. 1, and in addition to the construction already noted it has in the center of each sectional seat, and between the ports 5 and 6^b and 5^a and 6^c, an elongated transverse opening, 8, extending entirely through the valve-seat and the wall 3 into the cylinder. These openings are formed, preferably, with a double flare; or, in other words, the upper and lower walls diverge somewhat from a point a little in rear of the valve-seat in both directions.

The valves used in the steaming mechanism consist of two substantially semi-cylindrical parts, 9, having each a curved seating-surface,

10, which fits the valve seat 4. Upon each side of a central transverse portion, 11, in each valve is formed a chamber or cavity, 12, leaving the body of the valve essentially semi-annular in cross-section, as shown in Fig. 7. Through the valve upon each side of the solid central portion, 11, I cut steam-ports 13, alternating in position with each other, their position being such that when the valve is upon its seat the said openings may be made to register successively with the ports 5 and 6^b or 5^a 6^a, according to which half of the valve-seat 4 the valve is placed in.

Within the same portions of the valve are formed two ports, 14, likewise alternating with each other. These openings or ports are not cut through the valve-body, but are formed therein and elongated transversely to the valve, as shown in Fig. 7. These openings both have communication with a transverse exhaust-opening, 15, cut centrally in the seating-face of the valve. The openings 15^a, by which this central exhaust-port has common communication with both the alternating ports 14, are so formed as to be practically coextensive with the exhaust-port, as shown in Fig. 6 and by dotted lines in Fig. 5.

Each valve is mounted upon a stem, 16, having one end centrally and rigidly attached and projecting radially through the exhaust-port 15. This valve-stem passes through the transverse opening 8 in the valve-seat and enters the cylinder, the vertical axis of which lies directly in rear of the valve-center.

In each cylinder is arranged a piston, 17, of elongated cylindrical form, as seen in Fig. 2, having solid heads 18 packed in the cylinder. Each piston-head has a wide flange, 19, which carries the packing, and while these heads and flanges are connected together in any suitable manner an opening, 20, is formed directly through the piston from side to side. Within this opening the valve-stem 16 is introduced and its end placed in a telescoping sleeve, 21, pivotally mounted by one end in the interior of the cylinder and centrally as to its extremities. The exhaust from each cylinder through one or the other of the ports in wall 3 enters the valve by way of one or other of the exhaust-ports 14, and thence passes through the central opening, 15, whence it flows through the opening 8 in the valve-seat and into the piston.

Around the rear of the cylinders is formed a central passage, 22, communicating with each cylinder and with the interior of each piston by a channel, 23. The passage 22 opens into an exhaust-pipe, 24, common to both cylinders. The width of the channel 23 is such that at each stroke of the piston it will be wholly closed and the exhaust cut off by one of the flanges 19 an instant before the end of the piston or the head itself reaches the end of the cylinder, as clearly indicated in Fig. 2, a steam-space of about one inch (more or less) being left between the end or head of the piston and the end of the cylinder. The steam-ports also,

which enter the ends of the cylinder, are divided or practically forked at the point of communication; one branch, 25, opening a little distance from the end, and the other, 26, at the end of the cylinder, the two being separated by an intervening portion, 27, of the cylinder-wall. The purpose of this construction will be explained hereinafter.

The valve seats 4 are formed in a projecting portion, 3^a, of the wall 3, and upon the exterior thereof is bolted a bonnet, 28, which forms the steam-chest, a pipe, 29, for supplying live steam, passing through the center of said bonnet and communicating with the boilers. As the pistons 17 rise and fall in the cylinders, they vibrate the valve-stems 16 and communicate to each valve a limited movement upon its seat, whereby the valve-ports 13 and 14 in each valve may be successively caused to cross the steam-ports 5 and 6^b or 6^a and 6^a. It will be noted, by comparison of Figs. 1, 5, and 6, that when the pistons are central in the cylinders the steam-ports will all be closed by the solid central portions, 11^a. As they move farther, the one piston, as in cylinder 2^a, will bring the valve-port 14 into communication with the steam-port 6^b, and thereby open the exhaust from the bottom of the adjacent cylinder, 2, while at the same instant the other valve-port, 13, in the longitudinal line of the valve opens the port 5 and supplies live steam at the top of the cylinder 2. With the other piston the movements are precisely the reverse of those described, the valve operated thereby opening the exhaust from the top of the cylinder 2^a and the live-steam port supplying the lower end of the latter cylinder simultaneously with each other and with the reverse valve movement effected by the opposite movement of the piston in cylinder 2^a. The arrangement of the valve-ports 13 and 14 and construction of parts being such as described, the piston in cylinder 2^a, which is seen in Fig. 2 as at the limit of the downward stroke, will in this position open the exhaust and the live-steam ports 5 and 6^a, which communicate with the lower and upper ends, respectively, of cylinder 2, in which the piston is at the end of its upward stroke, and the latter cylinder has at the same instant opened, by means of the other valve, the live-steam and exhaust ports opening into the bottom and top, respectively, of cylinder 2^a. As the pistons move under the impulse of the steam admitted by the valve movements just described, the exhaust-channel 23 is closed by the flange 19 on the head of each piston, and the exhaust cut off just before the piston entirely completes its stroke. At the same instant, also, the live steam is admitted beneath the said piston in cylinder 2^a, forming, in connection with the closed exhaust, a steam-cushion, upon which the stroke of the piston is completed. The operation is the same in the adjacent cylinder and at each end of the stroke in both.

The valves 9 require no packing upon the valve-seat, as the pressure within the steam-

chest serves to hold them upon their seats and produce such contact that steam cannot pass between the parts.

By the division of the steam-passages into two branches, 25 and 26, the full body of the live steam is not thrown under the piston at the moment of the completion of the stroke, but is only admitted in its maximum volume after the piston has begun its stroke. As the pistons reach the centers of the cylinders both live steam ports are closed, as well as both the exhaust-ports, by the central solid portions, 11, of each valve. The stroke is completed by the expansion of the steam admitted to each cylinder prior to the half-stroke being made. The pumping mechanism shown in this case, being made the subject of a separate application, will not be described in this specification.

The relative arrangement and function of the steaming-valves are clearly shown in Fig. 5, wherein they are shown as laid out flat upon the valve-seats 4. In this view the steam-ports in the seats are all in the same horizontal line, and the pistons being at the ends of their strokes, respectively, it will be seen that the port 13 in the valve at the left is supplying live steam to the top of cylinder 2, while the exhaust-port 14 is in communication with the lower end of the cylinder. The arrangement of the adjacent valve is the opposite of that described, its live-steam port 13 giving steam to the lower end of cylinder 2^a while its port 14 is exhausting from the upper end of said cylinder. In this view the valves are supposed, for the sake of illustration, to slide vertically in right lines upon their seats.

By the construction and arrangement of ports shown and described each piston is made to cushion the other at the end of the stroke by tapping the exhaust-steam in the opposite cylinder, as shown in Fig. 2.

Although I have described and shown the steaming mechanism as connected with a pump, I may connect the same with any other form of apparatus, and I make no claim in this case to said pumping mechanism.

I also make no claim in this case to any matter shown and described in an application filed by me and pending concurrently herewith and numbered in serial 258,012.

What I claim is—

1. In a pumping-engine, the combination, with duplex steam-cylinders having their

ports crossing each other, of independent valves opening and closing said ports, a valve-seat arranged centrally and transversely in front of the cylinders, and valve-stems projecting through openings in the seat and connected with the pistons, substantially as described.

2. The combination, with duplex steam-cylinders having the steam-ports from the same ends crossing each other between said ends and the steam-chest, of semi-cylindrical valves sliding independently upon a transversely-arranged seat having a central line of ports, and valve-stems projecting through openings in the valve-seats between the ports and connected with the pistons, the valves each having a central transverse exhaust-opening, and a steam and exhaust port upon each side thereof alternating with the ports upon the other side, and both exhaust-ports having communication with the central exhaust opening, substantially as described.

3. The combination, with the cylinders having steam-ports which are divided or forked at the points where they enter the cylinders, of pistons having flanged heads and provided with interior exhaust-passages, and valves and valve-seats having exhaust-ports communicating with the interior of said pistons, the cylinders having a central exhaust-opening closed by the flanged heads of the pistons just before the entire completion of each stroke, substantially as described.

4. The combination, with the duplex cylinders having a central exhaust and steam ports which cross each other between the ends of the cylinders and the steam-chest, of a valve-seat in which the ports are arranged in a central horizontal line, pistons having interior exhaust-passages, and valves having stems projecting through the valve-seat and telescoping within tubes pivotally mounted in the pistons, said valves having the exhaust and live-steam valves on opposite sides and alternating with each other, and being provided with a central opening communicating with both exhaust-ports, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD G. SHORTT.

Witnesses:

A. G. PECK,
A. A. COLLINS.