No. 685,031. Patented Oct. 22, 1901.

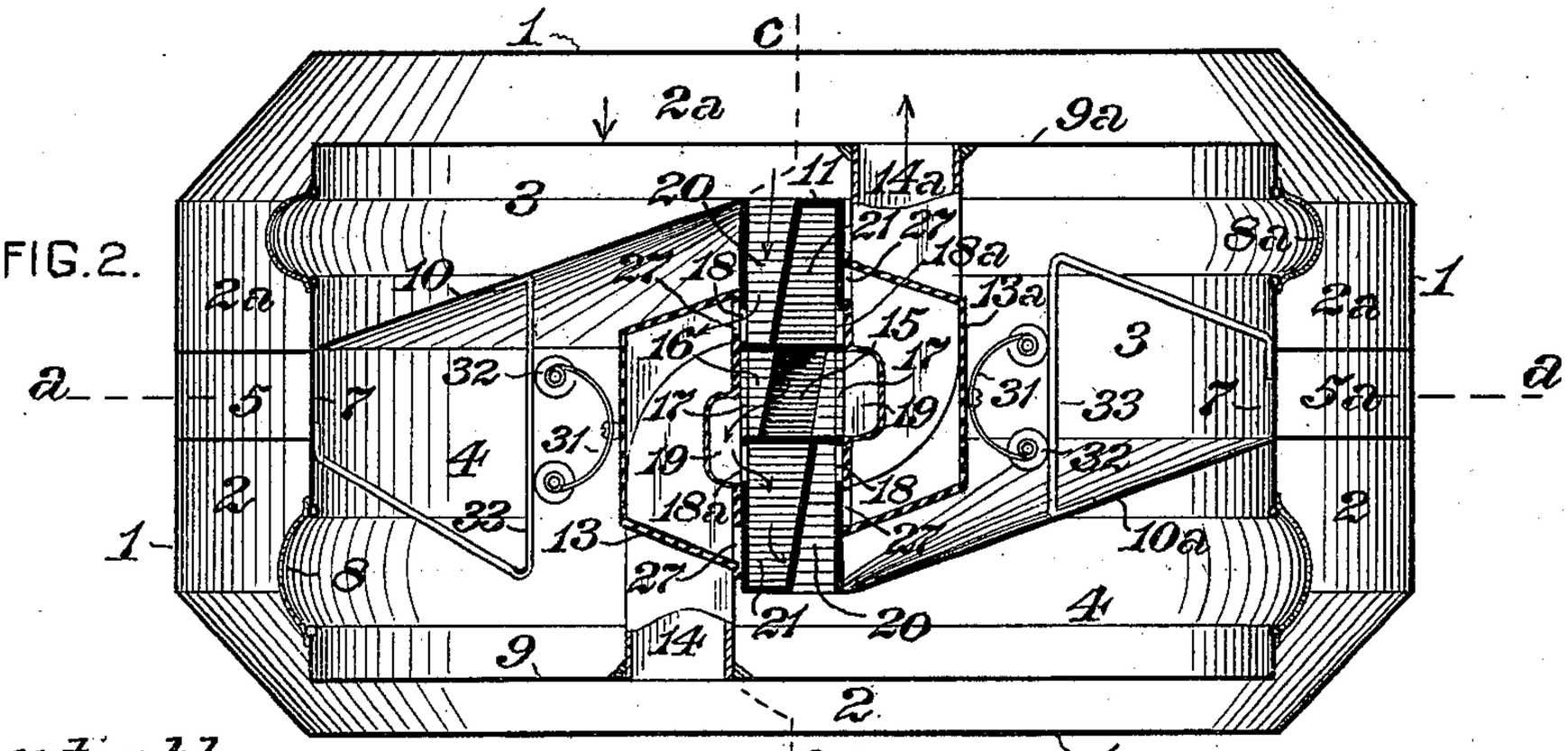
H. CHRISMAN.

FLUID METER.

(Application filed Apr. 17, 1901.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 2.



section b, b.

FIG. 1.

section a, a.

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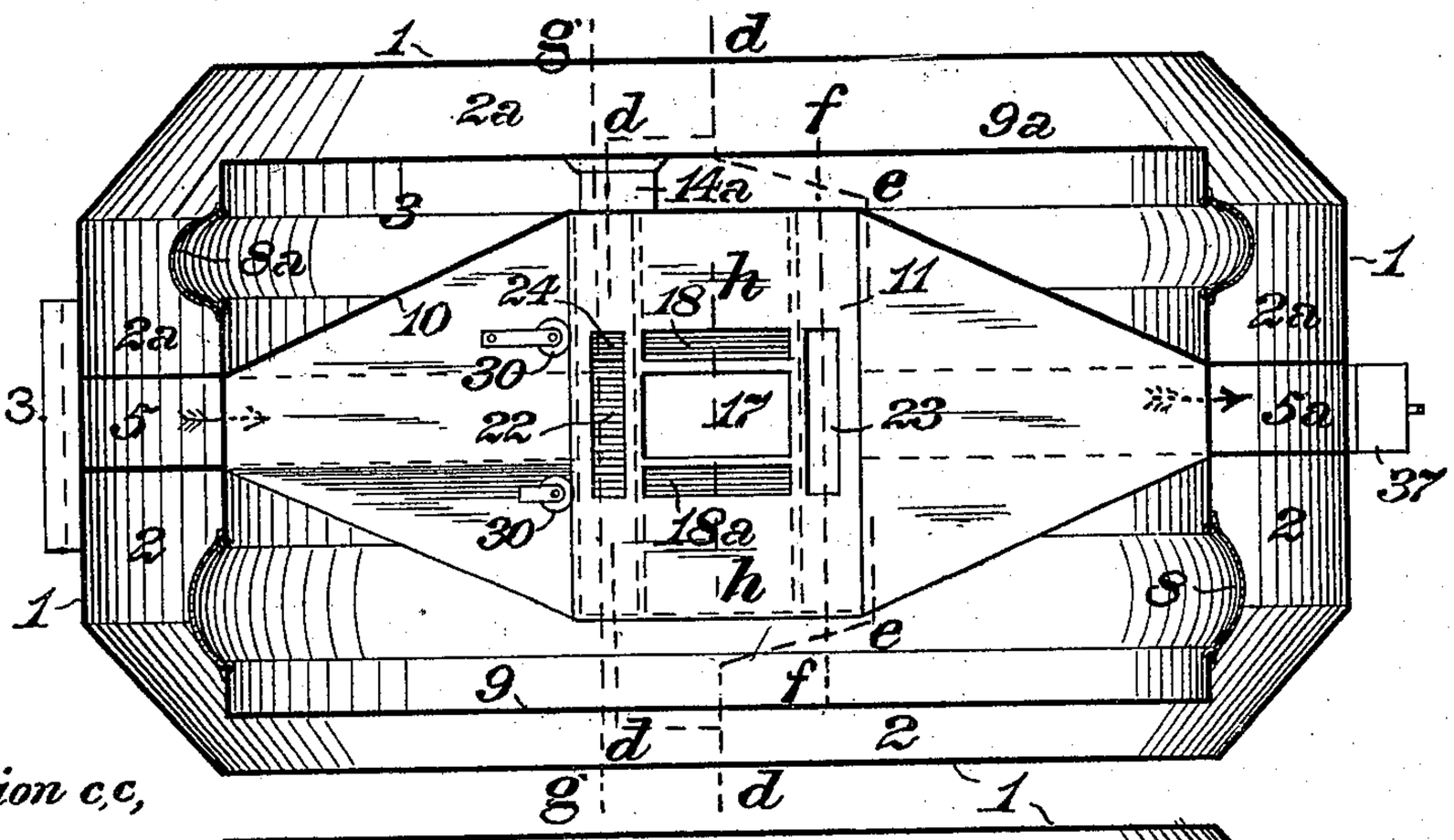
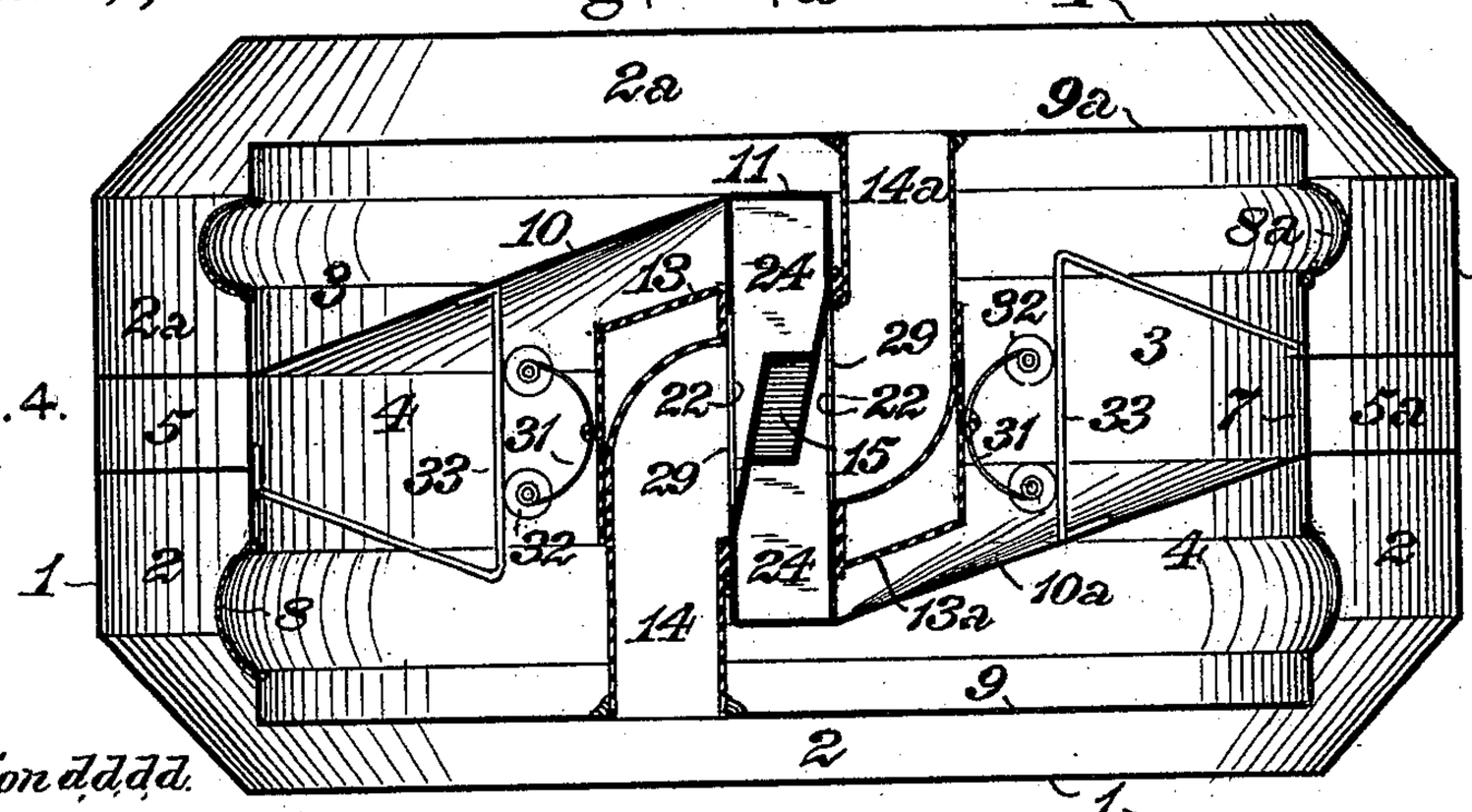
FIG. 3.



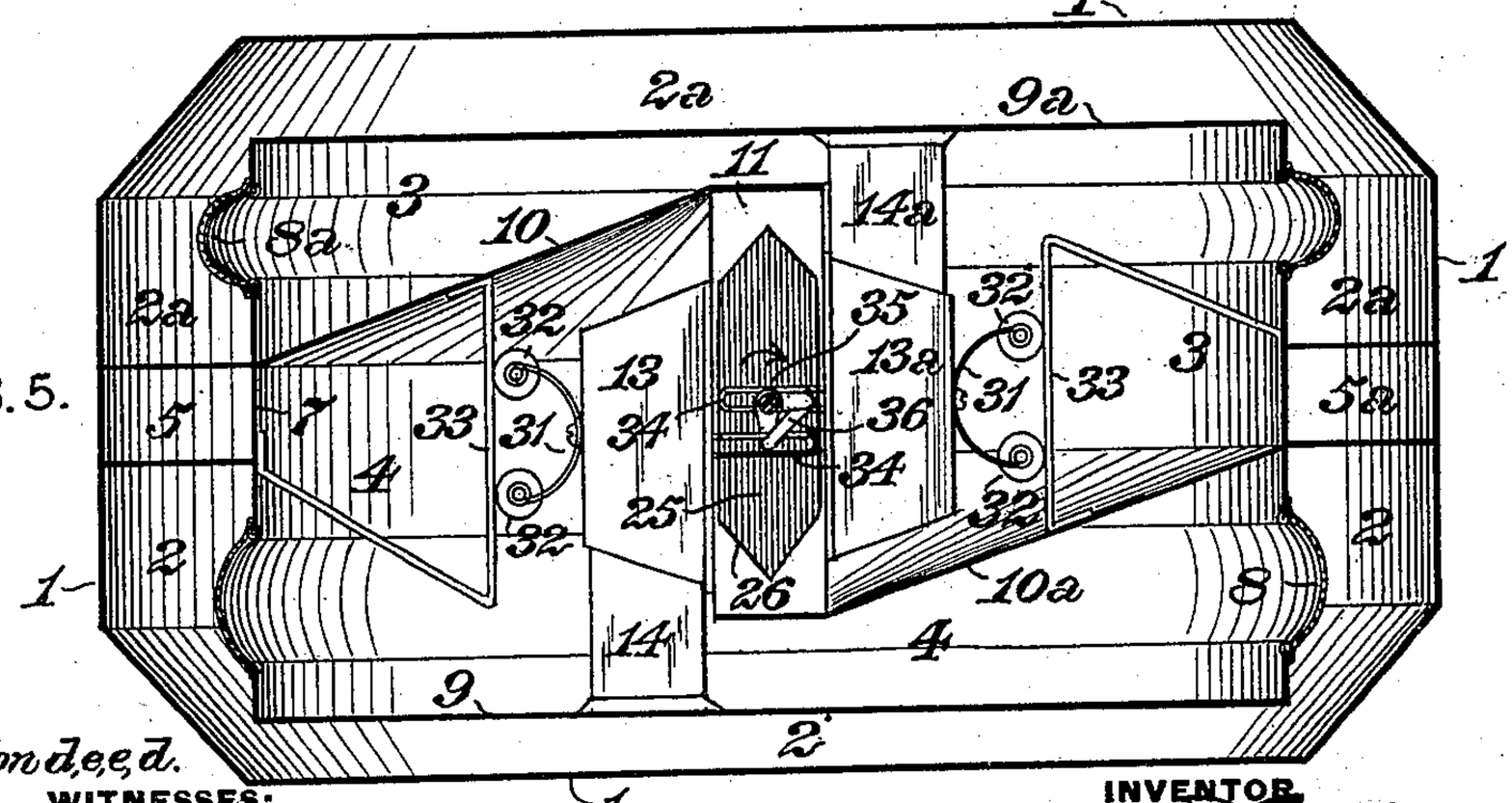
section c,c,

FIG. 4.



section d,d,d,d.

FIG. 5.



section d,e,e,d.

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FLUID METER.

(Application filed Apr. 17, 1901.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 6.

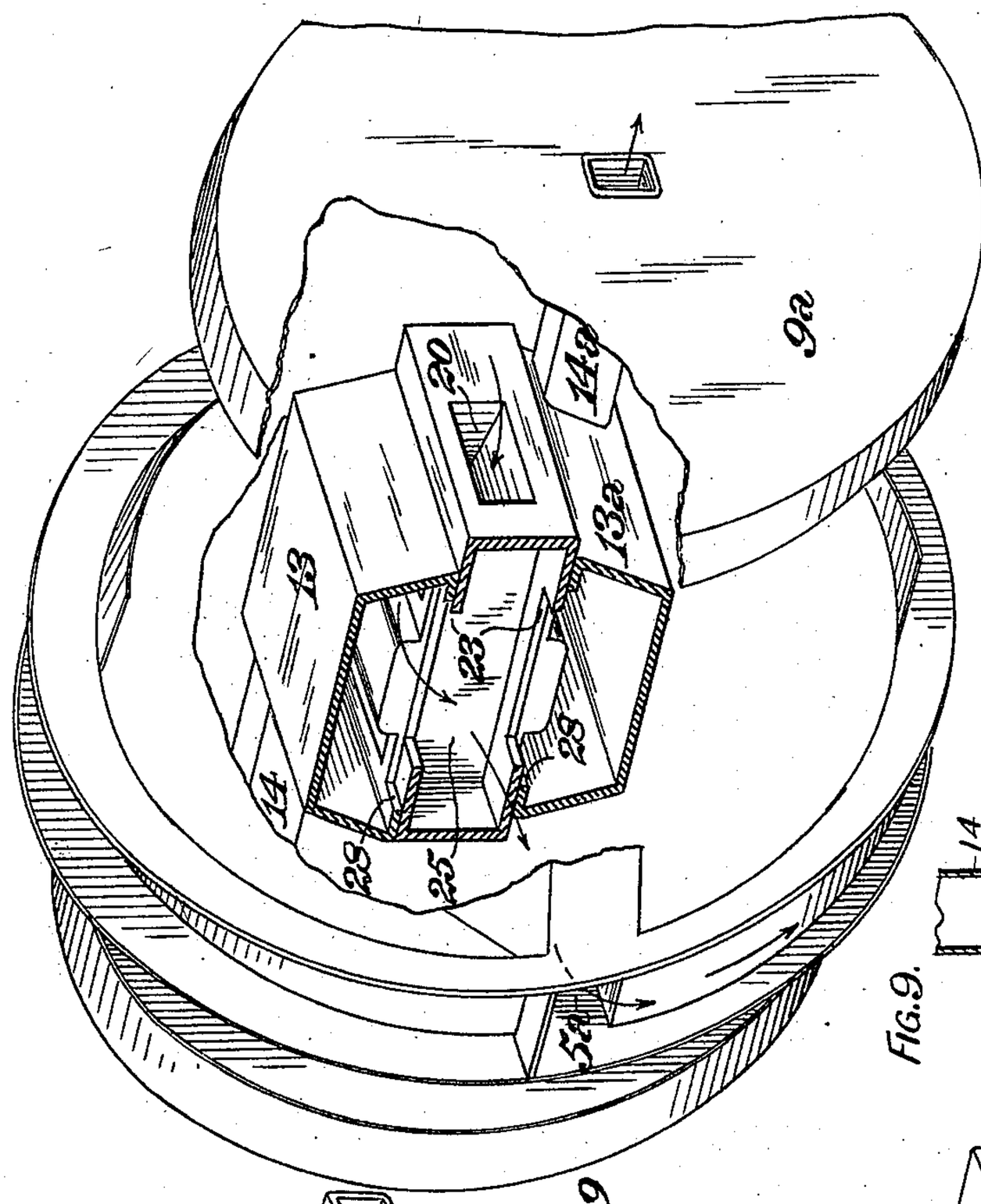


FIG. 9.

section ff.

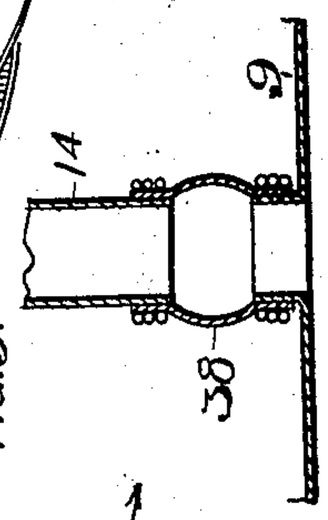
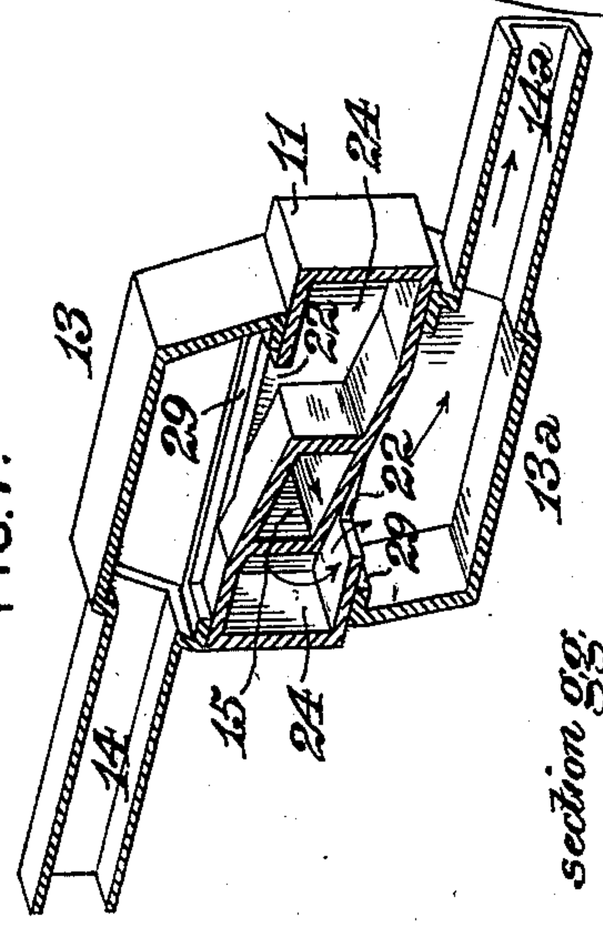
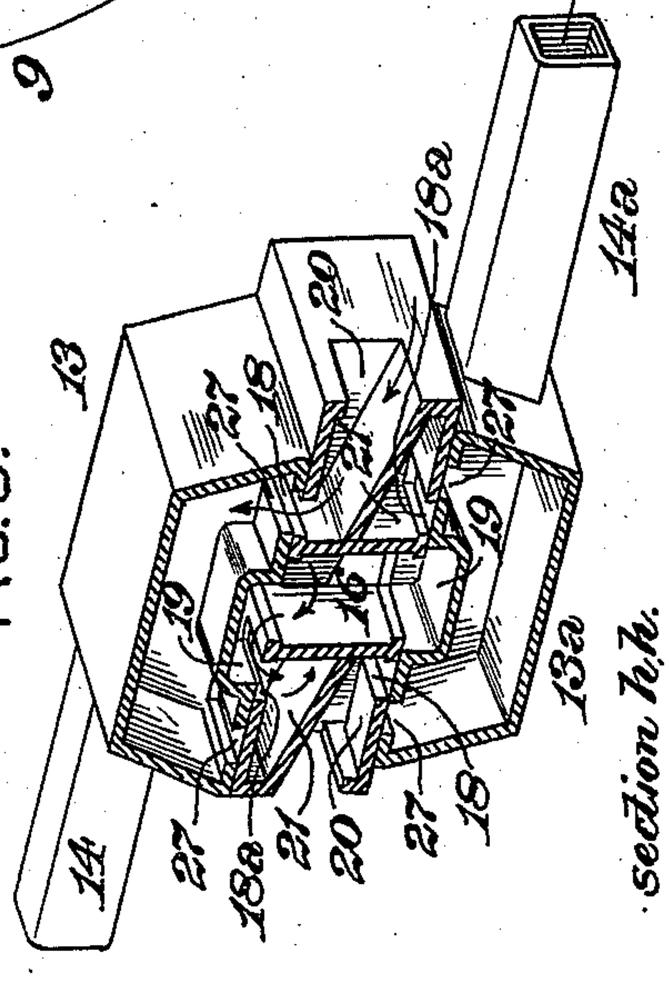


FIG. 7.



section gg.

FIG. 8.



section hh.

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UNITED STATES PATENT OFFICE.

HORACE CHRISMAN, OF PITTSBURG, PENNSYLVANIA.

FLUID-METER.

SPECIFICATION forming part of Letters Patent No. 685,031, dated October 22, 1901.

Application filed April 17, 1901. Serial No. 56,232. (No model.)

To all whom it may concern:

Be it known that I, HORACE CHRISMAN, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Fluid-Meters, of which improvement the following is a specification.

The object of my invention is to provide an appliance for measuring the volume of fluids which shall be of simple, light, and comparatively inexpensive construction, in which the minimum number of moving parts shall be employed, and in which stuffing-boxes and other packed joints shall be dispensed with and accuracy of measurement be promoted by consequent reduction of friction of moving parts and tendency to leakage of fluid.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical central section through a fluid-meter, illustrating an embodiment of my invention, on the line *a a* of Fig. 2; Fig. 2, a horizontal section through the same on the line *b b* of Fig. 1; Fig. 3, a vertical section on the line *c c* of Fig. 1; Fig. 4, a horizontal section on the line *d d d d* of Fig. 3; Fig. 5, a similar section on the line *d e e d* of Fig. 3; Fig. 6, a horizontal section, in perspective and on an enlarged scale, through the valves and valve-seat on the line *f f* of Fig. 3, showing also portions of the circumferential inlet and outlet passages and the movable abutments; Fig. 7, a similar section through the valves and valve-seat on the line *g g* of Fig. 3; Fig. 8, a similar section on the line *h h* of Fig. 3, and Fig. 9 a detailed sectional view illustrating a flexible connection between a conduit and a movable abutment.

In the practice of my invention I provide an inclosing casing 1, of sheet or plate metal, of proper thickness to sustain the pressure of the fluid to be measured, the space within which is divided by partitions and movable abutments, hereinafter described, into two outer and oppositely-located measuring-chambers 2 2^a, two inner measuring-chambers 3 4, adjoining the outer chambers 2 2^a, and fluid inlet and outlet passages 5 5^a, provided, respectively, with an inlet nozzle or connection 6 and an outlet nozzle or connection 6^a. A substantially cylindrical partition 7 forms the major portion of the outer wall of the measuring-chambers 3 4, and the outer ends of said partition are connected by flexible annuluses 8 8^a to movable abutments 9 9^a, one of which, 9, separates the outer measuring-chamber 2 from the inner measuring-chamber 4 and the other, 9^a, separates the opposite outer measuring-chamber 2^a from the inner measuring-chamber 3. Partitions 10 10^a and connected partitions 12 12^a separate the chambers 3 and 4 one from the other and from the inlet and outlet passages 5 5^a. A valve-seat 11, having ports and passages hereinafter described, is secured to the partitions 10 10^a 12 12^a and forms part of the dividing-wall between the chambers 3 and 4, and valves 13 13^a are fitted to reciprocate on faces on the opposite sides of the valve-seat 11. The valve 13 is positively connected to the movable abutment 9 by a conduit 14, which serves both as a means for transmitting movement from said movable abutment to the valve and as a passage for fluid to and from the chamber 2, and the valve 13^a is similarly connected to the movable abutment 9^a by a conduit 14^a, which serves both as a means for transmitting movement from said movable abutment to the valve and as a passage for fluid to and from the chamber 2^a. While the connections between the conduits and movable abutments are indicated as being made rigidly, as by means of solder, flexible connections—as, for example, rings of flexible material 38, (shown in Fig. 9)—may, if preferred, be employed to insure the accurate relation of the valves to the faces of the valve-seat.

An inlet-passage 15, which is formed in one end of the valve-seat 11, communicates at its outer end with the inlet-passage 5 of the meter-casing 1 and communicates at its inner end with a central chamber 16 in the valve-seat, which chamber opens to the two opposite valve-faces of the valve-seat by ports 17. Ports 18 and 18^a are formed in the valve-faces adjacent to the ports 17 and are reversed in relative position on the opposite valve-faces—that is to say, the port 18 is forward of the port 17 on one valve-face (when looking downwardly, as in Fig. 2) and in the rear of the port 17 on the other valve-face, and the position of the port 18^a is correspond-

ingly alternated. The ports 18 form the inner end openings of passages 20 in the valve-seat, the outer ends of which passages open into the chambers 3 and 4, respectively. The ports 18ª form the inner ends of passages 21 in the valve-seat, each of which communicates with an adjoining lateral passage 24, and the passages 24 terminate by ports 22 on the opposite valve-faces of the valve-seat. The ports 22 extend at right angles to the ports 18, 17, and 18ª at one end thereof, and ports 23, extending parallel with the ports 22 at the opposite end of the ports 18, 17, and 18ª, open into a chamber 25 in the valve-seat, the outer end of which communicates by a port 26 with the outlet-passage 5ª of the meter-casing.

The working faces of the valves 13 13ª are each provided with central recesses 19, corresponding substantially in form and dimensions with the valve-seat ports 17 and with ports 27, parallel with the recesses 19, which ports 27 are adapted to communicate with the valve-seat ports 18 18ª. Longitudinal ports 28 in the valves 13 13ª at one end of the ports 27 communicate with the valve-seat ports 23 and from said ports communicate through the interiors of the valves with the ports 27, and longitudinal ports 29 at the opposite ends of the ports 27 communicate with the valve-seat ports 22 and with chambers in the interiors of the valves, which chambers are open to and are substantially extensions of the conduits 14 and 14ª, respectively.

The valves 13 13ª, which are reciprocated by the connected movable abutments 2 2ª, are supported by and traverse on rollers 30, journaled in bearings on the partitions 12 12ª, and are held to a proper bearing on the faces of the valve-seat by springs 31 on their backs, the outer ends of which springs carry rollers 32, which traverse on tracks 33, fixed to the partitions 7, 10, and 10ª. A slotted arm 34 is fixed to each of the valves perpendicularly to its line of traverse, and the valves are coupled one to the other so as to move in proper relation and to a register-shaft 35, so as to impart rotation thereto by crank-arms 36, which are connected in triangular form and are fixed to the register-shaft and provided with pins which traverse in the slots of the arms 34. The register-shaft actuates a registering mechanism of any suitable known construction, which is inclosed in a register-case 37, fixed to the casing 1, and which as it does not in and of itself form part of my present invention need not be herein detailed.

In the operation of a fluid-meter embodying my invention the fluid to be measured enters the casing through the inlet-nozzle 6 and traverses the inlet-passage 5 of the casing, to and through the inlet-passage 15 of the valve-seat 11, and thence to the central chamber 16 of said valve-seat. From the chamber 16 it passes through the recess 19 of one of the valves, (as illustrated in the drawings the valve 13,) and through the adjoining valve-seat ports 17 and 18ª into one of the end valve-chambers 21, thence into the chamber 24, communicating therewith, thence through the communicating ports 22 and 29 into the chamber of the opposite valve 13ª, which is open to the conduit 14ª thereof, and through said conduit into the end chamber 2ª of the casing, filling said chamber and acting upon the adjacent movable abutment 9ª to effect the ensuing inward stroke thereof. The volume of fluid in the chamber 3, which has been previously measured and which is displaced by the inward movement of the abutment 9ª, enters the open end of the adjacent valve-seat chamber 20 and passes from said chamber through the adjoining ports 18 and 27 and the interior of the adjacent valve 13 to the port 23 and valve-seat chamber 25, from which it passes through the port 26 to the outlet-channel 5ª and outlet-nozzle 6ª, and thence to the point of delivery for consumption. It will be seen that the valve 13, by which fluid is admitted to the chamber 2ª on the outer face of the abutment 9ª, is actuated by the opposite abutment 9, and, conversely, that the valve 13ª, by which fluid is admitted to the chamber 2 on the outer face of the abutment 9, is operated by the opposite abutment 9ª. It should also be noted that the connection of the abutments 9 9ª, one to the other and to the register-shaft 35 by the crank-arms 36 is such that when one of the abutments 9 or 9ª is at either limit of its traverse the other abutment 9ª or 9 is at the middle of its traverse. When the abutment 9ª has reached the limit of its inward stroke, the connected valve 13ª is brought to such position on the adjacent face of the valve-seat that one of its ports 27—as, for example, that which is shown as uppermost in Fig. 2—registers with the adjacent valve-seat port 18ª. The volume of fluid which has effected the inward stroke of the abutment 9ª will then pass backwardly through the conduit 14ª and ports 29 and 22 into the adjoining valve-seat chamber 24, thence into the communicating chamber 21, thence through the adjacent ports 27 and 18ª into the body of the valve 13ª, and thence through the same into the valve-seat chamber 25, and thence through the port 26 to the outlet-channel 5ª and outlet-nozzle 6ª. Fluid will be supplied by the valve 13ª to the chamber 2 on the outer side of the abutment 9 to effect the inward stroke of said abutment and will be thereafter released from said chamber to the outlet-channel and outlet-nozzle in the manner and sequence described in connection with the supply and release of fluid to and from the chamber 2ª, and through the corresponding valve and valve-seat ports and chambers. The outward stroke of the movable abutment 9 is effected by fluid which passes from the inlet-passage 5 of the casing and inlet-passage 15 of the valve-seat 11 into the central chamber 16 thereof, and thence through the recess 19 of the valve 13ª,

adjacent valve-seat port 18, and valve-seat chamber or passage 20 into the measuring-chamber 4, in which it acts upon the inner side of the abutment 9. This admission of fluid to the chamber 4 is made when the inward traverse of the abutment 9^a brings the valve 13^a into position to establish communication between the chambers 16 and 20 through the valve-recess 19. The fluid which effects the outward stroke of the abutment 9 and which has been measured in said stroke is displaced from the chamber 4 by the ensuing inward stroke of said abutment and passes out through the open-ended valve-seat passage 20, the port 18 thereof, and the adjacent port 27 of the valve 13^a (which has been brought into communication with the port 18 by the outward movement of the abutment 9^a) into the interior of the valve 13^a, from which it passes through the port 23, valve-seat chamber 25, and port 26 to the outlet-channel 5 and outlet-nozzle 6^a, and thence to the point of delivery for consumption. Fluid will be supplied by the valve 13 to the chamber 3 on the inner side of the abutment 9^a to effect the outward stroke of said abutment and will be thereafter released from said chamber to the outlet-channel and outlet-nozzle in the manner and sequence described in connection with the supply and release of fluid to and from the chamber 4 and through the corresponding valve and valve-seat ports and chambers.

A substantial feature of advantage in my invention is found in the positive connection of the controlling-valve and movable abutments and also in the elimination of the gallery and plurality of rods passing through stuffing-boxes to the registering mechanism which have been heretofore employed.

I claim as my invention and desire to secure by Letters Patent—

1. In a fluid-meter, the combination of an inclosing casing, inlet and outlet connections for the supply and discharge of fluid to and from said casing, two movable abutments oppositely located in said casing, a chambered valve-seat fixed in the casing between the movable abutments and having ported valve-faces on its opposite sides, two fluid-supply valves, each fitted to traverse on one of the valve-faces and controlling the flow of fluid from the inlet connection, through the ports and chambers of the valve-seat, alternately to opposite sides of one of the abutments, and from said abutment to the outlet connection, and direct connections, each coupling one of the supply-valves to, and effecting its reciprocation by, one of the movable abutments.

2. In a fluid-meter, the combination of an inclosing casing, inlet and outlet connections for the supply and discharge of fluid to and from said casing, two movable abutments oppositely located in said casing, a valve-seat fixed in the casing and having an end port communicating with the inlet connection, an opposite end port communicating with the outlet connection, a plurality of internal chambers, and lateral ports in valve-faces on its opposite sides, each communicating with one of said internal chambers, and two fluid-supply valves, each connected to one of the movable abutments, and traversing on one of the valve-seat faces, and controlling the flow of fluid, through the ports and chambers of the valve-seat, from the inlet connection alternately to opposite sides of the abutment with which said valve is unconnected, and from said abutment to the outlet connection.

3. In a fluid-meter, the combination of an inclosing casing, two movable abutments oppositely located therein, each subject to variable fluid-pressures on its opposite sides, a chambered valve-seat fixed in the casing between the movable abutments and having ported valve-faces on its opposite sides, two fluid-supply valves, each fitted to traverse on one of the valve-faces and connected to one of the movable abutments, and controlling the flow of fluid through the valve-seat to the opposite abutment, and connecting mechanism coupling the supply-valves one to the other and maintaining them in normal relative positions during their traverses.

4. In a fluid-meter, the combination of an inclosing casing, two movable abutments oppositely located therein, each subject to variable fluid-pressures on its opposite sides, a chambered valve-seat fixed in the casing between the movable abutments and having ported valve-faces on its opposite sides, two fluid-supply valves, each fitted to traverse on one of the valve-faces and connected to one of the movable abutments, and controlling the flow of fluid through the valve-seat to the opposite abutment, a rotatable shaft adapted to actuate a registering mechanism, and crank connections coupling the supply-valves one to the other and to said shaft.

5. In a fluid-meter, the combination of an inclosing casing, inlet and outlet connections for the supply and discharge of fluid to and from said casing, two movable abutments oppositely located in said casing, a chambered valve-seat fixed in the casing between the movable abutments and having ported valve-faces on its opposite sides, two fluid-supply valves, each fitted to traverse on one of the valve-faces and connected to one of the movable abutments and controlling the flow of fluid from the inlet connection, through the valve-seat, alternately to opposite sides of the abutment with which said valve is unconnected, a rotatable register-shaft passing through the casing and adapted to actuate an exterior registering mechanism, and connections coupling the supply-valves one to the other and to the register-shaft, and imparting movement to said shaft in and by the combined movements of the fluid-supply valves.

6. In a fluid-meter, the combination of an inclosing casing, inlet and outlet connections for the supply and discharge of fluid to and

from said casing, two movable abutments oppositely located in said casing, each subject to variable fluid-pressures on its opposite sides, two fluid-supply valves, each controlling the flow of fluid from the inlet connection to one of the movable abutments, and from said abutment to the outlet connection, and actuated by the opposite abutment, and two fluid-conduits, each connected to one of the fluid-supply valves and to the actuating-abutment thereof, and serving to transmit movement from the abutment to the valve and to convey fluid to and from the abutment.

7. In a fluid-meter, the combination of an inclosing casing, inlet and outlet connections for the supply and discharge of fluid to and from said casing, two movable abutments oppositely located in said casing, a valve-seat fixed in the casing and having opposite end ports communicating, respectively, with the inlet and the outlet connections, a plurality of internal chambers or passages, and lateral ports in valve-faces on its opposite sides, each communicating with one of said internal chambers, two fluid-supply valves, each connected to one of the movable abutments and traversing on one of the valve-seat faces, and controlling the flow of fluid, through the ports and chambers of the valve-seat, from the inlet connection to and from the abutment with which said valve is unconnected, supporting friction-rollers on which the fluid-supply valves are fitted to traverse, and springs bearing on the backs of said valves and maintaining them in operative contact with the valve-faces.

8. In a fluid-meter, the combination of an inclosing casing, the internal space of which comprises two oppositely-located outer measuring-chambers, two adjoining inner measuring-chambers, an inlet-channel, and an outlet-channel, two movable abutments, each separating one of the outer measuring-chambers from the adjoining inner measuring-chamber, a valve-seat fixed in the casing and forming part of the wall which separates the inner measuring-chambers one from the other, said valve-seat having opposite end ports, open, respectively, to the inlet and the outlet connections, a plurality of internal chambers or passages, and lateral ports in valve-faces on its opposite sides, each communicating with one of said internal chambers, two fluid-supply valves, each connected to one of the movable abutments and traversing on one of the valve-faces, and controlling the flow of fluid, through the ports and chambers of the valve-seat, from the inlet connection to and from the measuring-chambers on opposite sides of the abutment with which said valve is unconnected, a rotatable register-shaft passing through the casing and adapted to actuate an exterior registering mechanism, and crank connections, located in the outlet-channel of the casing and coupling the supply-valves one to the other and to the register-shaft.

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