

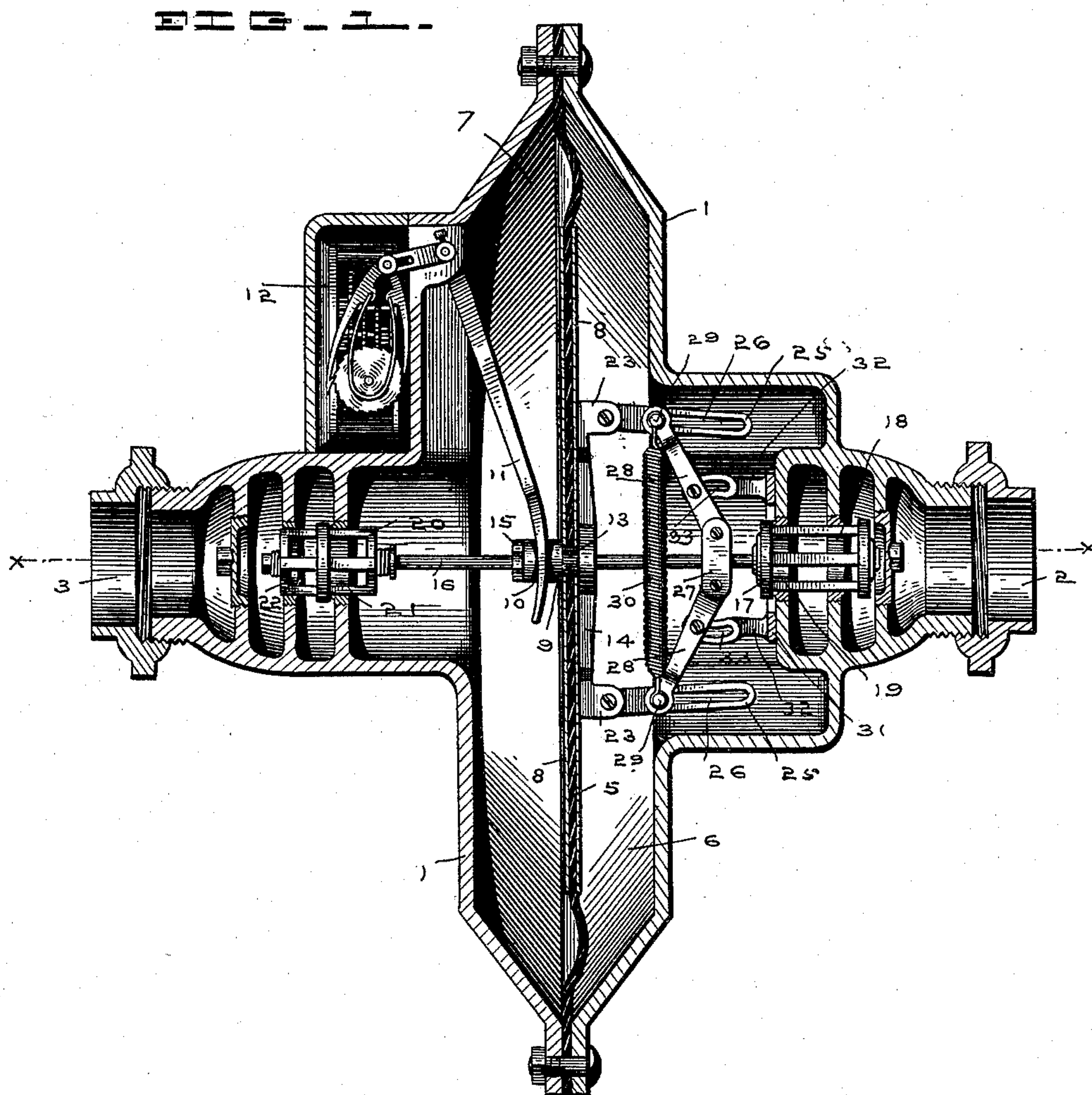
(No Model.)

2 Sheets—Sheet 1.

J. B. KNICKERBOCKER.
DIAPHRAGM METER.

No. 488,504.

Patented Dec. 20, 1892.



Witnesses

H. D. Neely
C. O. Griffith

Inventor

James B. Knickerbocker

By his Attorney

V. B. Lockwood.

(No Model.)

2 Sheets—Sheet 2.

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FIG. 2.

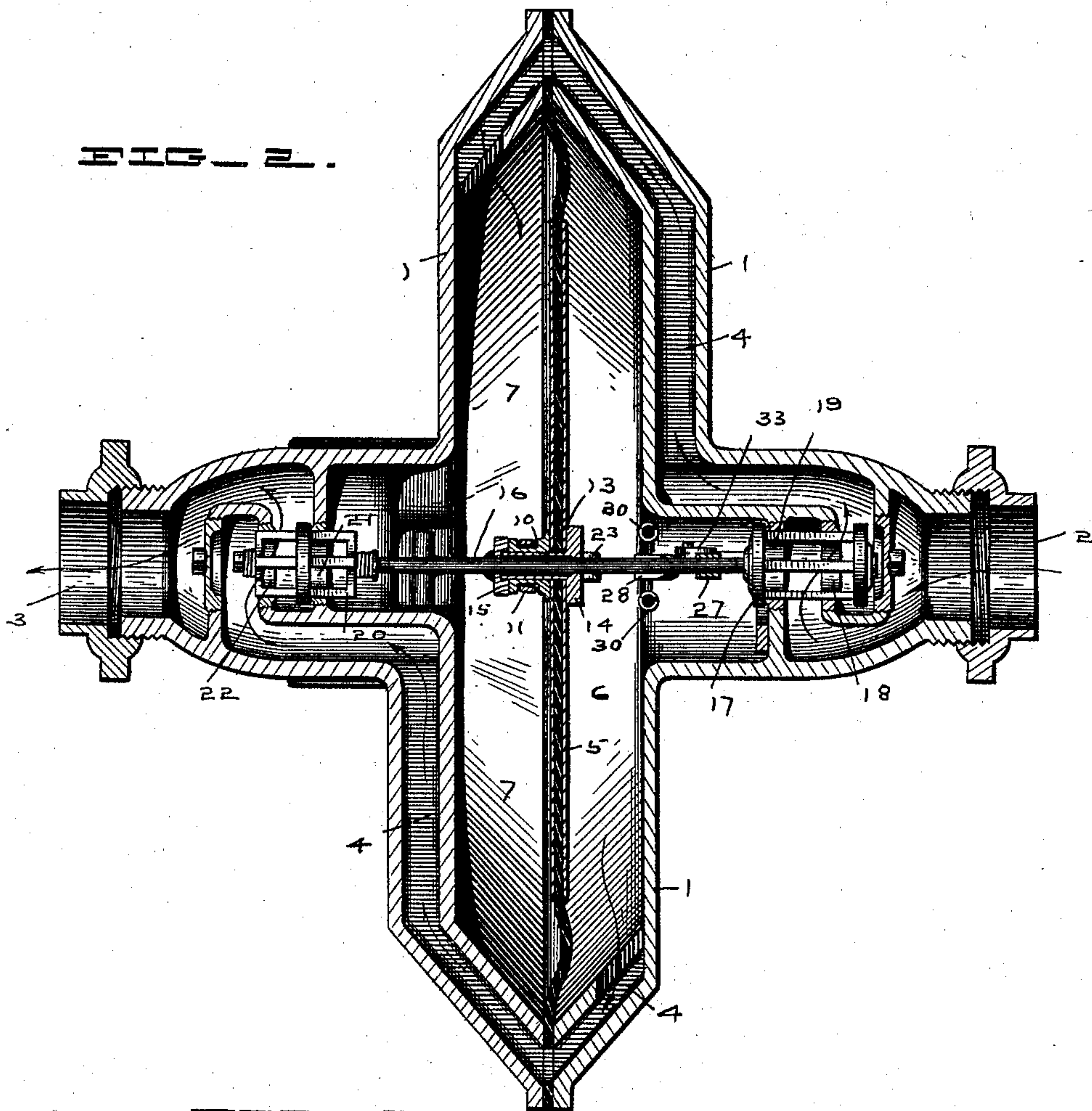
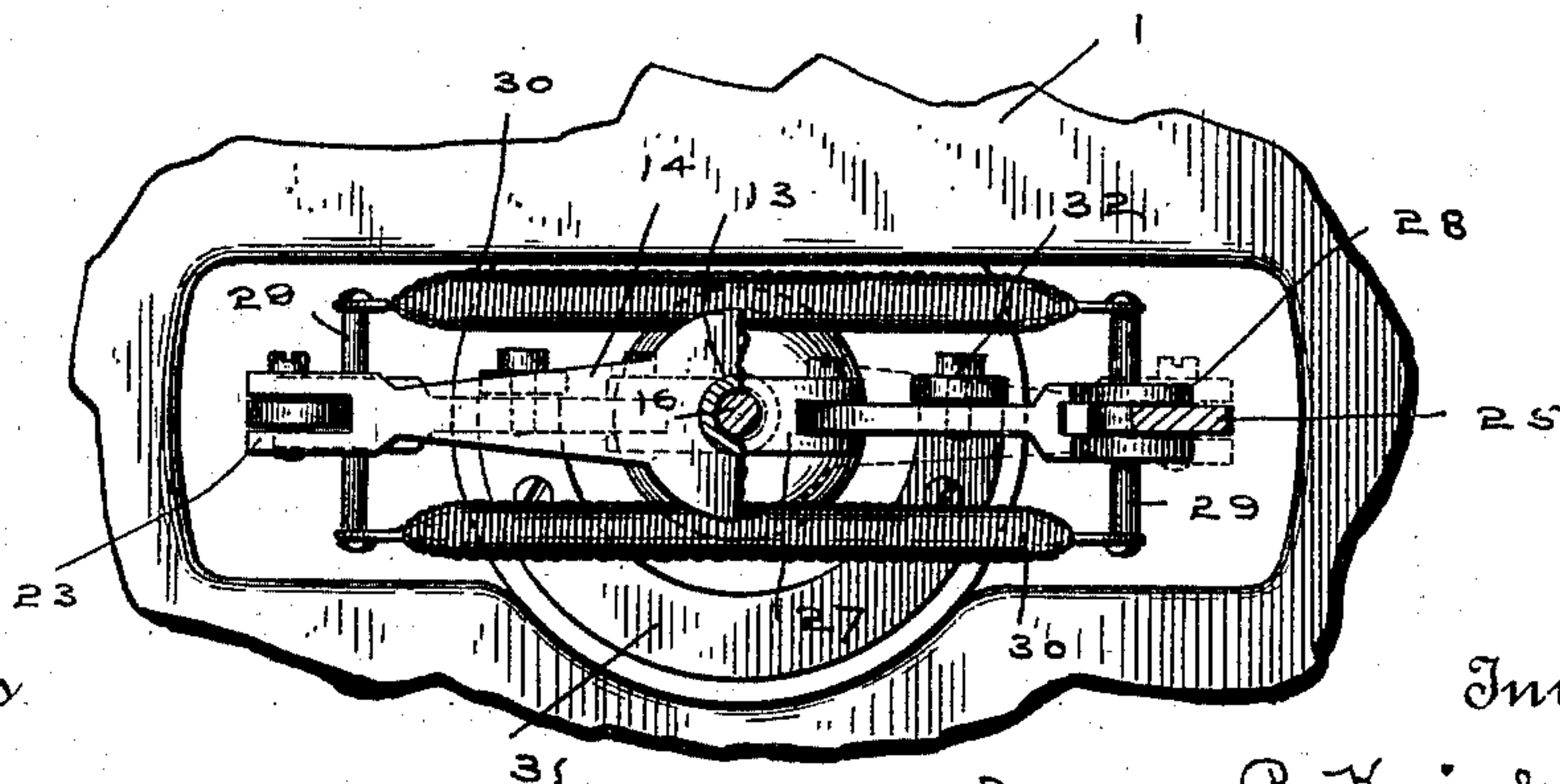


FIG. 3.



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UNITED STATES PATENT OFFICE.

JAMES B. KNICKERBOCKER, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO THE
KNICKERBOCKER METER COMPANY, OF SAME PLACE.

DIAPHRAGM METER.

SPECIFICATION forming part of Letters Patent No. 488,504, dated December 20, 1892.

Application filed June 16, 1892. Serial No. 436,978. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. KNICKERBOCKER, of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Gas-Meters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like figures refer to like parts.

My invention relates to the construction of gas or fluid meters, and more particularly to the spring mechanism for throwing the valves, and is an improvement on the device described and claimed in Letters Patent No. 468,008, issued to me February 2, 1892.

In the drawings Figure 1 is a longitudinal section of my device. Fig. 2 is a central cross section of the same on the line $x-x$, Fig. 1. Fig. 3 is an enlarged top view of the spring mechanism partly broken away.

In detail, (1) is a divided casing having an inlet (2), outlet (3), and a channel or passage way (4) for the gas, leading from the inlet to the gas chamber and from thence to the outlet.

(5) is a diaphragm secured between the halves of the casing, dividing the interior into two chambers (6 and 7). The diaphragm is composed of a central flexible sheet with metal backing plates (8) on either side, and (9) is a collar notched on opposite sides at (10) to receive the bifurcated arms of the lever (11) which operates the register (12). The collar (9) fits snugly over the sleeve (13), which is formed integral with the plate (14), and passes through the diaphragm, the plate fitting up against the same on one side and the collar (9) on the opposite side, the collar being retained on the sleeve by the nut (15) secured on the end of the same.

(16) is a valve rod which passes loosely through the central opening of the sleeve (13), the latter being cored out, as shown in Fig. 2, one end only bearing on the valve rod, the nut (15) performing a similar office at the opposite end of the sleeve, thus reducing the friction to a minimum.

(17) is a double valve mounted on the valve rod (16) on the inlet side of the casing, and operating alternately to close the ports (18 and 19) therein, and (20) is a single valve on

the opposite end of the rod, operating in a similar manner on the ports (21 and 22) on the outlet side. The valve ports are all provided with brass seats, as shown in Figs. 1 and 2, for reducing the wear by friction.

At either end of the plate (14) are formed brackets (23), and to each of these is pivoted the arm (25) having the slot (26). (27) is a double bracket rigidly secured to the valve rod at a point a little to one side of the double valve (17), and to opposite sides of this are pivoted arms (28), the outer ends of which straddle the arms (25), pins (29) passing through their ends and work in the slots (26), the pins extending outward on either side, and coiled springs (30) connect these arms together.

(31) is a curved base plate suitably secured to the inside of the casing around the double valve (17), and (32) are arms extending therefrom, their outer ends having slots (33) curved on a radial line with the pivotal points of the arms (28), and screws or pins pass through these near their center and work in the slots (33), and the movement of the arms is thus limited.

The operation of my improved meter is similar to that of the one shown in my former patent, the gas entering through the inlet (2), passing through the ports (4) in the direction of the arrows around the passage way to the gas chamber (7) on the left hand side of the diaphragm, as shown in Fig. 2, the expansion of the gas forcing the diaphragm to the right and carrying with it the plate (14) and the slotted arms (25), the ends of the slots engaging with the pins (29), carrying the spring arms (28) with it in their movement until the gas chamber (7) is filled, at which time the pins (29) carrying the springs (30) will have passed a straight line with the pivot pins of the arms (28) in the double bracket (27), and the tension of the springs will operate to throw the valve rod to the left, closing the port (18), and cutting off the flow of gas into the chamber (7), opening the inlet port (19) into the chamber (6), and at the same time opening the outlet port (21) from the chamber (7), and closing the outlet port (22) from the chamber (6), and the gas in the chamber will then pass out through the pas-

sage way (4) and through the outlet (3). The same operation is now repeated. The gas entering into the chamber (6), slowly filling the same, the diaphragm is carried toward the left, and with it the slotted arms (25), until the ends of the slots engage with the pins (29), with their springs carrying the arms (28) backward until the pins pass the line of the pivot points of the arms (28) in the double bracket (27), when the valve rod with its valves will be thrown to the right, bringing the springs and connecting parts back to their first position.

What I have obtained by this construction of the spring mechanism for throwing the valves is one where there is the least possible friction, the parts of the throwing mechanism being equally divided on either side of the valve rod, and therefore the friction is equal, and the meter can be placed in any desired position and work with equally as good results. As will be seen, the only points bearing against the valve stem are at each end of the sleeve (13), which passes through the diaphragm and around the valve stem, and no matter in what position the meter is placed, it will at all times give the same results, whereas in my former device there was always a good deal of friction on the valve stem and moving parts, and when placed in some positions the friction was so great that the meter would not operate as well as it should. Another improvement over my former meter is that the present device is much simpler in construction, more easily put in place, and the various parts are more readily adjusted, and, when in operation, the valves are always held firmly to their seats and the movements of the various parts are always in the opposite direction from the movement of the valves when thrown, so that a valve can never be moved prematurely, and as in my former device the throw is instantaneous.

In brief, what I have accomplished in this device is to retain the meritorious features of my former device, and to improve and perfect those that were likely to impair its successful operation.

The registering mechanism (12) of the present device will be readily understood, as it is similar in construction and operation to that shown in my former patent.

In some cases it may be desirable to form the curved slots 33, in the pivoted arms, 28, instead of in the brackets, 32, as shown in the drawings, and in any case where this is done the screws or pins which form the stops on the arms, 28, would be formed on the ends of the brackets, 32. This modification, however, would not be a departure from the principle of my invention, for the operation of the several parts would remain the same, the positions only being reversed.

What I claim as my invention and desire to secure by Letters Patent is the following:—

1. In a gas meter, a casing composed of two equivalent parts, inlet and outlet connections

on opposite sides thereof, a single flexible diaphragm centrally secured therein, such casing providing a channel for the passage of the gas through openings in and near the edge of the diaphragm, inlet and outlet valves seated in partitions formed in the halves of the casing adjacent to the inlet and outlet openings and connected by a valve rod passing through a central opening in the diaphragm, a lever connected with and operating a registering mechanism, its opposite end engaging with a notched collar, such collar held in position on a sleeve by a nut, such sleeve surrounding the valve rod and formed integral with a plate on the opposite side of the same, brackets formed on such plate, slotted arms pivoted to such brackets, spring arms pivoted to a bracket rigidly secured to the valve stem, pins passing through their outer ends and through the slotted arms, coiled springs connected to such pins connecting the outer ends of the two spring arms together, a base plate attached to the inside of the casing and provided with brackets having curved slots, pins connected to the spring arms and working in such slots for regulating the movement of the same, such spring arms operating to throw the valves when their outer ends have passed a line with their pivotal point, substantially as shown and described.

2. In a gas meter, a casing, an automatic lever mechanism for effecting the throw of the valves consisting of a plate attached to the diaphragm of the meter, brackets formed thereon, slotted arms pivoted to such brackets, spring arms pivoted to a bracket rigidly attached to the valve stem, pins passing through the outer ends of such spring arms and through the slotted arms, coiled springs attached to such pins and connecting the ends of such arms together, pins passing through such spring arms near their center and working in curved slots formed in brackets attached to the meter casing, the valves of such meter adapted to be thrown by the movement of the spring arms when the outer ends of the same have been forced past the line of their pivotal point by the movement of the diaphragm, substantially as shown and described.

3. In a gas meter having a central diaphragm, a plate secured on one side of the same, a sleeve formed thereon surrounding the valve rod and passing through the diaphragm, the interior of such sleeve cored out, leaving a bearing on the valve rod at one end, a notched collar secured on such sleeve by a nut, a bifurcated lever engaging such notches and connected with the registering mechanism, slotted arms pivoted to the plate on the opposite side of the diaphragm, the ends of such slots adapted to engage with pins passing through the ends of spring arms, the ends of such pins connected by coiled springs, the inner ends of such spring arms pivoted to a block secured on the valve rod, pins passing through the spring arms near their center and

working in slots for regulating the movement of the arms, valves adapted to be thrown by the movement of such arms when the outer ends of the same have been carried past a line with their pivotal points, substantially as shown and described.

4. In a gas meter, a central diaphragm, a plate on one side of the same connected with the mechanism for throwing the valves, a central sleeve formed on such plate surrounding the valve rod and passing through such diaphragm, the interior of such sleeve cored out, leaving a bearing at one end on the valve rod, a notched collar retained on the opposite end of such sleeve by means of a nut having bearings on the valve rod, a bifurcated lever connected with such notched collar and with the registering mechanism, substantially as shown and described.

5. In a gas meter, a valve rod connecting inlet and outlet valves, a bracket rigidly attached to such valve rod, with arms pivoted thereto, pins passing through their outer ends and connected by springs, a flexible diaphragm through which the valve rod passes, and mechanism connecting the diaphragm to the outer ends of the pivoted arms, whereby the diaphragm operates to force the outer ends of such arms past the center of their pivotal point, thereby actuating the valve rod and its valves alternately in opposite directions, substantially as shown and described.

6. In a gas meter, a casing composed of two equivalent parts, inlet and outlet openings on opposite sides thereof, a flexible diaphragm centrally secured in such casing forming gas chambers on opposite sides of such diaphragm, a channel for the passage of gas through openings in and near the edge of the diaphragm, inlet and outlet valves seated in partitions formed in the halves of the casing adjacent to the inlet and outlet openings, and connected by a valve rod passing through a central opening in the diaphragm, a register-

ing mechanism connected to the outlet side operated by the movement of the diaphragm, a plate centrally secured to the diaphragm and adapted to be carried forward by its movement, such plate provided with slotted arms for receiving the ends of jointed levers rigidly secured to the valve rod, the ends of such levers connected by springs for completing the throw of the valve rod inaugurated by the movement of the diaphragm, substantially as shown and described.

7. In a gas meter, a casing composed of two substantially equivalent parts, inlet and outlet openings on opposite sides thereof, a flexible diaphragm centrally secured therein and dividing the casing into two opposite gas chambers, a channel formed through openings in or near the edge of the diaphragm for permitting the passage of the gas, inlet and outlet valves seated in partitions adjacent to the inlet and outlet openings, and connected by a valve rod passing centrally through the diaphragm, registering mechanism on the outlet side connected to and operated by the movement of the diaphragm, a plate with brackets connected to the diaphragm on the inlet side, a pair of jointed levers rigidly connected to the valve rod, their ends pivoted in slotted arms secured to such bracket plate and connected diametrically across by suitable springs, whereby the movement of the valves inaugurated by that of the diaphragm will be automatically completed by the tension of the springs when the outer ends of the jointed levers have passed the central line of their pivotal points, all combined substantially as shown and described.

In witness whereof I have hereunto set my hand this 23d day of April, 1892.

JAMES B. KNICKERBOCKER.

Witnesses:

H. D. NEALY,
C. B. GRIFFITH.