(No Model.) 2 Sheets—Sheet 1.

M. L. SEVERY.

POWER PUMP.

No. 590,862. Patented Sept. 28, 1897.

Fig. 1.

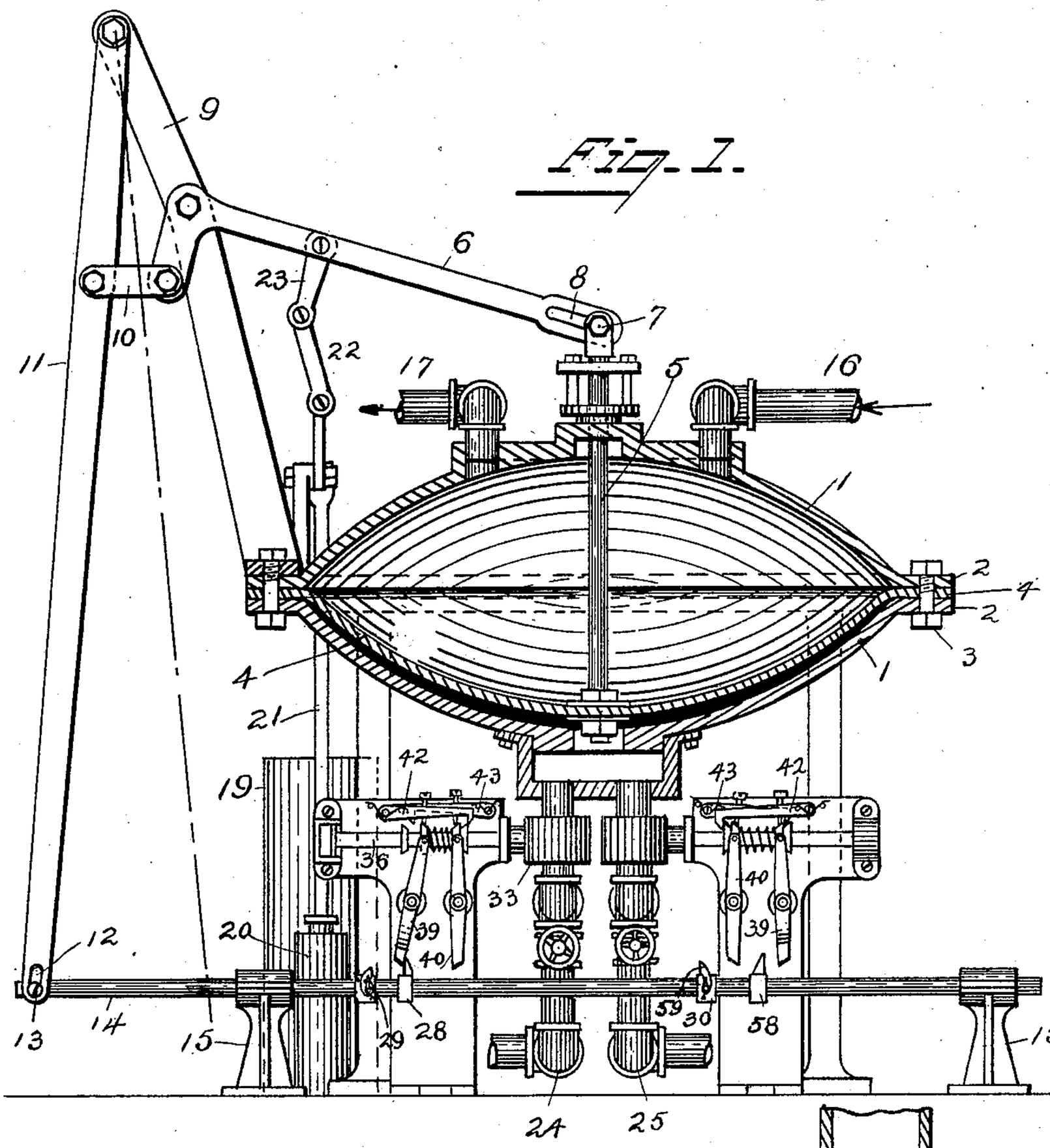
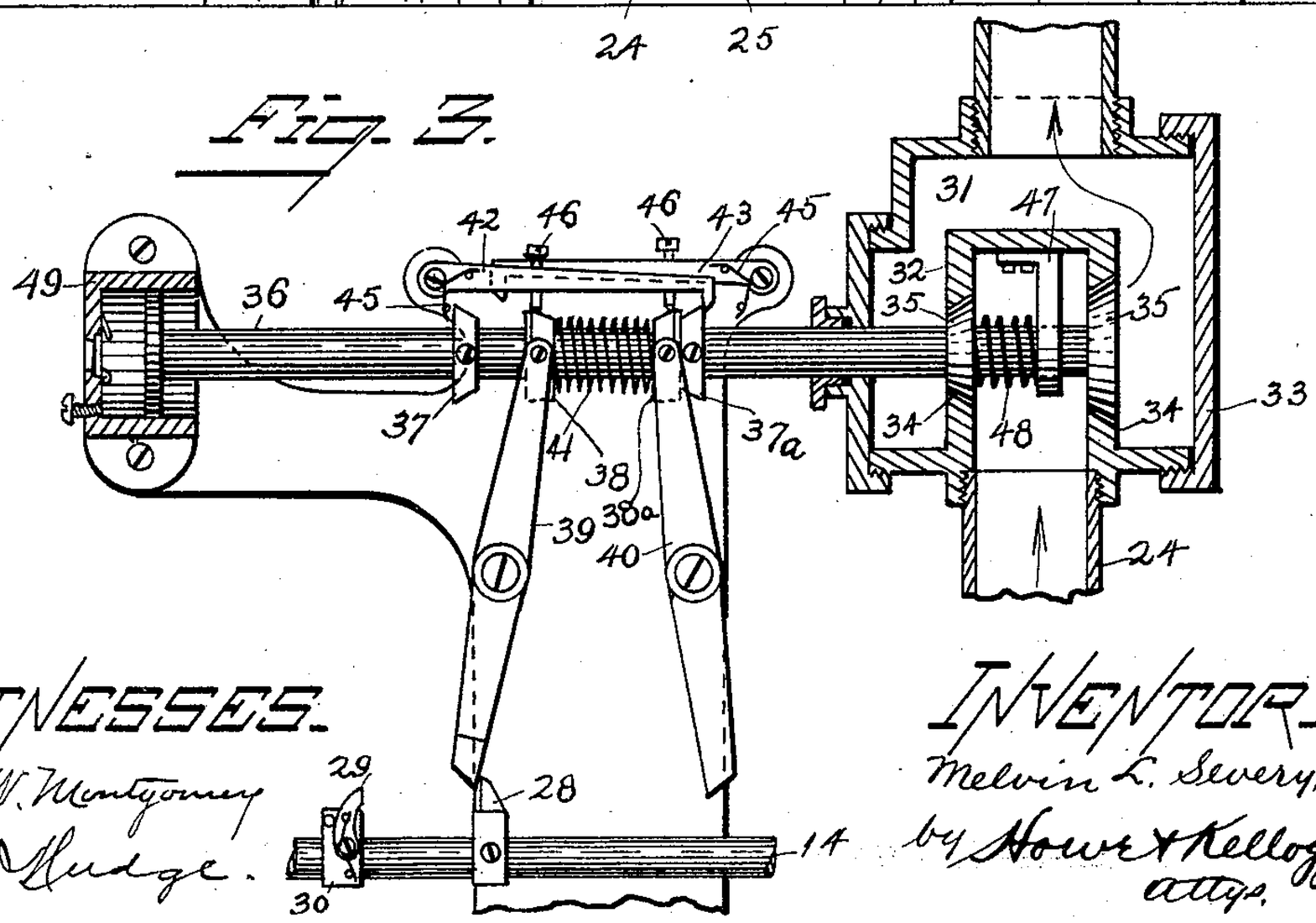


Fig. 3.



WITNESSES.

Wm. W. Montgomery

A. C. Hudge.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

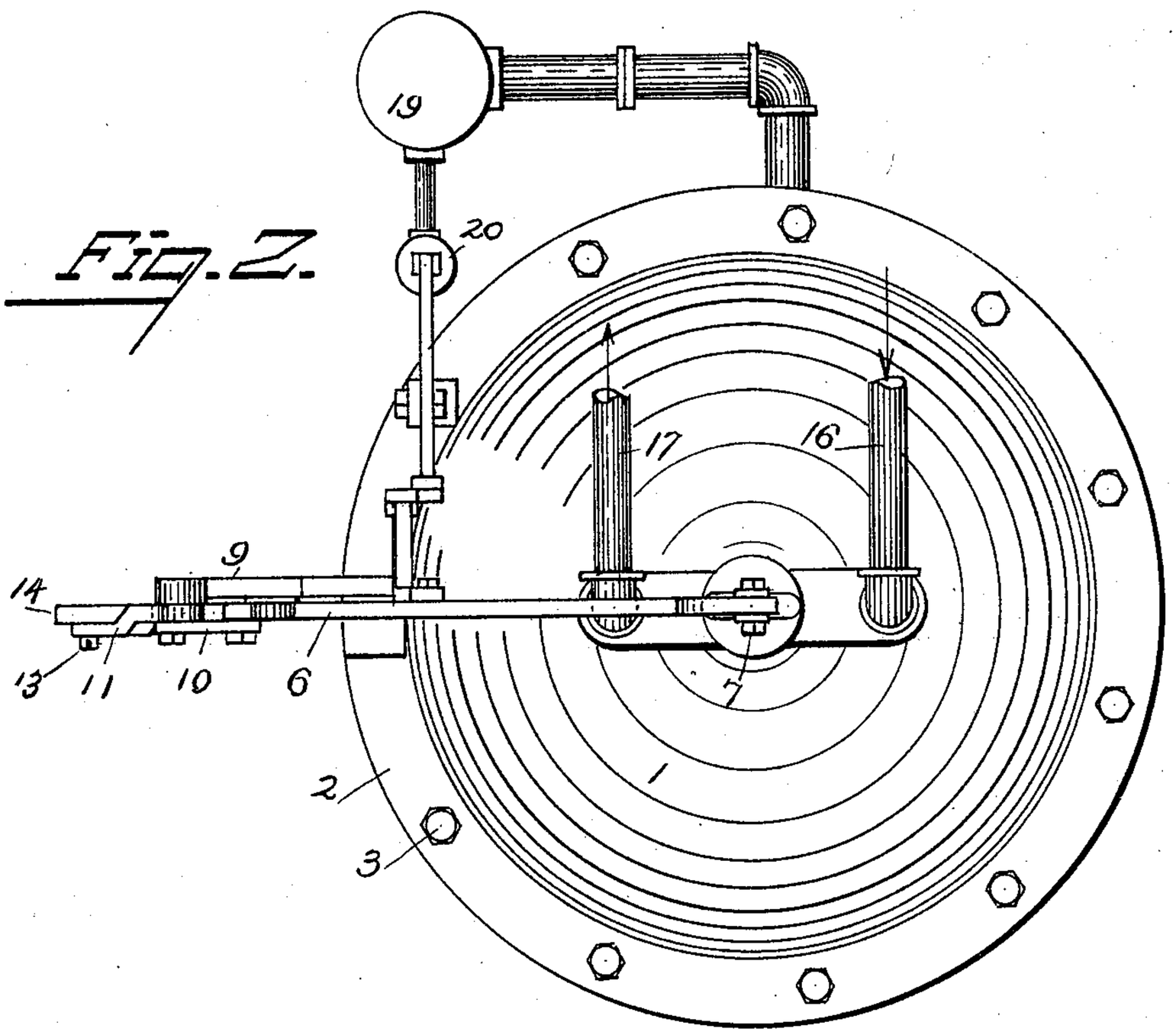
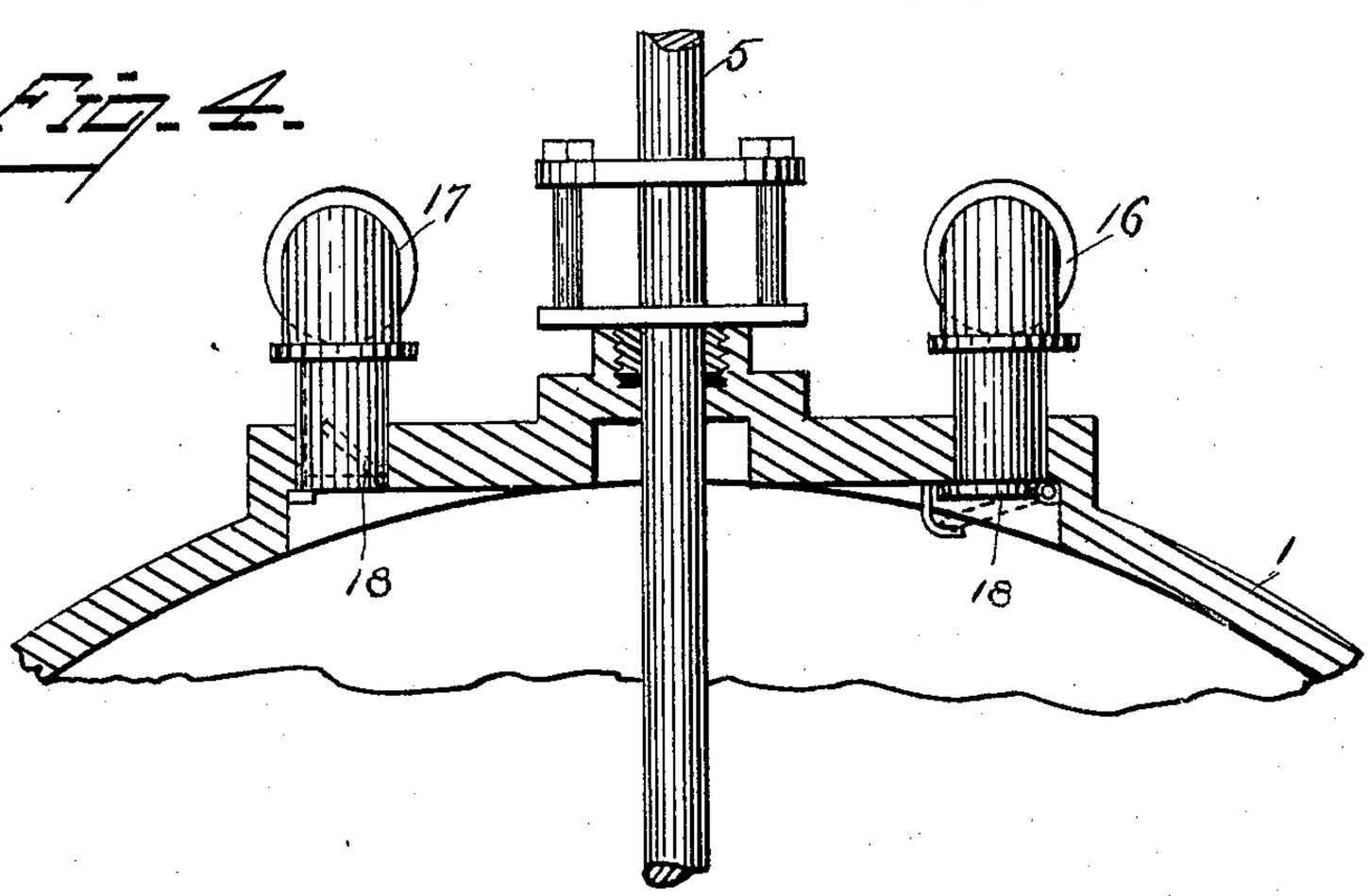


Fig. 4.



WITNESSES—

Wm. W. Montgomery

A. C. Mudge

INVENTOR—

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UNITED STATES PATENT OFFICE.

MELVIN L. SEVERY, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO FRANCIS DOANE, OF NORWOOD, MASSACHUSETTS.

POWER-PUMP.

SPECIFICATION forming part of Letters Patent No. 590,862, dated September 28, 1897.

Application filed February 6, 1896. Serial No. 578,272. (No model.)

To all whom it may concern:

Be it known that I, MELVIN L. SEVERY, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Power-Pumps, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to thermodynamic diaphragm-pumps, and more particularly to those which are operated by steam or vapor; and it consists, first, in the combination, with a single chamber having a flexible diaphragm dividing the chamber into two parts of substantially the same size, of induction and eduction pipes for the liquid to be pumped, separate supply and exhaust pipes for the actuating fluid, valves in these pipes, and mechanism, substantially as hereinafter more fully set forth, for operating these valves by the movement of the diaphragm, whereby a diaphragm-pump is produced of simple construction and efficient in operation; second, in mechanism thus operating these valves and constructed substantially as hereinafter more fully set forth, whereby the supply of the actuating fluid can be cut off at any point of the stroke, and, third, in mechanism whereby the valves of the supply and exhaust pipes of the actuating fluid can be suddenly operated to their full extent, thereby preventing "wire-drawing" and securing rapidity of action.

These various mechanisms are illustrated in the accompanying drawings, in which—

Figure 1 is a view in elevation of the pump, showing the chamber in section. Fig 2 is a plan view of the chamber. Fig. 3 is a view showing one of the valves in section and the operating mechanism in elevation, and Fig. 4 is a vertical sectional view of the top of the chamber, showing the induction and eduction pipes with the valves in the same.

In the several figures like numerals refer to like parts.

Referring to the drawings, 1 is a suitably-supported spheroidal chamber, preferably of metal, lined with porcelain or glass, or it may be made entirely of some silicious material. This chamber, as shown, is formed of two segments of a sphere opposed to one another, and the edge of each of these segments is provided with a flange 2, by means of which the segments are secured together in any suitable manner—as, for example, by bolts 3 passing through the opposed flanges. I do not confine myself to this particular form of chamber, as other shapes could be used to carry out my invention.

A diaphragm 4, of some flexible material not necessarily metal, but preferably water-proof and air and steam tight—as, for example, a fabric of cloth and rubber where low temperatures are to be used—is secured by its edge between the opposing flanges, or secured in any other suitable manner, so that it will be in the plane of the major axis of the spheroidal chamber. The area of the diaphragm is substantially equal to that of one-half of the interior surface of the chamber, so that the diaphragm will normally be in substantial contact with the inner surface of either one of the segments.

The chamber is preferably made spheroidal instead of spherical in order that the diaphragm may be more readily adapted to the inner surface of the segments, and where a metallic diaphragm is used the chamber might be even flatter than shown. The inner diameter of the spheroid may vary, but a suitable ratio between the major and minor diameters is that indicated by the figures. To the center of this diaphragm is suitably secured a vertical rod 5, which passes through a suitable packing in the top of the chamber and is connected to one arm of a bell-crank lever 6 by means of a pin 7, passing through a slot 8 in the horizontal end of the lever 6. This lever 6 is pivoted to an upright standard 9, attached to the chamber or otherwise supported. The other arm of the lever 6 is connected by a pivoted link 10 with the lever 11, pivoted at one end to the standard and at the other end provided with a slot 12, through which passes a pin 13 on the end of the horizontal rod 14, reciprocating on supports 15. The rod 14 and lever 11 are thus connected by the pin and slot, and as the lever 11 moves it gives a reciprocating movement to the rod 14.

Opening into the top of the chamber are the induction and eduction pipes 16 and 17, respectively, for the water, oil, air, or other fluid to be pumped. In each of the pipes is

a valve 18, the valve in the induction-pipe opening inward and the valve in the eduction-pipe 17 opening outward.

When the actuating fluid is exhausted from the chamber, the diaphragm 4 is drawn toward the bottom of the chamber and the fluid to be pumped will be drawn into the top of the chamber through the induction-pipe 16, and when the actuating fluid is admitted into the chamber the diaphragm will be forced toward the top of the chamber and the fluid contained in the top of the chamber will be discharged from the same through the eduction-pipe 17. By the reciprocating movement of the diaphragm a continuous flow of fluid through the chamber is maintained.

19 is the condenser; 20, the condenser-pump; 21, the pump-rod connected by links 22 and 23 to the lower arm of the bell-crank lever 6.

24 is the supply-pipe for the actuating fluid, and 25 is the exhaust-pipe. These pipes are placed side by side and both open into the bottom of the chamber. Connected to each of these pipes is a valve-chamber and valve, which are similar in construction both for the supply and exhaust pipes, and each is operated by similar mechanism, which is shown enlarged in Fig. 3.

In order to prevent wire-drawing of the actuating fluid and to secure the proper rapidity of action in the pump, it is desirable that the valves in both the supply and exhaust pipes should be suddenly operated to their full extent, so as, in the one case, to secure an immediate full supply of the actuating fluid to the chamber, and, in the other case, a quick exhaust from the chamber with minimum of back pressure, and the mechanism operating the valves is designed to accomplish this result and is constructed as follows:

On the reciprocating horizontal rod 14 are two pairs of fingers 28 29 and 58 59, each pair being similar in construction and one pair acting on the valve mechanism of the supply-pipe and the other on the valve mechanism of the exhaust-pipe. In the drawings the two right-hand fingers are for operating the valve mechanism of the exhaust-pipe and the two left-hand fingers are for operating the valve mechanism of the supply-pipe. The fingers 29 59 are curved on one side and straight on the other and are pivoted to blocks 30, adjustably fixed upon the rod 14, springs being used to maintain the straight side of the fingers in a vertical position, the straight sides of the fingers being turned toward each other.

The valve-chamber is formed of two cylinders separated by a space 31. The inner cylinder 32 is connected to the exhaust or to the supply pipe, as the case may be, and the outer cylinder 33 is connected to the spheroidal chamber 1. In the walls of the inner cylinder are two openings 34 opposite to one another, which openings are closed by puppet-valves 35, attached to a reciprocating rod 36. The valve-chambers are side by side and the rods to which the puppet-valves are attached are in the same line and extend in opposite directions. Upon the rod 36 are fixed two beveled collers 37 37ª, having their bevels turned toward one another, and between these two fixed collars are two loose beveled collars 38 38ª, beveled in the same direction as the fixed collars and having their bevels turned toward one another. To each of these loose collars respectively is attached one end of one of two levers 39 and 40, pivoted opposite to one another on a suitable standard. The lower ends of these levers are oppositely beveled off and are struck by the adjustable fingers 28 29 and 58 59, and the lever 39 is offset at its lower end to escape the action of the fingers 29 and 59, which are only intended to act upon the lever 40. Between the two loose collars is a coiled spring 41 on the rod 36. 42 and 43 are two horizontal levers each pivoted to the standard and turned toward one another and each is provided at its end with a downwardly-turned hook. This hooked end is given a downward tendency by means of a suitable spring 45 on the other end of the arm, and in each lever is a vertical screw 46.

On the rod 36 between the inner puppet-valve and a plate 47, extending from the inner cylinder and having the rod passing through it, is a helical spring 48. The outer end of the rod 36 is attached to the piston of an air-cushion 49, provided with an adjustable air-vent by means of which air-cushion the return of the valves to their seats is slightly retarded just before their point of contact, so that they will not pound and become injured by coming in violent contact with the seats.

The function of the devices described can be best explained by the description of the operation of the mechanism.

In the drawings the several parts of the mechanism are shown as in the position which they have when the piston-rod 5 is just completing its downward stroke and the horizontal reciprocating rod 14 its stroke to the left. The valve on the exhaust-pipe is closed and the valve to the supply-pipe is just ready to be opened. In order to effect the upward movement to the diaphragm and the consequent discharge of the contents of the chamber through the eduction-pipe, it will be necessary to admit the actuating fluid under the diaphragm. The movement of the rod 14 to the left has caused the finger 28 to move the lever 39 and collar 38, thus compressing the spring 41 and forcing the collar 38ª against the collar 37ª, which is fixed on the shaft 36. This collar, and by it the shaft, is prevented from moving by means of the hook on the end of the lever 42, which will retain it in this position till released by the screw 46 in the lever 42, riding up the collar 38, which will raise the lever 42, thus allowing the spring 41 to move the shaft and open the valves 35. The valves will be locked in the open position by the collar 37 engaging the

hook on the lever 43. On the return movement of the rod 14 the finger 29 will pass the lever 40, owing to the offsetting of the finger, but the finger 29 will strike the end of the lever 40 and compress the spring 41 against the collar 37 till released by the raising of the lever 43 in a similar manner to the operation described, when the valves will be closed.

The operation of the valves in the exhaust-pipe is similar to the operation of the valves in the supply-pipe and need not be particularly described.

It will be seen that by the reciprocation of the rod 14 and the adjustable fingers on the same the exhaust and supply ports are alternately opened and closed and that the point of cut-off is rendered adjustable by the movement of the fingers along the rod 14.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In the herein-described pump, the combination of the diaphragm-chamber 1 and diaphragm 4; the rod 5 connected with the diaphragm; bell-crank lever 6; lever 11; link 10 connecting levers 6 and 11; the reciprocating rod 14 connected with lever 11; beveled finger 28 and spring-finger 29, both on rod 14; the pivoted levers 39 40; rod 36; fixed collars 37 37ª on rod 36; loose collars 38 38ª, each connected respectively with levers 39 40; spring 41 between the loose collars; spring-levers 42 43; pins 46 46 on said levers; the valve-casing connected with chamber 1 and composed of an outer chamber 33 and an inner chamber 32 having valve-seats 34 34; valves 35 35 on rod 36; plate 47; spring 48 between the plate and one of said valves; and the air-cushion 49 having its piston attached to rod 36; substantially as shown and described.

2. The combination of the reciprocating rod 14; beveled finger 28 and spring-finger 29, both on said rod; the pivoted levers 39 40; rod 36; fixed collars 37 37ª on rod 36; loose collars 38 38ª connected respectively with levers 39 and 40; spring 41 between loose collars 38 38ª; spring-levers 42 43; and pins 46 46 on levers 42 43; substantially as shown and described.

3. The combination of the rod 5; bell-crank lever 6; lever 11; link 10 connecting levers 6 and 11; reciprocating rod 14 connected with lever 11; beveled finger 28 and spring-finger 29, both on said rod; the pivoted levers 39 40; rod 36; fixed collars 37 37ª on rod 36; loose collars 38 38ª connected respectively with levers 39 and 40; spring 41 between loose collars 38 38ª; spring-levers 42 43; and pins 46 46 on levers 42 43; substantially as shown and described.

4. The combination of the rod 5; bell-crank lever 6; lever 11; link 10 connecting levers 6 and 11; reciprocating rod 14 connected with lever 11; beveled finger 28 and spring-finger 29, both on said rod; the pivoted levers 39 and 40; rod 36; fixed collars 37 37ª on rod 36; loose collars 38 38ª connected respectively with levers 39 40; spring 41 between the loose collars; spring-levers 42 43; pins 46 46 on levers 42 43; the valve-casing composed of an outer chamber 33 and the inner chamber 32 having valve-seats 34 34; valves 35 35 on rod 36; the plate 47; spring 48 between the plate and one of the valves; and air-cushion 49 having its piston attached to rod 36; substantially as shown and described.

In testimony whereof I have hereunto subscribed my name this 7th day of January, A. D. 1896.

MELVIN L. SEVERY.

Witnesses:
CHAS. A. KELLOGG,
WM. W. MONTGOMERY.

Correction in Letters Patent No. 590,862.

It is hereby certified that Letters Patent No. 590,862, granted September 28, 1897, upon the application of Melvin L. Severy, of Boston, Massachusetts, for an improvement in "Power-Pumps," was erroneously issued to Francis Doane, as owner of the entire interest in said invention; that said Letters Patent should have been issued to the inventor *Melvin L. Severy, and Francis Doane, jointly*, said Francis Doane being the assignee of nine-twentieths interest only in said patent, as shown by the record of assignments in this Office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 26th day of October, A. D., 1897.

[SEAL.]

THOS. RYAN,
First Assistant Secretary of the Interior.

Countersigned:

BENJ. BUTTERWORTH,
Commissioner of Patents.