

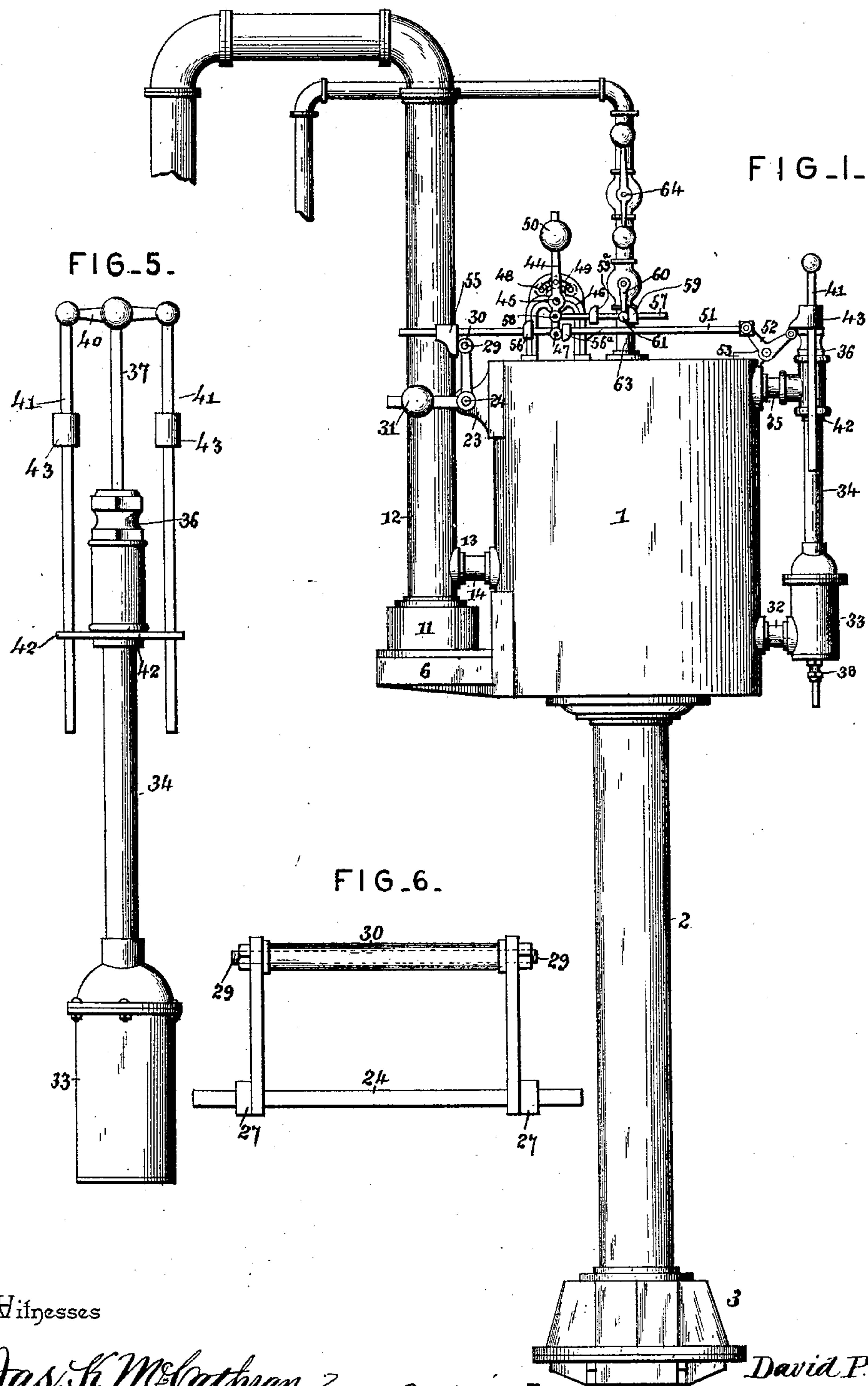
(No Model.)

3 Sheets—Sheet 1.

D. P. BURDON.  
STEAM VACUUM PUMP.

No. 482,072.

Patented Sept. 6, 1892.



Witnesses

Inventor

Jas. K. McLaughlin

By his Attorneys,

David P. Burdon

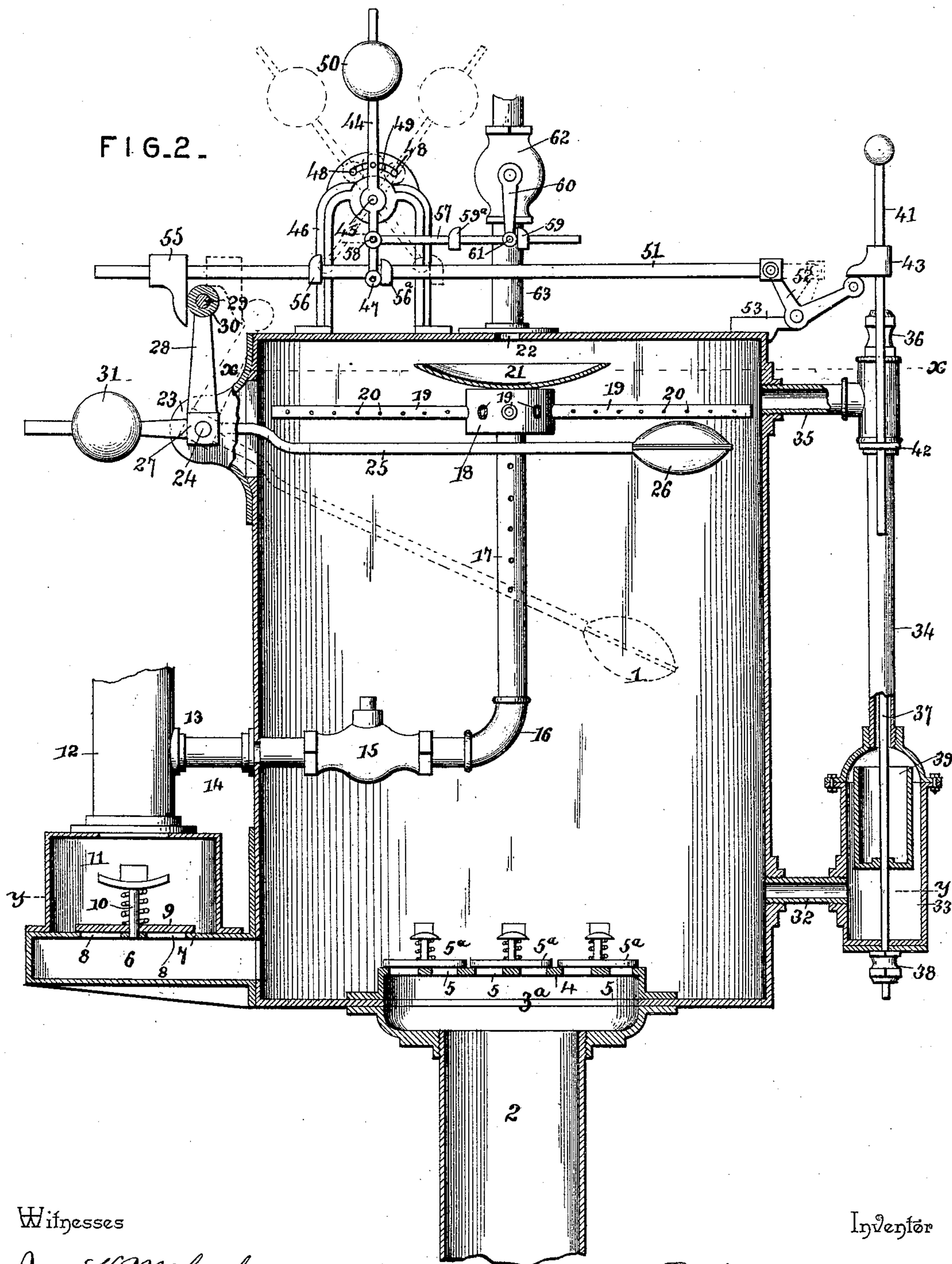
D. P. McLaughlin

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FIG. 3.

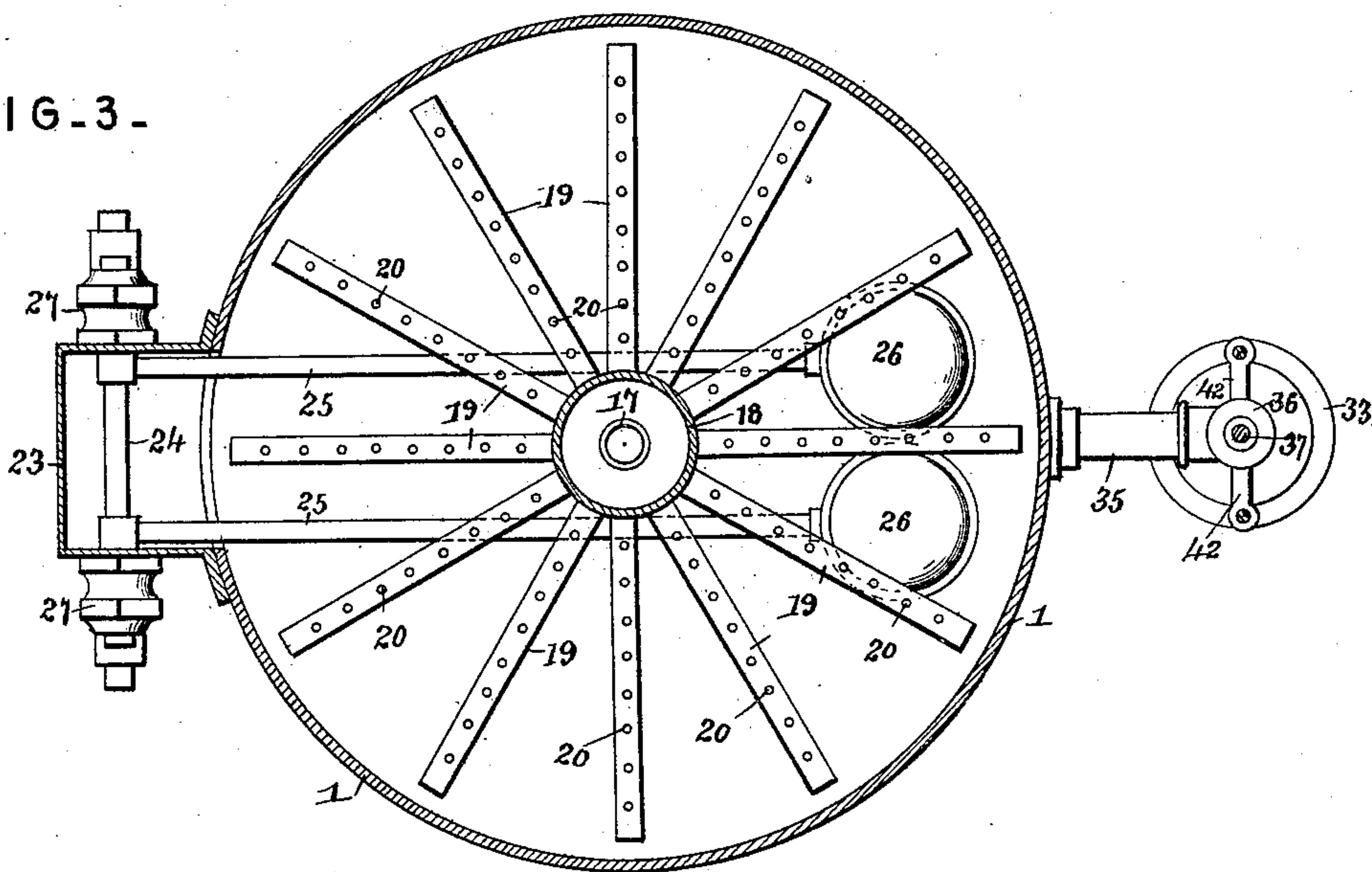
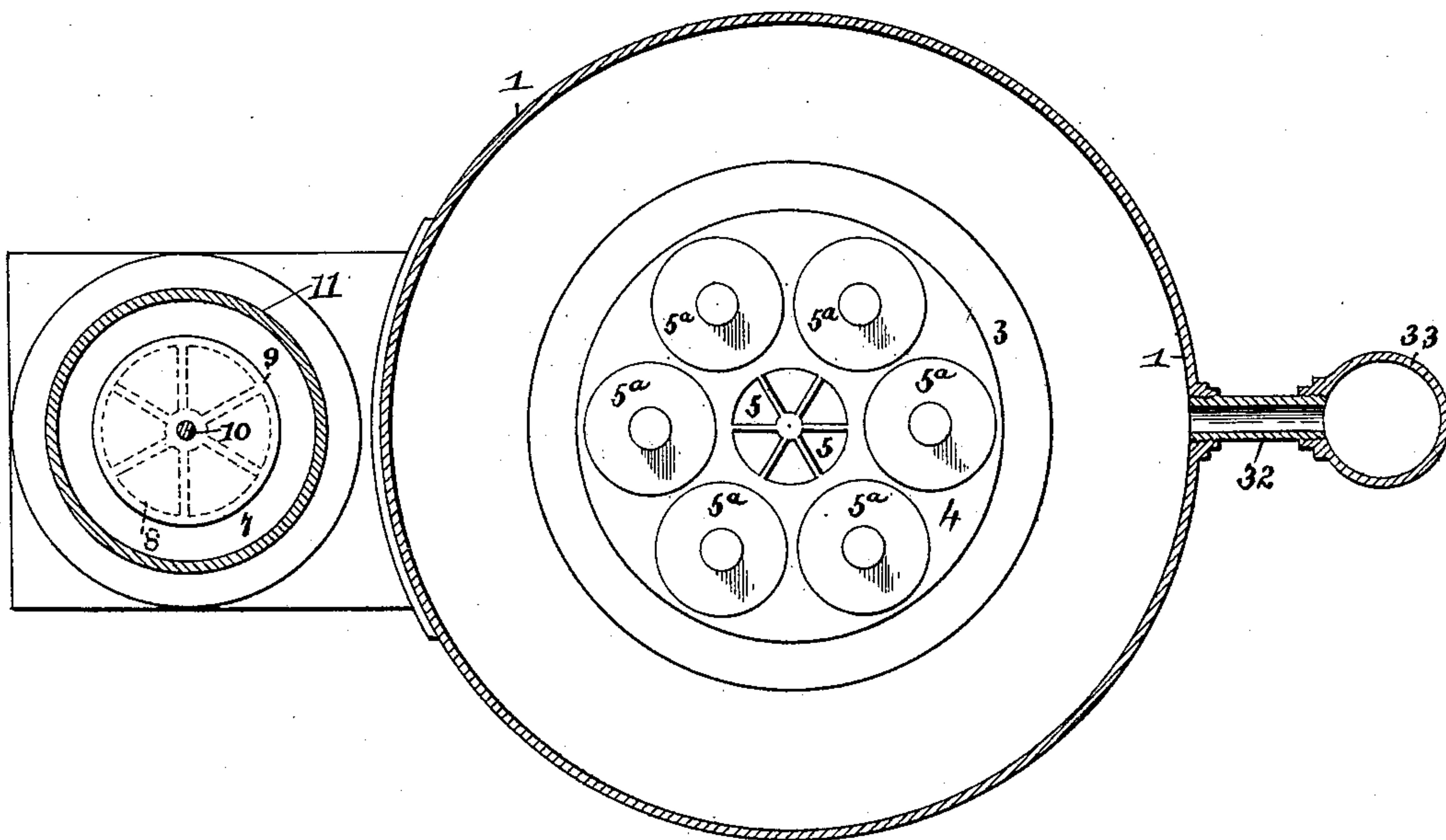


FIG. 4.



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# UNITED STATES PATENT OFFICE.

DAVID P. BURDON, OF JACKSONVILLE, FLORIDA, ASSIGNOR OF ONE-HALF  
TO PAUL SATTELKAU, OF SAME PLACE.

## STEAM VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 482,072, dated September 6, 1892.

Application filed September 24, 1891. Serial No. 406,663. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID P. BURDON, a citizen of the United States, residing at Jacksonville, in the county of Duval and State of Florida, have invented a new and useful Steam Vacuum-Pump, of which the following is a specification.

My invention relates to steam vacuum-pumps; and it has for its object to provide a pump of this class which is particularly adapted for automatically lifting and forcing water from a source of supply for whatever use the pump may be employed and being peculiarly adapted for use as a railroad-tank feeder or for forcing the water directly into the locomotive-tender; but, as stated, is applicable to be used for whatever purpose desired.

With these and other objects in view, which will readily appear, the invention consists in the novel construction hereinafter more fully described, illustrated in the accompanying drawings, and specifically pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation of a steam vacuum-pump constructed in accordance with my invention. Fig. 2 is a vertical section of the same, some of the parts being in dotted positions. Fig. 3 is a horizontal section on the line  $x x$  of Fig. 2. Fig. 4 is a similar view on line  $y y$  of Fig. 2. Fig. 5 is a detail end view of the gravitation cup-operated stem and tappets. Fig. 6 is a detail view of one of the double bell-crank levers.

Referring to the accompanying drawings, 1 designates the main receiving and discharging chamber of the pump, and is preferably cylindrical in shape, the same being adapted to be supported upon the tubular suction-pipe 2, the lower end of which is provided with the upwardly-opening foot-valves 3, which end is adapted to be beneath the water used as a source of supply. At the junction of the tubular upright or conducting pipe with the bottom of the cylinder 1 is formed a suction-chamber 3<sup>a</sup>, the upper face of which forms a valve-seat 4, which is provided with a series of circularly-arranged apertures 5, that are adapted to be normally closed by the upwardly-opening spring-pressed valves 5<sup>a</sup>,

which are circular in shape to cover the circularly-arranged series of openings. Connected to the bottom edge on one side of the cylinder is a closed discharge-chamber or outlet-spout 6, the upper face of which forms a valve-seat 7, having a series of circularly-arranged openings 8, forming a gridiron valve-seat, which supports the upwardly-opening circular valve 9, located thereover and mounted upon the stem 10, the same being inclosed within the valve-chamber 11, located over the top of the discharge-outlet 6. Secured or connected to the top of the valve-chamber 11 is the discharge-pipe 12, extending upwardly therefrom above the top of the tank and terminates at the tank, locomotive-tender, or any other receptacle to which it is designed to conduct the discharged water. Connected to said discharge-pipe 12 at 13 is the lateral conducting spray-pipe 14, extending from said discharge-pipe through the side of and into the large cylinder 1, and is provided within said cylinder with an ordinary check-valve 15, which prevents the return of the water through the said pipe to the discharge-pipe after the water has been once conducted within the same. By a suitable elbow 16 or other connection a vertical perforated spray-pipe 17 is connected with said conducting-pipe 14 and terminates at its upper end in a condensing-chamber 18, larger than the diameter of the pipe, and from which projects a series of radial arms 19, horizontally arranged with relation to the main pipe 17, and also provided with a series of perforations 20, by means of which a fine spray is injected within the cylinder at the proper time, and said enlarged spray-condensing chamber 18 is adapted to support upon the top thereof the concaved diffusion-disk 21, adjacent to the top of the tank and directly beneath the steam-inlet opening 22 in the top of said cylinder. The enlarged diameter of the chamber 18 provides a reservoir, as it were, to receive and collect the water and distribute the same under equal force through the divers pipes connected therewith. The upper end of said cylinder, upon one side thereof, is provided with a supplemental boxing or casing 23, that is adapted to accommodate the transverse shaft 24, journaled in the sides thereof, and to



which are secured the arms or rods 25, carrying at their inner ends within said cylinder the floats 26 that are adapted to rise and fall with the rise and fall of the water within the cylinder. The said shaft 24 projects without the sides of said casing 23 and through the ordinary packing or stuffing boxes 27 and is adapted to receive the double bell-crank levers 28, the upper ends of which are connected by the transverse rod 29, upon which is mounted the friction contact-roller 30, while the outer ends or arms of said bell-crank levers are adapted to receive the laterally-adjustable weights 31, working thereover and regulating and balancing the rising and falling floats within the cylinder. A branch pipe 32 is connected with said cylinder upon the side opposite the discharge-outlet thereof and supports the cylinder 33, from the upper end of which extends the tube or pipe 34, connected with the upper end of the cylinder by a supplemental branch pipe 35, and said pipe or tube is provided at its upper end with a stuffing-box 36, that is adapted to receive the stem or rod 37 passing therethrough and extending through said tube or pipe and the cylinder and works in the stuffing-box 38 at the lower end of the same. Mounted upon the rod or stem 37 and within the cylinder 33 is the float-cup 39, that is adapted to rise and fall with the rise and fall of the water in the adjacent cylinder 1, and thereby vertically reciprocates said stem. To the upper end of said stem is connected a cross piece or bar 40, from which depends the opposite parallel arms 41, working in the bearing-plate 42, secured to said tube 34, and said arms are adapted to receive the tappets or collars 43, mounted thereon and carried by the reciprocation of the stem 37. A tilting lever 44 is pivoted centrally at 45 to the U-shaped casting 46, supported upon the cylinder 1, and is provided at its lower end with the friction contact-roller 47 and the inwardly-projecting stud or roller 48, that is designed to travel in the segmental slot 49, located in said U-shaped casting, and by means of which the movement of said tilting lever is limited. An adjustable weight 50 is mounted upon the upwardly-extending end of said arm or lever and is adapted to throw the same sharply to the right or left after said lever has assumed a vertical position in the manner to be presently described. The main valve-operating rod 51 is supported upon and horizontally over the top of the cylinder 1 and is connected at one end to the arm of the double bell-crank lever 52, pivoted upon the bracket 53 at one end of said cylinder, and said bell-crank lever is provided with the connecting friction-roller, similar to roller 30, that is designed to be engaged by the tappets 43, carried by the reciprocating stem 37, and thus causes the said valve-rod 51 to be controlled from that side of the cylinder in one direction. The opposite end of said lever or arm 51 is provided with the downwardly-extending tappet 55, that is designed to be engaged by the roller

30 upon the double bell-crank lever 23 when the floats have been carried to a horizontal position, and thus draws said rod in an opposite direction to that in which the same is drawn by the tappets 43. The said lever or arm 51 is further provided with the intermediate tappets 56 and 56<sup>a</sup>, respectively, between which the contact-roller 47 of the tilting lever 44 is designed to travel, and accordingly as said rod or lever 51 is moved in either direction the said tappets carry the tilting lever 44 in a vertical position, in which position the weight 50 thereon overbalances the same and throws the lever sharply to the right or left, according to whether the lever or rod 51 is reciprocated to the left or right, and the sudden tilting movement of said weighted lever sharply reciprocates the small valve-arm 57, pivotally secured at 58 near the lower end of the tilting lever 44, and carries the spaced tappets 59 and 59<sup>a</sup>, between which the balance valve-lever 60 depends and carries the contact friction-roller 61, which is engaged by either of the said tappets, according to the direction in which the tilting lever falls, and thus opens the balance steam-valve 62, operated by said lever and located in the steam-pipe 63, communicating with the steam-opening 22, located in said cylinder directly over the diffusion-plate 21. The said steam-pipe 63 is connected with any suitable generating-boiler, and is further provided with a supplemental hand-operated balance-valve 64, by means of which the steam is let on and entirely shut off at the option of the operator. The cylinders 1 may be duplicated, if desired, and connected with a single water-supply pipe by suitable connection for the purpose of obtaining an increased volume of water, if desired.

The operation of the pump is automatic after the same has once been started by the operator. Primarily the cylinder 1 is filled with a sufficient quantity of water in order that the level of the same may be above the inlet spray-pipe 14, so that water will stand within the same within the cylinder. The steam is now let on by the operator through the hand-operated balance-valve 64, located in the steam-supply pipe 63, and the lever 60 of the balance-valve 63 is turned by hand, so as to give a free passage of the steam to within the cylinder. The steam filling the cylinder completely is almost instantly condensed by the spray-condenser 18, thus completely filling the cylinder with water and bringing the floats 26 up to a horizontal position, thus communicating motion through the bell-crank levers 23 to the horizontal arm or lever 51 by means of the contact-roller 30 of said bell-cranks engaging the tappet 55 on said rod or arm, and through the smaller intermediate tappets 56 and 56<sup>a</sup>, engaging the lower end of said tilting lever, causes the same to be sharply thrown to one end of its limit of movement, and thus starts the automatic operation of the pump. It can be readily seen that after the



tilting lever has been caused to assume a vertical position the weight of the ball or other suitable weight 50 on the end thereof causes the same to fall sharply to the right, as illustrated in the drawings, thus carrying its lower end in an opposite direction and communicating motion to the valve-operating arm 57, carrying the tappets which engage the contact-roller 61 upon the end of the valve-operating lever 60, thus opening the passage-ways and allowing the steam or other vapor which may be used for creating a vacuum to pass immediately into the cylinder, and, as can be readily seen, this primary operation causes the valve-operating part to assume a position holding the same open while the cylinder is full. The steam being thus admitted into the cylinder impinges on the concaved diffusion-plate and is equalized over the entire surface of the water in the cylinder, which under the pressure of the steam is forced downward and out through the discharge-outlet 6, through the valve-chamber thereover, and out through the discharge-pipe 12 to the place of delivery. The water being now discharged, the floats 26 have descended to their lowermost limit and carried the bell-crank levers 23 away from the tappet 55 on one end of the horizontal rod 51, thus leaving the rod free to be acted on by the vertically-reciprocating tappets 43, engaging the double bell-crank levers 52, secured to the opposite upper end of the cylinder and connected to the opposite end of said rod. The opening communicating the cylinder 33 with the main cylinder 31 governs the discharge of the water, inasmuch as the cup 39 located therein falls with the fall of the water, and when the water has fallen its allowed limit the said cup also has fallen with it and carries the stem or rod 37 downward, and thereby causes the tappets 43 to impinge upon the roller of the bell-crank levers 52 and draw the operating-rod 51 in the reverse direction, or to the right, as illustrated in the drawings. The tappet 56 upon said rod 51 now carries the tilting lever to a vertical or perpendicular position, at which point the same sharply falls to the left, or the reverse direction from which it fell to open the steam-valve, and thus carries the tappet 59<sup>a</sup> upon the valve lever or arm 57 to the right and against the lower end of the valve-lever 60, thus throwing the same to its vertical position, in which the ports or steam-passages are instantly closed. The water in the cylinder having been thus discharged to its allowed level, the steam is thus shut off through the medium of the float-cup 49 in the manner just described, and leaves the cylinder 1 completely filled with the steam or vapor. The instant the steam or vapor is shut off the pressure of the water in the discharge-pipe 12, extending above the top of the cylinder, forces its way into and through the conducting-pipe 4 and upward through the perforated pipe 17 into the spray-condensing chamber 18 and through the radially-extending perfo-

rated spray-arm 19, the column of water not only giving force to spray the same within the cylinder, but the spraying is also accelerated by the vacuum instantly formed at the closing of the steam-valve. The cylinder is again filled by the water sucked within the same by the vacuum through the suction-pipe 2 and suction-chamber 3, and the alternate automatic operations of the pump are repeated in the manner just described.

The construction and operation of my improved pump are thought to be apparent without further description.

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

1. In a steam vacuum-pump, the combination, with the steam-vacuum cylinder, the valve-controlling devices, and discharge-pipe, of a vertical spray-pipe connected with the discharge-pipe and extending vertically in said cylinder to near the top thereof, said vertical spray-pipe being provided with a series of longitudinally-arranged perforations and terminating at its extreme upper end in an enlarged collecting chamber or reservoir of larger diameter than the same, a series of radially-extending perforated spray-tubes connected to said enlarged chamber or reservoir and projecting near to the sides of the cylinder to thoroughly spread and diffuse the spray below the inlet, and a concaved diffusing-plate supported upon the top of said collecting chamber or reservoir directly beneath the cylinder steam-inlet to diffuse and spread the steam above and over the network of spray-tubes, substantially as set forth.

2. In a steam vacuum-pump, the combination, with a cylinder having a discharge-pipe extending above the top of the same, of a spray-condensing pipe connected to said discharge-pipe and projecting within said cylinder, a shaft journaled in the upper end of said cylinder, floats connected to said shaft, weighted bell-crank levers carried upon the outer ends of said shaft, an opposite reciprocating cup-stem, a horizontal valve-operating lever controlled in both directions alternately by said float-actuated bell-crank levers, and means for connecting said horizontal lever with the steam-valve, substantially as set forth.

3. In a steam vacuum-pump, the combination, with a cylinder having valved receiving and discharge openings and a spray-condensing tube, of a shaft journaled in the upper end of said cylinder, parallel float-carrying arms mounted upon said shaft within the cylinder, double bell-crank levers carried upon the outer ends of said shaft without the cylinder, an opposite reciprocating cup-stem, a horizontal operating lever or rod controlled in both directions alternately by said float-actuated bell-crank levers and said cup-stem, a weighted tilting lever controlled by said horizontal rod, and a valve arm or lever controlled by said tilting lever and connected



with the steam-valve, substantially as set forth.

4. In a steam vacuum-pump, the combination, with a cylinder having valved receiving and discharge openings and a spray-condensing tube, of a shaft journaled in the upper end of said cylinder, floats connected to said shaft, weighted bell-crank levers carried by said shaft without the cylinder, a horizontal lever or arm controlled in one direction by said bell-crank levers, a bell-crank lever connected to one end of said horizontal rod, a vertically-reciprocating cup-stem engaging the bell-crank lever connected to said rod and operating the same in an opposite direction, a weighted tilting lever controlled by said horizontal rod, and a valve arm or lever connected with said tilting lever and the steam-valve, substantially as set forth.

5. In a steam vacuum-pump, the combination, with the cylinder, of the float-operated weighted bell-crank levers, a cup-cylinder connected with the main cylinder at its lower end, a tube projecting upwardly from said cup-cylinder and connected with the main cylinder at its upper end, a reciprocating stem mounted in said tube and cylinder and carrying a gravitation or float cup located within the cylinder, depending parallel arms connected to said reciprocating stem and carrying tappets, a horizontal rod or lever having a tappet at one end engaged by said weight-

ed bell-crank levers, a bell-crank lever connected to the other end of said rod and adapted to be engaged by the tappets upon said depending arms, and means for connecting said horizontal lever with the steam-valve, substantially as set forth.

6. In a steam vacuum-pump, the combination, with the cylinder, of the float-operated bell-crank levers, the opposite reciprocating cup-stem carrying tappets, the horizontal lever or rod having a depending tappet engaged by said bell-crank levers and connected at its other end with a bell-crank lever operated by said stem and further provided with the intermediate spaced tappets, a U-shaped casting supported upon said cylinder and provided with a segmental slot, a tilting weighted lever pivoted to said casting and having a contact end engaged by said spaced tappets, and a stud or roller working in said slot, a horizontal valve lever or arm connected to said tilting lever and provided with spaced tappets, and a depending valve-operating lever engaging said tappets, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DAVID P. BURDON.

Witnesses:

D. G. LOVE,

JOHN PRETORIUS.