No. 865,556. PATENTED SEPT. 10, 1907.

J. M. ANDERSEN.

POWER OPERATED VALVE.

APPLICATION FILED OCT. 22, 1901.

4 SHEETS—SHEET 1.

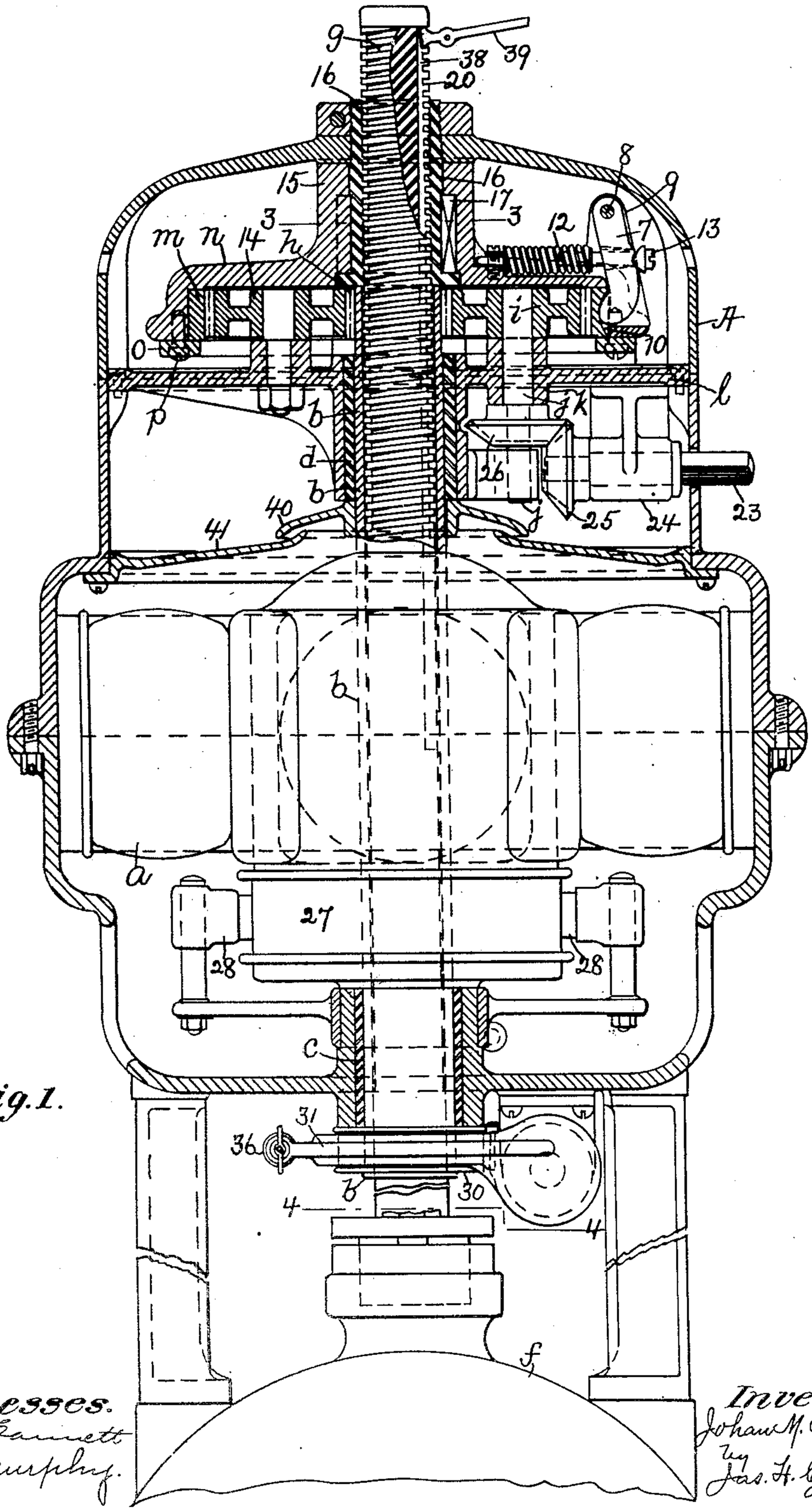

Fig. 1.

Witnesses.
C. H. Sammett.
J. Murphy.

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4 SHEETS—SHEET 2.

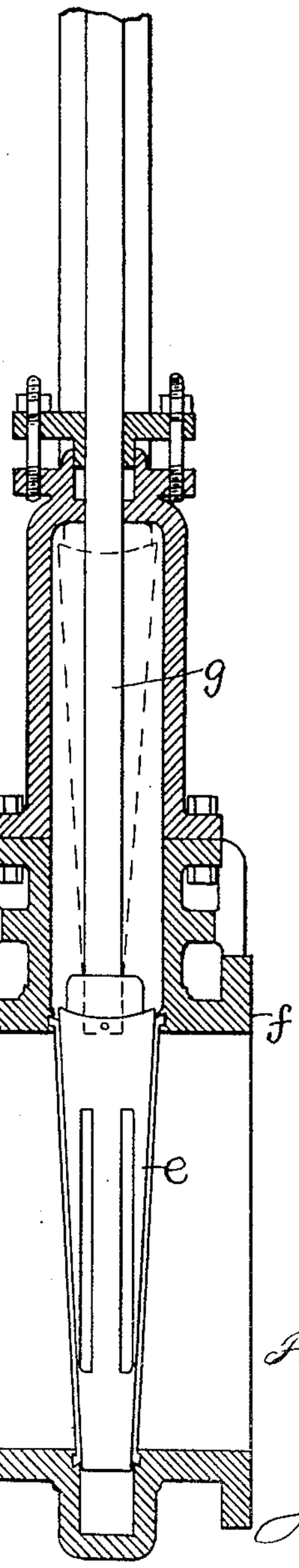

Fig. 2.

Witnesses.
C. H. Garnett
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4 SHEETS—SHEET 3.

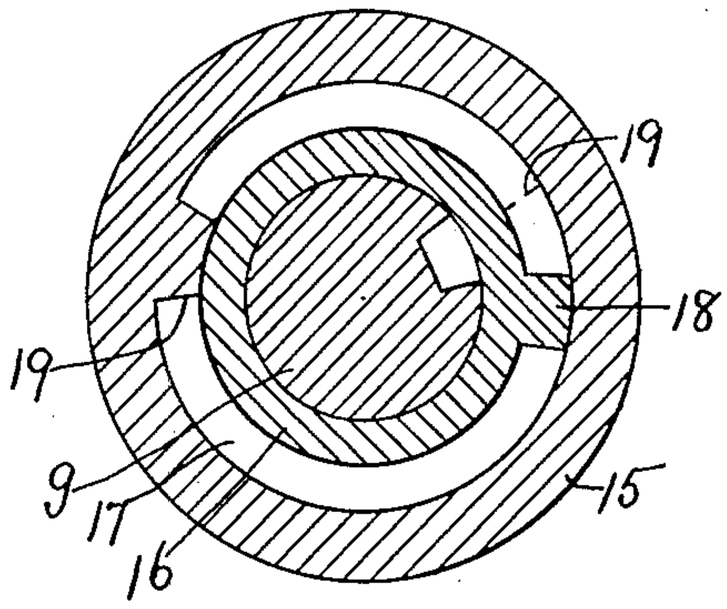

Fig. 3.

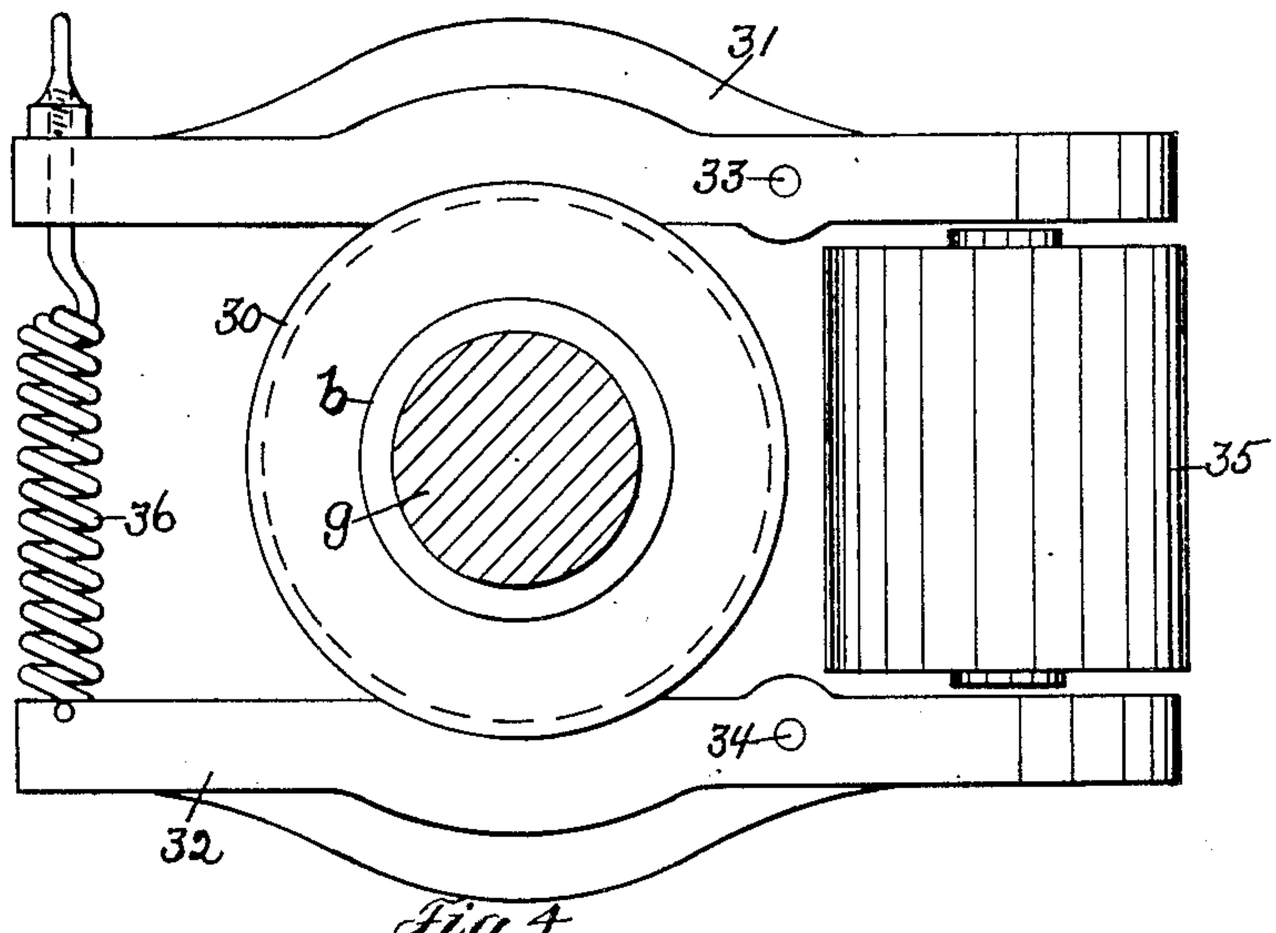

Fig. 4.

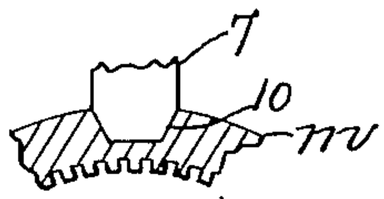

Fig. 5.

Witnesses.
C. H. Emmett
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4 SHEETS—SHEET 4.

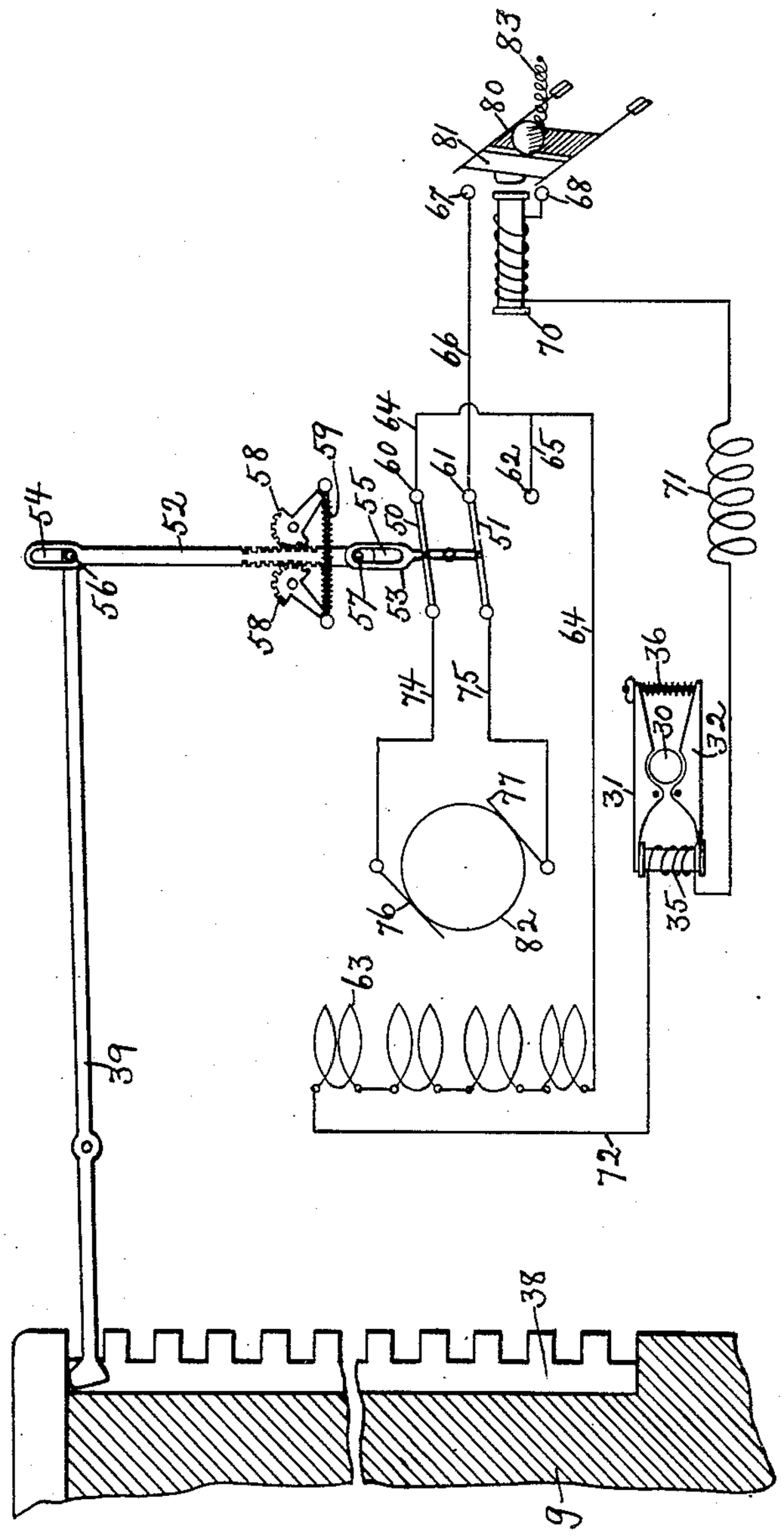

Fig. 6.

Witnesses.
C. H. Barnett
J. Murphy

Inventor:
Johan M. Andersen
by Jas. H. Churchill
Atty.

UNITED STATES PATENT OFFICE.

JOHAN M. ANDERSEN, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO ALBERT ANDERSON, OF BOSTON, MASSACHUSETTS.

POWER-OPERATED VALVE.

No. 865,556. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed October 22, 1901. Serial No. 79,567.

To all whom it may concern:

Be it known that I, JOHAN M. ANDERSEN, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Power-Operated Valves, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to provide mechanism with which a reciprocating motion may be imparted to a driven member by a driving member having a rotary motion.

The invention is adapted among other uses, to be applied to substantially large size valves whereby the said valves may be operated by power.

In the adaptation of the invention to a valve, the valve proper constitutes the reciprocating driven member, and an electric or other motor constitutes the driving member, which latter may and preferably will be connected with the said valve by means of mechanism having provision for preventing an excess of power or strain being applied to the valve mechanism, when the valve has been brought into its opened or closed position. Provision is also made for operating the valve by hand in case of accident to the motor or for the purpose of completing the movement of the valve in either direction. Furthermore provision is made for permitting the motor to be started in operation before it is operatively connected with the valve, so as to avoid injuring the motor by starting the same with a full load. These and other features of this invention will be pointed out in the claim at the end of this specification.

Figure 1 is a partial section and elevation of a sufficient portion of an apparatus embodying this invention, to enable the same to be understood. Fig. 2, a section of the valve shown in Fig. 1, with the valve stem in elevation. Fig. 3, a cross section on the line 3—3, Fig. 1. Fig. 4, a cross section on the line 4—4, Fig. 1. Fig. 5, a detail to be referred to and Fig. 6, a diagram of circuits to be referred to.

In the present instance, the rotary driving member is represented as an electric motor *a*, of any suitable type, and having its armature shaft *b* made hollow and mounted to turn in suitable bearings *c*, *d*. The reciprocating driven member is shown as a valve *e* of any suitable type, which reciprocates in a suitable casing *f* and is provided with a stem or rod *g*, which in the present instance is fastened to its valve and moves therewith.

The valve stem or rod *g* is extended through the hollow shaft *b* and is connected therewith to be driven thereby, by mechanism which may and preferably will be of a construction as will now be described.

The hollow armature shaft *b* is provided at one end with a substantially small pinion or gear *h* (see Fig. 1), which meshes with a gear or pinion *i* fast on a shaft *j* supported in a boss *k* formed in a partition wall *l* of an inclosing casing A. The pinion or gear *i* meshes with an internally toothed gear or ring *m*, revoluble within a disk or wheel *n* and confined therein by a ring *o* secured as by screws *p* to the flange or rim of the said wheel. The internally toothed ring *m* is adapted to be turned within the flange of the disk or wheel *n*, without producing movement of the latter, under circumstances as will be described, and is further adapted to be clutched or coupled thereto, by what I prefer to designate as a slip joint, and for this purpose I have provided a lever 7 pivoted at 8 to lugs or ears 9 on the disk or wheel *n*, and having its free end adapted to pass down through a slot in the rim or flange of the said disk or wheel *n* and enter a recess or pocket 10 in the periphery of the internally toothed ring *m* (see Figs. 1 and 5). The lever 7 is held in the recess or pocket 10, under normal conditions, by means of a spring 12 secured at one end to the disk or wheel *n* and having its other end attached to an adjusting screw 13 extended through the lever 7.

In the present instance I have provided a companion gear to the gear *i* and which is herein marked 14 and is located substantially diametrically opposite to the gear *i*, which gear 14 also engages the internally toothed ring *m*. The disk or wheel *n* is provided with a hub 15 mounted on an internally threaded nut or sleeve 16, the said hub being provided on its interior with a substantially annular pocket 17 (see Fig. 3), into which extends a lug or projection 18 on the exterior of the internally threaded nut or sleeve 16, the lug or projection 18 coöperating with a like lug or projection 19 on the hub 15.

The internally threaded nut or sleeve 16 engages with screw-threads 20 on the valve stem or rod *g*. It will thus be seen that rotation of the hollow armature shaft will produce rotation of the internally threaded nut or sleeve 16, through the pinion *h*, gear *i*, internally toothed ring *m*, clutch lever 7, disk or wheel *n*, projection 19 on the hub thereof, and the projection 18 on the internally threaded nut or sleeve 16.

Rotation of the internally threaded nut or sleeve 16 produces in the present construction longitudinal movement of the valve rod *g* and of the valve *e*, the rotation of the nut 16 in one direction moving the rod *g* so as to open the valve, and in the opposite direction so as to close the same.

The pockets or recesses 10 in the periphery of the internally toothed ring *m* are provided with bevel side walls as shown in Fig. 5, so that when an excessive power is applied to the ring *m* or excessive strain is applied to the valve and its operating parts, the said ring will move the clutch lever 7 outward or against the

action of the spring 12 so as to unlock the ring *m* from the disk or wheel *n*. As a result the motor *a* and the internally toothed ring *m* may continue to revolve without producing rotation of the disk or wheel *n* and consequently without producing longitudinal movement of the valve. This construction is desirable inasmuch as in actual practice it prevents injury to the valve or to the operating parts thereof.

The valve may also be closed manually, which may be accomplished as herein shown by means of a shaft 23 extended through the casing A and supported in suitable bearings in a bracket 24 attached to the wall *l* and provided with a bevel pinion 25, which meshes with a bevel pinion 26 on the shaft *j* of the gear *i*.

The motor and the intermediate mechanism between the same and the valve rod, may and preferably will be inclosed in the casing A, which may be of any suitable construction and preferably will be made in sections as represented in the drawings.

The motor *a* is provided with the usual commutator 27 and brushes 28, and I prefer to also use a magnetically operated brake of any suitable construction.

The brake referred to, is herein shown represented as a pulley or sheave 30 fast on the armature shaft *b*, and coöperating levers 31, 32 pivoted as at 33, 34, the said levers having one end adapted to be attracted by an interposed magnet 35, which acts in opposition to a spring 36 connected with the opposite ends of the said levers.

The electro-magnet 35, when energized, attracts the short arms of the brake levers and releases the armature shaft *b*, whereas when the current is cut off from the magnet 35, the spring 36 operates, and engages the brake levers with the sheave 30 to stop rotation of the armature and consequently of the motor. The valve rod *g* is provided with a longitudinal key-way 38 into which extends the end of a lever 39, which in the longitudinal movement of the valve rod *g* is adapted to be moved in opposite directions when the valve rod has reached the limit of its movement in said directions, and the said lever is designed to operate a suitable switch or switches, as will be described which may be of any suitable construction, and which control the current flowing through the brake magnet and through the motor.

Referring to Fig. 6, I have shown one arrangement of the electric circuit which is controlled by the switch 39. In this arrangement the switches 50, 51 are connected to the lever 39 by the rack bar 52 and link 53, provided respectively with the slots 54, 55, the slot 54 having extended into it a stud or pin 56 on the lever 39 and the slot 55 having extended into it a stud or pin 57 on the rack bar 52. The rack bar 52 is engaged by segmental gears or toothed levers 58, which are connected by a spring 59, the purpose of which is to move the switches from engagement with the terminals 60, 61, into engagement with the terminals 61, 62 with a quick movement. The terminals 60, 62 are connected in circuit with the field coil 63 of the motor *a* by the wires 64, 65, and the terminal 61 is connected by the wire 66 with a terminal 67 of a double pole switch, the other terminal 68 of which is connected through the magnet 70 and resistance 71 with one end of the coil of the brake magnet 35, the other end of which coil is connected by wire 72 with one end of the field coil 63 of the motor *a*, the other end of which is connected as described with the terminals 60, 62. The switch levers 50, 51 are connected by wires 74, 75 with the commutator brushes 76, 77 of the motor *a*. The circuit of the motor is completed in the first instance by the switch 80 which is manually operated, the contact bar 81 connecting the terminals 67, 68 when the switch is closed. The circuit may be traced as follows, viz:—from the terminal 68, through the magnet 70, resistance 71, brake magnet 35, wire 72, field coil 63, thence by wire 64 to terminal 60, thence by switch lever 50, wire 74, brush 76, armature 82 of motor, brush 77, wire 75, switch lever 51, terminal 61, wire 66, terminal 67 and armature or contact bar 81 to the terminal 68. When this circuit is manually completed as described, the magnet 70 holds the contact bar or armature 81 in engagement with the terminals 67, 68, until the circuit is interrupted by the movement of the switch levers 50, 51 from engagement with the terminals 60, 61 into engagement with the terminals 61, 62 and when this interruption takes place, the armature or contact bar 81 is withdrawn by its spring 83, thus opening the circuit of the motor at the manually operated switch, and stopping the motor with the switch levers 50, 51 in contact with the terminals 61, 62.

As represented in Fig. 6, the lever 39 has been moved by the upper end of the slot 38 in the valve stem or rod *g*, which takes place when the valve is closed. The switch levers 50, 51 are in the position they occupy to effect rotation of the armature 82 in such direction as will open the valve, and when the switch levers are in contact with the terminals 61, 62, the current through the armature is reversed and it is revolved in the opposite direction to close the valve, the closing movement of the valve effecting the movement of the switches 50, 51, so as to place them in contact with the terminals 60, 61, and thus into position to direct the current through the armature in such direction as will open the valve when the manually operated switch is closed.

In the operation of the apparatus as herein shown, the current is first passed through the brake magnet and then through the motor, so that the armature may be released before the motor is set in operation, and the recessed hub 15 provided with the projection 19, which coöperates with the projection 18 on the internally threaded nut 16, provides for the motor attaining a certain speed before being loaded, as for instance, the motor is energized and set in operation without doing work until the projection 19 engages the projection 18, and by means of the interposed gearing, the motor may attain a considerable speed before its rotation is effective upon the internally threaded nut 16.

The casing A may contain suitable oil guards 40, 41, (see Fig. 1), and if desired said casing may be provided with suitable openings by which access may be had to the parts, or as herein shown, the casing may be composed of sections.

From the above description, it will be seen, that the valve may be opened and closed by power, and that when brought into its opened or closed position, the power may be automatically disconnected from the valve by the clutch or slip joint above referred to, and further the power may be automatically stopped.

I have herein shown my invention as applied to a valve having its stem or rod fast thereto to move longi-

tudinally therewith, but I do not desire to limit my invention in this respect, as it is equally applicable to those constructions of valves in which the valve rod rotates but does not move longitudinally, the rotation of the rod effecting reciprocation of the valve.

Claim.

1. In an apparatus of the class described, the combination with a reciprocating valve provided with a rod or stem having screw-threads, of a rotary motor having a hollow shaft into which said rod or stem is extended, and mechanism connecting said hollow shaft with said rod or stem and including an internally toothed ring driven from the hollow armature shaft, a disk or wheel connected with the threaded valve rod or stem, and means to detachably clutch said wheel to said ring to permit automatic disconnection of said valve from said motor, substantially as described.

2. In an apparatus of the class described, the combination with a reciprocating valve provided with a rod or stem having screw-threads, of a rotary motor having a hollow shaft into which said rod or stem is extended, and mechanism connecting said hollow shaft with said rod or stem and including an internally toothed ring driven from the hollow armature shaft and provided on its periphery with a recess, a disk or wheel, and a spring-actuated lever carried by said disk or wheel and normally extended into said recess to couple the said ring to said disk or wheel, substantially as described.

3. In an apparatus of the class described, the combination with a valve provided with a stem or rod having a longitudinally extended key-way or slot, of an electric motor having a hollow armature shaft into which said valve stem or rod is extended, mechanism for connecting said hollow shaft with said valve stem, and means for controlling said electric motor extended into said key-way or slot and actuated by said stem or rod, substantially as described.

4. In an apparatus of the class described, the combination with a reciprocating valve provided with a rod or stem having screw-threads, of a rotary motor having a hollow shaft through which said rod or stem is extended, and mechanism exterior to said hollow shaft for connecting it in engagement with said rod or stem, said mechanism consisting of a pinion on the hollow shaft, an internally toothed ring or gear, a gear or pinion connecting the pinion on the hollow shaft with said internally toothed ring or gear, a disk or wheel within which said toothed ring revolves, means to detachably clutch said disk or wheel to said toothed ring, an internally threaded nut or sleeve engaging said threaded stem or rod, and means for connecting said sleeve with said disk or wheel, substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

JOHAN M. ANDERSEN.

Witnesses:

JAS. H. CHURCHILL,

J. MURPHY.