(No Model.) 3 Sheets—Sheet 1.

J. H. McGOWAN.

SYSTEM OF AND APPARATUS FOR RAISING WATER.

No. 506,927. Patented Oct. 17, 1893.

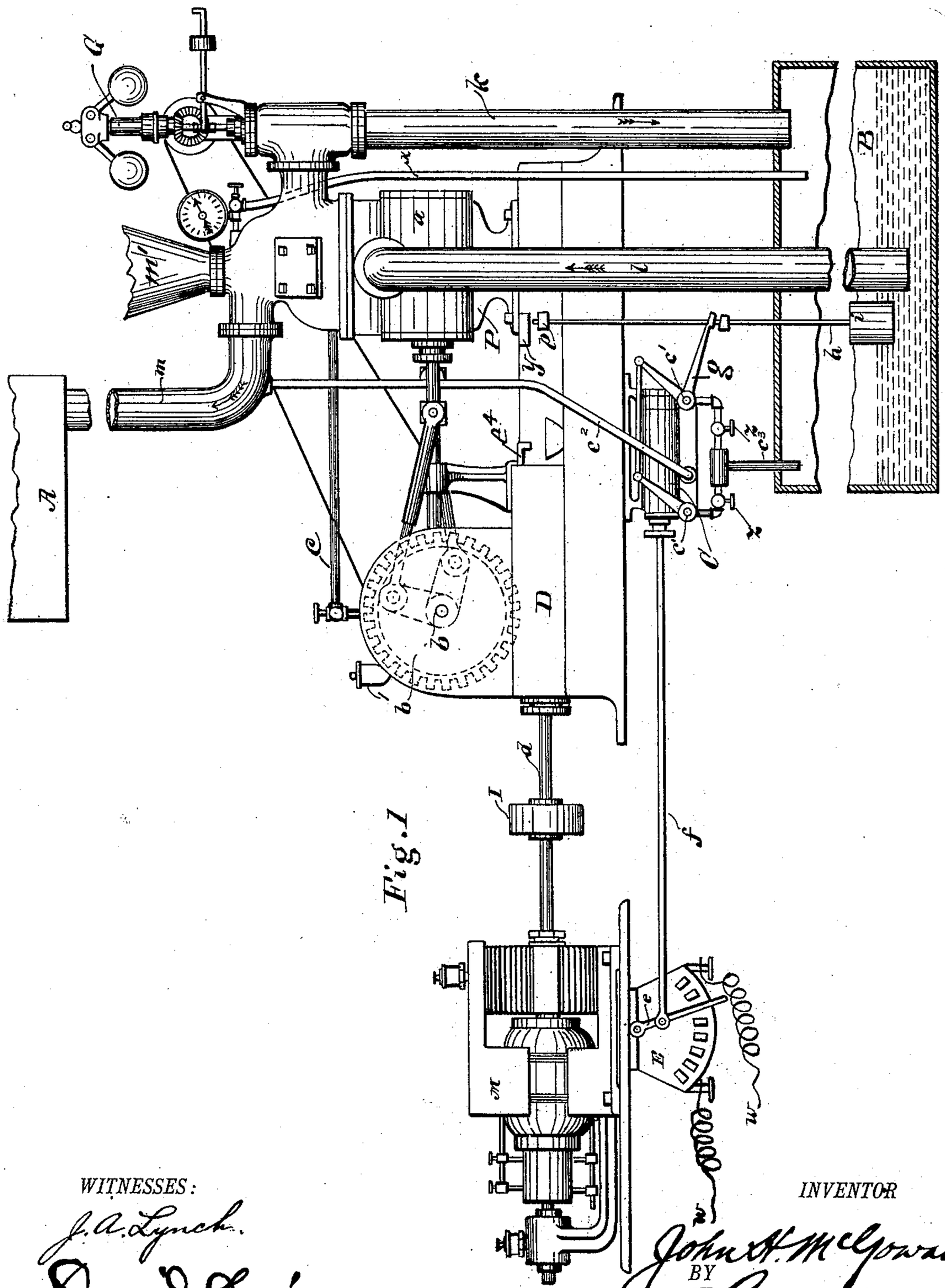

Fig. 1.

WITNESSES:

J. A. Lynch.

David Davis

INVENTOR

John H. McGowan

BY

L. M. Hosea

ATTORNEY

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J. H. McGOWAN.

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Fig. 2.

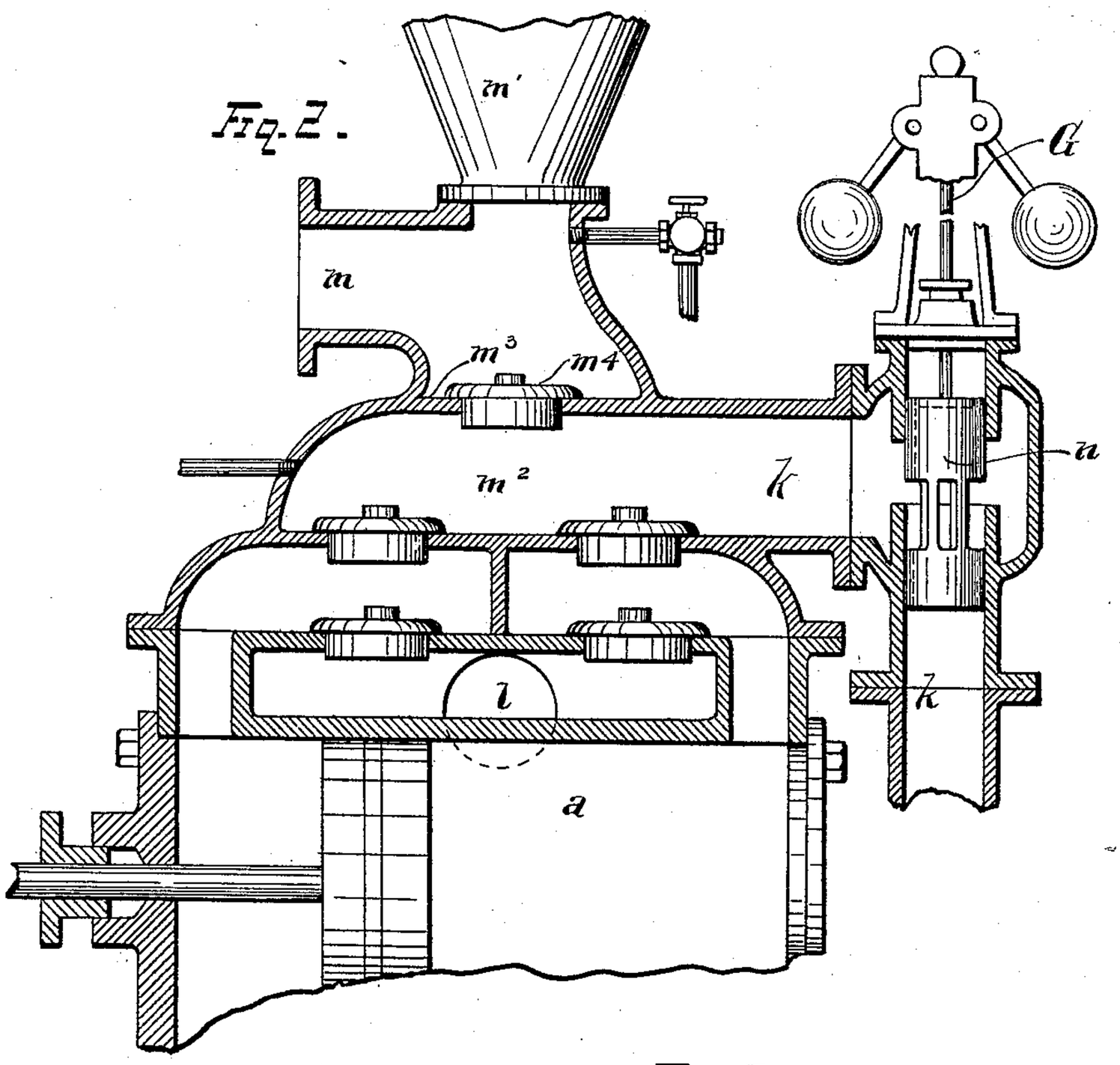
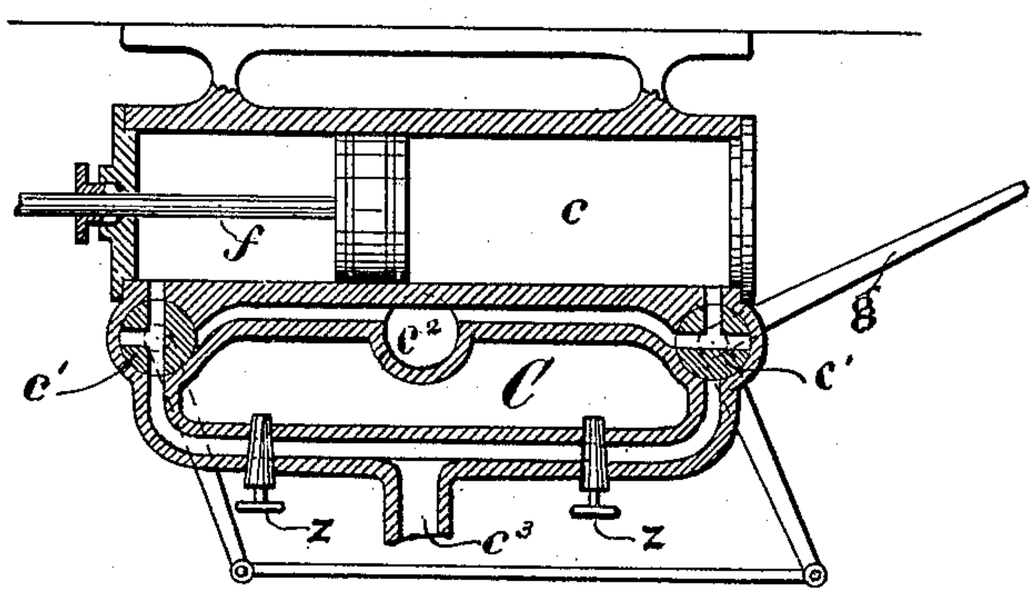


Fig. 3.



WITNESSES:

J. A. Lynch.

David Davis

INVENTOR

John H. McGowan

BY

Wolcott & Hoadley

ATTORNEY

(No Model.)

3 Sheets—Sheet 3.

J. H. McGOWAN.

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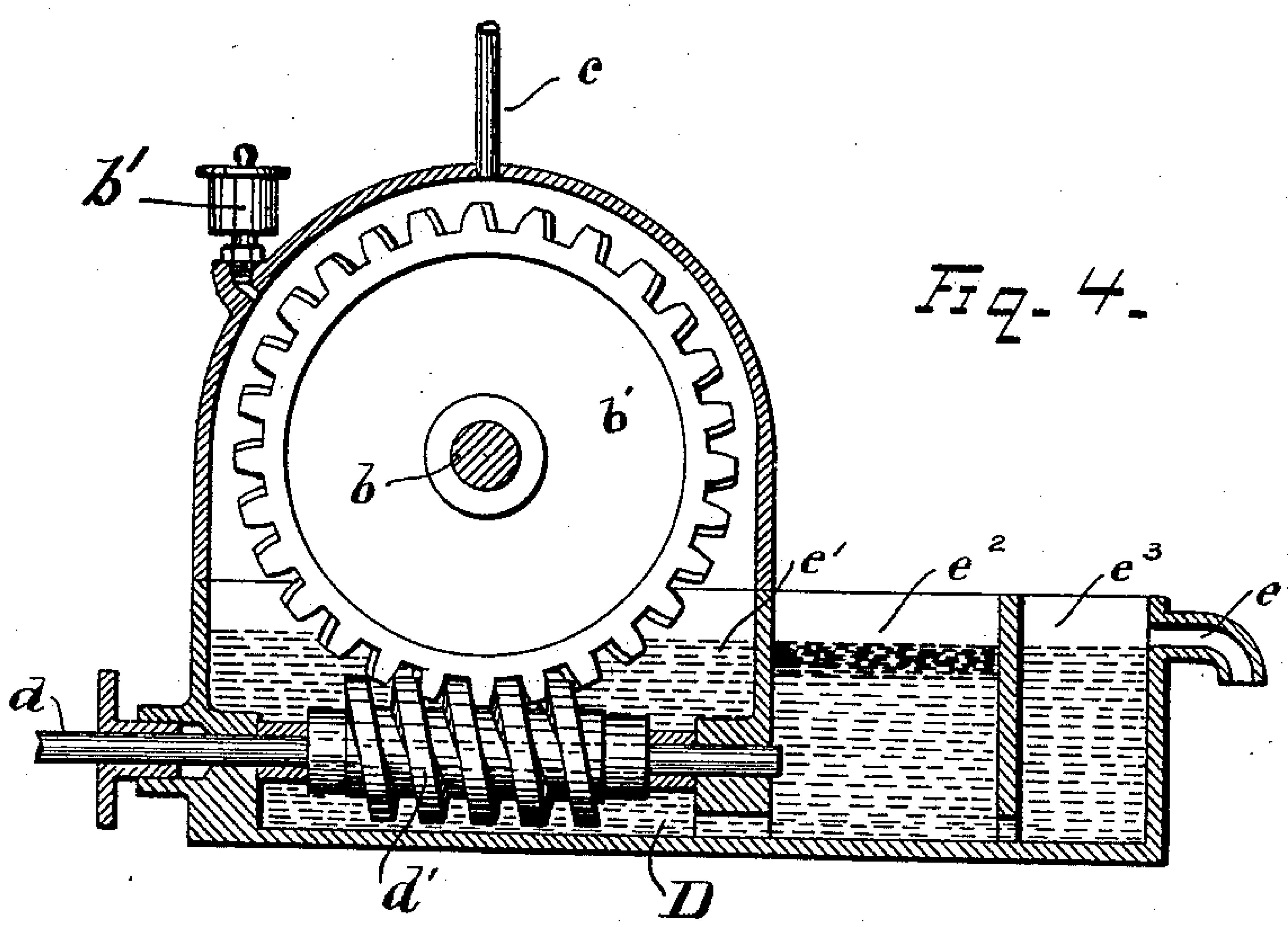
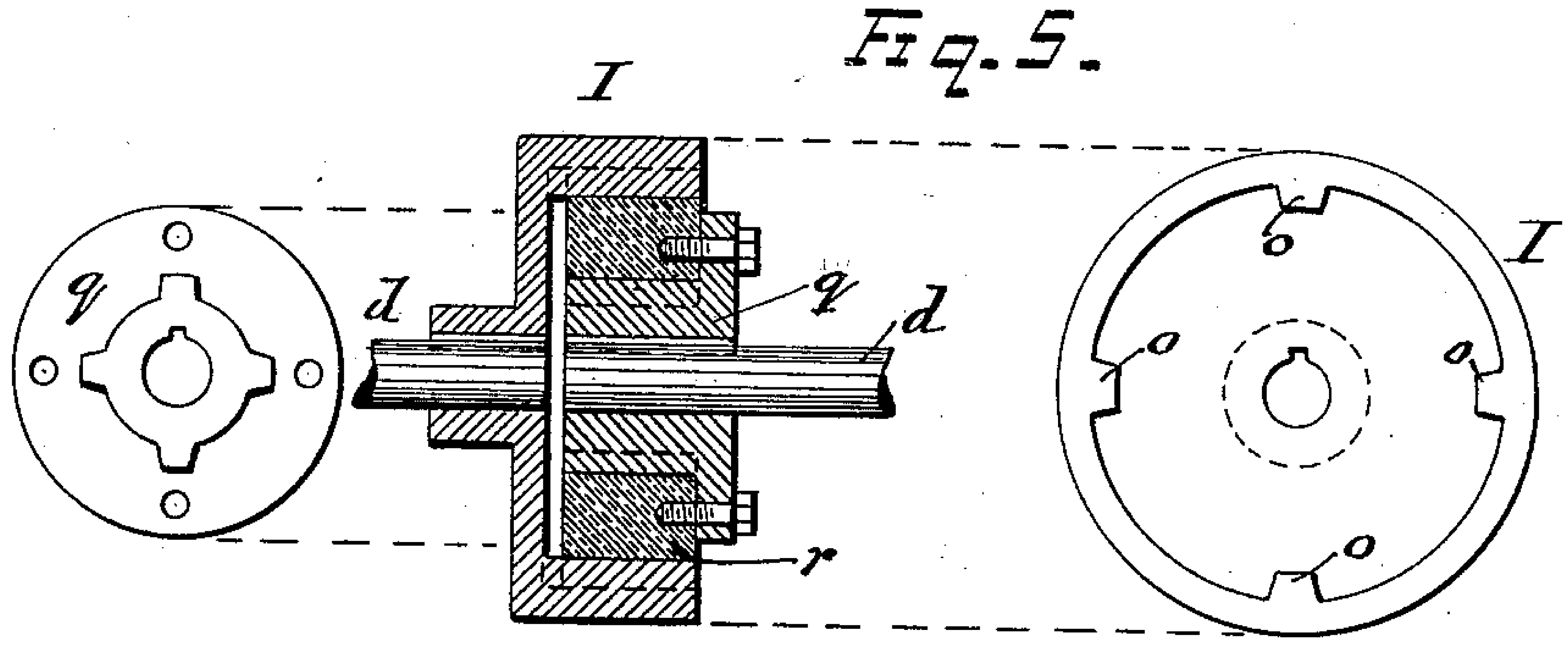


Fig. 4.

Fig. 5.



WITNESSES:

J. A. Lynch.

David Dorns.

INVENTOR

John H. McGowan

BY

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN H. McGOWAN, OF CINCINNATI, OHIO.

SYSTEM AND APPARATUS FOR RAISING WATER.

SPECIFICATION forming part of Letters Patent No. 506,927, dated October 17, 1893.

Application filed December 4, 1890. Serial No. 373,613. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. McGOWAN, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Systems and Apparatus for Raising Water, of which the following is a specification.

My invention relates to a system and mechanism for raising water or other fluids automatically as required by given conditions, and is applicable to use in various situations such for example, as in hydraulic-elevator systems where the supply of water is scant, or where it is desirable to employ an elevated tank to obtain an increased head for elevator or other purposes; or in cases where, for any reason, it is desired to maintain a supply of water or other fluid in an elevated tank by replenishing from time to time as occasion requires.

The nature and objects of my invention will be clearly understood from the illustration of its application to a supply system for hydraulic elevators as herein described and as shown in the accompanying drawings in which—

Figure 1, is a general side elevation of an entire apparatus embodying the invention applied as aforesaid, in which all the parts, so far as practicable, are exhibited in a common plane of illustration; Fig. 2, a detail sectional elevation of the pump valve-chambers, showing the mode of maintaining intact the head or column of fluid in the main discharge pipe and of regulating the action of the pump in relation to the work to be done in lifting said column of fluid in starting the motor; Fig. 3, a detail section of the mechanism for controlling the starting, stopping and action of the motor; Fig. 4, a detail of the worm-gear employed in operating the pump and the attachments for lubrication, &c.; and Fig. 5, detail sections showing the insulating connection employed when an electric motor is used for driving the pump.

Referring now to the drawings in connection with the subjoined description, it should be premised that I have here shown one only of many possible applications of the invention, and that certain features, parts and combinations of parts less than the whole may be usefully employed in such applications.

In the present illustration I have indicated an elevated fluid tank, A, which may be located on the top of a building, or otherwise, in order to obtain a head or hydrostatic pressure for useful work in a working cylinder or other mechanism, (not shown.) I have also indicated a second tank, B, which may be located in the cellar of a building, or otherwise, to receive the fluid discharged from said working cylinder after performing the desired work.

The main features of apparatus, otherwise, consist of a lifting force pump, P; a driving motor, M, a controlling device, C, for regulating the movements of the motor; and a governor, G, to regulate the action of the pump.

Constructed as shown in the drawings, the pump, P, is of the ordinary class of lift-and-force-pumps, which may embody two cylinders, *a*, set side by side, having the usual slide and pitman connections with a crank shaft, *b*, provided with a worm-gear-wheel, *b'*, and driven by a worm, *d'*, whose shaft, *d*, extends to and is rotated by the motor, M.

It will conduce to clearness of understanding to describe, first, the motor and connections, and afterward the pump and connections.

The driving motor, M, is shown in the drawings as an electric engine of an approved type, and requires no specific description, since any other type may be used; indeed, a motor operated by steam, gas or other motive power may be substituted. I lead the electric conducting wires, *w*, *w'*, to the motor, M, through a resistance switch-board, E, over which plays a pivoted contact arm, *e*. The board is also of well known construction and functions and is shown merely as a type of means—such as a valve in a fluid motor—by which the initial or starting power may be gradually and increasingly applied to the motor. The arm, *e*, is attached to the outer end of a prolonged piston rod, *f*, extending into a driving cylinder, *c*, and there provided with a piston operating in the cylinder in the usual manner. The cylinder, *c*, is provided with suitable governing valves—rotating three-way cocks, *c'*, *c'*, being here shown;— a supply pipe, c^2, connecting to the upper tank, A; and an exhaust pipe, c^3, extending to the lower tank, B. I place a governing cock, *z*, in each of the cylinder-branches of

the exhaust pipe, c^3, so that by throttling the exhaust at one side or the other the movement of the piston rod, f, may be slowed to any desired extent in one direction, while allowed to travel at full speed in the other. The object of this is to open the controlling valve or switch, E, slowly, so as to admit the motive power gradually and give movement to the pump accordingly without shock or injury to working parts or connections. Incidentally to the use of an electric motor, the resistance switch-board here shown has an important function in preventing the burning out of the coils. The closing movement, however, is not required to be so regulated. The valves, c', c', are moved in unison by an outside crank connection, g, engaged by stops, p, p', upon a lifting rod, h, attached to a float, i, governed by the rise and fall of water in the receiving tank, B. As the tank, B, is being filled to the desired level, the float rises, carrying the rod, h; and the lower stop, p, engages the crank g, throws over the valves, c', c', and the action of the piston rod, f, turns on the supply of motive power and gradually starts the pump P, into operation to pump the contents of tank, B, up into tank, A. As the float falls, the upper stop, p', engages the crank, g, and, by reversal of the movements described, shuts off the motive power and stops the pump. In practice the tank, B, is made large enough to receive the entire contents of the tank, A, and all the connecting pipes and chambers in addition. so that in freezing weather all those parts may be drained downward and exhausted of their contents. To this end a drainage pipe, k, is provided, and for the same reason a stop, y, is provided whereby when the contents of the tank and pipes are drained downward into the tank, B, and raise the water above the normal level, the float, i, is prevented from rising above its proper limit of movement.

It will be readily understood that the movements of the motor may be governed as well by a float placed in the upper tank and made to regulate the movements of the mechanism according to the supply of water in said upper tank; also, that what is here shown as a discharge reservoir B may be a well or other source of water-supply, and the discharge may be outward as waste.

The constructive features of the driving connection between the motor and the pump will be referred to later.

The pump, P, as here shown, possesses, in addition to the ordinary suction pipe, l, discharge pipe, m, and other features common to pumps, certain other features of improvement constituting the subject matter of another application for Letters Patent, executed and filed by me simultaneously herewith. These consist of an independent pipe connection, k, leading from the discharge chamber m^2, (Fig. 2) back to the supply reservoir, B; a partition, m^3, interposed between the discharge chamber, m^2, and the pipe, m, and a lift valve, m^4, seated in said partition. The passage, k, is governed by a valve, n, of any suitable construction. As here shown, the valve, n, is a balanced piston-valve of the usual construction, having side openings properly formed for graduation. The valve, n, is in turn controlled by a centrifugal governor, G, of ordinary construction and belted or otherwise driven from the pump shaft, b, or from the motor shaft, d. The valve, n, is set normally open, and is closed by the centrifugal action of the governor, G. In normal conditions the supplemental valve, m^4, is held to seat by the pressure of the column of water in the pipe, m, which pressure, in ordinary cases such as here illustrated, would be considerable. To start the pump at once against so great a resistance would strain the entire mechanism. It will be seen however that, by my improvements, when the pump starts, it discharges immediately back to the reservoir, B, through pipe, k, and continues so to do until, in consequence of its own speed of operation the action of the valve, n, gradually interposes an increasing resistance in the discharge passage, k, until a gradually increasing portion of the water lifted begins to pass up into the pipe, m, and finally the passage, k, is entirely shut off and the pump forces directly and entirely through the pipe, m. At the beginning of its motion therefore, the pump has practically no resisting load, and its final load is taken in gradual increments which relieves all strain and enables the driving motor to get into full operation. It will also be observed that the preliminary action of the pump fills all cavities with water and insures a solid mass of water between the forcing pistons and the column to be lifted; also that when the pump is not in operation there is no back pressure in the pump joints and consequently no leakage. When the pump is stopped the pump is entirely relieved of pressure of column. At the same time while the pump is stopped its working parts are entirely relieved of the pressure of the water column.

In order to maintain the worm gear connection constantly lubricated and also to prevent overheating of the parts through friction, I inclose the worm in a boxing, D, the construction and arrangement of which are shown in Fig. 4. It consists substantially of a boxing divided into three compartments e', e^2, e^3. Into the first of these the worm shaft, d, enters, having bearings for the shaft in the end walls of said compartment at either side of the worm. The partitions between compartments, e' and e^2, and between e^2 and e^3, are open at the bottom, and compartment e^3 is provided with an overflow opening, e^4, near the top. Compartment, e', contains mingled oil and water submerging the screw and the lower cogs of the worm-gear-wheel. I also provide a casing, r, constituting a top to compartment, e', and inclosing the worm gear-wheel. Into this, at the top, I lead a small supply pipe, s, by which water in

graduated quantity is permitted to flow upon the top of the gear wheel, *b*, thence downward over the same. In the operation of the worm and its gear-wheel the oil and water in compartment, *e'*, are thoroughly mingled, and the excess of fluid passes beneath the connecting partitions into compartment e^2, where the oil rises to the surface, from which it may be from time to time skimmed off and returned through the funnel *t* into the casing, *r*, upon the teeth of the gear wheel over which it flows back into compartment, *e'*. The excess of water in compartment, e^2, passes under the connecting partition into compartment, e^3, and thence flows outward through the overflow orifice, e^4.

In employing an electric engine as a driving motor, I much prefer the connection shown, in which the motor shaft, *d*, is prolonged into the worm, *d'*. In such case I construct the prolonged shaft, *d*, in two longitudinal sections and provide an insulating connection, I, shown in detail in Fig. 5. It is composed of a cup-shaped flanged collar I secured to one section of the shaft and extended over the other. The inner periphery of the cup is provided with longitudinal ribs, *o*, to engage corresponding recesses of a cylylindrical block of "fiber" or other insulating material secured to the opposite shaft by and upon a ribbed thimble or sleeve, *q*. A washer, *v*, of the insulating material may be interposed between the contiguous ends of the shafts and between the bottom of the cup, I, and the thimble, *q*.

The mechanism is here shown entire as constituting a complete system of supply for hydraulic elevator or similar uses, but as already stated, some of its features and combinations may be otherwise employed to advantage and for this reason are separately claimed.

The special improvements in the pump proper, which are here shown, while they contribute to the perfect character and operation of the system, may nevertheless be dispensed with and an ordinary pump used.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. In a hydraulic elevator apparatus, the combination of a supply and a discharge tank connected through the motor-apparatus; a pump for restoring the water from the discharge to the supply tank; an electric motor for driving said pump; a resistance switch for regulating the supply of current to the said electric motor; an auxiliary motor for operating said switch; and a float actuated by the head of water in one of said tanks and attached to and governing the operation of said auxiliary motor, substantially as set forth.

2. In hydraulic-elevator-mechanism, in combination with supply and discharge tanks connected through the elevator apparatus, a pump for lifting the contents of the discharge into the supply tank; an electric motor attached as a driver to said pump; a graduated resistance-switch for governing the supply of current to said motor; a hydraulic motor connected to said switch; a valve or valves for admitting water to said hydraulic motor; and a float in the discharge tank connected to said valve and operated by the head of water in said discharge tank substantially as set forth.

3. In pumping apparatus of the character described, embodying a supply-pump driven by an electric motor, the combination of a graduated resistance-switch for admitting the current to said motor, and an auxiliary motor connected with and moving said switch and provided with valves for admitting the motor-fluid differentially for effecting a differential movement of said auxiliary motor in opposite directions, substantially as set forth.

4. In automatic pumping apparatus of the character described, the combination of the pump, the electric driving motor, the hydraulic switch-shifter, the cistern-float, the rod provided with stops at opposite terminals; and the lever for operating the valve of the hydraulic switch-shifter, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN H. McGOWAN.

Witnesses:
S. M. HOSEA,
E. HOSEA.