(No Model.)

J. H. McGOWAN.

MECHANISM FOR RAISING WATER.

No. 473,949. Patented May 3, 1892.

Fig. 1.

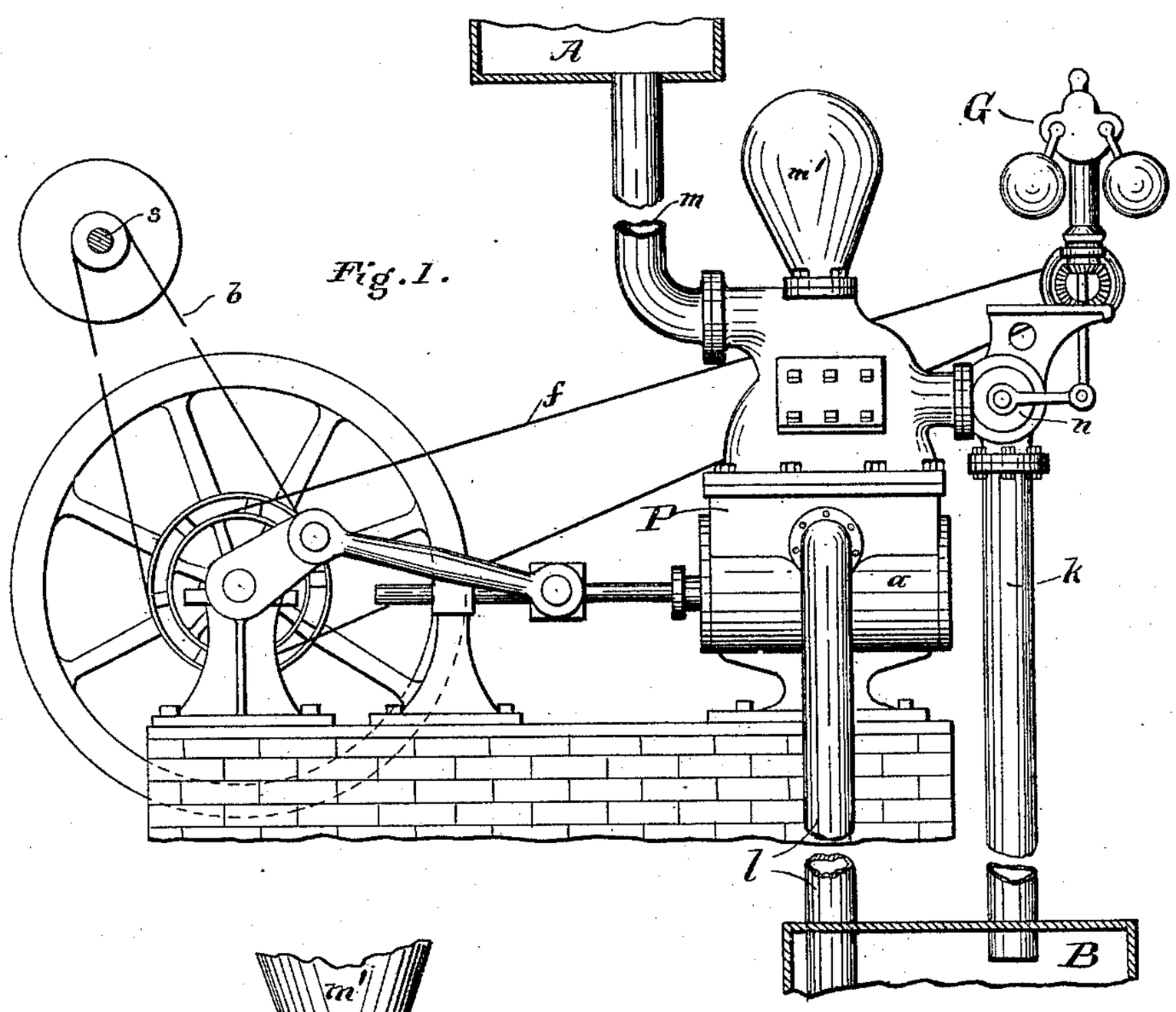


Fig. 2.

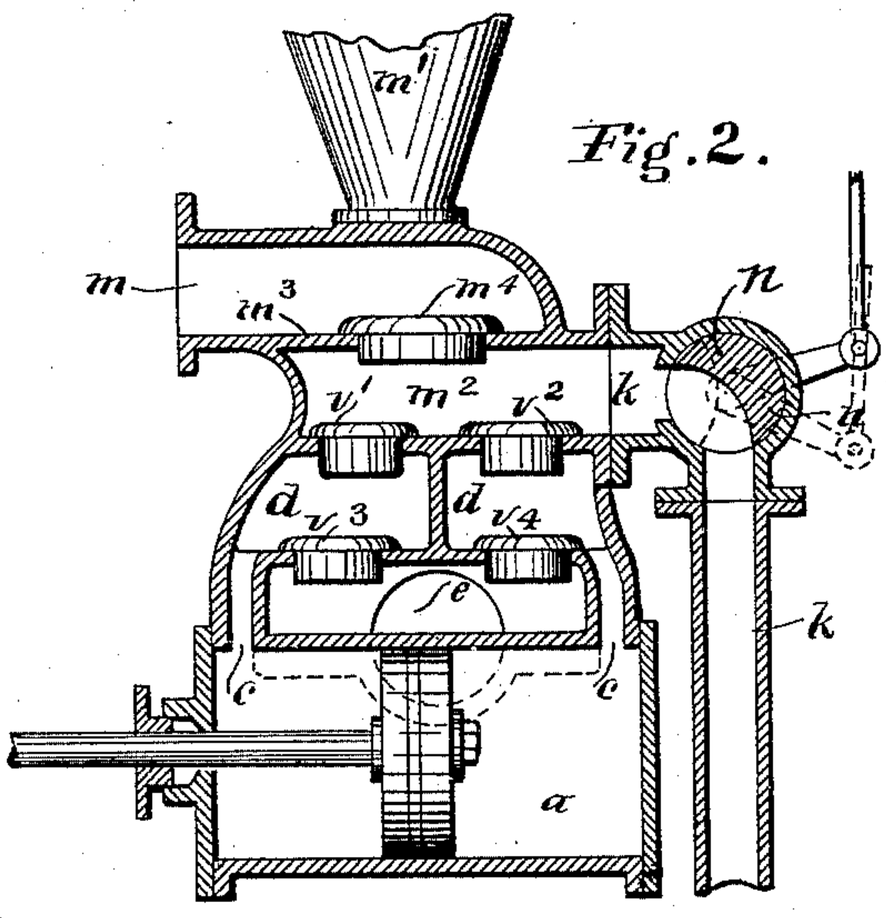
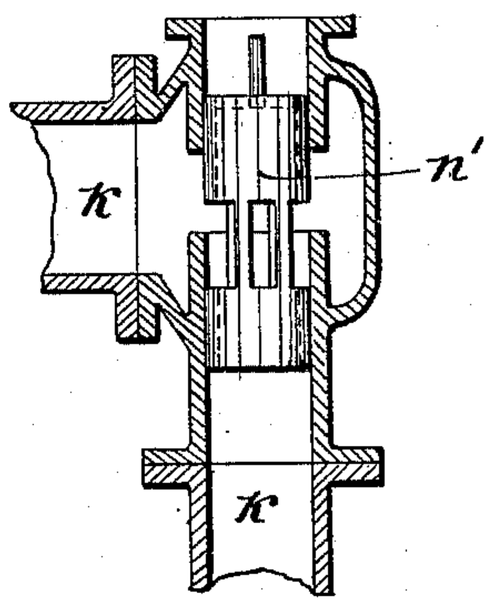


Fig. 3.



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MECHANISM FOR RAISING WATER.

SPECIFICATION forming part of Letters Patent No. 473,949, dated May 3, 1892.

Application filed December 4, 1890. Serial No. 373,612. (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, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Mechanism for Raising Water, of which the following is a specification.

My invention relates to apparatus for forcing water or other liquid against a static pressure—such, for example, as the hydrostatic head of an elevated reservoir—its object being to facilitate the starting of the hydrostatic column and the pumping motor and mechanism from a state of rest, thereby enabling the work to be done by a smaller and less expensive motor and with less expenditure of motive power.

Incidentally, further objects of my invention are to relieve the working valves and parts of the pumping mechanism against the continuous pressure of the hydrostatic column while the pumping mechanism is at rest, to avoid loss by leakage at the pump-joints or piston while at rest, and to insure the continuity and solidity of the discharge-column when the pumping mechanism is set in operation.

To these ends my invention consists, first, in temporarily diverting the preliminary discharge of a pump at a point immediately below the hydrostatic column to be lifted through an outlet-passage, and gradually contracting and finally closing said outlet, thereby introducing a resistance gradually approximating and ultimately overbalancing the resistance of the column.

It consists, further, in a mechanism designed and adapted to produce these results, as hereinafter more fully set forth.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the pumping apparatus containing my improvement; Fig. 2, a vertical section of the pump, exhibiting the additional valve-chamber, governor-valve, and auxiliary discharge-conduit; and Fig. 3, a section showing a modification in the type of controlling-valve employed in the auxiliary discharge of the pump.

In ordinary pumping apparatus of the character indicated, where the effective action of the pump is against the pressure, for example, of the hydrostatic head of an elevated reservoir, the initial movement of the pump-piston is directed against the entire weight of the lifted column or the total pressure in the receiving-vessel. More or less difficulty is experienced, therefore, in applying the motive power of other machinery already in motion through belting, gearing, &c., or in starting an independent driving-motor connected with the pump by reason of the inertia of the parts themselves and the unyielding character of the resisting load, which is of necessity taken at its maximum at the outset. These conditions not only require a more expensive and powerful motor than would be required to continue the operation when the lifted column is in motion, but also result in injurious straining of the parts and often involve breakage of connections. Sometimes, also, when leakage has broken the continuity or solidity of the fluid column the too-sudden action of the pump in starting results in "water-ram" and breakage of pipes, chambers, or valves. These difficulties are entirely obviated by my improvements, as will be understood from the following description.

Referring now to the drawings, A designates an elevated receiving-reservoir, or may be understood to be a steam-boiler or pressure-tank into which fluid is to be forced against a static pressure.

P designates the pump proper, shown here as of the ordinary class of piston lift and force pumps driven by any independent power—such, for example, as a belt *b* from a line-shaft *s*. The pump P possesses the ordinary suction-pipe *l*, connecting to a source of fluid-supply B, a discharge-pipe *m*, extending to the tank or reservoir A, and the usual suction and discharge chambers and valves. The construction of the latter parts incident to a double-acting piston-pump of the variety here indicated is shown in Fig. 2, and is such as is common in approved practice. The special constructive improvement involved in my invention is also indicated—to wit: a supplemental discharge-chamber m^2 and an auxiliary discharge or waste connection *k*, leading outward or back to the source of supply B,

said connection being controlled by a valve n, operated, as here shown, by a governor G. The construction and function of these parts is more particularly as follows: The cylinder a of the pump is provided with the usual ports c c, leading into the chambers d d, the latter opening into a common discharge-chamber m^2 above through the apertures controlled by lift-valves v' v^2 and into a common suction-chamber e below through apertures controlled by lift-valves v^3 v^4. In ordinary pumps there is no chamber independent of the lower terminus of the discharge-conduit m; but in my improvement the discharge-chamber m^2 is entirely separated from said discharge-conduit m by a partition m^3, provided with a lift valve or valves m^4. The usual equalizing air-chamber m' is placed in the discharge-conduit m to act upon the discharge-column. The discharge-chamber m^2 is connected outward by an auxiliary discharge-pipe k, which may lead back to the source of supply B, or where economy of liquid is not important it may discharge outward as a mere waste-pipe. It is governed by a valve n of any desired type. That shown in this case is a rotating or "plug" valve actuated by a crank connection with the governor G, operated by belt f from the crank-shaft of the pump. I may, however, substitute for the valve n and the centrifugal governor G, actuating the same, a valve actuated by fluid-pressure of the chamber m^2 against the resisting force of a spring or weight. Many types of such valves being well known, I have not thought it necessary to illustrate the same here. Where a governor operated by the speed of the pump or its motor is employed to control the valve n, the area of the auxiliary discharge-conduit k may be fully equal to the capacity of the pump; but where the pressure in the chamber m^2 is relied upon to actuate said valve the capacity of said conduit or of the valve-opening should be somewhat less than that of the pump in order to create a pressure in said chamber to actuate the valve. While the pump is at rest, the valve n stands normally open, the pressure of the column in the discharge-pipe m being upon the valve m^4, holding the same seated. Thus the other chambers and valves and cylinder of the pump are relieved of all static pressure at such times and no leakage of joints therein can effect the integrity of the column in the pipe m.

When the pump is started into operation, the water discharged by the piston during its initial strokes passes into the chamber m^2 and thence out through the conduit k. As the speed of the pump increases, the centrifugal action of the governor G (or the increasing pressure in chamber m^2) actuates the valve n to gradually close the conduit k. The pressure in the chamber m^2 gradually increases in proportion to the degree of closure of said discharge-conduit k until said pressure begins to exceed the resisting pressure of the fluid column in the discharge-pipe m, when the valve m^4 will be lifted and a gradually increasing portion of the discharge of the pump directed into the conduit m. Thus it will be seen that during its initial action the pump has practically no load, and that it is permitted to overcome all resisting inertia and get well into operation before its discharge is directed against the hydrostatic column, and that it thus assumes its ultimate load by gradually-increasing increments in such manner as to ease and relieve all strain and shock.

I may in some cases dispense entirely with all means of controlling the valve n automatically and operate it by hand, in which case it is always under control of the attendant for the purposes hereinbefore indicated, and also as a means of temporarily diverting the discharge of the pump in cases where it might not be desirable to stop the machinery for this purpose.

I may substitute for the rotary valve shown any other suitable form of valve—such, for example, as the balanced piston-valve h, as shown in Fig. 3, which is an ordinary type of shell valve and will therefore require no detailed description. It will also be seen that, incidentally, a solid fluid connection is established between the hydrostatic column and the pump-piston before the piston is required to act upon the column. Any break in such connection, such as is often produced by leakage and introduction of air, is restored before the piston acts upon the lifted column.

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

1. In a force-pump, the combination of a lift-valve therein seated in the pump-outlet by the pressure of the discharge-column, a second lift-valve seated therein in the same direction, a vent-passage leading outward above said second valve independently of the discharge-column and of the suction end of the pump, and a controlling-valve in said outlet, substantially as set forth.

2. In a force-pump, a discharge-passage, two independent valves in said passage both opening tandem in the direction of discharge, a waste-passage leading from said discharge-passage between said valves, and an adjustable controlling-valve in said waste-passage, substantially as set forth.

3. In pumping apparatus, in combination with a supplemental discharge-chamber and a supplemental discharge-valve interposed between the pump mechanism and its ultimate discharge-passage, an independent vent-passage leading from said supplemental chamber, and a valve in said vent-passage automatically actuated to control the discharge of fluid through the same, substantially as set forth.

4. The combination, in pumping apparatus, of a normal discharge-passage, a supplemental discharge-chamber and valve inter-

posed between said normal discharge-passage and the pump mechanism, an independent vent-passage leading from said supplemental discharge-chamber, a controlling-valve in said vent-passage, and a governor device operated by the pump and actuating said controlling-valve, substantially as set forth.

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

JOHN H. McGOWAN.

Witnesses:
L. M. HOSEA,
E. HOSEA.