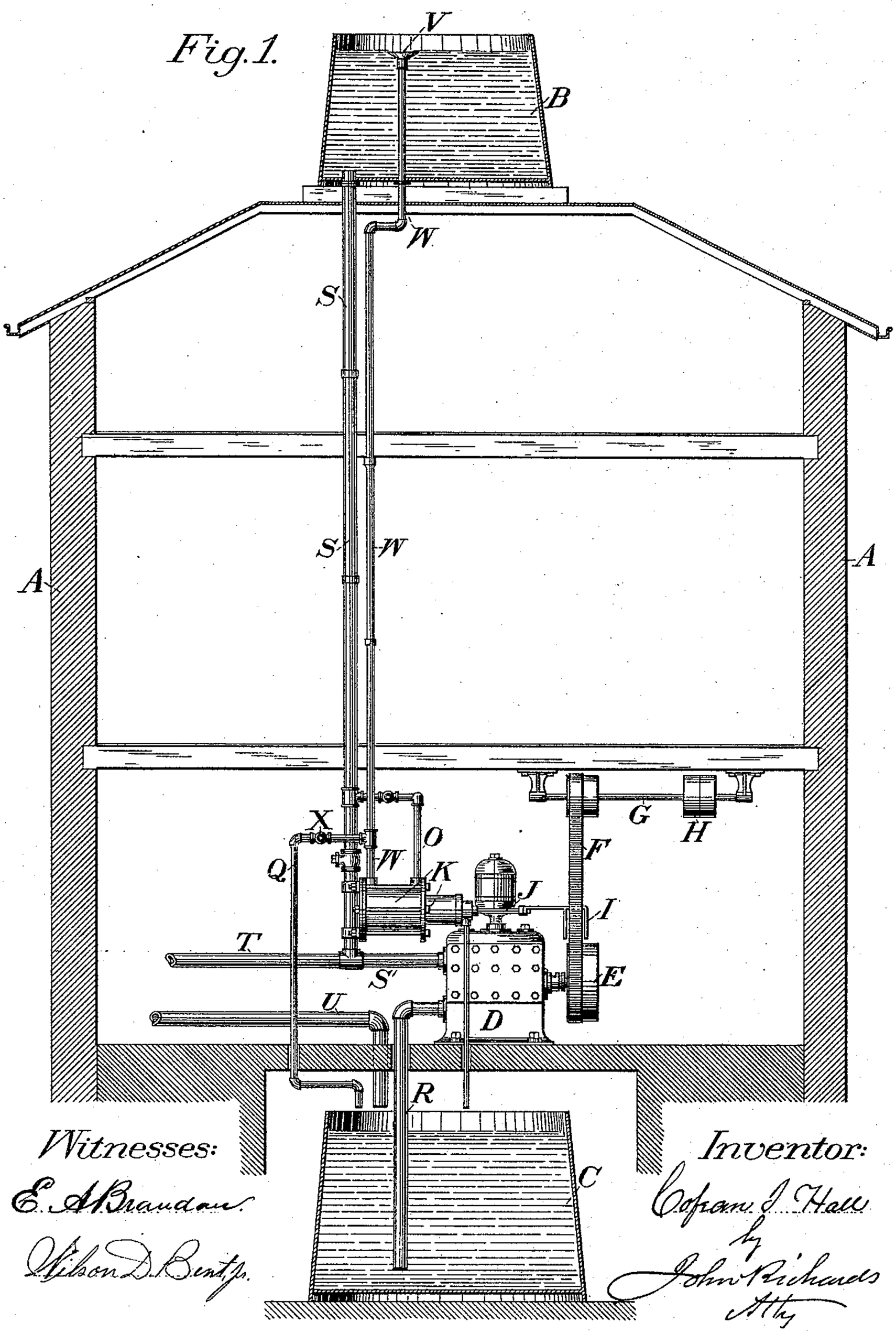
(No Model.) 2 Sheets—Sheet 1.

C. I. HALL.

APPARATUS FOR CONTROLLING PUMPS.

No. 492,723. Patented Feb. 28, 1893.

Fig. 1.



Witnesses:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

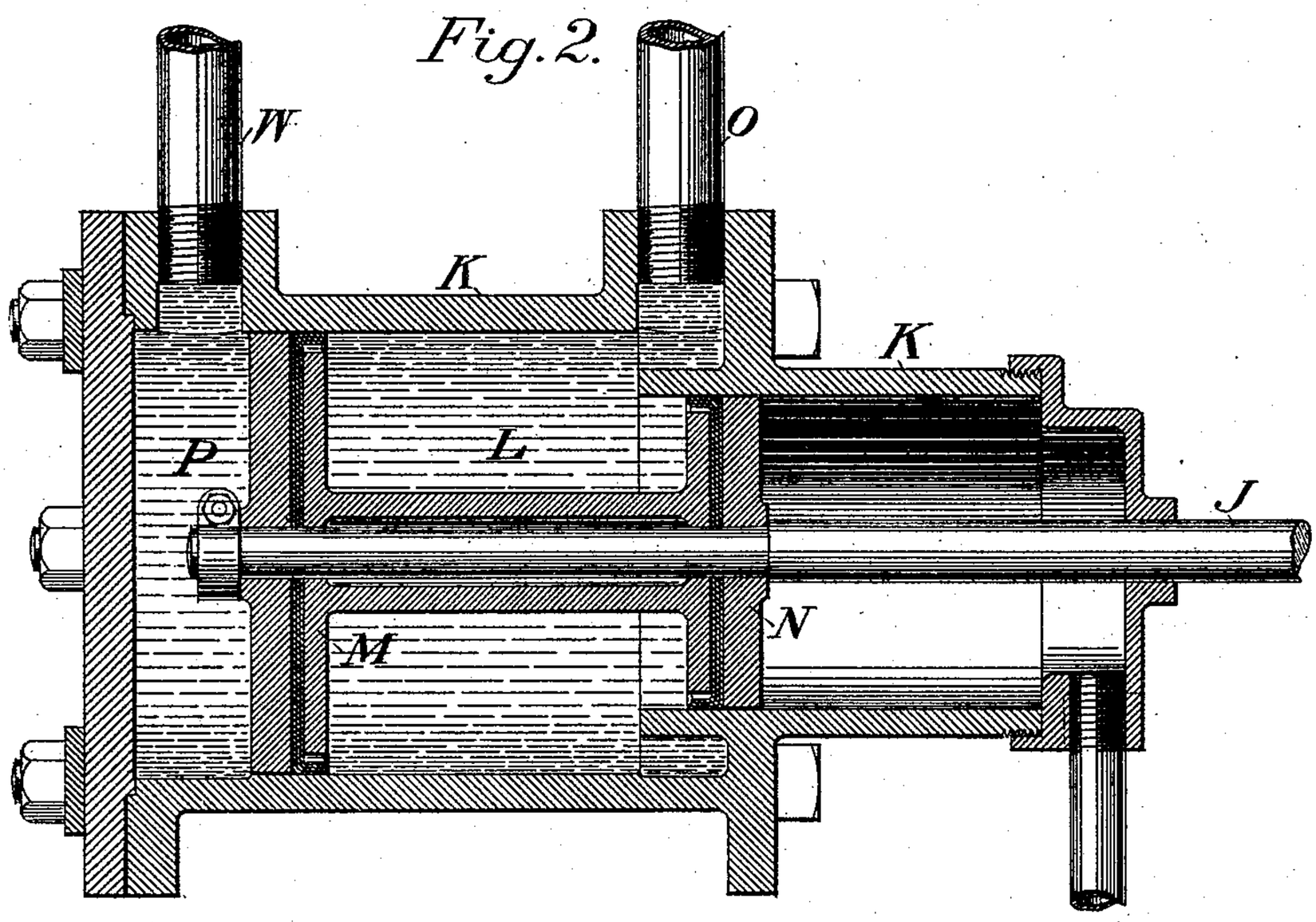
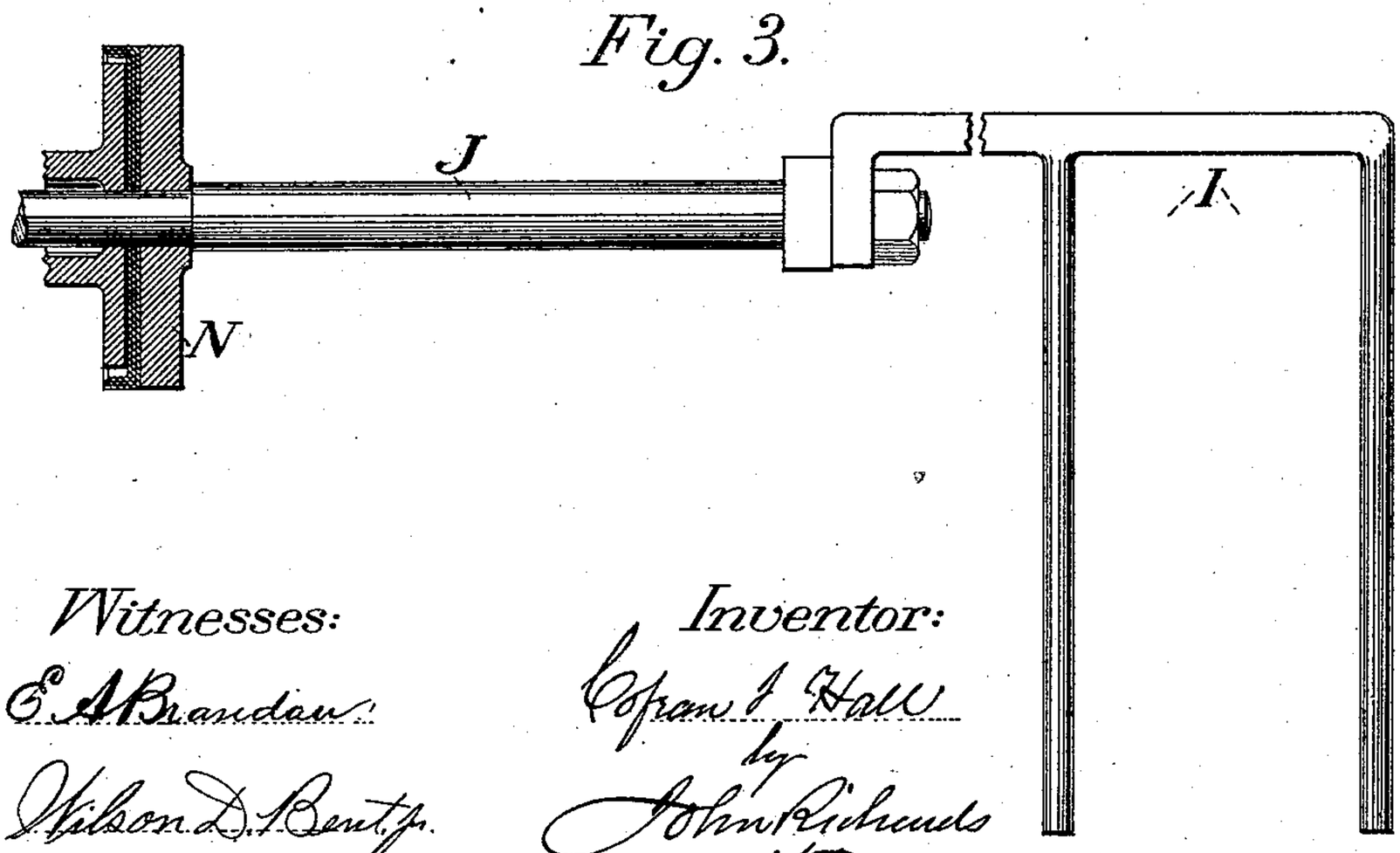


Fig. 3.



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UNITED STATES PATENT OFFICE.

COFRAN I. HALL, OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR CONTROLLING PUMPS.

SPECIFICATION forming part of Letters Patent No. 492,723, dated February 28, 1893.

Application filed July 11, 1892. Serial No. 439,631. (No model.)

To all whom it may concern:

Be it known that I, COFRAN I. HALL, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Apparatus for Controlling Pumps; and I hereby declare the following specification, with the drawings accompanying the same, to be a full, true, and exact description of my improvements.

My invention relates to pumps requiring intermittent action, whereby a supply of water is raised for irregular, or variable, use, especially in the case of hydraulic elevators operated from tanks set high enough to produce the required pressure by gravity.

My invention consists in arranging the driving gearing of supply pumps so that an overflow of the water raised, after the desired quantity is supplied, will stop the pump by means of a hydraulic piston, and then escape therefrom within some predetermined period arranged by adjustment, so the pump will again start and supply until another overflow takes place.

The mechanism consists essentially of a differential hydraulic piston having the difference of its major and minor areas constantly exposed to the constant pressure of the head of water elevated, and the major area of the piston acted upon by the overflow water, as before named, producing a reciprocating movement of the piston coincident with a full supply and some predetermined period of time; such reciprocating motion engaging and disengaging the pump-driving mechanism so as to keep up, automatically, a constant, or nearly constant, supply of the elevated water.

By my invention the great utility of employing as a pump controller a piston operated upon by overflow water from the elevator tank in lieu of spring devices which are liable to vary in their action, after being sometime in use, instead of being unchanging in their effect like in the case of controllers wherein water acts against piston heads of different diameters and areas.

Referring now to the drawings: Figure 1 is a vertical section through an imaginary building in which is placed tanks and a pump for raising water, the pump being supplied with my improved controlling apparatus. Fig. 2 is a longitudinal section through the differential hydraulic cylinder, employed to operate, or stop, and start the pump-driving mechanism. Fig. 3 is a detail showing a portion of the hydraulic piston, and a belt-shifting fork attached thereto, such as is employed in the arrangement shown in Fig. 1.

Similar letters of reference on the different figures indicate corresponding parts of the apparatus.

The building A, shown in Fig. 1, may be of any height or arrangement so long as the head of water from the upper tank B affords pressure enough to operate elevators for passengers and goods, or other purpose requiring water pressure.

At the bottom of the building is placed a second tank C to receive the water after it has acted on an elevator, or other apparatus, and performed its work, thus circulating the water without waste, and permitting the use of glycerine or other liquids in connection therewith to avoid freezing, or to serve as a lubricant for pistons on which the water acts. The waste tank C is not essential, however, except to save the water, or for the other purposes named. The supply can be drawn from any source, and the spent water discharged as waste if preferred.

In the arrangement shown, water is drawn from the tank C, through the suction pipe R, by the pump D, and is forced up into the tank B, through the pipe S, which also answers as a downtake, or service pipe, for water escaping at the pipe T and applied to operating an elevator or other apparatus. When the pump D is in motion, and water is at the same time being used from the pipe T, so much of the supply as is consumed in the work passes directly from the pump D into the pipe T, but is of course subject to the pressure of the head from the upper tank B. After use the water used from the pipe T returns through a waste pipe U to the tank C, as shown in Fig. 1. The pump D may be of any type. The one shown is inclosed in a casing, and is driven by the pulleys E, a belt F and countershaft G, power being applied to the pulleys H, or in case of an electric motor being employed, the controlling apparatus can operate a switch. In the present case the pump D is stopped, or started, by means of the shifting fork I moving the band F on fast and loose pulleys in the usual manner. This shifting fork I is operated by a differ-

ential hydraulic piston rod J carrying a piston contained in the cylinder K, having two piston heads M and N of different diameters, as shown in Fig. 2. The chamber L of the cylinder K is connected by a pipe O with the main supply, and uptake-pipe S, so this chamber sustains at all times a pressure equal to the head from the upper tank B, and when water is permitted to escape from the chamber P, by means of the pipe Q, the difference in the area of the pistons M and N causes an inward movement of these pistons M and N and the piston rod J, shifting the band F, or moving an electric switch, to start the pump D. The pump then operates until the tank is filled to the level of the intake funnel V on the pipe W. This funnel is made wide at the top, as shown in Fig. 1, so that when the water flows over the periphery the quantity will be sufficient to suddenly fill the pipe W and the chamber P of the hydraulic cylinder K. When this takes place, the cock X being closed or partially closed, both of the chambers P and L will sustain a static pressure due to the head of water from the tank B, and the piston head M will be in equilibrium with an equal pressure on each side, but the piston head N, having pressure on the inside only, will move the two piston heads and the piston rods outward, shifting the band F to the loose pulley at E, stopping the pump D. This condition will continue so long as the pipe W is filled with water, but the waste valve at X is left partially open so that in some predetermined time, corresponding as nearly as possible to the amount used from the pipe T, the water will escape from the pipe W, through the cock X and the waste pipe Q, and the pressure in the chamber P will fall accordingly. In the mean time the pressure in the chamber L remains constant, and the difference in the area of the pistons M and N causes them, with the piston rod J, to move inward, again shifting the band F to the fast pulley starting the pump D. This operation proceeds automatically, the frequency of stopping and starting being, as before explained, dependent upon the adjustment of the cock X, and how rapidly the water is permitted to escape from the pipe W. This adjustment can always be made so the pump will start within the period in which the contents of the tank B are consumed, consequently when once adjusted the water supply reqires no further attention, and no power is lost by raising water not required to perform useful work.

It will be understood that instead of a shifting band a clutch, or other mechanism, can be used for engaging and disengaging the pump gearing, or in the case of a steam pump the hydraulic piston can be employed to admit and shut off steam from the pump engine, the operation being the same in either case.

Having thus explained the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pump controlling apparatus as herein described, a hydraulic differential cylinder having joined piston heads of different diameters and areas connected with an elevated supply vessel or tank, and a pumping apparatus, whereby the chamber between the piston heads will sustain continually a pressure due to the head, and a chamber outside the larger piston head subjected to a variable pressure by overflow from the supply vessel, and thus a reciprocating movement of the hydraulic piston head, such as is required to start and stop the pump, secured, substantially in the manner described.

2. In a pump controlling apparatus, a supply pump and an elevated supply vessel or tank, a differential cylinder fitted with differential pistons, means for shifting a belt or switch connected with the differential hydraulic piston and to the pump gearing for starting and stopping the pump, whereby, by means of a static or uniform pressure, the piston is moved in one direction, and by the pressure from overflow water is moved in the other direction, and the pump thus caused to operate automatically, substantially as and for the purpose described.

3. In a pump controlling apparatus, an elevated supply vessel or tank, a supply pump, a cylinder fitted with two piston heads of different diameters and so arranged and connected that the differences of their areas when exposed to a constant pressure between the heads will cause an inward movement of the piston rod and engage or start the pump, and when the larger piston head is exposed to an equal pressure on each side will move outward and disengage the pump, a pipe connecting the hydraulic cylinder with the overhead supply vessel provided with an expanded overflow inlet, substantially as and for the purpose described.

4. In a pump controlling apparatus as herein described, a supply pump and overhead supply tank, means for shifting a belt or switch of the pump gearing, a differential hydraulic cylinder having differential piston heads connected with the shifting means, a pipe extending from one end of a hydraulic cylinder to the bottom of the supply tank, and a pipe connection extending from the other end of said cylinder to the highest water level in the said tank and having connection also with a waste pipe having an adjustable valve or cock, whereby the hydraulic cylinder is caused to move in one direction when the elevated vessel is not full and in the other direction when said vessel is full, thus starting and stopping the supply pump, substantially as described.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

COFRAN I. HALL.

Witnesses:
ALFRED A. ENQUIST,
WILSON D. BENT, Jr.