No. 650,168. Patented May 22, 1900.

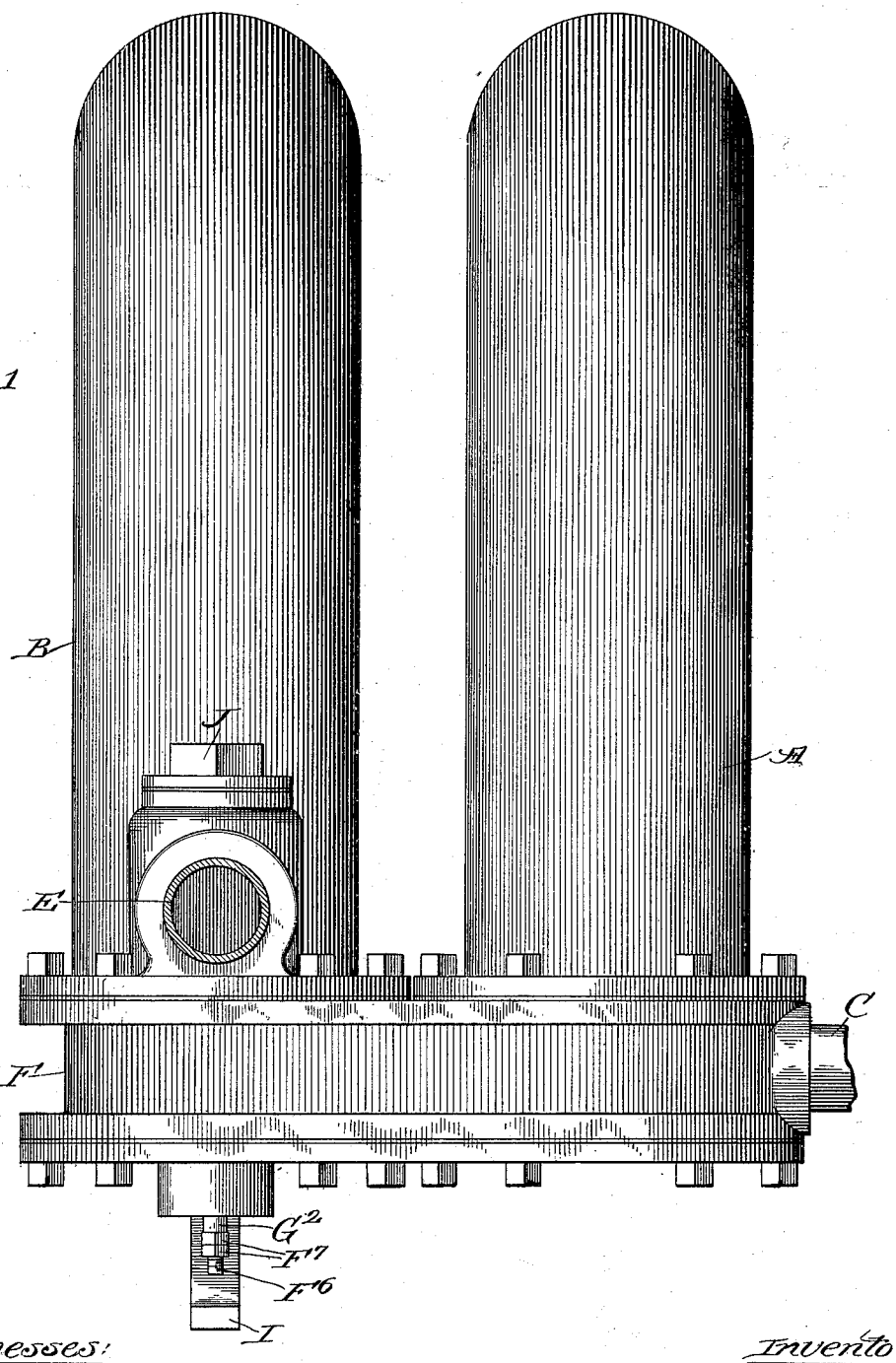
H. D. COLMAN.

WATER LIFT.

(Application filed Nov. 2, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1



Witnesses:
W. C. Cordis
Luther L. Miller

Inventor:
Howard D. Colman,
By Luther L. Miller
Atty

No. 650,168. Patented May 22, 1900.

H. D. COLMAN.

WATER LIFT.

(Application filed Nov. 2, 1898.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 4.

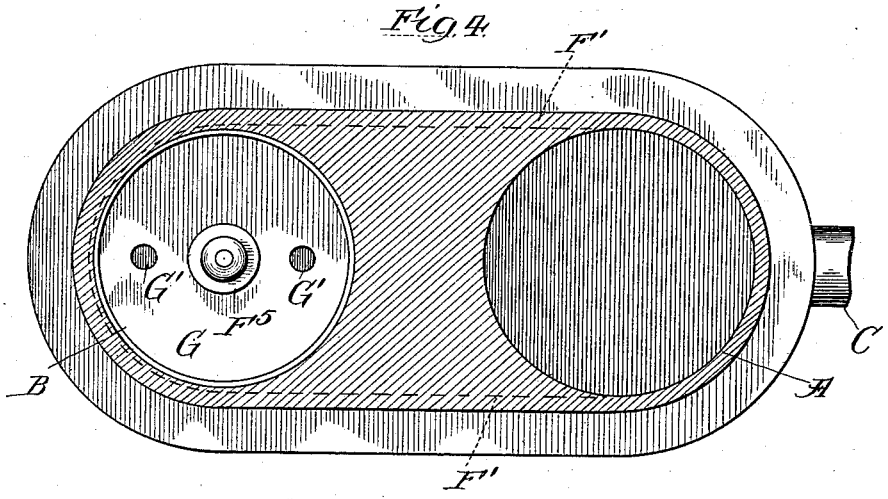
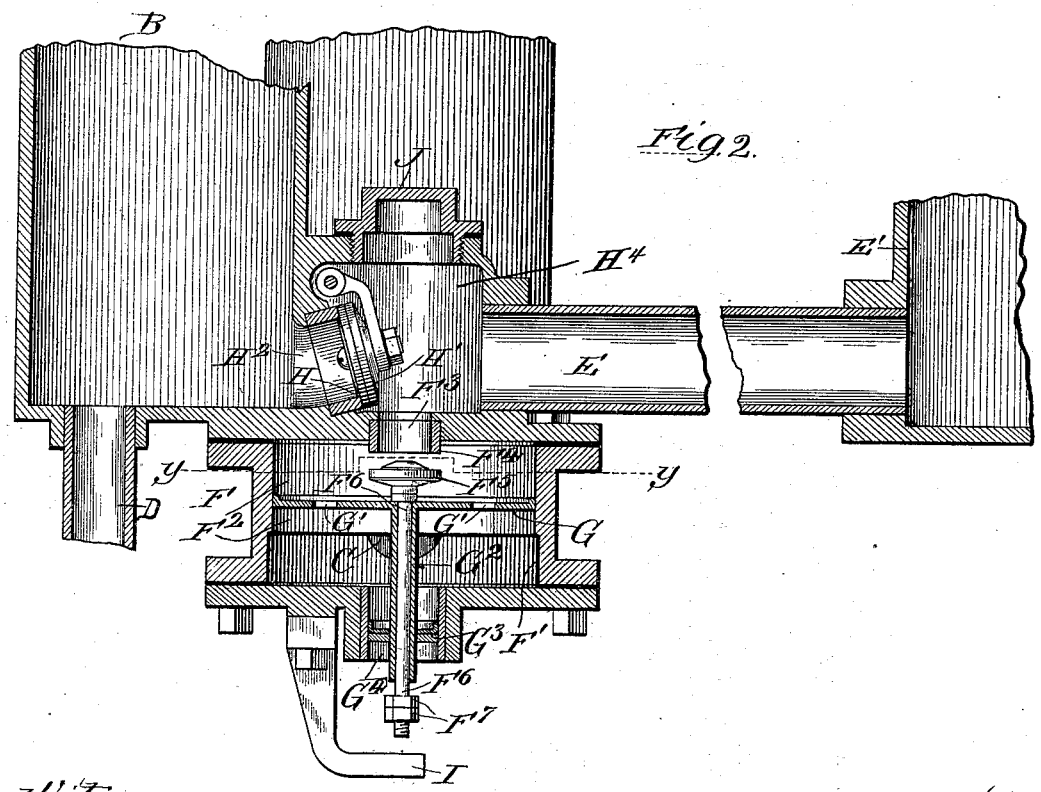


Fig. 2.



Witnesses:

W. C. Coales

Lute S. Miller

Inventor:

Howard D. Colman.

By Luther L. Miller

Atty.

No. 650,168. Patented May 22, 1900.

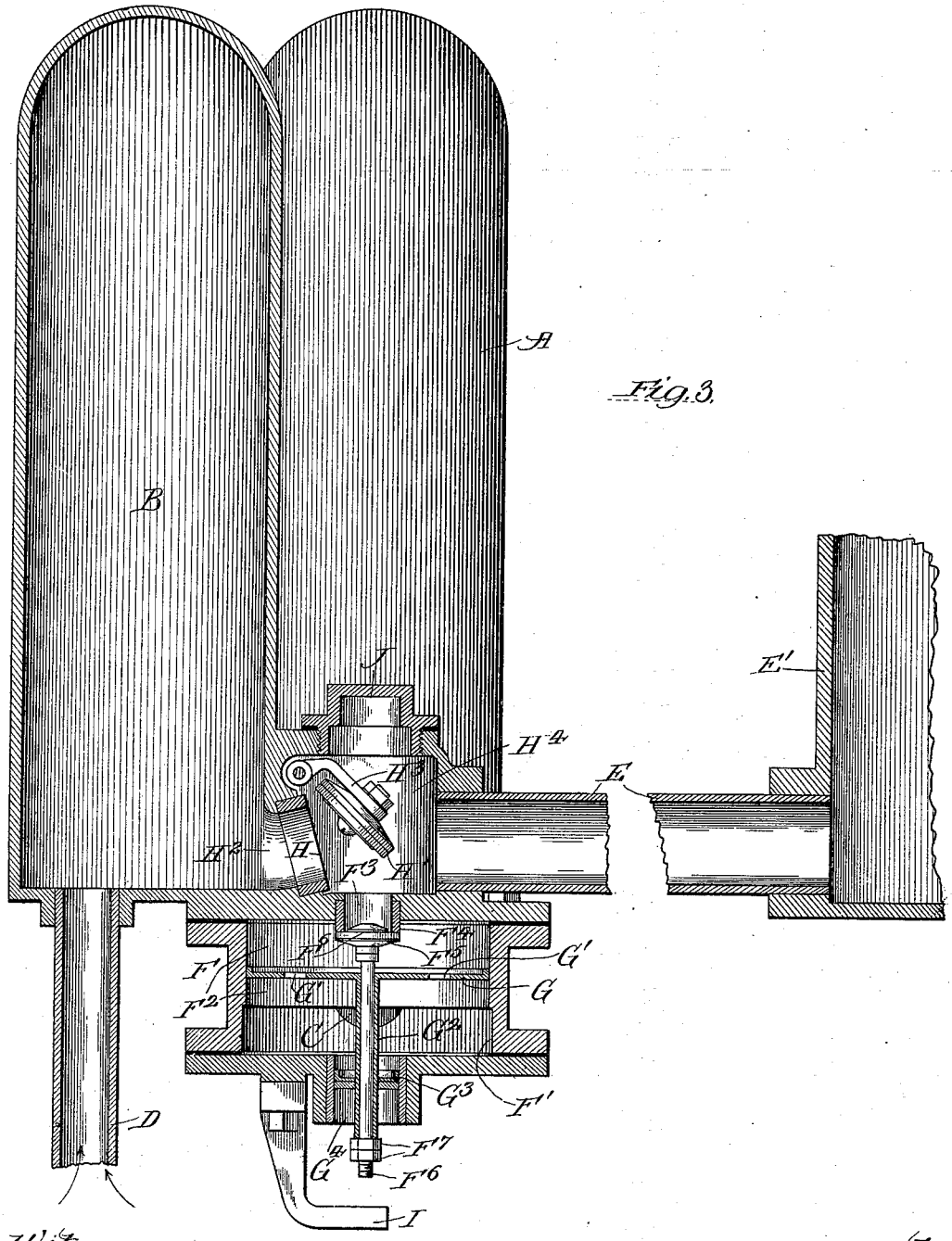
H. D. COLMAN.

WATER LIFT.

(Application filed Nov. 2, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 3.



Witnesses:
W. C. Coode
Lute S. Hitt

Inventor:
Howard D. Colman,
By Luther L. Miller
Atty

UNITED STATES PATENT OFFICE.

HOWARD D. COLMAN, OF ROCKFORD, ILLINOIS.

WATER-LIFT.

SPECIFICATION forming part of Letters Patent No. 650,168, dated May 22, 1900.

Application filed November 2, 1898. Serial No. 695,258. (No model.)

To all whom it may concern:

Be it known that I, HOWARD D. COLMAN, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Water-Lifts, of which the following is a specification.

The object of this invention is the production of an apparatus for elevating water by other water under pressure where the discharge of the water used for operating the apparatus and the water elevated may be made from the same pipe.

In the accompanying drawings, Figure 1 is a side elevation of this water-lift. Fig. 2 is a vertical section on the center line of the vacuum-chamber. Fig. 3 is a view identical with the preceding figure, excepting that the moving parts are shown in different positions. Fig. 4 is a horizontal section through the base of the apparatus on dotted line *y y* of Fig. 2.

Like letters of reference indicate corresponding parts throughout the several views.

A is an air-chamber.

B is a vacuum-chamber.

C is the pressure-water-supply pipe, having communication with the chamber A.

D is the intake-pipe for the water to be elevated, opening into the vacuum-chamber B.

E is the discharge-pipe for all of the water.

E′ is a reservoir for receiving the water.

F is the base of the apparatus.

F′ is a flume or passage extending through the base F, being practically a continuation of the pressure-water-supply pipe C. It communicates with the cylindrical chamber F^2 within the base.

F^3 is a passage opening from the upper part of the chamber F^2 into the discharge-pipe E.

F^4 is a valve-seat at the lower end of the passage F^3.

F^5 is a pulse-valve for the seat F^4. This valve has a valve-stem F^6 fixed thereto, provided with the setting-nuts F^7 near the lower end thereof.

G is a disk fitting the cylindrical chamber F^2 and having a slight vertical movement therein. It is provided with the two openings G′. G^2 is the hollow stem for said disk, which stem closely surrounds the valve-stem F^6.

G^3 is a piston fixed on the hollow stem.

G^4 is a cylinder situated just beneath and having free communication with the chamber F^2. The piston G^3, being rigidly connected with the disk G, has the same vertical movement as the said disk.

H is a valve-seat, and H′ a check-valve for controlling the passage H^2 between the vacuum-chamber B and the discharge-pipe E.

H^4 is a chamber for the valve H′, which valve is pivotally mounted on the swinging arm H^3.

I is a fixed stop-arm for limiting the downward movement of the valve-stem F^6.

J is a screw-cap providing easy access to the moving parts of the apparatus.

The valve F^5 corresponds somewhat in office and operation with the pulse-valve and the valve H′ with the check-valve of a hydraulic ram.

Assuming the pipes to be full of water and the movable parts in the position indicated in Fig. 2, the operation of the apparatus is as follows: The pressure-water in the ingress-pipe C and passage F′ flows through the openings G′ in the disk G and through the passage F^3, escaping through the discharge-pipe E until its velocity is sufficient to raise the pulse-valve F^5 against its seat F^4. The momentum of the column of water in the discharge-pipe E causes it to flow on toward the reservoir E′ and tends to produce a vacuum in the chamber H^4. To fill this partial vacuum, water enters from the vacuum-chamber B through the passage H^2, forcing open the valve H′ and joining the current flowing through the discharge-pipe E. The drive-water by its pressure upon the pulse-valve F^5 holds the latter against its seat and at the same time tends to pull it away from its seat by pressing against the piston G^3. This piston is of such a size that the pressure upon it is insufficient to open the pulse-valve F^5 during the continuance of the partial vacuum in the chamber H^4; but when that partial vacuum ceases the pressure upon the piston G^3 is sufficient to open the pulse-valve F^5 partially, causing the pressure above and below it to become momentarily the same. The valve F^5 then drops to the position shown in Fig. 2 by reason of its own weight, assisted by the pressure of the drive-water against the piston area formed by the valve-stem F^6, passing through the tubular stem G^2. The

difference between the upward and the downward pressure exerted, respectively, upon the lower and the upper sides of the pulse-valve F^5 is the amount of pressure exerted downwardly upon an area equal to that of the valve-stem F^6, and to this extent the downward pressure upon the pulse-valve predominates over the upward pressure thereon. The valve F^5 being again open the pressure-water rushes through the openings G′ and past said valve until the flow is strong enough to raise the disk G a sufficient distance to permit the closure of the said valve F^5. The momentum of the onflowing water in the pipe E again tends to produce a vacuum in the chamber H^4, and water is again drawn into that chamber from the vacuum-chamber B.

In the operation of this apparatus the flow through the suction-pipe D is nearly uniform on account of the equalizing effects of the vacuum-chamber B, and the air-chamber A, receiving the shock of the sudden stoppage caused by the quick shutting of the valve F^5, permits a like continuous flow of drive-water through the pressure-water-supply pipe C.

In starting the apparatus when the intake-pipe D is not filled with water the pulse-valve F^5 may be actuated by hand until all the air in that pipe is expelled through the discharge-pipe E and a sufficient quantity of air removed from the vacuum-chamber B to cause that chamber to properly perform its function. The valve F^5 is operated for this purpose by grasping the set-nuts F^7 at the lower end of the valve-stem.

I claim as my invention—

1. In a water-lift, in combination, a pressure-water-supply pipe, a pulse-valve, a disk having a connection with the pulse-valve, a piston connected with the disk, for opening the pulse-valve by the pressure of the drive-water, an intake-pipe, a discharge-pipe and a check-valve.

2. In a water-lift, in combination, a pressure-water-supply pipe, an air-chamber, a pulse-valve, a cylindrical chamber, a disk therein, a piston, a piston-cylinder, a connection between the pulse-valve, the disk, and the piston, an intake-pipe, a discharge-pipe and a check-valve.

3. In a water-lift, in combination, a pressure-water-supply pipe, an air-chamber connected therewith, a pulse-valve, a stem for the valve, a cylindrical chamber, a disk therefor, a tubular stem for the disk, which stem surrounds the stem of the pulse-valve, a piston mounted on the tubular stem, a piston-cylinder, a stop on the stem of the pulse-valve for being engaged by the tubular stem of the disk, an intake-pipe, a vacuum-chamber, a discharge-pipe and a check-valve.

4. In a water-lift, in combination, a pressure-water-supply pipe, an air-chamber connected therewith, a discharge-pipe, a cylindrical chamber between the pressure-water-supply pipe and the discharge-pipe, a pulse-valve within the cylindrical chamber, a stem for the pulse-valve, a disk mounted on the stem, a piston connected with the disk, a piston-cylinder, a vacuum-chamber, an intake-pipe communicating therewith, and a check-valve between the vacuum-chamber and the discharge-pipe.

5. In a water-lift, in combination, a pressure-water-supply pipe, an air-chamber communicating therewith, a discharge-pipe, a pulse-valve between the pressure-water-supply pipe and the discharge-pipe, a stem for the pulse-valve, a stop on the stem, a perforated disk and a tubular stem therefor on the stem of the pulse-valve, a cylinder for the disk, a piston on the tubular stem, a cylinder for the piston, an intake-pipe, a vacuum-chamber and a check-valve.

6. In a water-lift, in combination, a pressure-water-supply pipe, an air-chamber connected therewith, a discharge-pipe, a cylindrical chamber between and having communication with the pressure-water-supply pipe and the discharge-pipe, a pulse-valve in the cylindrical chamber, a stem for the valve, a stop on the stem, a stop-arm to limit the downward movement of the stem, a perforated disk in the cylindrical chamber, a tubular stem for the disk, which tubular stem surrounds the pulse-valve stem, a piston on the tubular stem, a cylinder for the piston having communication with the cylindrical chamber, a vacuum-chamber, an intake-pipe having communication therewith, an opening from the vacuum-chamber to the discharge-pipe, and a check-valve for said opening.

7. In a water-lift, in combination, a pressure-water-supply pipe, an air-chamber connected therewith, a discharge-pipe, a cylindrical chamber between the pressure-water-supply pipe and the discharge-pipe, a pulse-valve in said chamber, a stem for said pulse-valve, a stop on said stem, a perforated disk in the cylinder, a tubular stem for said disk, which stem surrounds and has a slight longitudinal movement with relation to the stem of the pulse-valve, a piston fixed on the tubular stem, a cylinder for the piston, a stop-arm to limit downward movement of the stem of the pulse-valve, a suction-pipe, a vacuum-chamber in connection therewith, a discharge-pipe and a stop-valve located between the vacuum-chamber and the discharge-pipe.

HOWARD D. COLMAN.

Witnesses:

JEANETTE M. EVANS,

J. B. WHITEHEAD.