(No Model.)

3 Sheets—Sheet 1.

L. E. MILLER.

CURRENT PUMPING MACHINE.

No. 548,078. Patented Oct. 15, 1895.

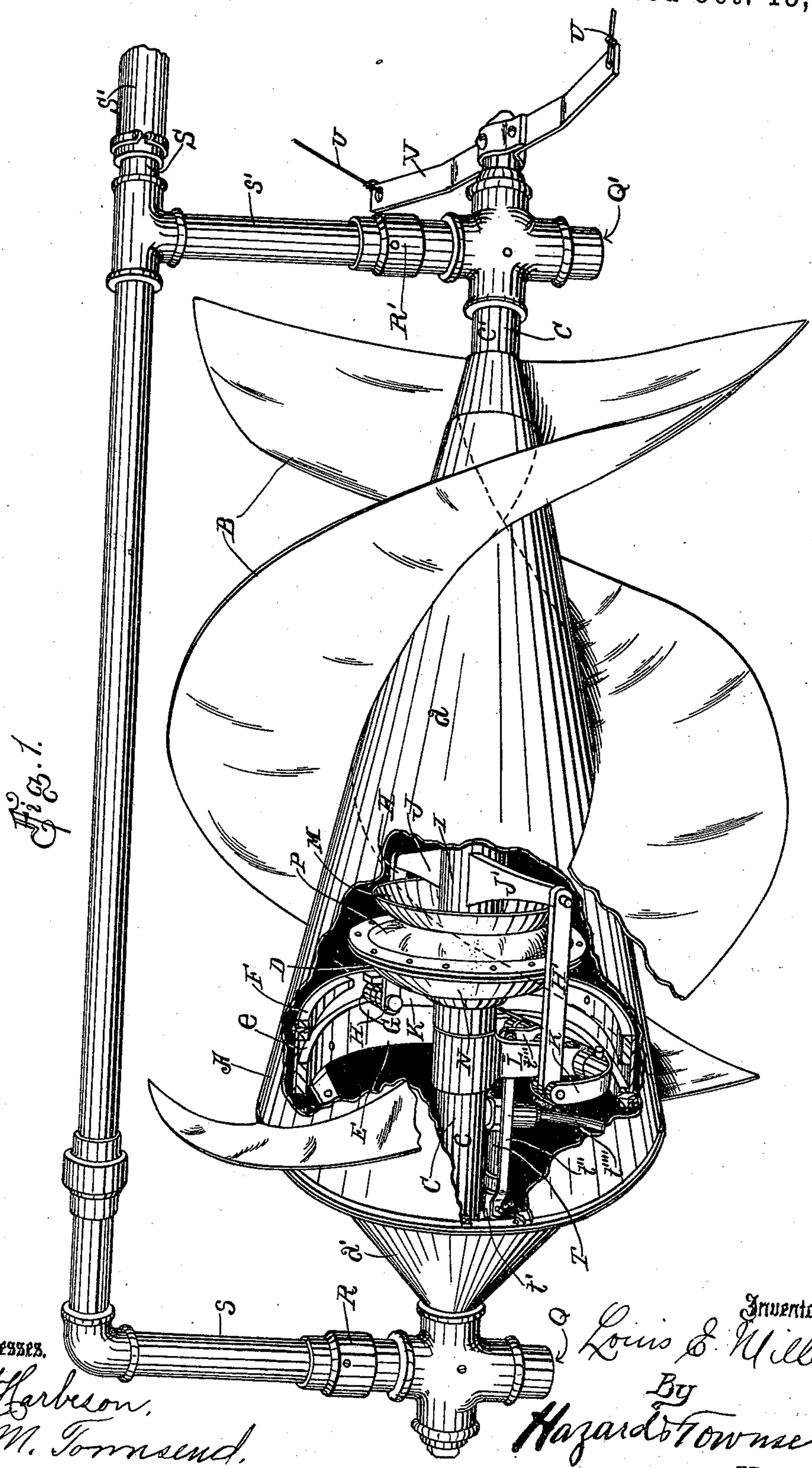

Fig. 1.

Witnesses.
D. W. Harbeson.
F. M. Townsend.

Inventor.
Louis E. Miller
By
Hazard & Townsend
His Attys.

(No Model.) 3 Sheets—Sheet 2.

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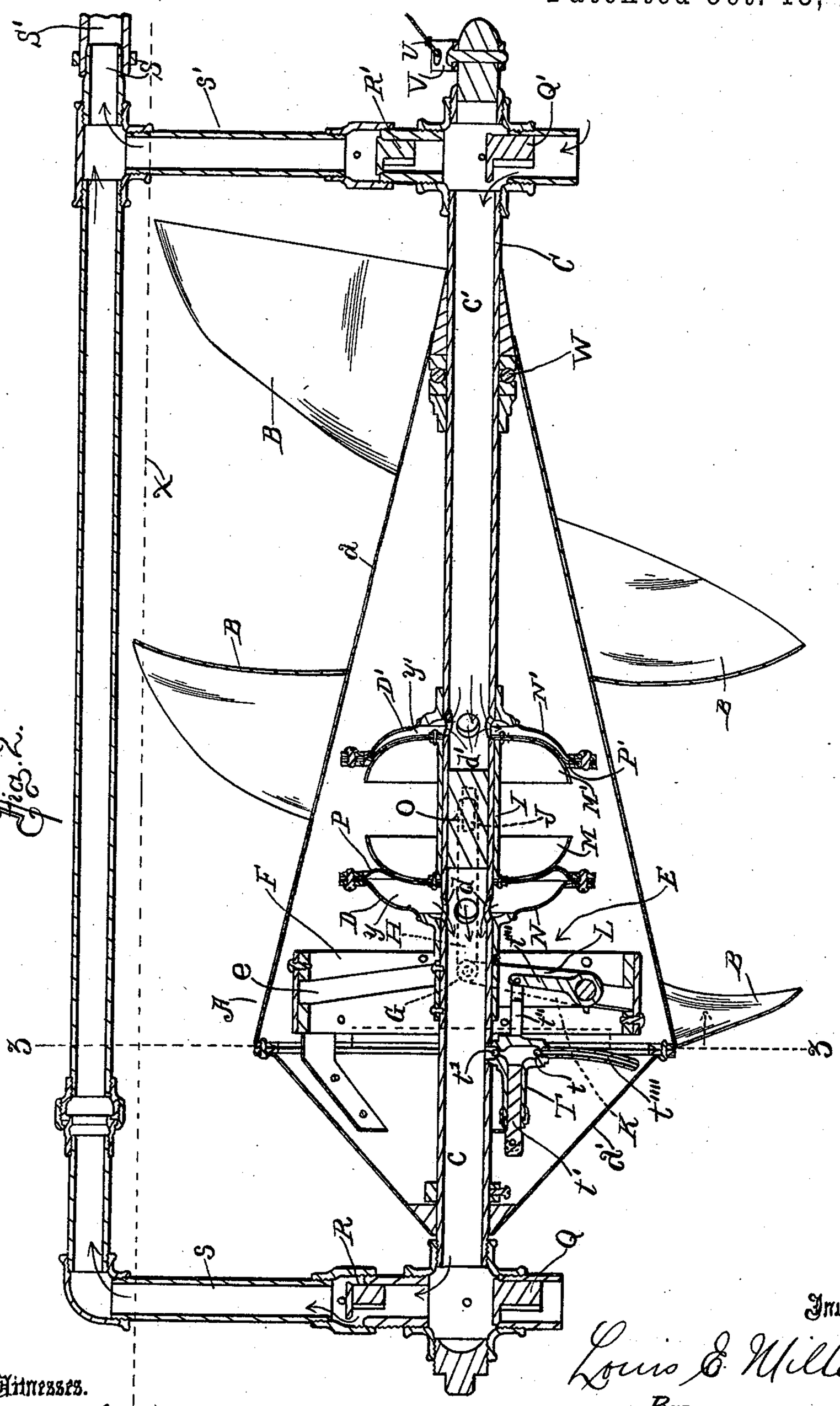

Fig. 2.

Witnesses.

P. W. Larbeon.

F. M. Townsend.

Inventor.

Louis E. Miller

By

Hazard & Townsends

His Attys.

(No Model.) 3 Sheets—Sheet 3.

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Fig. 3

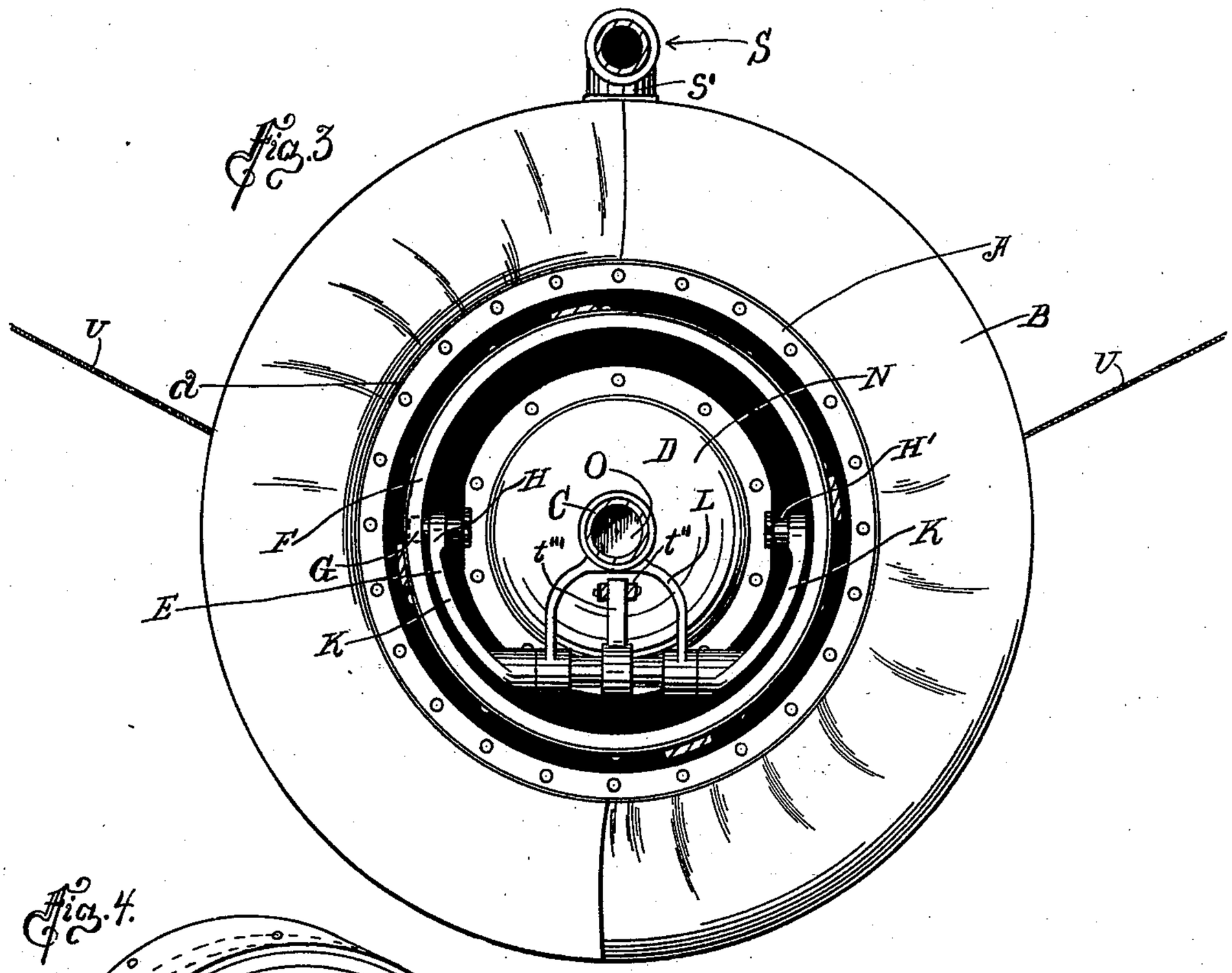


Fig. 4.

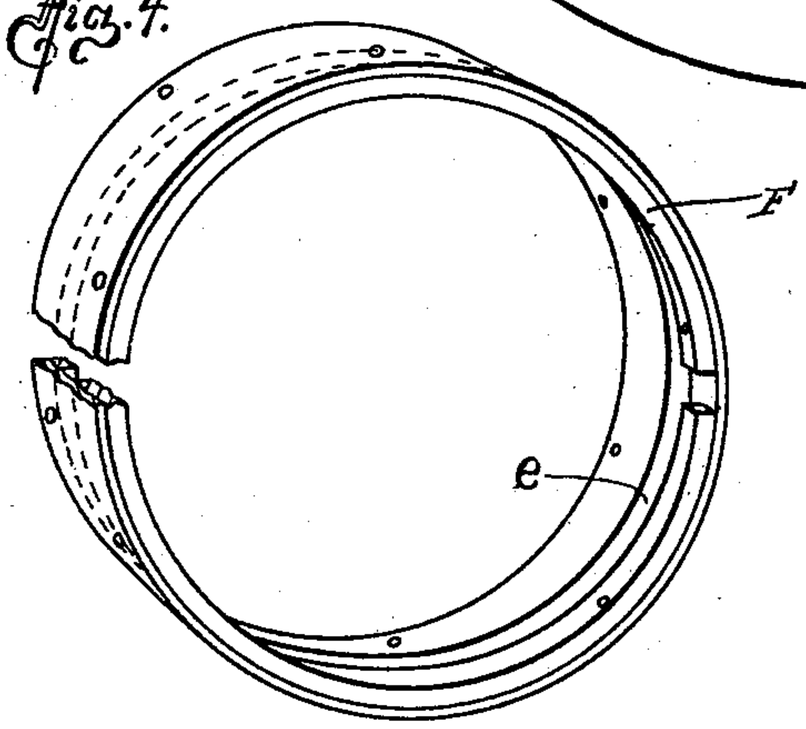
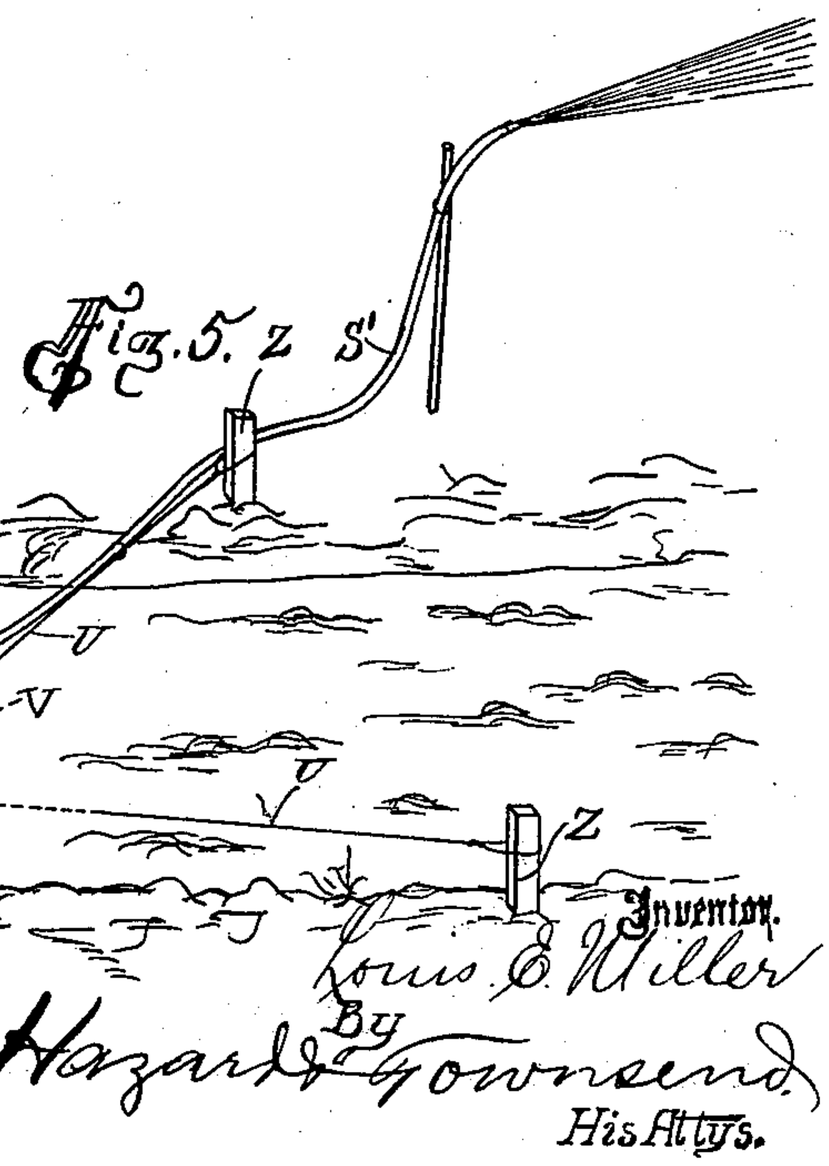


Fig. 5.



Witnesses.
P. W. Harbeson,
F. M. Townsend

Inventor.
Louis E. Miller
By Hazard & Townsend.
His Attys.

UNITED STATES PATENT OFFICE.

LOUIS E. MILLER, OF LOS ANGELES, CALIFORNIA.

CURRENT PUMPING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 548,078, dated October 15, 1895.

Application filed August 17, 1894. Serial No. 520,586. (No model.)

To all whom it may concern:

Be it known that I, LOUIS E. MILLER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Current Pumping-Machine, of which the following is a specification.

One object of my invention is to produce a simple compact portable pumping-machine, which is adapted to be placed in a current of water and thereby be operated, and which in itself comprises all of the machinery necessary for utilizing the force of the current for pumping water to an elevation whence it can be used for irrigation and other purposes.

Another object is to provide a pumping-machine which has no packing nuts or glands, and which, therefore, will run for a long time without attention.

Another object is to provide a machine of the character specified, which, when placed in the water, will need no foundations or other supports or holding devices, except anchorage, thus doing away with expensive foundations or other structures.

Another object is to provide a compact simple, and efficient portable machine for utilizing the power of a current of water for pumping water and to provide a machine of this kind which can be anchored in the water-current and left free to rise and fall with the water in which it is anchored.

I accomplish these objects by the means described herein and illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of my current pumping-machine with portions broken away to expose the working parts. Fig. 2 is a vertical axial section of the same. Fig. 3 is an end elevation as it would appear with the rear cap removed and with parts in section on line 3 3, Fig. 2, looking to the right of Fig. 2 and toward the front end of the machine. Fig. 4 is a perspective view of one form of cam used, the same being a detached view of the cam shown in the preceding figures. Fig. 5 is a perspective view illustrating the machine in operation in a stream.

My newly-invented machine comprises the combination of a screw arranged to be rotated by a current of water, a pump arranged within the screw, and suitable means for transmitting power from the screw to operate the pump.

Various styles of pump may be applied and various forms of mechanism be used for transmitting the power thereto from the screw without departing from the spirit of my invention, and while the specific form of pump and operative mechanism shown herein for that purpose are embraced in my invention I do not wish to limit my claims thereto.

An important feature of my specific form of machine shown is that the pump and the operative mechanism is contained within a closed buoyant case, which affords sufficient buoyancy to sustain the apparatus in the water sufficiently submerged to allow the screw, which is connected with the case, to receive a maximum of energy from the moving water when the apparatus is anchored in the current.

Another important feature of the specific machine shown is the peculiar form of the main water-pump, whereby I secure great capacity at slight cost of friction and wear.

Other features and combinations shown are of more or less value and will be hereinafter described and claimed.

In the drawings, A indicates a buoyant case or float, conical in shape and tapering toward each end, and provided upon its periphery with a screw B, extending from one end toward the other end along the anterior cone or front section *a* of the case.

C indicates the hollow axle, upon which, through the medium of the case A, is journaled the screw B, which, together with the case, rotates upon said hollow axle.

D D′ indicate, generally, pumping mechanism mounted upon the hollow axle and arranged to fill and exhaust through the ports *d d′* in said axle.

E indicates, generally, suitable mechanism for operatively connecting the pump with the conical case A and with the screw through the medium of the case. This mechanism, as shown, comprises an annular cam F, fixed to the case, a pin G, arranged in the cam-groove *e*, to be operated by said cam, a connecting-rod H, carrying said pin and connecting the same with the reciprocating cross-

head I, which is provided at its opposite ends with piston heads or plungers arranged to respectively seat in suitable cups, as hereinafter described. As practically constructed, the cross-head I is provided with the two arms J and J′, and the connecting-rod is pivoted to arm J.

K is a rocker-shaft journaled in a stay-brace L and pivoted at one end to the connecting-rod H and at the other end to a connecting-rod H′, which is journaled to the arm J′ of the cross-head. This arrangement causes the power to be transmitted from the rotating cam to the pump through the cross-head without any sidewise strain which might otherwise be produced. The piston-heads M M′ are convex and fit into the bowl-shaped pump-cups N N′, respectively.

O is a partition which prevents communication between the ports *d* and *d′* and divides the hollow axle C into two chambers or two hollow members *c c′*.

P is a flexible cap or diaphragm fixed by its rim to the wall of the cup N at the rim thereof and fixed at its inner portion to the piston-head M. P′ is a like cap or diaphragm, connecting the piston-head M′ with the cup N′.

Q is a valved inlet for supplying the pump D, which pump comprises the piston-head M, the cup N, and the diaphragm P.

Q′ is the valved inlet for the pump D′.

R is the valved outlet for the pump D, and R′ is the valved outlet for the pump D′.

S is the discharge-pipe.

T is an auxiliary pump arranged to pump water from the case and force it into the pipe or hollow axle C. *t* is the inlet-valve, and *t′* the outlet-valve, of this pump. The piston T′ of this pump is connected by the connecting-rod *t″* with the rocker-arm *t‴*, so that when the rocker-arm operates it operates the piston to draw the water out of the case and force it into the hollow axle, thereby preventing the case from becoming water-logged from any slight leakage which might occur.

t⁗ is a pipe arranged to draw water from the lowest part of the case to supply the pump T.

U U indicate the anchor lines or guys by which the device is anchored in the stream. The anchor lines or guys U U are fastened to a cross-arm V, which is fixed to the hollow axle C, so that when the machine is placed in a current of water the guys can be so adjusted as to cause the machine to assume the most advantageous position for receiving the energy from the current, and when thus adjusted the machine will retain that position in the current.

The discharge-pipe S is connected with the two members *c c′* of the hollow axle C by standards *s s′*, respectively, which are preferably arranged at right angles to the guy-arm or cross-head V, so that when the machine is in position in the current the discharge-pipe S will be above water.

S′ indicates a flexible pipe or hose, which leads from the discharge-pipe S to conduct the water to the shore where it is to be used.

W indicates a ball-bearing, arranged to minimize the friction caused by the back-pressure of the screw.

In practice the machine is placed in a current, either in a running stream or in an ocean current or other current of water, and is secured in place by the guys, so that the axis of the machine will be parallel with the direction of the current. In constructing the machine care is taken that the weight thereof will be so proportioned to the buoyancy of the case that the machine will be submerged to approximately the water-line X, indicated in Fig. 2. This depth of submergence is believed to be ordinarily preferable as giving the maximum amount of power, but the machine will operate at greater or less degrees of submergence. When in place in the water, the current operates upon the screw and rotates the same and the attached case and cam, and the piston-heads are thereby caused to reciprocate and alternately operate with the two diaphragms to enlarge and reduce the chambers *y y′*, respectively, of the two pumps, thereby drawing water into and forcing it out of said chambers. The result is a practically continuous stream through the discharge-pipe S.

By arranging the pump within the screw, as shown, the machine is made very compact and the operative parts are out of the way.

The case protects the operative parts, but the case may be omitted if other means of buoying the screw are provided. By arranging the pump within the screw I am thus enabled to apply the power to operate the pump with less intermediate gearing or connection than would be necessary otherwise, and I do not limit my invention to having the case inclosing the pump mechanism, but broadly claim the pump arranged within the screw.

The diaphragm pump shown avoids the necessity of packing nuts and glands, and there is, therefore, no appreciable loss of power by friction.

The body of the cross-head I is a sleeve, which is nicely fitted to the axle C to reciprocate thereon. The areas of the piston-heads are comparatively great with relation to the inlet and outlet, thus giving the pump the desired capacity, with very slight movement of the operative parts, and thus minimizing the friction and wear.

The convex piston-heads are arranged to fit into their respective cups, so that at each inward stroke all the water is forced out of the cup by the piston-head and its diaphragms, and the operation of the pump is more effective with the same power than is possible where the piston-head does not fit closely into

the cup or diaphragm-chamber, for the reason that any dead water which remains in the diaphragm-chamber must be set in motion by the operation of the pump when the piston is withdrawn to cause the diaphragm-chamber to fill with water, and this moving of a body of practically-superfluous water causes a consumption of power which is detrimental to the operation of the pump. This is entirely avoided by my axial arrangement of the inlet and outlet of the cup and the bowl shape of the cup into which the convex piston-head closely fits; also, by arranging the pump-cup surrounding the inlet and discharge-pipe and by arranging the piston-head to slide upon this discharge-pipe, which practically forms a piston-guide projecting from the bottom of the cup, I am enabled to thereby cause the piston-head to reciprocate back and forth in a direct line with relation to the bowl of the cup and am enabled to avoid any straining of the diaphragm by reason of unequal movement of its parts. I am also enabled to cause the piston-head to seat perfectly in the cup to thereby expel all the water from the diaphragm-chamber, and the contact of the piston-head with the cup prevents any liability of rupture of the diaphragm by reason of the piston-head being forced too far into the diaphragm-chamber.

The conical case is adapted to split the current, and the screw is practically the only part of the machine which offers any resistance to the current.

In Fig. 5 Z indicates anchorage for the machine.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A pumping machine comprising a screw arranged to be rotated by a current of water; a pump arranged within the screw, and suitable means for transmitting power from the screw to the pump to operate the same.

2. A pumping machine comprising a float-sustained screw arranged to be rotated by a current of water; a pump arranged within the screw; suitable means for transmitting power from the screw to the pump to operate the pump, and means for anchoring the screw in the current.

3. A pumping machine comprising a screw mounted on a buoyant case and arranged to be rotated by a current of water; such case; a pump arranged within the case; suitable means for transmitting power from the screw to the pump to operate the pump, and means for anchoring the screw in the current.

4. A pumping machine comprising a screw mounted on a conical buoyant case and arranged to be rotated by a current of water; such case; a pump arranged within the case; suitable means for transmitting power from the screw to the pump to operate the pump, and means for anchoring the screw in the current.

5. A pumping machine comprising a hollow axle provided with suitable valved inlets and outlets; a pumping device arranged to draw water into the axle through such inlets and to force the same out through such outlets; a buoyant case journaled to rotate upon such axle; a screw mounted upon such case and adapted to be rotated by a current of water to rotate the case, and suitable mechanism arranged to operatively connect the case with the pumping device to operate said pump.

6. The combination of the hollow axle provided with the valved inlet and outlet; the conical closed buoyant case journaled to rotate thereupon; a screw mounted upon the conical case and adapted to be rotated by a current of water and to rotate the case; a main pump arranged to draw water into said axle through the inlets and force it out through the outlets and operatively connected with said case; and an auxiliary pump arranged to pump water out of the case into the hollow axle and operatively connected with the case.

7. A diaphragm pump provided with a bowl shaped cup having an axially arranged inlet and discharge pipe; a piston guide arranged projecting axially into the cup from the bottom thereof; a convex piston head arranged to slide upon the piston guide and to fit closely in the bowl shaped cup; a diaphragm having its rim secured to the rim of the cup, and its center portion secured to the piston head, and suitable means for reciprocating the piston head.

8. A diaphragm pump comprising a pipe; two bowl shaped cups arranged surrounding the pipe and facing each other and communicating with the bore of the pipe through suitable ports; a plug or closure arranged in the pipe between the ports of the two cups; a sleeve arranged to reciprocate on the pipe between the two cups; two convex piston heads secured to the sleeve and arranged to fit closely in their respective cups and to be alternately forced into and withdrawn from such cups; two diaphragms, each having its rim secured to the rim of its respective cup, and its center portion secured to its respective piston head; and suitable means for reciprocating the piston.

9. In a pumping machine the combination of a pipe having at each end a valved inlet and a valved outlet; two cups arranged facing each other and communicating with the interior of the pipe through suitable ports, respectively; a partition cutting off communication between the ports which communicate between the pipes and the cups respectively; a reciprocating double-headed piston adapted to reciprocate within said cups; means for reciprocating said piston; a diaphragm connecting one of the heads of said piston with the wall of said cup and a diaphragm connecting the other head of the piston with the wall of said other cup.

10. A current pumping machine having an axle; a buoyant case journaled to revolve upon such axle and provided with a screw upon its periphery; a pump arranged on the axle in such case; suitable inlet and discharge for such pump; means for operating the pump connected with the case and arranged to be operated by the rotation of the case, and the anchored guys attached to the axle and arranged to hold the buoyant case in a current of water axially in line with such current.

LOUIS E. MILLER.

Witnesses:
JAMES R. TOWNSEND,
F. M. TOWNSEND.