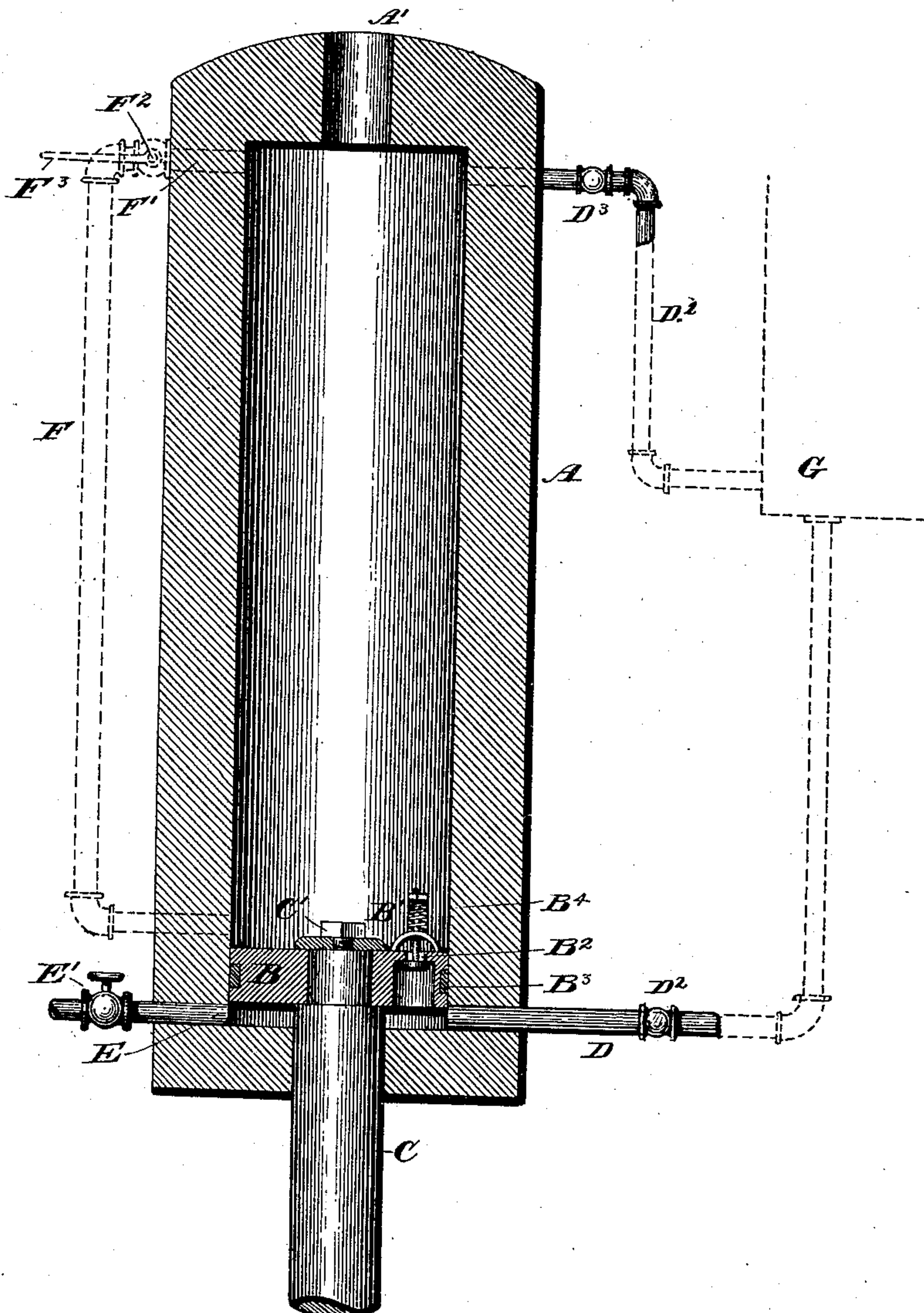


(No Model.)

S. J. WEBB.  
FORCE PUMP.

No. 444,128.

Patented Jan. 6, 1891.



Witnesses

D. C. Gilles.  
Harold Mack Kaye

Inventor

Samuel J. Webb.  
E. B. Stocking  
Attorney



# UNITED STATES PATENT OFFICE.

SAMUEL J. WEBB, OF MINDEN, LOUISIANA.

## FORCE-PUMP.

SPECIFICATION forming part of Letters Patent No. 444,128, dated January 6, 1891.

Application filed February 13, 1889. Renewed June 3, 1890. Again renewed December 11, 1890. Serial No. 374,363. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL J. WEBB, a citizen of the United States, residing at Minden, in the parish of Webster and State of Louisiana, have invented certain new and useful Improvements in Force-Pumps, of which the following is a specification, reference being had therein to the accompanying drawing.

The object of my invention is to provide a form of force-pump for air, water, or other fluid which shall be adjustable to varying pressures and be so constructed as to proportion the effective power of the pump to the resistance at any point of its stroke. This may be accomplished either automatically or by hand, as will be shown in the following specification.

The novel features of my invention will be pointed out in the claims at the end of the specification.

In the drawing, the figure shows a vertical section of one of my improved force-pumps, showing the preferred form in full lines and the modified form in dotted lines, attached to the side of the cylinder of said pump.

The main use of my improvement, and that to which I myself prefer to put it, is in hydraulic presses, particularly for baling purposes, where the first portion of the stroke is made against very slight pressure, and where at a certain distance farther the pressure becomes far greater. In such a case as this it causes a waste of power, and consequently of time, to force the bale together under the same pressure throughout the stroke, and my device is intended to obviate this difficulty and proportion the effect of the pump-piston to the work to be done without increasing the amount of steam employed in case of steam-pumps, or without other extra pressure applied at the working end of the pump. This construction is as efficacious in the case of any form of force-pump, whether for air or water or oil, as it is in the case above specified, and I do not wish to be understood as confining myself to any well-known form of pump, or, indeed, to any pump in which the principle is the "forcing" principle.

In the drawing, A is a cylinder of a force-pump, having an exit-opening at its top, as at A'. Working within this cylinder A is a piston-head B on the end of a piston-rod C, and

fastened thereto by means of the nut C' or any other well-known means. This piston-head has a packing surrounding it at B<sup>3</sup> for purposes of water tightness. The head extends all around the end of the rod C, leaving a space behind it as it rises in the cylinder. Anywhere upon this flange is situated an automatic valve B', adapted to open in a direction opposite to that of the effective stroke of the piston—in this case opening downward against a spring B<sup>4</sup>, which keeps it normally in contact with the seat B<sup>2</sup>. Underneath, or rather back of, the piston-head is an opening E, which communicates with one of the delivery-pipes of the force-pump which is used when it is desired to make it double-acting. It is provided with the positively-operated valve E', acting to allow of the efflux but not of the influx of water therethrough.

D is a pipe communicating with the reservoir or source of supply G, and is provided with a check-valve D<sup>2</sup> opening inward. The opening A' is another and the main delivery pipe, indeed the only pipe through which the varying pressure characteristic of my device is transmitted. This opening may communicate with any pipe or pipes and be provided with suitable valves; or in case of hydraulic presses it will be a clear opening without a valve, as ordinarily used.

Of course it is not requisite that my device be used with a vertical pump, as shown, for it is evident that its construction is as compatible with any other form of force-pump as with the one in the drawing. The form of valve B' which is best adapted to this use, is analogous to that employed for safety-valves in steam-engines and adapted to be adjusted by means of the nut at the top of the stem to vary the pressure exerted by the spring B<sup>4</sup>, which holds it to its seat. The operation of my device will then be evidently as follows:

As the piston is raised against a small initial pressure the spring holds the valve B' rigidly against said pressure, and the whole area of the piston-head will act to force out the water above it. In the meantime water flows in under the head from G. After the head has been raised, however, through such a distance as to increase the resistance sufficiently to cause the pressure of the superin-



cumbent water to open the said valve, the fluid is allowed to pass through the piston-head and its pressure is exerted against the under side of the flange surrounding the end of the piston. Thus all the area of this flange is rendered inoperative, as the pressure against the same is equalized by the action of the water upon both sides thereof. Thus during the further rising of the piston only the area of the end of the piston-rod itself is effectual for the forcing out of the fluid through the opening A', and the actual pressure is increased in proportion to the decreased area thus rendered effective.

The evident advantages presented in the case of hydraulic pumps have already been described, especially where such pumps or presses are used for bale-compressing, where there is a light pressure at the beginning of the stroke.

It is of course evident that any device which allows the passage of the fluid from the forward to the back portion of the cylinder during the forward action of the piston will be effectual in carrying out this principle, which is dependent upon the counter-balancing of the back-pressure of the water being forced. I have shown in dotted lines in the drawing another means for this purpose, which consists of the pipe F, connecting the extreme forward end of the cylinder with a point near the rear end of the same. There is a valve F<sup>2</sup> near the forward opening F', opening outward, which may be actuated by hand by means of the lever F<sup>3</sup>, or may be of the same nature as the valve B', and adjustable and automatic, as that is. The valve on the piston is, however, the preferable form.

Where this pump is made to act upon both strokes, my device is especially effective in presenting a gradually-increased pressure. For this purpose the valve B' is adjusted to yield at such a pressure as will not be experienced during the first forward stroke. Thus this stroke is accomplished as quickly as may be against the first light pressure. On the back-stroke the area of the piston-head flange is all that acts, and hence there is thus exerted an extra pressure on the back-stroke without the intervention of any valve whatever, the water leaving on this stroke through E. The back-stroke being accomplished, the forward stroke will be made, probably, with an open valve B', and thus a maximum pressure obtained at last. When used as a double-acting pump, it will be necessary to connect the reservoir G with the space above the pis-

ton B to supply said space with fluid during the back-stroke of said piston. This connection is shown at D', and there is an inward-opening valve D<sup>3</sup> situated in the same.

In any case the reservoir G will always be in communication with the under side of the piston, as it is necessary to prevent the formation of a vacuum behind the rising piston-head.

I do not wish to be understood as limiting myself to the exact details of construction shown, as many details may be varied without departing from the spirit of my invention.

In the following claims I use the words "front" and "forward" to indicate that side of the piston-head toward which it moves on the effective stroke as distinguished from the direction in which it moves in backing preparatory to such effective movement.

What I claim is—

1. In a force-pump, a cylinder having exit-opening at its top and a pipe connected with the source of supply and entering the cylinder near its lower end, combined with a piston working in said cylinder and a valve carried by said piston and constructed to admit the fluid from the front to the back of the head of the piston and constructed to close during the initial movement of the piston, but to automatically open as the piston advances, substantially as described.

2. In a force-pump, a cylinder, combined with a piston working therein and a valve on the head of said piston, arranged in a depression in the piston-head and constructed to remain closed during the initial movement of the piston and to automatically open under the pressure of the water in the further movement of the piston, substantially as described.

3. In a force-pump, the combination, with a cylinder having a discharge-opening in the top, of a piston working in said cylinder and a spring-pressed valve in the head of said piston, said valve opening in a direction opposite to the effective stroke of the piston and arranged to be closed during the initial forward movement of the piston and to automatically open in the further movement of the piston, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL J. WEBB.

Witnesses:

HAROLD MACKAYE,  
HARVEY S. W. DE GAW.