No. 891,422. PATENTED JUNE 23, 1908.

A. W. HUNSAKER.

VERTICAL SHAFT CENTRIFUGAL PUMP.

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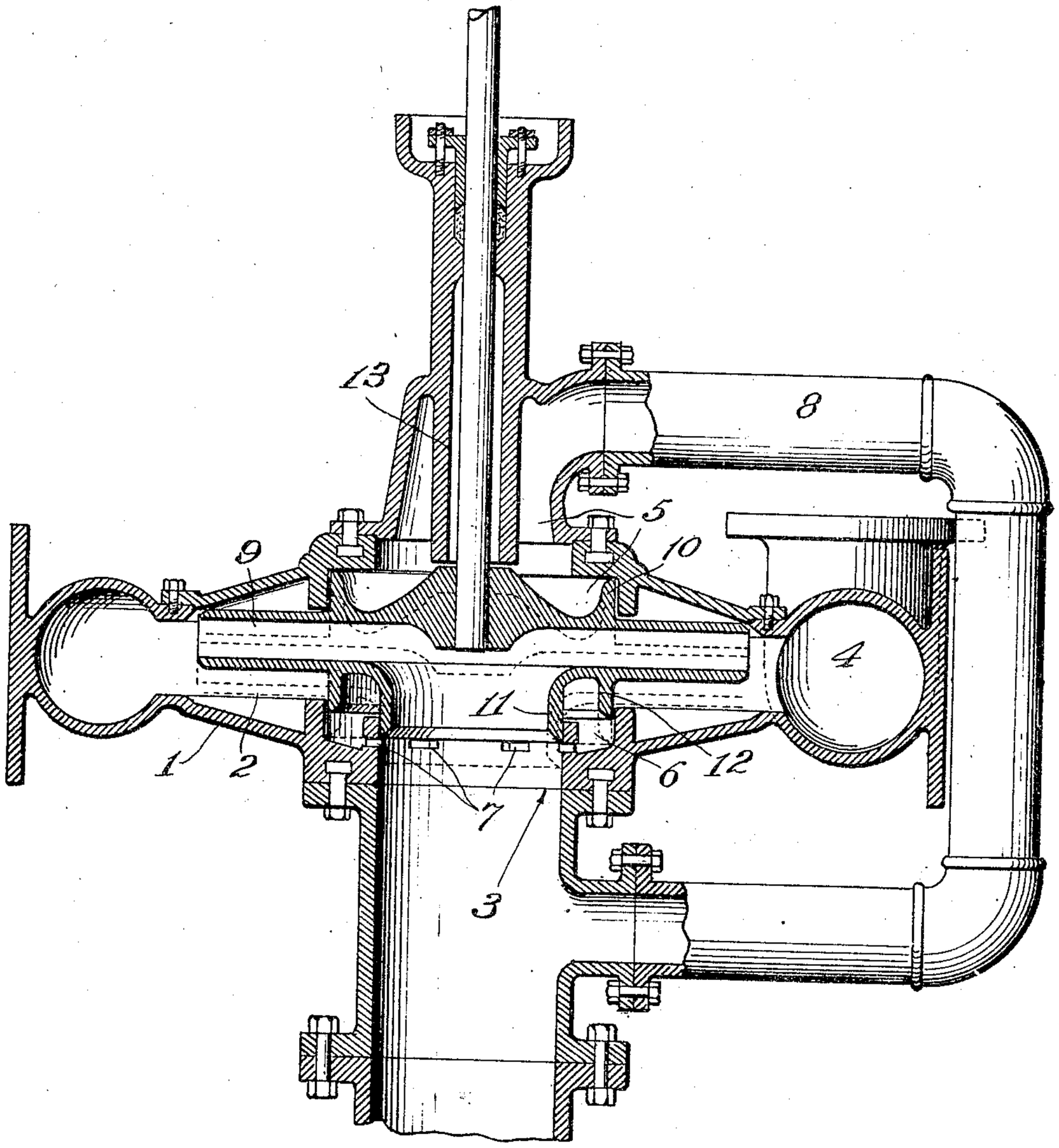

Witnesses:
C. C. Holly.
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Inventor,
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his Atty.

UNITED STATES PATENT OFFICE

ARCHIBALD W. HUNSAKER, OF POMONA, CALIFORNIA.

VERTICAL-SHAFT CENTRIFUGAL PUMP.

No. 891,422. Specification of Letters Patent. Patented June 23, 1908.

Application filed January 22, 1906. Serial No. 297,235.

To all whom it may concern:

Be it known that I, ARCHIBALD W. HUNSAKER, a citizen of the United States, residing at Pomona, in the county of Los Angeles and State of California, have invented new and useful Improvements in Vertical-Shaft Centrifugal Pumps, of which the following is a specification.

An object of this invention is to construct a vertical centrifugal pump having the intake at the bottom of the shell and in line with the shaft and to provide novel means for automatically counterbalancing the weight of the runner and shafting under varying conditions of suction and lift heads.

Other objects and advantages may appear from the subjoined particular description.

I do not limit my invention to the exact construction shown but may vary the construction and arrangements of parts without departing from the spirit of the invention.

The accompanying drawing illustrates the invention, the same being a fragmental vertical mid section of a pump embodying the invention.

1 designates the shell of the pump having impeller chamber 2, a bottom intake 3, a peripheral outlet 4, an upper suction chamber 5 above the impeller chamber 2, a lower counterbalancing suction chamber 6 below the impeller chamber 2 and outside the intake 3, and also having ports 7 connecting the intake 3 and said lower suction chamber 6; a balancing suction pipe 8 extending from the upper suction chamber 5 to the intake 3; and an impeller 9 in the shell between said upper and lower suction chambers 5, 6, and provided with an upper head 10 working in said upper suction chamber 5, and with two lower heads 11, 12 working in the intake 3 and in the lower suction chamber 6 respectively, one head being adapted to cut off connection between the lower suction chamber and the intake when the impeller lowers, and to open said connection when the impeller rises. The upper suction chamber 5 is preferably extended upwardly around the lower portion of the shaft bearing 13 so as to give a suitable space above the impeller to insure a water packing for the upper face of the impeller or runner 9.

The head 11 is constructed to move up and down across the ports 7 to open the same when the impeller rises and closing same when the impeller lowers.

The outer rim of the head 12 is a working fit inside the chamber 6 to practically prevent pressure from entering said chamber from the impeller chamber 2 which is subject to the atmospheric and discharge pressure.

In practical operation when the impeller is rotated thus discharging water through the outlet 4, the suction through the intake is applied through the by-pass suction pipe 8 to somewhat relieve from atmospheric pressure that portion of the runner which is exposed to chamber 5, thus allowing the runner to move upward responsive to the pressure from chamber 6. When the runner lifts sufficiently to open the ports 7 the pressure from 6 is relieved by below suction of the intake, thus causing the impeller to stop its upward travel and to establish an equilibrium with a water bearing for the runner.

The intake 3 is practically an upward right extension of the usual vertical suction pipe and the ports 7 are radial openings therethrough and the inner lower hollow piston head 11 works up and down across said radial ports and thus controls the pressure in the chamber 6, thereby regulating the thrust of the impeller.

The inner lower piston head 11 is hollow and forms a direct connection between the intake and the interior of the impeller. By this construction it is made possible to take the suction vertically direct to the impeller through the bottom thereof and yet perfectly balance the impeller and its vertical shaft, changing the direction of the stream from a vertical course only as it passes through the impeller.

In manufacturing these pumps, the diametrical proportions of the circular heads 10 and 11 will be determined for different maximum weights of shaft by calculating the lift of the effective vacuum that will be produced in the chambers 5 and 6 by the operation of the pump. I have made a practice of figuring such effective vacuum at ten pounds per square inch, and make such a difference in the cross-sectional area of the two heads as will equal, at the rate of ten pounds pressure per square inch, the weight of the shafting to be upheld by the runner in operation, and I find that that rule affords satisfactory results regardless of the diameter or cross-sectional area of the chamber 6.

What I claim is:—

1. A vertical shaft centrifugal pump comprising a shell having an impeller chamber,

a bottom intake, a peripheral outlet, an upper suction chamber above the impeller chamber, a counterbalancing suction chamber below the impeller chamber and outside the intake, and also having ports connecting the intake and said lower counterbalancing chamber, a balancing suction pipe extending from the upper suction chamber to the intake; and an impeller in the shell between said suction and lower counterbalancing chambers and provided with an upper head working in said suction chamber, and with two lower heads working in the intake and in the lower counterbalancing chambers, respectively, the one head being adapted to cut off communication between the pressure chamber and the intake when the impeller lowers, and to open said communication when the impeller rises.

2. A vertical shaft centrifugal pump comprising a shell provided with a suction chamber and a pressure chamber on opposite sides of the impeller chamber, the same being adapted to counterbalance the weight of impeller and shafting and the end thrust caused by suction and discharge heads; and an impeller provided with a hollow piston head which is constructed to open communication between the intake and the counterbalancing pressure chamber when the impeller rises, and to close such communication when the impeller lowers, said hollow piston-head forming a direct connection between the intake and the interior of the impeller.

In testimony whereof, I have hereunto set my hand at Los Angeles California this 17th day of January 1906.

ARCHIBALD W. HUNSAKER.

In presence of—
JAMES R. TOWNSEND,
C. J. WILLIAMS.