No. 666,023. Patented Jan. 15, 1901.

H. PERRY.

CENTRIFUGAL PUMP.

(Application filed May 9, 1900.)

(No Model.)

Fig: I

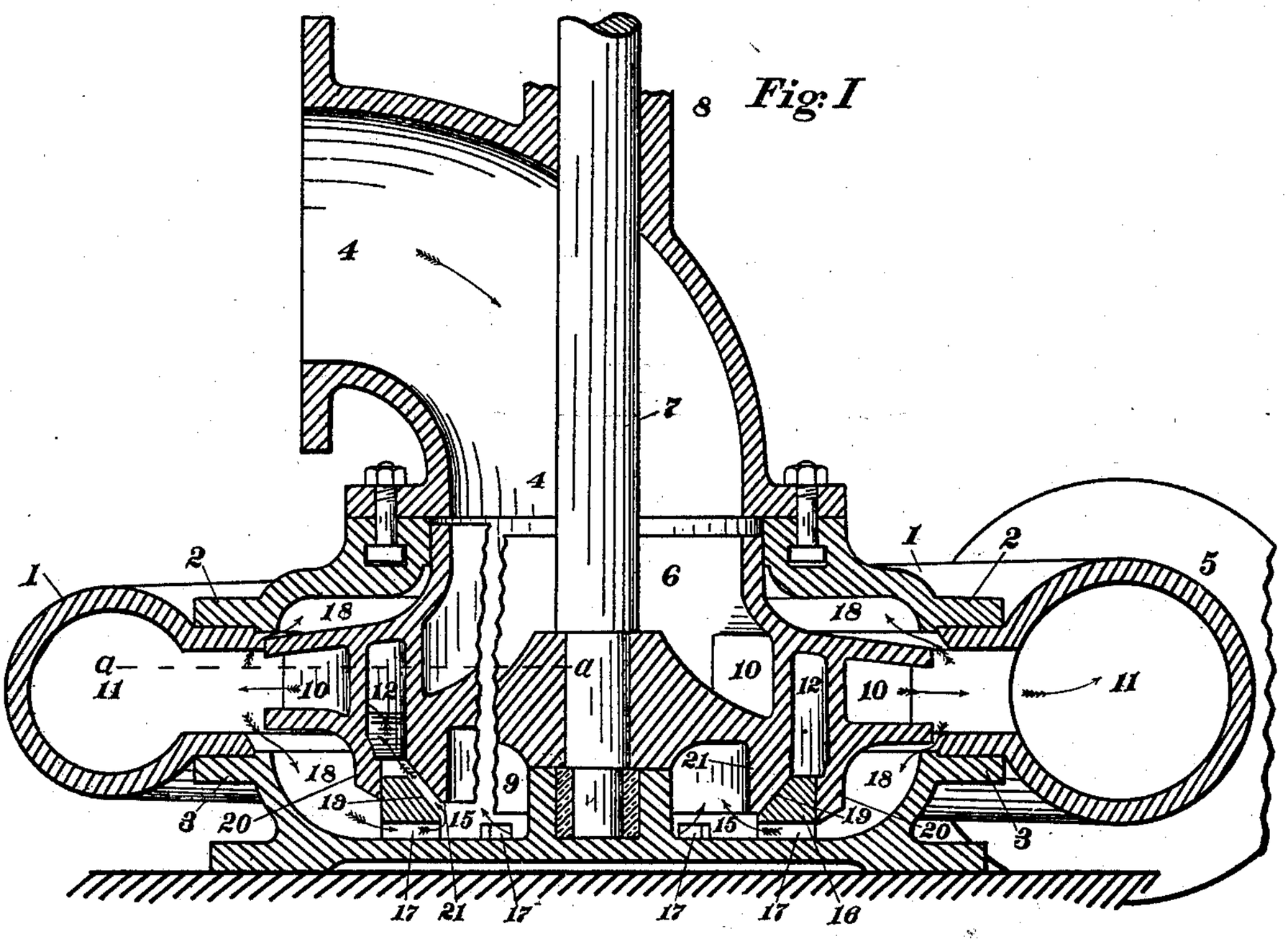
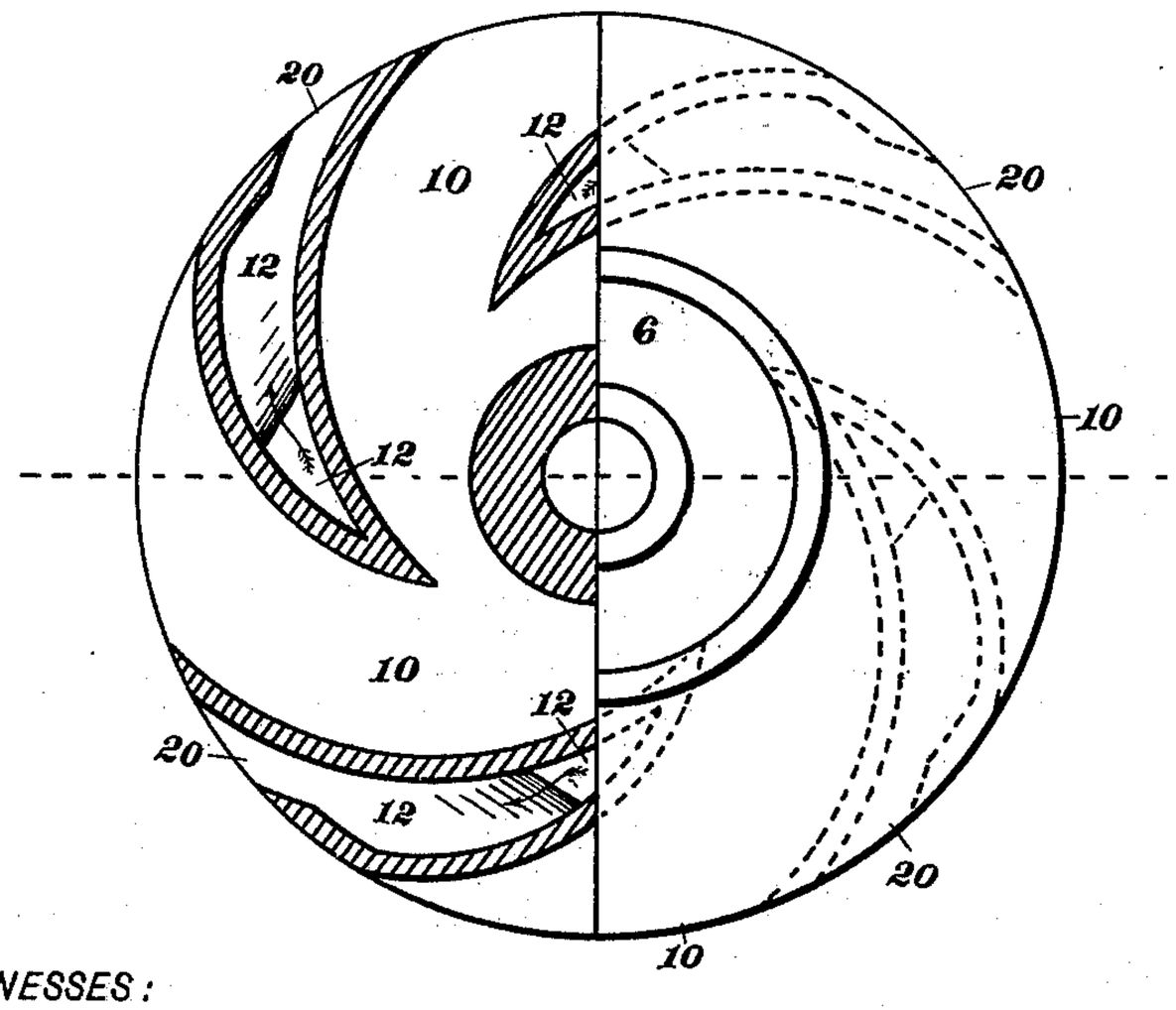


Fig: II



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CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 666,023, dated January 15, 1901.

Application filed May 9, 1900. Serial No. 16,073. (No model.)

To all whom it may concern:

Be it known that I, HOMER PERRY, a citizen of the United States of America, residing at San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Centrifugal Pumps; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to centrifugal pumps for raising and forcing liquids, and especially to pumps of this type that receive the water at or through one side of the impellers, and to certain useful improvements therein whereby lateral thrust on the impellers is compensated or controlled automatically.

My improvements consist in constructing the impellers of such pumps with two sets or series of chambers, one set or series communicating with the main inlet and discharge ways to perform the usual functions of pumping, the other series of chambers communicating with the discharge-way and with an inclosed chamber at one side of the impellers in such a manner as to maintain in this chamber a pressure and counter force equal to the lateral thrust on the impeller, such counter force varying automatically to equalize the forces at each side of the impeller, as hereinafter fully explained in this specification and illustrated in the accompanying drawings, forming a part thereof.

Referring to the drawings, Figure I shows a central section parallel to the axis of a centrifugal pump provided with my improvements, the impeller being broken to show it in two positions and the axis in a vertical position. Fig. II is a plan view of the impeller, half in section, on the line *a a* in Fig. I, showing the passages therein.

In that type of centrifugal pumps that receive water at one side and have disk or incased impellers and in which the water is not set in full revolution at the sides thereof there is a static pressure on the sides of the impeller equal to the head or resistance except at the inlet-way. This being deducted leaves an unbalanced force equal to the area of the inlet-way multiplied into the whole head or resistance. Such thrust is to some extent compensated in the case of a vertical pump by the weight of rotary parts, but not fully, and provision must be made for compensating such thrust, which varies with the pressure in the pump, and it is to this end I employ the devices now to be described.

The pump-casing 1 is of the usual construction, preferably of a volute form and provided with side plates 2 and 3, an inlet-nozzle 4, and tangential discharge-way 5.

The impeller 6 is in Fig. I broken and drawn in slightly different positions at the sides for purposes of explanation, as will hereinafter appear.

7 is the pump-spindle, and 8 and 9 are the top and bottom bearings therefor.

The impeller 6 (shown half in section in the plan view, Fig. II) is provided with the usual main passages 10, connecting with the inlet-nozzle 4, the discharge-way 5, and the volute chamber 11 in the usual manner. Another set or series of passages 12 communicate outwardly with the volute discharge-chamber 11 and the discharge-way 5 and inwardly with the chamber 15 beneath the impeller, as indicated by arrows at the left in Fig. I.

The chamber 15 is formed by an annular ledge 16, rising from the bottom side plate 3, and is provided with perforations 17 at several points to admit a predetermined amount of water from the space 18 at the bottom of the impeller 6. This ledge or annular rim 16 is vertical or parallel to the pump-spindle 7 on the outside, beveled on the inside, as seen at 19, and is embraced by the two ledges 20 and 21, projecting downward from the impeller 6. In Fig. I those ledges 20 and 21 are shown in contact with the ledge 6, closing the chamber 15 at the top, while on the left the impeller is shown slightly raised, permitting escape of water from the chamber 15 to the passages 12 in the impeller 6, as indicated by arrows.

Water drawn from the chamber 15, beneath the impeller 6, by the passages 12 is subjected to the same degree of centrifugal force as water drawn from the inlet-way 4 by the passages 10 and is discharged in the same manner into the volute chamber 11.

The operation of the pump is as follows, the impeller 6 being in the position shown at

the right in Fig. I: On starting the whole interior of the casing 1, including the chambers 18 at the top and bottom of the impeller 6, also the chamber 15, is filled and subjected to a pressure in proportion to the speed and centrifugal force of the water contained in the impeller 6. As, however, the upward pressure in the chamber 15 is not compensated, because of the opposite inlet-way 4, there is an unbalanced upward thrust on the impeller 6 equal to the area of the inlet-way 4 multiplied by the water-pressure, and acting in the same direction is the negative force of the suction-head. This causes the impeller 6 to rise, opening a passage from the chamber 15 to the passage 12 in the impeller, as shown at 19 in Fig. I, so that water is thus drawn by centrifugal force from the chamber 15 and discharged, as before explained. As soon as the impeller 6 rises to such an extent that the area of the annular passage at 19 is equal to the sum of the area of the inlet-ways 17 pressure in the chamber 15 falls and the impeller 6 is in equilibrium at any speed or any working head, in so far as water-pressure; but there is the weight of the impeller, the shaft 7, and connected parts to be sustained. The impeller does not therefore rise, as shown on the left in Fig. I, until the passage at 19 equals in area that of the passages 17, but just far enough to reduce the pressure in the chamber 15 to a point of equilibrium, rising or falling a minute distance as the speed, head, or pressure is changed. In this manner it will be seen that the impeller has, by its separate passages 10 and 12, a dual centrifugal action—one directed to the regular duty of pumping and a like centrifugal action in discharging from the chamber 15—and that in operating it assumes automatically a position dependent on the head or pressure operated against.

While the description here is made to conform to the drawings and to a pump having its impeller in a horizontal plane, it will be understood that the axis of rotation may be vertical or horizontal, as the circumstances of use may demand.

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

1. In a centrifugal pump, an impeller provided with main passages, and auxiliary passages located in the spaces between and formed by the side walls of said main passages, an inlet-way communicating with and supplying water to said main passages, and a balancing-chamber of approximately the same area as the inlet-way, opposite said inlet-way on the other side of the impeller, in communication with a balancing source of pressure, said chamber communicating with and supplying water to said auxiliary passages in the impeller, substantially as specified.

2. In a centrifugal pump, a main casing having an inlet-way, a rotary impeller in said casing having main and auxiliary passages, open at the periphery but non-communicating, and a balancing-chamber opposite the inlet-way on the other side of the impeller, supplied from the main source of pressure outside the suction area, said chamber communicating with and supplying water to said auxiliary passages, substantially as specified.

3. In a centrifugal pump, a main casing having an inlet-way, a rotary impeller having independent main and auxiliary passages, a balancing-chamber opposite said inlet-way on the other side of the impeller, in communication with said auxiliary passages, and supply-passages to said balancing-chamber from the peripheral discharge-way of the main casing, substantially as specified.

4. In a centrifugal pump, a main casing, an impeller arranged as shown, a circular ledge rising from the bottom of the casing and forming a chamber beneath or at one side of the impeller, perforations to admit water from the pump-casing to this chamber, ledges projecting from the impeller embracing the ledge on the casing, and passages from between these ledges on the impeller leading outward to the discharge-chamber, substantially as specified.

5. In a centrifugal pump, a main casing, an impeller therein, a chamber at the bottom or side of the impeller formed by a circular ledge on the main casing, the latter having orifices to admit water to the chamber formed thereby and beveled at the top to meet a corresponding beveled ledge on the impeller, which beveled surfaces when separated form an escape-passage from the chamber, communicating with discharge-passages in the impeller, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HOMER PERRY.

Witnesses:

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