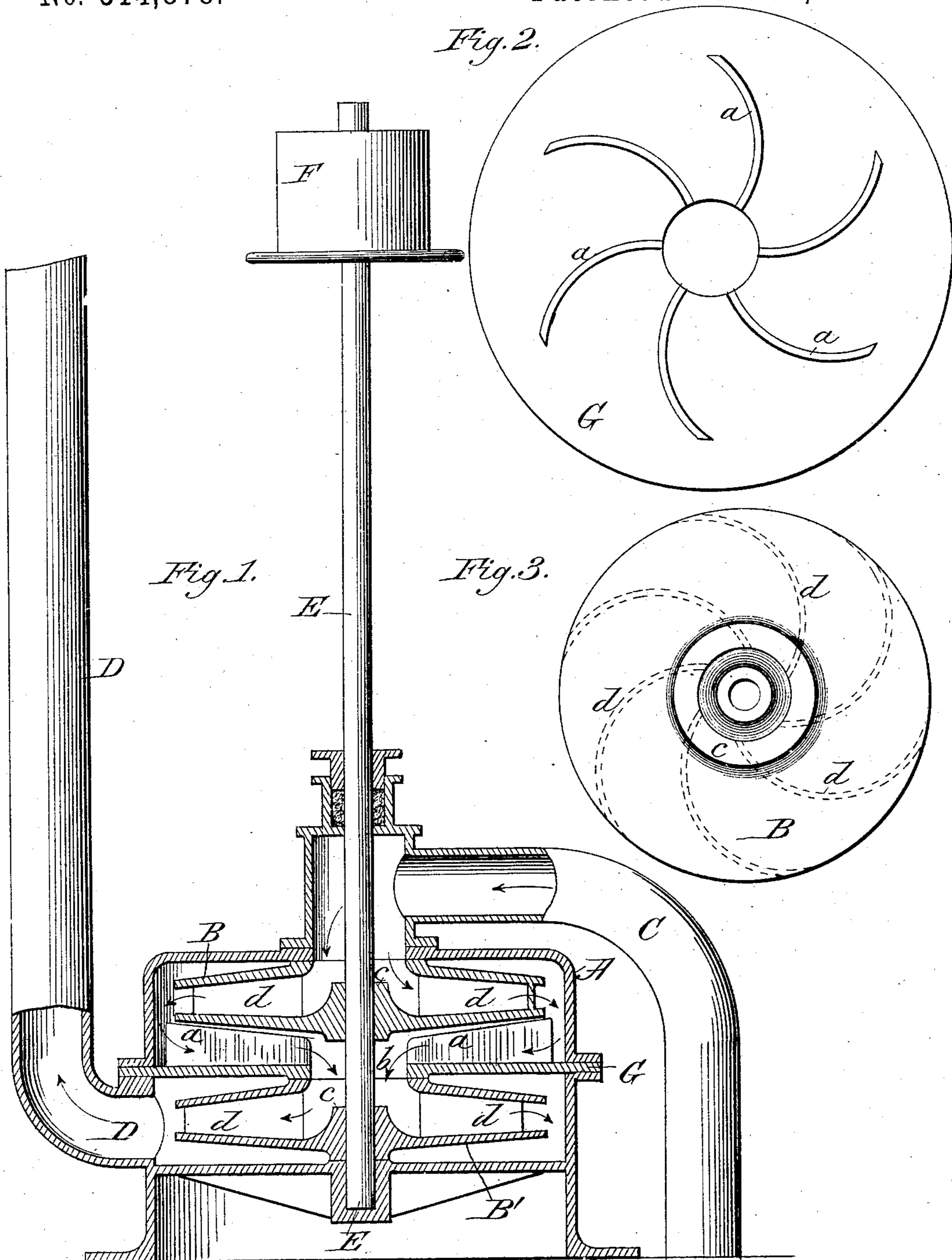


(No Model.)

J. RICHARDS.
CENTRIFUGAL PUMP.

No. 314,878.

Patented Mar. 31, 1885.



Attest
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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 314,878, dated March 31, 1885.

Application filed May 7, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN RICHARDS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Centrifugal Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to that class of centrifugal pumps that are intended for lifting water, the pump shown in the drawings being designed to raise water to a greater height than has been hitherto successfully attempted.

My improved pump consists of two or more runners keyed on one shaft and inclosed in a casing that is divided into two or more compartments by diaphragms or division-plates, the casing being provided at its upper part with an inlet for water, and at its lower part with a discharge-opening. The pump is thus so arranged that the weight of the water in the suction and discharge pipes will be balanced by the weight of the pump-shaft and attached runners—that is, the draft or force of the pump is applied downward and contrary to the gravity of the driving-shaft and attachments.

In the annexed drawings, illustrating the invention, Figure 1 is a sectional elevation of a centrifugal pump embodying my improvements. Fig. 2 is a plan view of the diaphragm-plate with curved vanes, and Fig. 3 is a plan of one of the runners.

Like letters designate like parts.

A represents the main pump-casing. B is the first or upper runner, and B' is the second or lower runner.

The suction-pipe C communicates with an opening in the upper part of the pump-casing at its center, while the discharge-pipe D conveys water from the lower part of the casing.

E is the pump spindle or shaft, to which the runners B B' are keyed. This shaft or spindle is also provided with a driving-pulley, F, by which the shaft and runners are rotated.

The pump-casing A is divided horizontally by a diaphragm or division plate, G, that is

provided on its upper side with curved vanes *a a*, as shown in Fig. 2, a separate compartment being thus provided for each runner.

It is obvious that the pump can be provided with two or more of these runners and division-plates, if desired. The diaphragm or division plate G is formed with a central opening, *b*, through which the upper and lower compartments of the pump-casing communicate, and the curved vanes *a a* on its upper face serve to deflect the water to this central opening after it is discharged from the periphery of the first or upper runner. The runners B B' are each formed on the upper side with a central opening, *c*, that corresponds in diameter with the water-passages of the pump-casing, and each runner is provided internally with curved vanes *d d*, as indicated by dotted lines in Fig. 3. The water takes the course indicated by the arrows in Fig. 1, passing first through the upper runner, B, which develops a force in the upper chamber due to the speed or number of revolutions imparted to the runner-shaft. When the upper chamber of the pump is filled, the rotation of the water is stopped by the vanes *a a*, and it is forced between these vanes to the central opening, *b*, in the diaphragm, and enters the second or lower runner, B', at the pressure due to the action of the first runner. The second or lower runner, B', then adds its force, which in practice is found to be about eighty per cent. more, and the water is forced out of the pump through the lower compartment and discharge-pipe.

It is evident that in drawing the water through the runners B B' at the upper side and discharging it at their periphery there is a reactive force or thrust upon the shaft E equal to the whole duty of the pump or to the head of the water lifted. This force is in a measure and in some cases wholly balanced by the weight of the runners B B', shaft E, and pulley F; but in case the thrust is not so balanced an additional weight can be applied to the shaft, preferably by loading the pulley F until all is in equilibrium. It will be seen that the discharge-pipe D leads from the side of the lower compartment and is curved upward, while the water delivered by the induction-pipe C enters the top of the pump-casing at the center and surrounding the driving-shaft. By this construction the bottom of the pump-cham-

ber does not need to be perforated for the passage of pipes. When the induction-pipe is made to enter the bottom of the pump-chamber, as is sometimes done, the chamber is liable to be emptied by leakage at the foot-valve as soon as the runners are stopped, thus requiring priming, or otherwise delaying the action of the pump when the runners are again started. This difficulty is entirely avoided by arranging the induction and eduction pipes in accordance with my invention, the pump-casing being thus so arranged as to be always full of water after the runners are stopped.

I am aware that the induction-pipe is sometimes made to enter the side of the pump-chamber, while the eduction-pipe leads from the top, the runners being mounted on either a horizontal or a vertical shaft; but this I do not claim.

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

In a centrifugal pump, the combination of

the pump-casing A, provided with one or more horizontal diaphragms, G, having central opening, *b*, and provided on the upper side with curved vanes *a a*, the vertical driving-shaft E, having a weighted pulley, F, the runners B B', mounted on said shaft, the suction-pipe C, communicating with the top of the upper compartment of the pump-casing and surrounding the driving-shaft, and the discharge-pipe D, leading from the lower compartment at the side, whereby the thrust of the water is balanced by the weight of the driving-shaft and its attachments and the pump-casing made to retain a quantity of water after the runners are stopped, substantially as described.

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

JOHN RICHARDS.

Witnesses:

JOHN H. COOPER,
ARTHUR F. L. BELL.