

(No Model.)

H. A. BARBER.
CENTRIFUGAL PUMP.

No. 557,300.

Patented Mar. 31, 1896.

Fig. 1.

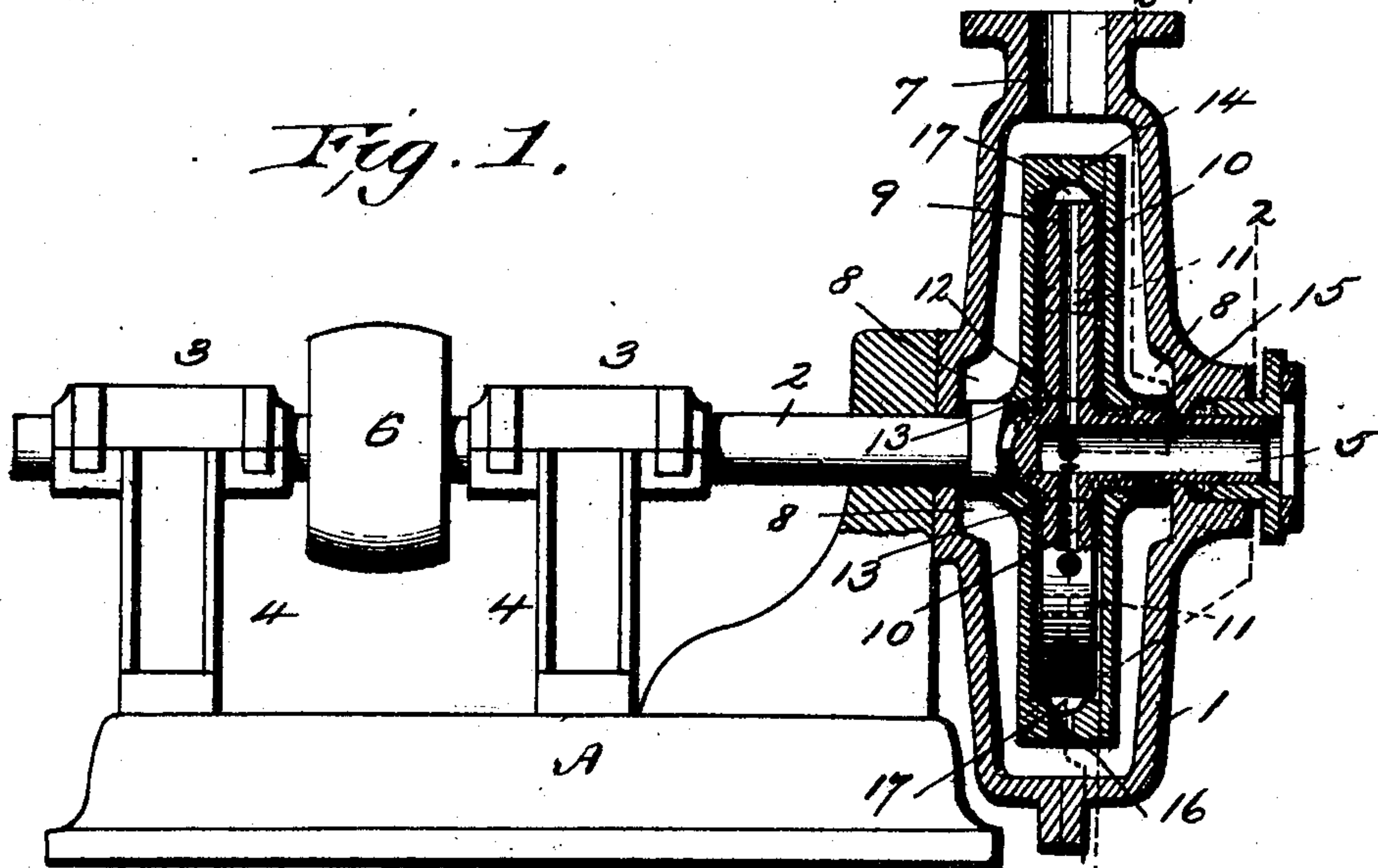


Fig. 2.

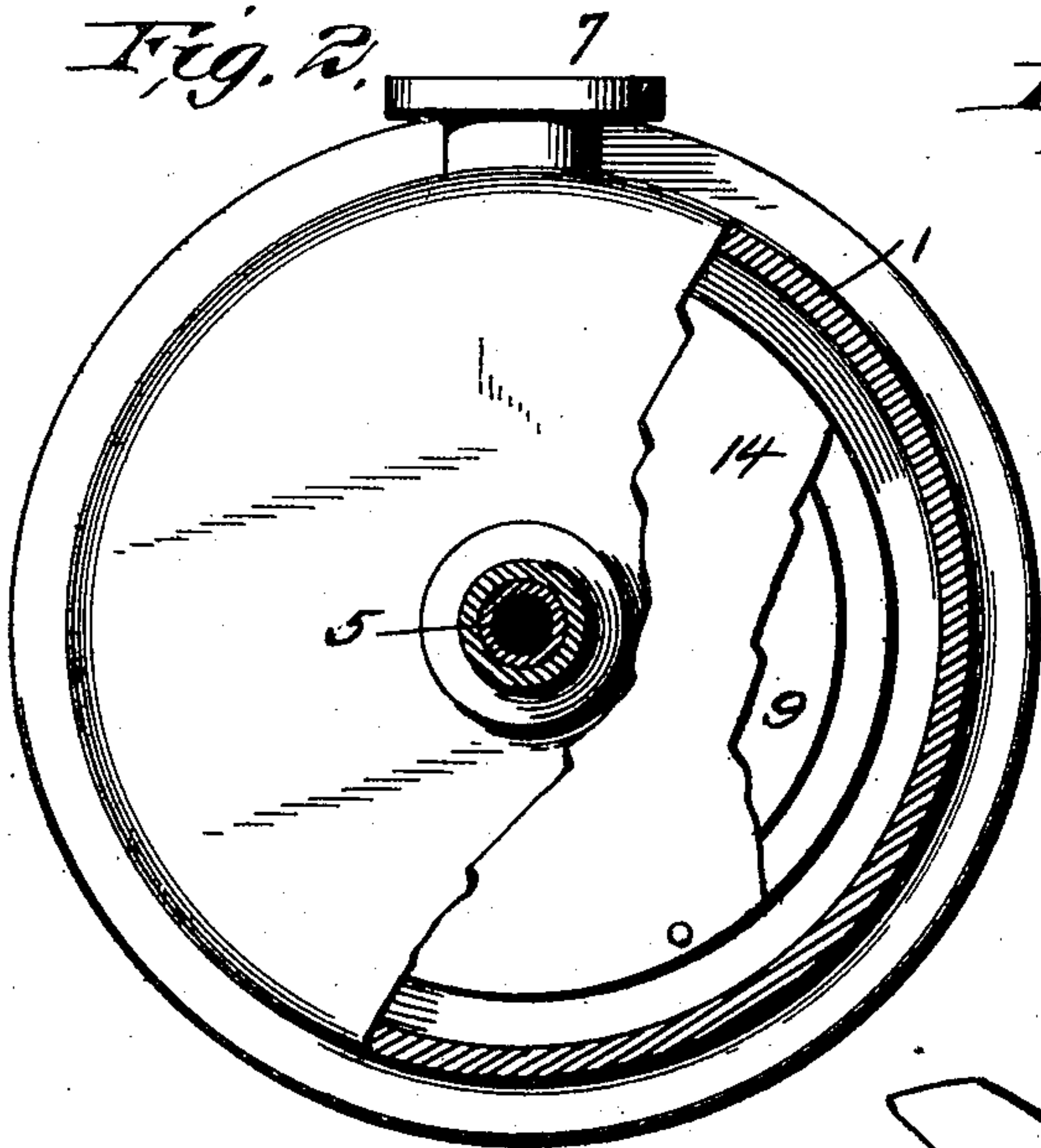


Fig. 3.

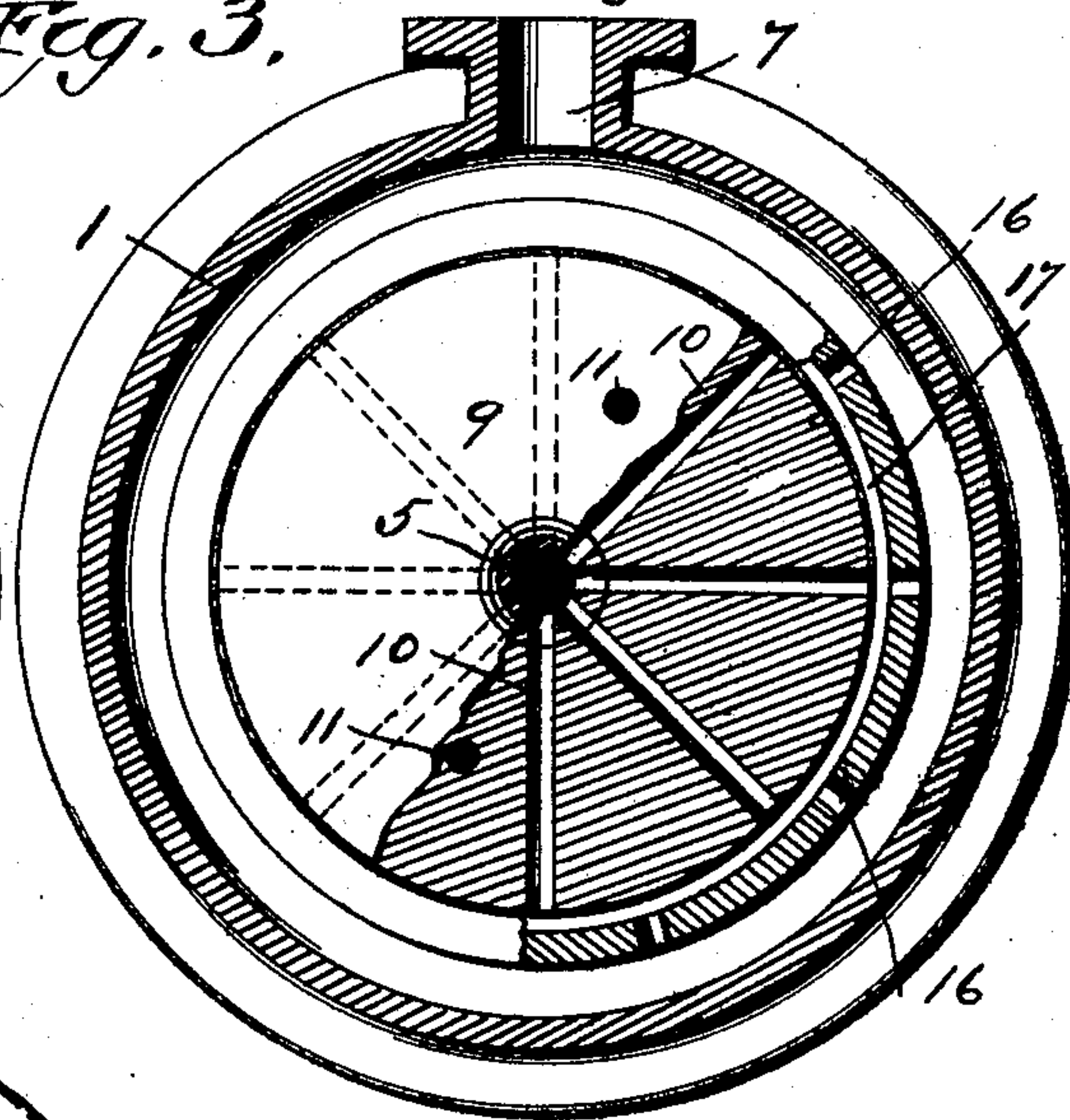
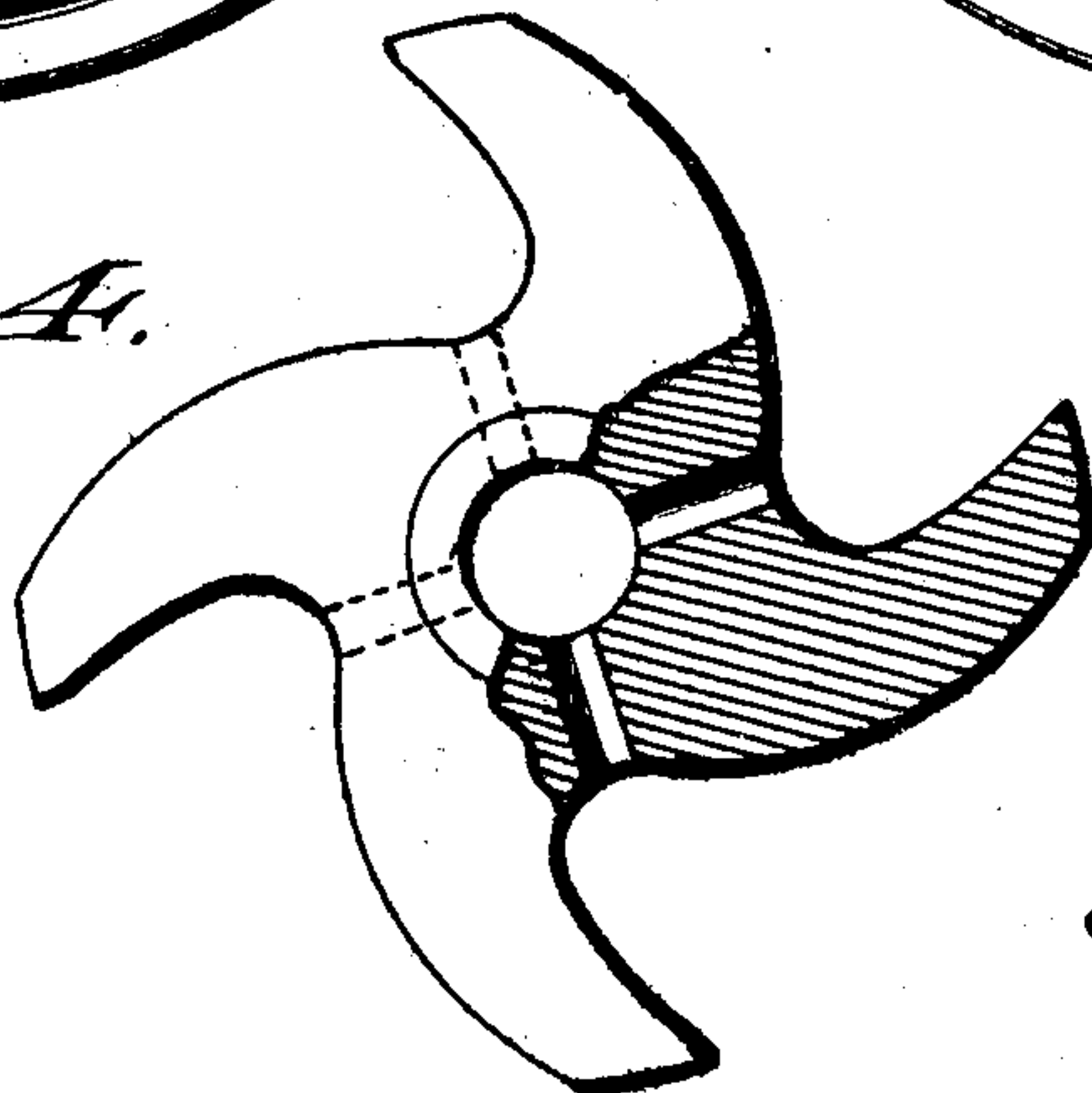


Fig. 4.



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CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 557,300, dated March 31, 1896.

Application filed June 5, 1895. Serial No. 551,773. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. BARBER, a citizen of the United States, residing at Watertown, in the county of Jefferson and State of New York, 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.

My invention relates to centrifugal pumps, air-blowers, and similar devices utilized to project a fluid of any description whatsoever, but principally aims to provide improvements on the centrifugal pump shown and described in United States Letters Patent No. 526,339, granted me September 18, 1894.

In pumps of the class to which my patent referred to relates a vast amount of skin-friction is encountered, which, in obedience to a well-known law of mechanics, increases directly as the square of the number of revolutions of the piston. In other words, if the number of revolutions of the piston were doubled four times the initial resistance would be encountered, and tripling the number of revolutions would be met by a resistance nine times that of the initial resistance, &c. Heretofore this skin-friction has been overcome to a greater or less degree, but highly satisfactory results have not as yet been obtained; and a further object of my invention is to provide improved means whereby this skin-friction may be more satisfactorily overcome and a greater amount of fluid projected with a less amount of expenditure of power than heretofore.

With this and various other objects in view my invention consists in combining with the usual rotary piston a body which is adapted to revolve freely and independently within the outer pump-casing and adjacent to the rotary piston, but out of contact therewith, and also in such other novel features and combinations, as will be more fully described hereinafter and embodied in the claims.

In the accompanying drawings, Figure 1 represents a partial elevation and partial sec-

tion of a pump embodying my invention; Figs. 2 and 3, enlarged sectional views of the pump-casing, the piston, and the rotary shell, taken, respectively, on lines 2-2 and 3-3 of Fig. 1; and Fig. 4, a detail view of a substitute form of piston adapted for use in blowers for ventilating purposes, blowers for forges, &c.

A represents a suitable bed or foundation adapted for the attachment at one end thereof of the pump-casing 1.

As in my former patent, I employ a piston-carrying shaft 2, which is journaled in suitable boxes 3, supported upon standards 4 rising from the foundation A, and in boxes or glands in the sides of the pump-casing, the said shaft being bored longitudinally from one end to provide an inlet or induction passage 5. A suitable drive-pulley for the shaft is shown at 6. The casing 1 is substantially the same as that shown in my former patent, being provided with a suitable discharge-orifice 7 and differing only in that it is recessed immediately around the shaft 2, as shown at 8, to serve a purpose hereinafter set forth.

The disk piston is shown at 9 and is substantially the same as that shown in my former patent referred to, being provided with a series of radial passages 10, all of which lead from the periphery of the piston inward and communicate with the inlet or induction passage 5 when the piston is keyed to the shaft 2. Holes 11 are bored transversely of the piston and are so positioned that they will not intersect the radial passages 10. These holes serve to keep the pressure of the fluid in an equilibrium, which might otherwise be disturbed were they omitted, owing to the operation of devices which will be hereinafter described. For the sake of strength and to allow of high speed, the shaft 2 is enlarged at the point where the rotary piston is keyed thereto, as shown at 12. Integral hubs 13 project a slight distance from the faces of the piston and serve a purpose described hereinafter.

I will now describe that portion of the present structure in which my real invention resides, the foregoing construction being shown in substantially the same form in my former patent.

The reference-numeral 14 designates a cir-

cular plinth-like shell or casing which is mounted loosely upon shaft 2 and is adapted to revolve independently thereof, being provided with hubs 15, which project into the recesses 8, formed in the sides of the outer pump-casing 1. The shaft 2 is enlarged, as shown at 16, where a bearing is afforded for the loosely-revolving shell 14, thus allowing for wear of the shaft at this point without materially weakening it, suitable bushings being inserted when needed. The hubs 15 afford a long bearing and act to keep the casing in position, and by being received in the recesses 8 permit of a more compact arrangement of the parts. It will also be observed that hubs 13 projecting from the piston serve to allow the shell 14 to rotate freely with its inner faces in close proximity to, yet never engaging with, the faces of the piston, which would result in a creation of friction and defeat the very object of the present invention, as will appear hereinafter. This outer shell or casing 14 is of an internal diameter only a trifle greater than that of the rotary piston, and is provided with a series of peripheral orifices 16, these orifices being brought into communication by an annular groove 17 formed on the inner face of the rim of the shell.

When the piston is made to revolve, it encounters what is known as "skin-friction," before referred to in this specification and my former patent, with what water may not have been projected from the pump-casing 1, and which proves a serious obstacle to the efficient working of the pump, inasmuch as the resistance thus met with increases rapidly with an increase of the number of revolutions of the piston in the proportion heretofore referred to, thereby absorbing much power which might otherwise be utilized in projecting the fluid from the pump.

By the employment of the shell or casing 14 I obtain highly superior results over the old construction. This shell being free to loosely revolve, when the rotary piston revolves it communicates motion through the thin film of water between it and the inner faces of the shell, causing the latter to ultimately attain about one-half the number of revolutions of the piston. The water is drawn into the rotary piston and projected therefrom in the usual manner and finds its way through the orifices 16 of the shell and thence out of the discharge-orifice of the outer pump-casing. The groove 17 takes up the water projected from the piston and leads it to the orifices in the shell. The holes 11 permit the water to pass through the piston and thereby be kept at an equilibrium of pressure thereabout. By the employment of this loosely-revolving shell I find that the amount of skin-friction ordinarily encountered is reduced by about seventy-five per cent., thereby allowing of a much greater efficiency. It is not essential that the casing or shell 14 be made with a rim having the orifices 16 therein, as

excellent results are obtained by dispensing with the rim and merely using the sides or faces of the shell, each of which revolves independently. Neither is it necessary to employ a rotary circular disk piston, as very good results are obtained by using the winged form of piston shown in Fig. 3.

My invention in its various modifications can be applied to all forms of apparatus whereby fluids are projected by centrifugal force, the form of piston shown in Fig. 3 and its various modifications, such as used in the "Harmon" pump, being applicable to pumps or blowers for ventilating purposes, blowers for forges, &c. Therefore I do not confine myself to the exact construction herein shown and described, but consider myself entitled to all such variations as come within the spirit and scope of my invention.

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

1. In a centrifugal pump, the combination with a pump-casing and rotary piston located therein, of a device for diminishing skin-friction between the piston and the fluid within the pump-casing, which device consists of an independent body loosely and revolvably mounted in relation to the piston and located within the pump-casing, being separated from the piston by a fluid-space through which motion is communicated from the piston to the revoluble body to set the latter in revolution, when the piston is in operation.

2. In a centrifugal pump or blower, the combination with an outer pump-casing and a piston, of an independent and loosely mounted shell surrounding the piston and adapted to be set in revolution by motion communicated to it through the fluid within the casing, substantially as described.

3. In a centrifugal pump, the combination with a pump-casing, of a rotary piston having transverse passages affording communication from one face of the piston to the opposite face, and an independent body loosely and revolvably mounted in relation to the piston and located within the pump-casing, being separated from the piston by a fluid-space through which motion is communicated from the piston to the revoluble body to set the latter in revolution.

4. In a centrifugal pump or blower, the combination with an outer pump-casing, of a rotary piston provided with a series of radial discharge-passages, and mounted on a shaft having an inlet or induction passage formed therein and in communication with the discharge-passages in the piston, and an outer shell or casing mounted loosely on the said piston-shaft and adapted for revolution independently thereof, and surrounding and incasing the said piston, the said shell being provided with peripheral discharge-passages and an annular groove formed on the interior of the shell and affording communication between

the laterally - mentioned passages, whereby
when the rotary piston revolves motion is
communicated through the fluid from the pis-
ton to the shell that surrounds it, causing the
5 same to revolve thereby reducing skin-fric-
tion of the piston with the fluid, substantially
as described.

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

HENRY A. BARBER.

Witnesses:

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