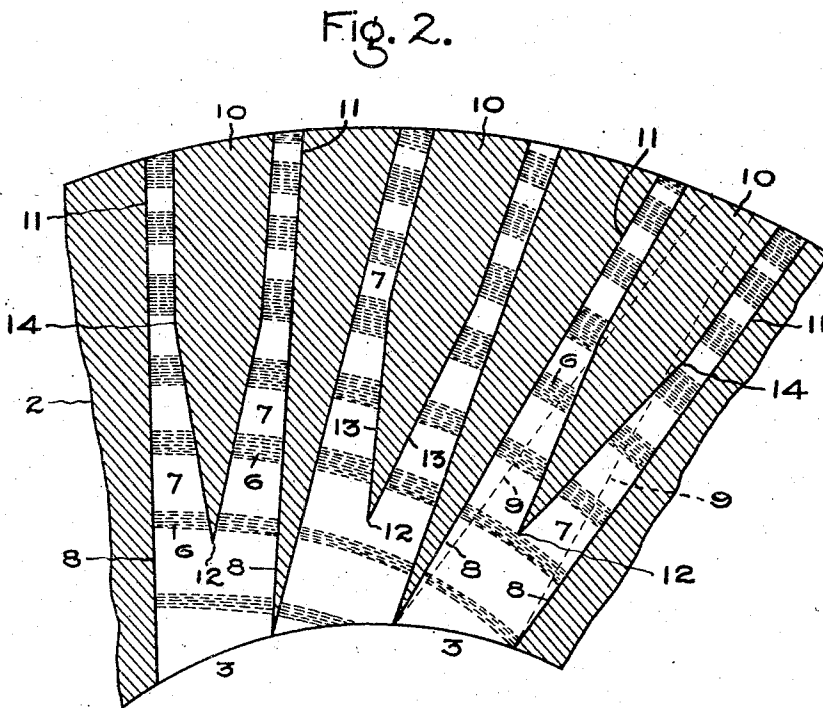
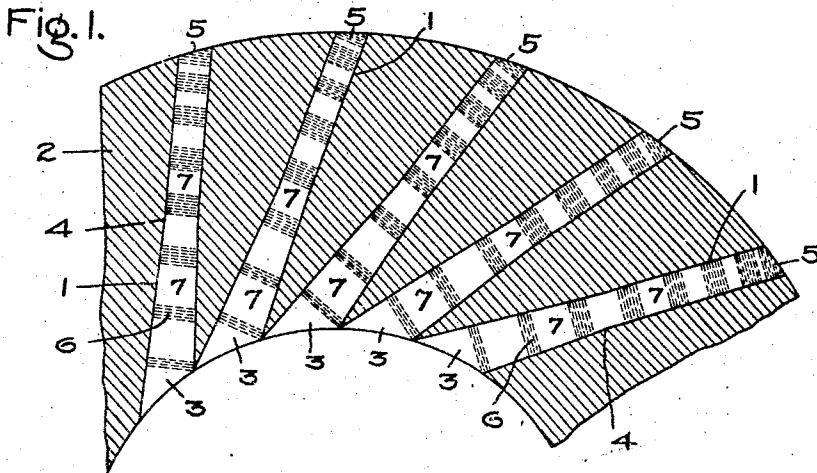


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CENTRIFUGAL PUMP.
APPLICATION FILED OCT. 9, 1908.

987,995.

Patented Mar. 28, 1911.



Witnesses:

Benjamin B. Hull
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UNITED STATES PATENT OFFICE.

HULDREICH KELLER, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CENTRIFUGAL PUMP.

987,995.

Specification of Letters Patent.

Patented Mar. 28, 1911.

Application filed October 9, 1908. Serial No. 456,980.

To all whom it may concern:

Be it known that I, HULDREICH KELLER, a citizen of Switzerland, residing at Berlin, Germany, have invented certain new and useful Improvements in Centrifugal Pumps, of which the following is a specification.

This invention relates to pumps for transforming and compressing fluids, and especially to that type of pump in which the fluid is impelled by centrifugal force, being thrown out through a rapidly revolving circular runner and delivered to a stationary diffuser or conducting ring. The centrifugal action is intensified by admitting a liquid driving medium such as water, so that the air or gas to be pumped is entrained between pellets or pistons of water and carried forcibly out through the impeller and diffuser. In a pump of this type it is well known that the compressing action is increased by decreasing the size of the conduits outwardly as they pass through the diffuser or conducting ring. If this constriction extends throughout the entire conduit, the particles in a piston of the driving medium must be constantly changing position as it moves along the conduit. This shifting of course entails great friction losses in said piston, and the energy thus transformed into friction is lost.

The object of the present invention is to reduce as much as possible the aforesaid shifting of the particles and the consequent friction losses, by confining the constriction of the conduits to their initial portions, leaving them to continue thereafter at a constant size.

In the accompanying drawing, Figure 1 is a longitudinal section of a portion of a conducting ring embodying my invention; and Fig. 2 is a similar view of a modified construction.

Referring first to Fig. 1, the conduits 1 which are found in the conducting ring 2 are constricted or tapered from their entrances 3 on the inside of the ring outwardly for a portion of their length. Calculation and experiment demonstrate that the most favorable point for the minimum constriction is about midway of the length of the conduit, as at 4. From there on to the exits 5 the conduits preserve a substantially uniform cross section, being preferably straight, as shown. In these conduits the water pistons 6 grow continuously smaller in cross

section and greater in length as they move from the entrance 3 to the point of greatest constriction, the spaces between them becoming smaller. The gas pistons 7 confined between the water pistons decrease in volume, because not only their cross section but their axial length constantly grows less. In progressing along the uniform portion of the conduit to its exit 5, the water pistons do not change in shape, so that there is no shifting of their particles and friction losses are reduced. The pistons approach nearer together, however, by reason of the gradual reduction of their velocity. The gas pistons maintain the section, but decrease in axial length, so that a high degree of compression is attained at the exit 5.

In Fig. 1 the constriction, of the conduit begins at the entrance, so that the quantity of air entrained between successive water pistons is not so great as if the conduit were constant in section or were even increased.

In Fig. 2 is shown a constriction by means of which larger increments of air can be obtained. Here the side walls 8 of the conduit diverge from the entrance 3. The successive water pistons 6 inclose a larger volume of air than would be the case if the sides of the conduit were to approach each other from the entrance onward; for example, like the dotted lines 9. In order to secure the proper compression of these larger volumes of air, a tongue 10 is inserted in the conduit, dividing its outer portion into two sub-conduits, 11 11. The tongue tapers to an edge 12 at its inner end, and the adjacent surfaces 13 rapidly approach the side walls 8 of the main conduit until at the point 14 a suitable narrow cross section is obtained. From this point to their exits the sub-conduits preserve substantially the same cross section. It will be observed that each sub-conduit in Fig. 2 is substantially the same as the single conduits shown in Fig. 1, so that Fig. 2 may be said to show main conduits leading to two single or constricted conduits.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is,

1. In a centrifugal pump in which gases are compressed by a specifically heavier driving medium, a conducting ring provided with conduits which are tapered from their entrances for a portion of their length only, and are substantially straight for the remainder of their length.
2. In a centrifugal pump in which gases are compressed by a specifically heavier driving medium, a conducting ring provided with conduits whose cross section diminishes at a certain distance from the entrance and thereafter remains substantially constant to the exit.
3. In a centrifugal pump in which gases are compressed by a specifically heavier driving medium, a conducting ring provided with conduits whose outer portions are of substantially constant cross section, but whose inner portions are larger.

4. In a centrifugal pump in which gases are compressed by a specifically heavier driving medium, a conducting ring provided with conduits whose cross section diminishes from the entrance for a certain distance and thereafter remains constant to the exit, and main conduits leading to two of the aforesaid conduits.

5. In a centrifugal pump in which gases are compressed by a specifically heavier driving medium, a conducting ring provided with conduits whose cross section diminishes from the entrance for a certain distance and thereafter remains constant to the exit, and main conduits leading to two of the aforesaid conduits and having diverging walls.

In witness whereof, I have hereunto set my hand this 15th day of September, 1908.

HULDREICH KELLER.

Witnesses:

HANS REINEIKE,
MARTIN KREMP.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."