

F. J. PETERMÖLLER.
CENTRIFUGAL PUMP.
APPLICATION FILED JUNE 25, 1910.

1,060,937.

Patented May 6, 1913.

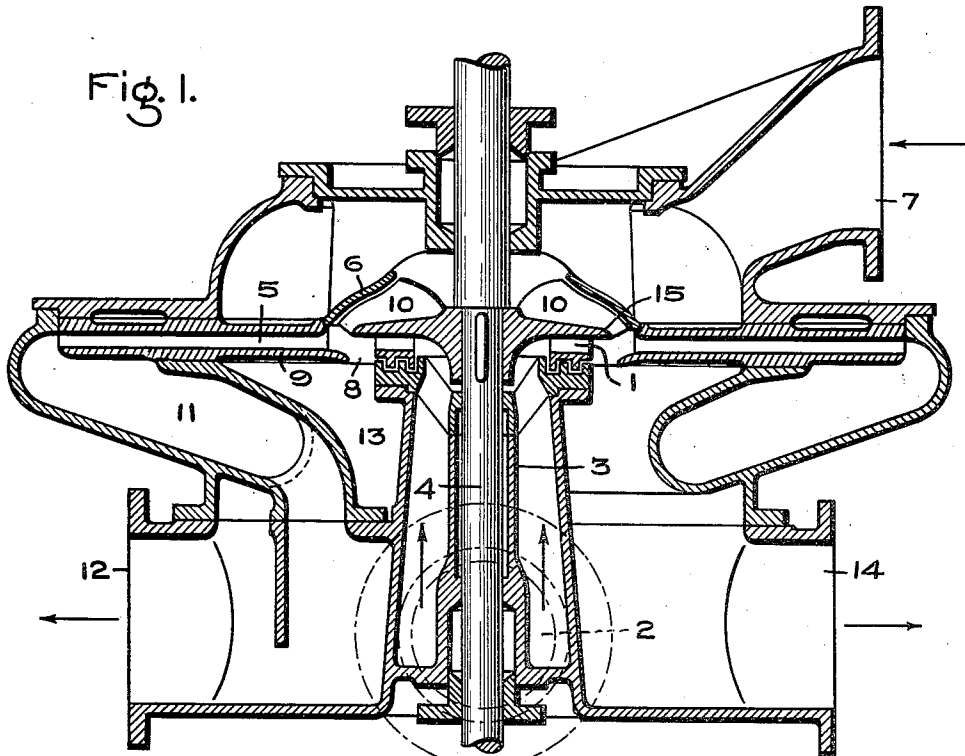
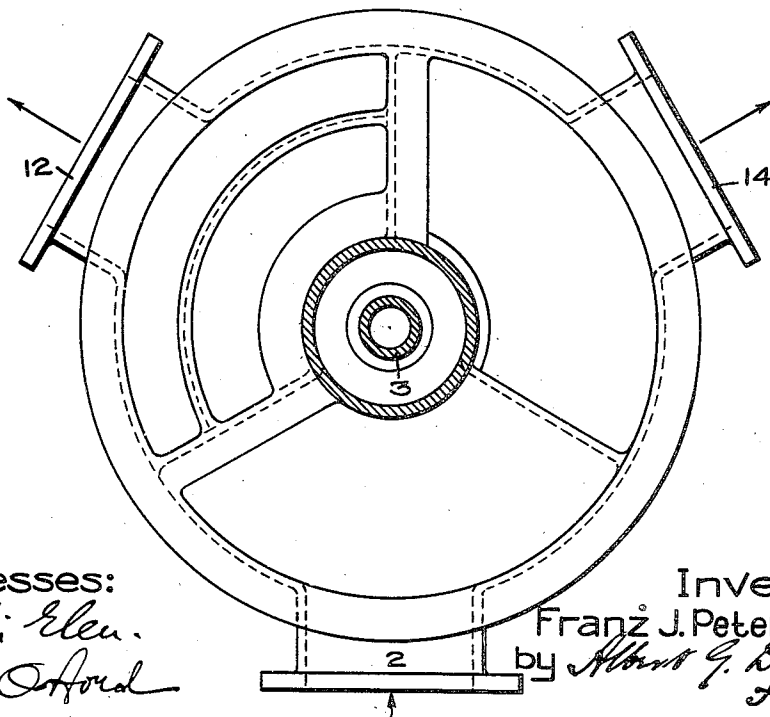


Fig. 2.



Witnesses:

J. Elli Elen.
Allen Oxford

Inventor,
Franz J. Petermoller,
by *Albert G. Davis*
Att'y.

UNITED STATES PATENT OFFICE.

FRANZ J. PETERMÖLLER, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CENTRIFUGAL PUMP.

1,060,937.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed June 25, 1910. Serial No. 568,801.

To all whom it may concern:

Be it known that I, FRANZ J. PETERMÖLLER, a subject of the Emperor of Germany, 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 centrifugal pumps for compressing air or other gaseous fluid, and operating by means of a supply of water or other incompressible liquid which is fed into the pump coincidently with the air or other fluid, and entraps the latter and carries it outwardly through the passages of the pump to the delivery. In the operation of such pumps it has heretofore been an absolute necessity that the impelling water be kept cool, either by furnishing a constant fresh supply, or by recirculating the water coming from the pump, in case a given quantity of water must be used again and again. The reason for this is that if the temperature of the water is only a little higher than that at which vaporization takes place in the chamber from which the gas or other medium to be moved is drawn, then the water will be vaporized to a certain extent in passing through the pump. It is true that such vaporization takes a certain number of calories from the water, so that what remains is cooled slightly, but the disadvantage is that the steam or vapor tends to choke the openings through which the gas to be moved is drawn by the impelling water. For this reason, it has been found necessary to cool the water in order to keep up the efficiency of the machine as a pump.

The object of the present invention is to dispense with the special cooler heretofore provided, and to this end, the invention consists in a special construction of the pump enabling the steam which separates from the hot impelling water to escape, and also providing means to force back any steam which may attempt to enter the passages through which the gas reaches the delivery. The first of these results is accomplished by means of a gap between the running and the directing wheels, through which gap the steam may pass to a condensing chamber. The second result is effected by placing on the running wheel special buckets or vanes which act to impel the gas through the space provided for

that purpose above the running wheel to the delivery, and also serve to throw back any steam which may try to pass up into said space. In this way, the disadvantage of the choking of the gas passages by the steam is avoided, and at the same time there is a certain advantage gained from the cooling effect due to the vaporization of a portion of the impelling water. Nevertheless, the impelling water if used over and over will gradually become heated until at length it reaches a temperature where the radiation losses balance the heat additions. The lower efficiency caused by the warmer impelling water is somewhat compensated for by the forced supply of the gas, since the additional expenditure of energy for this purpose is very small.

Instead of arranging the special buckets in the gas passages, it is possible to place vanes on the running wheel in the openings or gaps designed for the escape of the steam. But in such an arrangement, there is the disadvantage that even in case the temperature of the impelling water is below that of the vaporizing temperature of the chamber from which the gas is drawn, so that there is no formation of steam, yet a drawing-off action takes place, so that a portion of the water and also of the gas is diverted and lost.

In the accompanying drawing, Figure 1 is a vertical section of a centrifugal pump embodying my invention; and Fig. 2 is a plan view of the same, with the upper part of the pump removed.

The impelling water necessary for the operation of the pump is supplied to the running wheel or impeller 1 through the inlet 2, passing up around the bearing 3 for the shaft 4 on which said wheel is mounted. Surrounding said running wheel is the stationary directing ring wheel or member 5, whose upper plate 6 forms a guide extending over the running wheel and leaving an annular space between them through which the gas to be compressed can enter from the supply pipe 7. A circumferential gap 8 is left between the running wheel or member and the lower plate 9 of the directing wheel, this gap being preferably overhung by the top plate of the running wheel, as shown in Fig. 1. On the upper side of said top plate, and in the space between it and the plate 6, radial blades or vanes 10 are

arranged. The outer edge of the directing wheel or member communicates with the chamber 11 leading to the delivery pipe 12 for the mingled impelling water and gas, while the space 13 below the running wheel into which the gap 8 opens is provided with an escape pipe 14 communicating preferably with a condenser (not shown).

The gas or other medium to be compressed enters through the pipe 7 and is drawn by the impelling water through the space between the plate 6 and the running wheel and delivered to the directing wheel from which the mingled water and gas pass to the delivery outlet 12. The steam, which forms by reason of the high temperature of the impelling water, passes through the gap 8 to the space 13 and thence to the escape pipe 14. The buckets or blades 10 assist in the movement of the gas flowing between them, and also throw back any of the steam which may try to enter the gas space. The overhang 15 of the top plate aids in preventing this abnormal flow of the steam. The light steam is constantly forced by the impelling water into the exit opening or gap 8, since the impelling water tends to continue its path in the straightest possible line. It is preferable that the point where the gas passes into the space between the water supply device and the adjoining compression device shall be under somewhat higher pressure than that at which the steam passes out, and that by reason of suitable precautions the separated steam cannot flow back again into the gap as steam. The vanes 10 and the guide 6 for directing air and gases into the gap are not claimed broadly herein because they are shown and claimed in my co-pending application, Serial No. 544,519, filed February 17, 1910.

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, the combination of a running wheel, a horizontally disposed directing ring surrounding the wheel and having upper and lower plates, there being a gap between the edge of the wheel and the lower plate of the ring, and a chamber with which the gap communicates, said chamber being provided with an escape pipe.

2. In a centrifugal pump, the combination of a running wheel, a horizontally disposed directing ring surrounding the wheel and having upper and lower plates, there being a gap between the edge of the wheel and the

lower plate of the ring and an overhanging member on the wheel above said gap, and a chamber communicating with the gap, said chamber being provided with an escape pipe.

3. In a centrifugal pump, the combination of a running wheel, a horizontally arranged directing ring surrounding the wheel and having top and bottom walls, there being a gap between the wheel and the edge of the lower wall of the directing ring, and buckets on the upper part of the wheel in the space through which the medium to be moved enters.

4. In a centrifugal pump adapted to operate with hot throwing water, the combination of a rotary impeller, a directing ring surrounding the impeller, there being a gap between the periphery of the impeller and the inner edge of the ring, and means arranged adjacent one side of the gap for removing from said gap the steam given off by the throwing water.

5. In a centrifugal pump adapted to operate with hot throwing water, the combination of a rotary impeller, a directing ring surrounding the impeller, there being a gap between the periphery of the impeller and the inner edge of the ring, means supplying gas or other medium to be moved to one side of the gap, a device for preventing steam given off by the throwing water from entering the space through which said gas or medium flows on its way to the gap, and means for removing said steam from the other side of the gap.

6. In a centrifugal pump adapted to operate with hot throwing water, the combination of a rotary impeller having passages arranged between its top and bottom walls, a horizontally arranged directing ring surrounding the impeller and having upper and lower walls, the inner diameter of the lower wall being less than that of the upper wall, there being a gap between the lower walls of the impeller and ring that is overhung by the upper wall of the impeller, and a gap between the upper walls of the impeller and ring to which gas is supplied, blades carried by the upper wall of the impeller for moving the gas toward the upper gap and for preventing steam given off by the throwing water from entering said gap, and means for removing said steam from the lower gap.

7. In a centrifugal pump, the combination of an impeller, a shaft on which the impeller is mounted, a bearing for the shaft arranged at one side of the impeller, an annular chamber surrounding the bearing through which throwing water is supplied to the impeller, a directing ring surrounding the impeller with a gap between the two, a second chamber surrounding said annular chamber that is in communication with one side of the gap, a conduit leading from the second chamber, a third chamber surrounding the

second chamber that receives the discharge from the ring, a conduit leading from the third chamber, and means for supplying gas to the side of the gap opposite the second chamber.

8. In a centrifugal pump, the combination of a directing ring having a centrally disposed opening therein, a rotatable shaft arranged in the opening, an impeller carried by the shaft and arranged in the opening with its periphery adjacent the walls of said opening, the impeller having a hub, a web or disk on the hub that is arranged transversely to the axis of the shaft, an annular member on one side of the web whose outer

diameter is less than that of the web, said member being provided with passages for the throwing water, blades or vanes on the opposite side of the impeller, means for supplying water to the inner ends of said passages, and means for supplying gas to the inlet ends of the blades.

In witness whereof, I have hereunto set my hand this 4th day of June, 1910.

FRANZ J. PETERMÖLLER.

Witnesses:

CORN. D. NIESSINGER,

FR. CUBELIC.