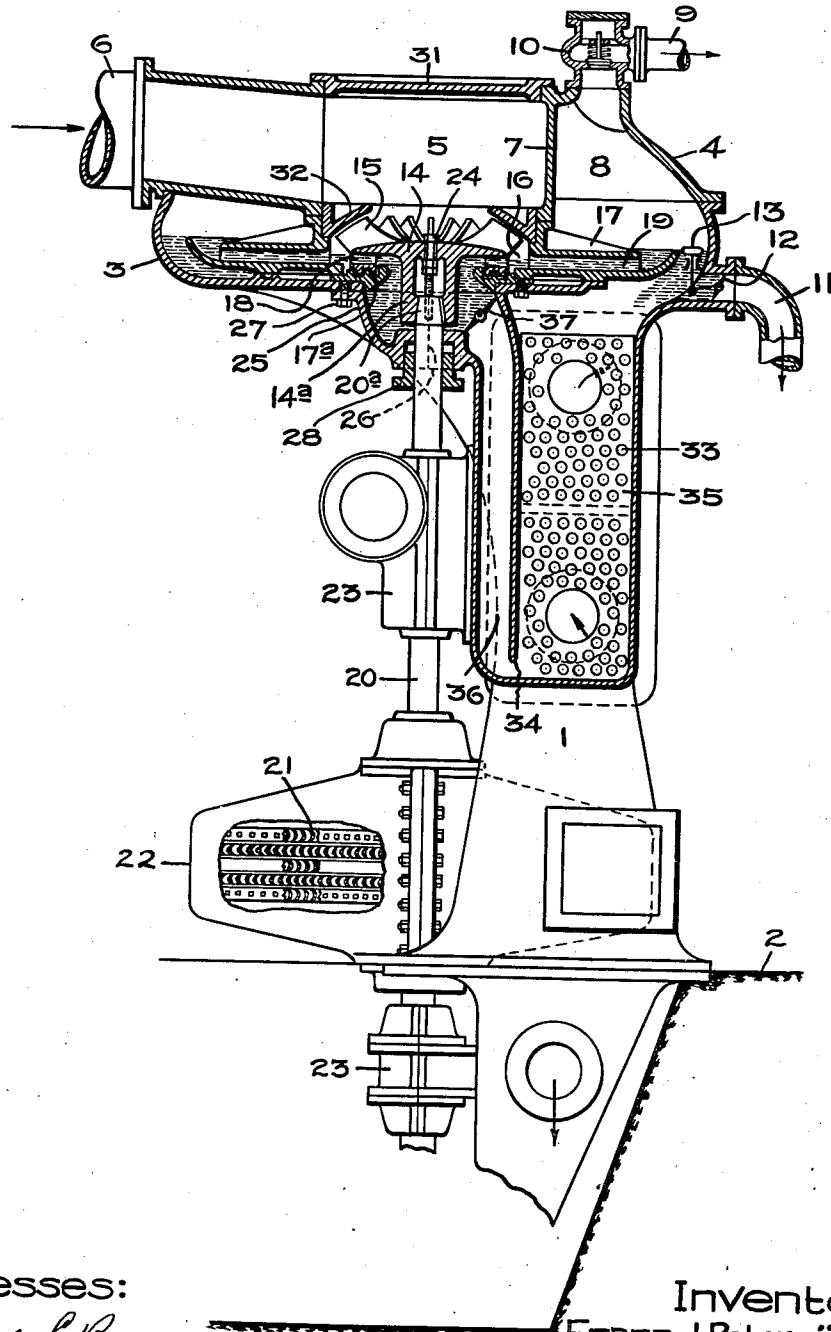


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CENTRIFUGAL THROWING AIR PUMP.
APPLICATION FILED APR. 29, 1910.

1,060,936.

Patented May 6, 1913.



Witnesses:
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Att'y.

UNITED STATES PATENT OFFICE.

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

CENTRIFUGAL THROWING AIR-PUMP.

1,060,936.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed April 29, 1910. Serial No. 558,401.

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 Throwing Air-Pumps, of which the following is a specification.

The present invention relates to centrifugal air pumps of the throwing type, and has for one of its objects to improve their construction, particular reference being made to the arrangement of the impeller and its driving shaft and to the cooling means for the throwing medium.

Another object of the invention is to provide the outlet openings of the air pump with automatically closing shut-offs which come into operation whenever either the pressure of the compressed air or other gas falls below a certain limit, or the level of the used throwing water falls to such a point that there is danger of the return of the compressed air or the penetration of atmospheric air into the pump.

In the accompanying drawing is illustrated, partly in elevation and partly in section, a centrifugal air pump of the throwing type.

1 indicates a vertically extending hollow column that is provided with a flanged base that rests on the foundation 2. The upper end of the column is enlarged to form a part of the pump casing 3, said casing overhanging the column on one side to enable the shaft to be mounted in a place where it is accessible, together with its bearings and packing. Mounted on the top of said part is a cover 4. Formed in the pump casing is a chamber 5, to which vapor, air or other gas is admitted by the inlet conduit 6. Surrounding the chamber and separated therefrom by a wall 7 is a second chamber 8, which receives air or other gas drawn by the pump from the chamber 5 and also the throwing medium, in this case water. This latter chamber is provided with an outlet conduit 9 containing an automatic pressure responsive valve 10 that opens outwardly to discharge air or gas, and an outlet conduit 11 for the discharge of excess throwing water and water of condensation.

The conduit 11 is located below the normal level of the water. In the conduit is a butterfly valve 12 controlled in its operation by the float 13, said float being connected to the valve by a rod and arm, which are pivotally united. By means of the two automatic shut-off devices 10 and 12, I prevent the loss of the vacuum or low pressure in the chambers 5 and 8 when the pump ceases to operate. In such an event, only the compressed gases which are at the moment in the chamber 8 can be returned to the condenser or other chamber connected to the pipe 6 and as their volume is comparatively small, the pressure or vacuum existing in the chambers 5 and 8 remains almost unchanged. Moreover, the shut-off 12 prevents the atmospheric air from entering the pump to an objectionable degree, when the pump is stopped, by driving water back into the chamber 5 if the valve 12 happens to be open at that time, since if any water is forced back the float 13 will quickly cause the valve to close and stop the flow as soon as the water level is lowered a small amount. If the pump is used with a steam engine or turbine having a condenser then just as soon as the engine or turbine starts again, the condenser is available.

14 indicates the impeller, which is provided with vanes 15 that direct the air and gases into the enlarged gap 16 between the impeller and the annular discharging device 17. Mounted on the underside of the body of the impeller are vanes 18 that discharge the throwing water by centrifugal action across the gap 16 into the discharging device 17, and also concentric bafflers 17^a. The discharging device 17 is provided with vanes 19 that form passages and assist in directing the mixture of air and gas into the chamber 8. The action of the throwing water, due to the impeller, is to raise the pressure of the gas from that of the condenser or other vessel connected to the conduit 6 to atmospheric pressure, or to a pressure in excess thereof.

The impeller is driven by the vertical shaft 20, on which is a driving motor 21, in this case an elastic-fluid turbine. The turbine is provided with a casing 22 that is supported by the base of the vertical column

and is split axially into two parts. The shaft is held in bearings 23, one above and the other below the motor.

It will be noted that the pump casing is not split in the plane of the shaft, while the motor casing is. It is sometimes necessary to remove the shaft from the apparatus, and owing to the fact that the motor is of such a character that the shaft cannot be moved any appreciable distance in a longitudinal direction, due to the limited clearance between the rotating and stationary parts of the motor, and also to the lack of room below and sometimes to the lack of head room, special arrangements must be provided. This arrangement forms one of the features of my invention. To this end, the top 20^a of the shaft terminates at a point below the lower wall of the pump casing. The hub 14^a of the impeller is elongated, so that the socket for the shaft projects below the bottom wall of the casing and receives the upper end of the shaft. The impeller is attached to the shaft by a bolt 24, the latter being threaded into the shaft at one end and provided with a nut near the other end that is seated on the impeller. The upper portion of the shaft is inclosed in a housing 25 that is split in an axial plane, as indicated by the dotted line 26, one portion of said housing is or may be integral with the vertical column, the other portion being detachable and secured to the other part and to the pump casing by bolts 27. The housing also carries a packing 28 of suitable construction. The bearing 23 below the motor is split in a vertical plane.

The shaft can be removed in the following manner without moving it longitudinally. The small cover 31 of the pump casing is removed and then the annular guide 32 that coöperates with vanes of the impeller. The next step is to remove the nut on the bolt 24 and pull the impeller off the shaft. The detachable portion of the housing is then taken off by first removing the bolts 27. The covers of the bearings are also taken off and the left-hand portion of the motor casing. This leaves the shaft and its rotor free to be moved bodily to the left by a sidewise movement, and this without either raising or lowering the shaft. It will be noted that this operation does not require disturbing the vertical column or the piping, or the pump casing except the small cover, which is a very advantageous arrangement. The shaft and its rotor can be mounted in place by reversing the various steps above set forth.

The next feature of my invention to be considered is the cooling of the throwing medium and the arrangement of the chambers therefor, whereby I am able to effect economies in the use of such medium where the supply is scarce or high priced, or

both. Mounted in the hollow vertical column is a plurality of horizontal tubes 33 through which a cooling fluid, such as water, is circulated. It is necessary for reasons of strength to make the column substantial and of considerable size, and I utilize what would otherwise be lost space for cooling purposes. The hollow portion of the column is divided by the vertical partition 34 into two chambers 35 and 36. The former receives the hot water discharged from the chamber 8, and after reducing its temperature the water enters the chamber 36 and flows upwardly to the suction side of the throwing pump. Between this chamber and the inlet of the pump is a valve 37 that may be operated by hand or otherwise to shut off the supply of water to the pump and to hold a body of water in the suction chamber preparatory to starting. The heated water flows downwardly in the cooling chamber 35, the length of which is determined by the extent it is desired to cool the water. It then turns and flows upwardly. In other words, there is heated water in one chamber and cool water in the other, the latter normally having free access to the suction side of the pump. This arrangement has the advantage, in addition to the saving of space (even when only a small amount of water is available for the throwing pump), of practically avoiding the necessity of lifting the water, since the level of the latter is maintained substantially the same as that of the vanes 18 of the impeller. By this means I am able to avoid losses in friction, etc. I am also able to do away with a number of pipes, joints, etc.

The impeller 14 with its vanes 15 and co-operating guide 32 for directing the air and gases into the enlarged gap 16, and the packing 17^a of the apparatus disclosed in this application are not claimed 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 an apparatus of the character described, the combination of a support, a pump casing carried by the support and extending to one side thereof, a motor having a casing which is split in a plane parallel to the vertical plane of the support, a shaft driven by the motor, one end of which extends into close proximity to but does not

enter the pump casing whereby it can be removed by a sidewise movement without disturbing said casing, an impeller located in the casing and having a hub with a socket that extends through the wall of the casing and receives the end of the shaft, and a removable housing for the end of the shaft and socket.

2. In an apparatus of the character described, the combination of a vertical column, a pump casing mounted thereon and overhanging it on one side, a motor mounted on the column, a casing therefor that is split in an axial plane of the motor shaft, a vertically disposed shaft that is driven by the motor, the upper end of the shaft terminating at a point below the overhanging portion of the pump casing, an impeller having an elongated hub which is mounted on the shaft, and a housing that incloses the upper end of the shaft and the hub which is detachable to permit of removing the shaft by a sidewise movement.

3. In an apparatus of the character described, the combination of a vertical column, a pump casing, one portion of which is formed integral with and overhangs the column on one side, an impeller in the casing whose body is located above and whose hub extends below the bottom wall of the casing, an upright shaft to the upper end of which is secured the impeller, said shaft being removable by a sidewise movement, a driving motor rigid with the column, the casing of which is split in an axial plane of the motor shaft, bearings for the shaft that are split in an axial plane, a housing that is split axially and incloses the upper end of the shaft and the hub of the impeller, and a packing for the shaft carried by the housing.

4. In an apparatus of the character described, the combination of a hollow upright column, a centrifugal throwing pump supported thereby, an impeller for the pump, communicating chambers formed in said column to receive the throwing medium, one of which communicates with the suction side of the impeller and the other with the discharge side thereof, cooling means which act on the fluid medium as it flows from the discharge to the suction side of the impeller, an inlet for the air or other gas to be pumped, and an outlet therefor.

5. In an apparatus of the character described, the combination of a hollow upright column, a centrifugal throwing pump supported thereby, an impeller for the pump, a chamber in the column that receives the heated medium discharged by the impeller, a cooling means in said chamber, a second chamber also in the column communicating with and receiving the cooled medium from the first, the second chamber communicating with the suction side of the impeller, the level of the fluid in the cham-

bers being such that the inlet of the impeller is submerged, an inlet for the air or other gases, and a discharge conduit therefor which receives said gases after their pressure has been raised.

6. In an apparatus of the character described, the combination of an upright column, a pump casing mounted on the top of the column and overhanging it on one side, a vertical shaft arranged on said side of the column, an impeller within the casing, means connecting the impeller to the upper end of the shaft, a motor for driving the shaft that is mounted on the lower portion of the column, and a stuffing box for the shaft that is carried by the lower wall of the pump casing, there being an opening in the upper wall of the casing opposite the impeller having a cover that can be taken off to remove the impeller from the pump.

7. In an apparatus of the character described, the combination of a hollow upright column, a centrifugal throwing pump supported thereby, a rotary impeller for the pump, a discharging device surrounding the impeller, a chamber adjacent the upper part of the column that receives the discharge from said device, cooling means arranged in the column below said chamber, a conduit conveying water from the lower portion of the chamber to said means, a conduit for the excess water that leads from the lower portion of the chamber, a float-controlled valve that regulates the flow through the last mentioned conduit, and a conduit conveying the cooled water from said means to the inlet of the impeller.

8. The combination with a centrifugal air pump having a rotary impeller, means for supplying a throwing medium to the impeller, a discharging device surrounding the impeller, and a chamber arranged around the discharging device and receiving the mixture of air and throwing medium from said device, of separate outlets for the air and the excess of throwing medium leading from said chamber, and automatic shut-off devices for said outlets adapted to operate when the pressure in said chamber falls below a predetermined minimum.

9. The combination with a centrifugal air pump having a rotary impeller, means for supplying a throwing medium to the impeller, a discharge device surrounding the impeller, and a chamber receiving the mixture of gas and throwing medium from said device, of an outlet for the gas at the upper part of the said chamber, an outlet for the throwing medium leading from the chamber below the normal level of said medium, and automatic shut-off devices for said outlets which operate when the pressure in the chamber drops below normal.

10. The combination with a centrifugal air pump having a rotary impeller, means

for supplying a throwing medium to the
impeller, a discharge device surrounding the
impeller, and a chamber receiving the mix-
ture of gas and throwing medium from said
5 device, of an outlet for the gas at the upper
part of said chamber, an outlet for the
throwing medium leading from the lower
part of the chamber, a pressure responsive
valve controlling the flow through the gas
10 outlet, and a float-actuated valve controlling

the flow through the outlet for the throwing
medium.

In witness whereof, I have hereunto set
my hand this 12th day of April, 1910.

FRANZ J. PETERMÖLLER.

Witnesses:

P. BUCHGARTH,
SÜRGEN CLAUSEN.