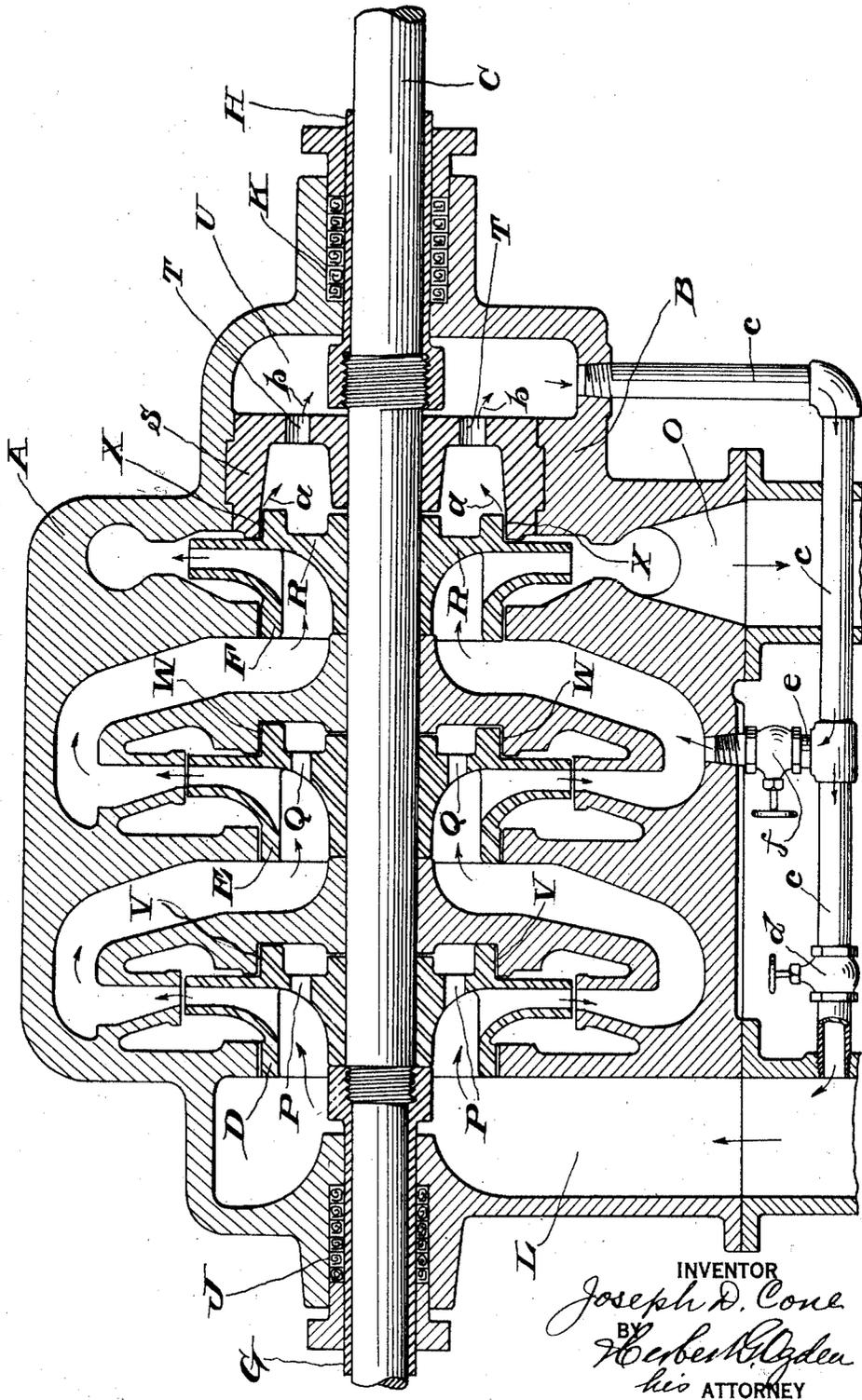


J. D. CONE.
CENTRIFUGAL PUMP.
APPLICATION FILED AUG. 13, 1920.

1,385,115.

Patented July 19, 1921.



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To all whom it may concern:

Be it known that I, JOSEPH D. CONE, a citizen of the United States, and resident of Montclair, county of Essex, and State of New Jersey, have invented a certain new and useful Improvement in Centrifugal Pumps, of which the following is a specification, accompanied by drawings.

This invention relates to centrifugal pumps but more particularly to pumps of that type having one or more single suction impellers rotating within the pump casing.

In a centrifugal pump having a single suction impeller or impellers, that is, receiving water on one side only, there is a thrust set up in the machine tending to force the rotating element toward the inlet of the pump. This thrust is due to the fact that there is no pressure or low pressure at the inlet of the pump, while the opposite side of the impeller is subjected to the higher pressure generated within the impeller, which tends to force the impeller or impellers toward the low pressure or inlet side. The total thrust set up is measured by the difference in pressure between the inlet pressure and the pressure generated, multiplied by the inlet area.

The primary object of the present invention is to relieve the pressure on the back of the impeller to an extent substantially equal to the total thrust, so that practically no thrust will exist, and the impeller or impellers will be in equilibrium as far as lateral movement or thrust is concerned. Heretofore holes have been provided in the central portions of the impellers, for the purpose of equalizing the pressure on the two sides of the impellers but these holes have not been entirely effective, probably owing to the fact that they are in portions of the machine moving at high velocity, and while they accomplish some relief, they do not by any means meet the full requirements, especially when the parts of the machine become worn, and such being the case, some form of mechanical device has been found desirable to counteract the thrust, as a thrust bearing.

I have found that by placing the relief holes in one of the stationary members of the pump, at a point from which communication can be conveniently established between the high pressure side and the low pressure side of the pump, the desired relief

can be readily obtained in a simple and practical manner which has been found to be satisfactory and efficient in actual practice.

To these ends the invention is shown in one of its preferred forms in the accompanying drawing, which is a diagrammatic longitudinal sectional side elevation of a centrifugal pump embodying the invention.

Referring to the drawing, A represents the upper part of the pump casing and B represents the lower part of the casing constructed in any suitable and usual manner through which the shaft C extends, in this instance having a plurality of impellers D, E and F suitably mounted on the shaft to rotate therewith. The machine may be provided with the usual shaft sleeves G and H and stuffing boxes J and K. Water is supplied at the inlet or inlet side L of the machine and discharged at the outlet side O in the usual manner.

The impellers D and E are shown provided with the holes P and Q in their central portions to aid in equalizing the pressures on the two sides of the impellers but it will be observed that the web R of the impeller F is in this instance solid and unprovided with the relief holes. A stationary filling piece S is located within the discharge side of the casing and its walls are provided with permanent continuously open relief holes T opening into a relief chamber U within the casing. As shown, a small amount of clearance is provided between the impellers and the casing at the points V, W, and X and pressure tends to be built up in the relief chamber U as indicated by the arrows *a* and *b*.

In order to relieve the thrust tending to force the impeller or impellers toward the inlet side of the pump, a connection *c* is provided between the relief chamber U and the inlet L controlled by any suitable valve *d* preferably located at the end of the pipe near the inlet L. The permanent relief apertures T afford continuous uninterrupted communication between the interior of the pump and the relief chamber U and by adjusting the valve *d* to the proper degree, the pressure in the chamber U is relieved as desired so that the pressure at the discharge side of the pump tending to thrust the impeller or impellers toward the inlet side of the pump is relieved.

In a multi-stage pump like that shown in the drawing a branch connection *e* may be provided from a point in the pipe connection *c* between the relief chamber U and the valve *d*, to one of the intermediate stages of the pump, at a lower pressure than the pressure which would exist in the chamber U if it were not for the relief connection. The branch connection *e* is also provided with a suitable valve *f* controlled as desired, and by closing one valve and opening the other valve, the relief connection may be made either to the inlet side of the pump or to one of the intermediate stages as desired. Either one or the other of these valves *d* and *f* should be closed, but both should not be closed at the same time if it is desired to relieve the thrust in the machine.

Obviously the invention applies to a centrifugal pump having one or a plurality of impellers and is not limited to the precise construction shown in the drawings which has been selected as an example to illustrate the invention.

I claim:

1. In a centrifugal pump, the combination of a casing having inlet and discharge sides and at least one single suction impeller, a stationary portion of the casing structure

located within the discharge side being provided with permanent continuously open relief apertures affording continuous communication between the interior of the pump and a relief chamber within the end of the casing, a connection between said relief chamber and a point in the pump at a lower pressure, and means for controlling the flow of fluid through said connection, whereby the thrust tending to force the impeller toward the inlet side of the pump is relieved.

2. In a centrifugal pump, the combination of a casing having inlet and discharge sides and at least one single suction impeller, a stationary filling piece within the casing at the discharge side of the pump having relief apertures affording communication between the interior of the pump and a relief chamber within the end of the casing, a connection between said relief chamber and the inlet of the pump, and means for controlling the flow of fluid through said connection, whereby the thrust tending to force the impeller toward the inlet side of the pump is relieved.

In testimony whereof I have signed this specification.

JOSEPH D. CONE.