Dec. 9, 1941. L. GOLDSCHMIED 2,265,806

PUMP

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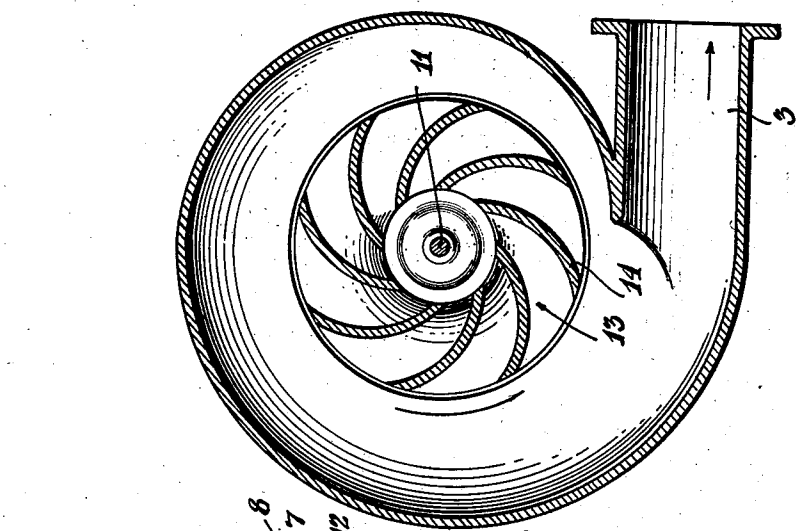


Fig. 3

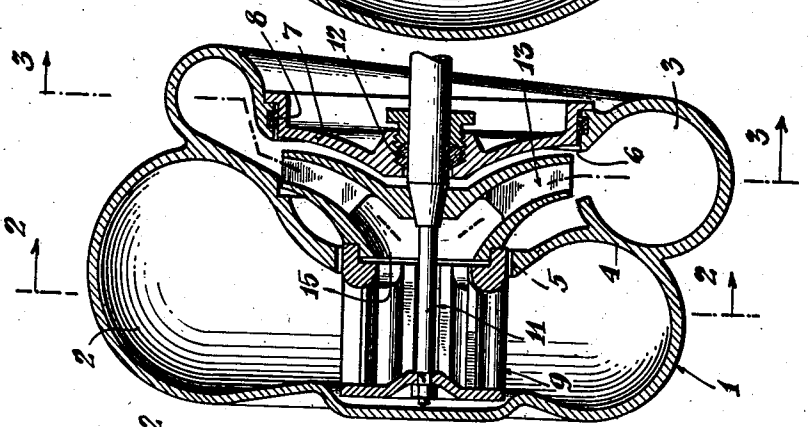


Fig. 1

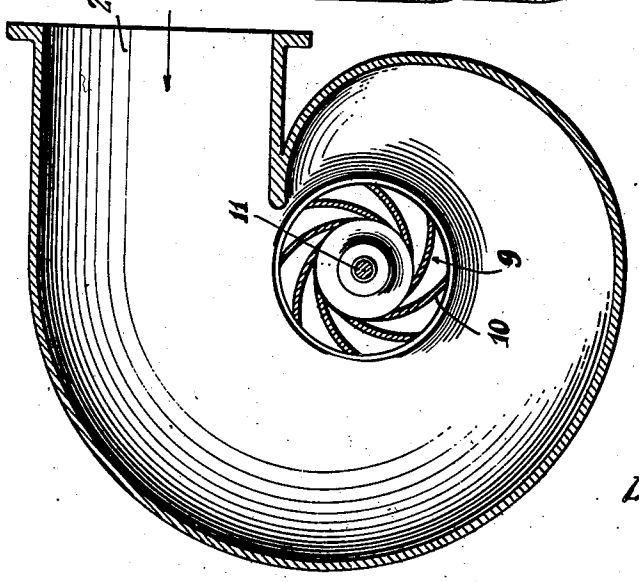


Fig. 2

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2 Claims. (Cl. 103—105)

This invention relates to pumps and more particularly to an improved multi-stage extraction pump of the centrifugal type.

In accordance with an illustrative embodiment of the present invention, the pump includes a generally spiral inlet chamber, into which the fluid is drawn peripherally and passes into a first stage impeller in an inward direction and from thence axially into a second stage or principal impeller which forces the fluid in an outward direction into a spiral outlet chamber from which the fluid is discharged peripherally.

The inlet chamber is so shaped and dimensioned that the fluid velocity is substantially uniform and the pressure loss is relatively low. The inlet chamber and first stage impeller are so designed that the fluid is supplied to the second stage impeller substantially without cavitation. Both impellers are mounted on a single overhanging shaft which is journaled externally of the chambers and thus there are no bearings in contact with the fluid. The impellers are in immediately adjacent relation and the pump casing is so shaped that the pump is very compact in construction.

An object of the present invention is the provision of a highly efficient pump of the type hereinbefore referred to in which the fluid flows smoothly through the casing and there is a minimum of interference and cavitation.

Another object of the invention is the provision of a pump which is very compact and efficient as to space required for installation of the pump.

Still another object of the invention is the provision of a pump of the multi-stage type wherein the impellers are so mounted that there are no bearings in contact with the fluid in the pump.

Various other features and advantages of the invention will be apparent from the following particular description and from an inspection of the accompanying drawing.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawing forming a part hereof, in which

Fig. 1 is a vertical cross-sectional view taken axially through one form of pump constructed in accordance with the invention;

Fig. 2 is a longitudinal sectional view taken along line 2—2 of Fig. 1; and

Fig. 3 is a longitudinal cross-sectional view taken along line 3—3 of Fig. 1.

In the following description and in the claims, various details will be identified by specific names for convenience, but they are intended to be as generic in their application as the art will permit. Like reference characters denote like parts in the several figures of the drawing.

The pump made in accordance with the present invention is suitable for extracting liquids from condensers and generally similar uses.

The pump comprises a casing or housing 1 which may be constituted by a single member, or a plurality of members, suitably secured together. The casing 1 is formed to define an inlet chamber 2 and outlet chamber 3. The inlet chamber 2 is of spiral shape which decreases in effective cross-sectional area inwardly from a peripherally located intake opening. The outlet chamber 3 is also of spiral form which preferably increases in cross-sectional area outwardly toward a discharge opening peripherally located at the lower portion of the same side of the casing as the intake opening. The inlet chamber 2 and the outlet chamber 3 are separated by a partition or wall 4 which has an opening 5 therethrough located axially of the pump to provide communication between the chambers.

An opening 6 is formed in the side wall of the casing adjacent the outlet chamber 3 to permit the insertion of the impellers hereinafter described, which opening preferably is closed by a closure plate 7 having a seal 8 associated therewith.

Rotatably mounted centrally of the inlet chamber 2 and extending into the opening 5, is a first stage impeller 9 having suitably shaped and arranged blades 10 which cause the fluid to be drawn inwardly from the inlet chamber 2 toward the axis of the impeller. The impeller 9 is carried on a shaft 11 extending through the end plate 7 and terminating within the inlet chamber 2, a suitable stuffing box 12 being provided in the end plate 7. The shaft 11 is journaled in a bearing or bearings (not shown) located externally of the casing 1 and thus the bearings are not in contact with the fluid in the pump.

Also carried on the shaft 11 for rotation therewith is a second stage impeller 13 disposed immediately adjacent the first stage impeller 9 and adapted to receive fluid therefrom in a direction axially of the pump. The adjacent portions of the impellers are so formed that the fluid flows

smoothly from the first to the second impeller. The second stage impeller 13 is an out-flow impeller and has blades 14 of suitable shape and arrangement which hurl the fluid outwardly by centrifugal force and cause it to flow in a spiral direction along the outlet chamber 3. The first stage impeller 9 has a substantially smaller external diameter than the second stage impeller 13.

The portion of the outlet chamber 3 which receives the second stage impeller is shaped similarly to the impeller, the partition 4 being made generally concave, or dished, so that a very compact construction is provided. The pump, therefore, has a relatively small axial dimension.

When the pump is to be operated, the intake opening is connected to a suitable intake pipe (not shown) and the pump is suitably primed. Upon rotation of the shaft, the pump draws fluid into the inlet chamber 2 and the fluid flows in a spiral direction in the inlet chamber 2 and inwardly into the first stage impeller 9. The fluid is forced in an axial direction through the impeller 9 and into the impeller 13. The impeller 13 forces the fluid outwardly by centrifugal force into the outlet chamber 3 from which the fluid is expelled through the outlet opening.

The first stage impeller accomplishes only a small proportion of the work to be done by the pump and the principal work is done by the second stage impeller.

Since the inlet opening and the inlet chamber are relatively large and are shaped to provide a constant fluid velocity, the loss of pressure in the inlet chamber is relatively low and the efficiency of the pump, therefore, is relatively high. Moreover, the fluid travels in a generally spiral path continuously throughout the casing with a minimum of change in direction and no abrupt change; this further contributes to the high efficiency of operation. In addition, the external friction of the impellers is relatively low.

Owing to the construction of the casing and particularly the arrangement of chambers, the overall axial length of the pump may be made relatively small for any particular size of pump. Because of the efficiency of the pump, the impellers can be made relatively small and accordingly, light in weight, thus also permitting a compact and efficient construction. Moreover, owing to the small size of the impellers, an overhung mounting of the impellers on the shaft can be employed, thus avoiding the necessity for internal bearings.

If desired, one or more additional impellers may be provided, which impellers operate as centrifugal impellers, in a manner similar to the second stage impeller.

While certain novel features of the invention have been disclosed herein, and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. A multi-stage pump of the centrifugal type comprising a casing defining a generally spiral inlet chamber having a peripherally located inlet opening and a generally spiral outlet chamber of lesser effective cross-sectional area and axially displaced from said inlet chamber, said chambers being defined in part by a partition converging inwardly in a direction toward said inlet chamber.

2. A multi-stage pump of the centrifugal type comprising a unitary housing member defining inlet and outlet chambers and a central communication passage therebetween, an opening in an exterior end wall of said housing adjacent said outlet chamber, an inwardly concave end plate closing said opening, a first impeller in said inlet chamber, a second impeller in said outlet chamber complementary in shape to said end plate, and a shaft extending through said end plate and into said inlet chamber and carrying said impellers for rotation in said chambers respectively.

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