April 24, 1934. M. M. BORDEN 1,956,309

MECHANISM FOR INDICATING FLOW

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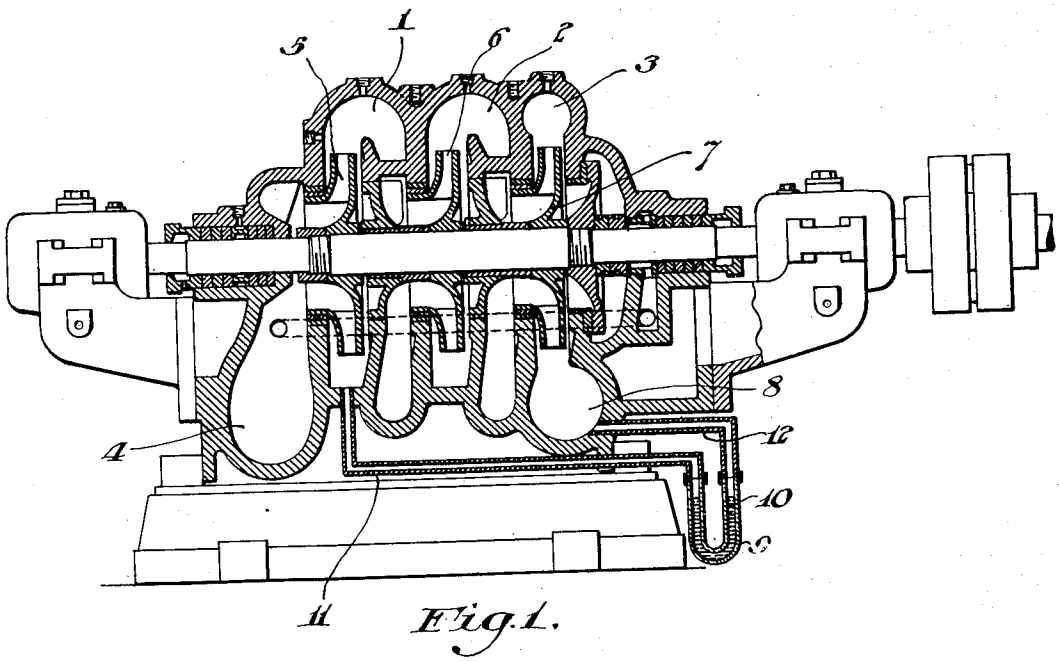


Fig. 1.

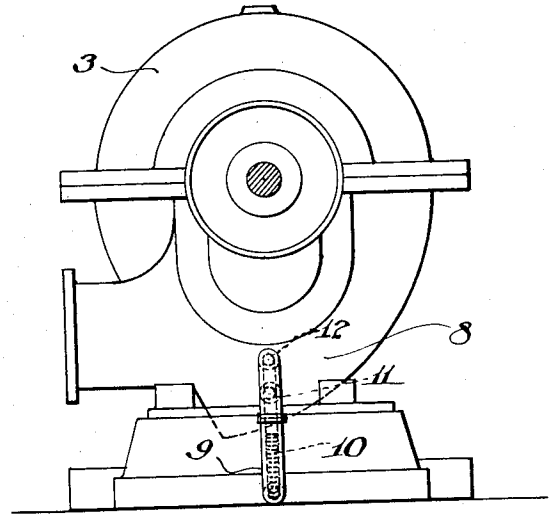


Fig. 2.

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MECHANISM FOR INDICATING FLOW

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5 Claims. (Cl. 73—167)

My invention is an improved mechanism for indicating or measuring the flow of fluid by utilizing the differences in pressure resulting from the flow of fluid through a volute chamber particularly when impelled by the centrifugal action of the rotor or impeller of a centrifugal pump. The differences in the pressures of the fluid at different zones within the pump casing bear a functional relation to the volume and to the velocity of fluid flowing through the pump, and are most conveniently utilized for indicating such volume and/or rate of flow by connecting differential pressure mechanism with the zones of minimum and maximum pressures adjacent to the inlet or the beginning of the volute passage and to the exit therefrom. The differential pressure mechanism may be of any type commonly utilized for indicating or measuring flow from pressure differences or for controlling the flow of an auxiliary fluid, but is preferably a simple manometer or U-tube having its throat sealed with mercury or other indicating liquid and its legs connected with the zones of different pressures of the pump chamber.

The pump may be of the single stage or multistage type and may be provided with usual means for utilizing the kinetic energy of the discharge from the impeller and increasing the pressure, such as diffusion vanes or a vortex chamber. The U-tube may be provided with graduations calibrated to indicate directly a desired function or functions of the differences or variations in pressure indicated by the deflections of the mercury columns. During the usual testing of the pump capacity, as by a weir, nozzle, Pitot tube or the like, readings may be taken simultaneously of the U-tube and used for plotting a curve from which the U-tube or scale may be calibrated.

The practical application of my invention is illustrated somewhat diagrammatically in the accompanying drawings, in which Fig. 1 is a diagrammatic longitudinal sectional view of a multistage centrifugal pump having my improvements applied thereto; and Fig. 2 is a diagrammatic end elevation thereof.

As illustrated in the drawings, the casing of a multi-stage centrifugal pump is interiorly divided by diaphragms into stages or chambers 1, 2 and 3, each spiral in transverse section so that the sectional area of the discharge passage of each stage increases approximately uniformly. Liquid admitted to the pump is drawn from the low pressure chamber 4 by the impeller 5 and delivered thereby at high velocity and increased pressure into the stage 1. The water is again centrifuged by the impeller 6 and delivered thereby at higher pressure into the stage 2 from which it is drawn by the impeller 7 and delivered at still higher pressure to the stage 3 from which it is discharged at maximum velocity through the discharge passage 8.

A U-tube 9 having its neck sealed by mercury 10 has one of its legs connected through tubing 11 with the zone adjacent to the beginning of the volute of the stage 1. The other leg of the tube is connected through tubing 12 with a zone adjacent to the outlet from the stage 3. When the pump is started the pressure at the point of connection of the tube 11 is higher than the pressure at the point of connection of the tube 12, but when normal running speed is attained, the pressure at the point of connection of the tube 12 becomes greater than the pressure at the point of connection of the tube 11, and is so maintained during normal operation. By suitably graduating the legs of the U-tube, the rate of flow or volume of liquid passing through the pump in the normal operation thereof are readily determinable from the deflection of the mercury resulting from the differences or variations in pressures at the respective zones.

Having described my invention, I claim:

1. The combination with a volute casing and a rotary impeller forcing fluid therethrough and forming zones within the casing having differences in pressure bearing a functional relation to the volume and to the velocity of fluid flowing through the casing, of differential pressure flow indicating mechanism having tubes each connected with one of said zones and a flow indicating device operable by the differential pressures communicating through such tubes.

2. The combination with a pump having zones of relatively low and high pressures, of differential pressure flow-indicating mechanism connected with said pump at different distances from the axis thereof and with said zones of different pressures.

3. The combination with a volute casing and means for forcing fluid therethrough, of differential pressure flow-indicating mechanism including tube ends connected at different distances from the axis of said casing and with zones of different pressures in said casing.

4. The combination with a volute casing and an impeller therein, of differential pressure flow indicating mechanism connected with said casing adjacent to the inlet and discharge zones thereof, said zones being separated by said impeller.

5. The combination with a centrifugal pump having a volute casing and a rotary impeller therein of a U-tube having its neck sealed with a liquid and its legs provided with transparent sections adjacent to the meniscuses of said liquid and connected with said casing adjacent to different zones of pressure therein.

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