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TURBINE DRIVEN CENTRIFUGAL PUMP.

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1,004,822. **Patented Oct. 3, 1911.**

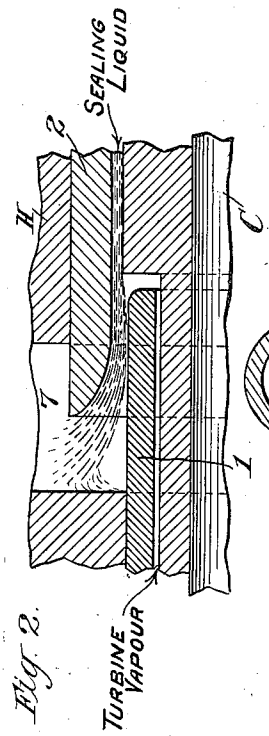


Fig. 2.

Fig. 1.

Witnesses:
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UNITED STATES PATENT OFFICE.

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TURBINE-DRIVEN CENTRIFUGAL PUMP.

1,004,822. Specification of Letters Patent. Patented Oct. 3, 1911.

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To all whom it may concern:

Be it known that I, WALTER SCHEURMANN, a citizen of the Republic of Switzerland, residing at Newark-upon-Trent, England, have invented certain new and useful Improvements in Turbine-Driven Centrifugal Pumps, fully described and represented in the following specification and the accompanying drawing, forming a part of the same.

This invention relates to an improved combination of steam turbine and direct driven centrifugal pump, by which the construction is simplified, the weight and over-all lengths reduced, unnecessary parts eliminated and efficiency improved.

The general practice in building steam turbines and centrifugal pumps direct driven thereby has been to build the turbines and pumps substantially as independent units, with separate casings, the usual stuffing boxes, labyrinth packings and intermediate bearings between the turbine and pump. In accordance with the present invention, the shaft extends directly from the turbine into the pump through a sleeve formed or carried by the turbine and pump covers, so that the shaft is inclosed throughout the turbine and pump, and the space between the shaft and sleeve is sealed to prevent leakage between the turbine and pump and the necessary lubrication provided, by introducing water or other lubricant under suitable pressure. The turbine and pump are thus brought close together and the usual stuffing boxes and packings for preventing leakage from the turbine and pump casings are not required. The turbine and pump covers are preferably combined in one casting for economy of weight and space, although this is not essential.

In some constructions in which the pressure of the liquid in the pump or that of the sealing liquid introduced between the turbine and pump may exceed that of the adjoining turbine space, there may be danger of the liquid leaking in too large quantities along the clearance left about the rotating shaft, so as to accumulate in the turbine and interfere with its satisfactory working. To avoid this leakage in such cases, I preferably form an ejector around the shaft between the turbine and pump, by which water is conducted away in such a manner as to avoid leakage between the turbine and pump.

In the accompanying drawing forming a part of this specification, I have shown for purpose of illustration a construction embodying the invention in its preferred form as applied with a turbine and pump of common types, and this construction will now be described in detail and the features forming the invention then specifically pointed out in the claims.

In the drawing Figure 1 is a central vertical section of a horizontal combined turbine and centrifugal pump. Fig. 2 is a detail section of a portion of the ejector illustrating the ejector action.

Referring to said drawings, A is the turbine rotor and B the pump impellers, the pump being shown as a three-stage centrifugal pump of a well known type, the turbine and pump impellers having the common shaft C by which the impellers are direct driven by the turbine. The pump suction D (shown in dotted lines) is next the turbine and E is the delivery chamber surrounding the last impeller. The turbine casing F and pump casing G are closed at their adjacent ends by the common head or cover H through a central opening in which the shaft C extends from the turbine to the pump, so that the shaft is inclosed between the turbine and pump by the head or cover. This head or cover H between the turbine and pump is of such a thickness as to provide for introduction of sealing liquid into the clearance space between the shaft and head, so as to avoid leakage in either direction between the turbine and pump, this sealing liquid being taken from the pump or any other source suitable to secure the desired pressure.

In the preferred construction shown, an ejector is formed about the shaft by which liquid in the clearance space is conducted away so as to prevent the passage to the turbine of either the sealing liquid or liquid from the adjacent pump space. In this construction the sleeve between the turbine and pump, in which the shaft runs, is divided into two sleeves, 1, 2, and these sleeves are arranged at their adjacent ends to form the ejector, by which the velocity of the liquid

passing through the ejector throat into the diffusing portion of the ejector is changed into pressure and the liquid delivered through the outlet passage so as to prevent its leakage into the turbine. The liquid enters from inlet 4 into the small circular chamber 5 about the sleeve 2 and through openings 6 into the clearance space between sleeve 2 and the shaft and then through the ejector formed between the adjacent ends of sleeves 1, 2 into circular chamber 7 and to outlet 8, from which it is led either to the atmosphere or to the vacuum space in the condenser and air pump as desired and according to the pressures used. The action of the ejector will be clear from the detail Fig. 2.

While the invention has been illustrated and described in connection with a steam turbine and centrifugal pump for liquids, the invention is applicable also to gas turbines and to other rotary pumps for liquids and to rotary air or gas pumps or compressors, and the feature of the ejector on the clearance space may be used in other classes of constructions in which such shaft sealing or lubrication is required and such uses are within the invention.

It will be understood that the invention is not to be limited to the detail form or particular arrangement of parts in the construction illustrated, but that many modifications may be made within the invention as defined by the claims.

What I claim is:—

1. A combined turbine and direct driven centrifugal pump or the like, having its shaft inclosed between the turbine and pump and having a liquid seal to prevent leakage between the turbine and pump formed by circulating liquid through the clearance space about the shaft independently of the turbine chamber.

2. A combined turbine and direct driven centrifugal pump or the like, having its shaft inclosed between the turbine and pump and having a liquid seal to prevent leakage between the turbine and pump formed by circulating liquid through the clearance space about the shaft independently of the turbine chamber, and an ejector about the shaft through which the liquid passes from the clearance space.

3. A combined turbine and direct driven centrifugal pump or the like, having its shaft inclosed between the turbine and pump and having a liquid seal to prevent leakage between the turbine and pump formed by circulating liquid through the clearance space about the shaft independently of the turbine chamber, and a sleeve surrounding the shaft between the turbine and pump and arranged to form an ejector through which the liquid passes from the clearance space.

4. The combination with a shaft and passages for circulating liquid through the clearance space about the shaft, of an ejector inclosing the shaft for conducting the liquid from the clearance space.

5. The combination with a shaft, of sleeves 1, 2, about the shaft arranged to form at their adjacent ends an ejector for conducting liquid from the clearance space about the shaft.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

WALTER SCHEURMANN.

Witnesses:
GEO. F. SANDIFORD,
A. WOLSTENHOLME.