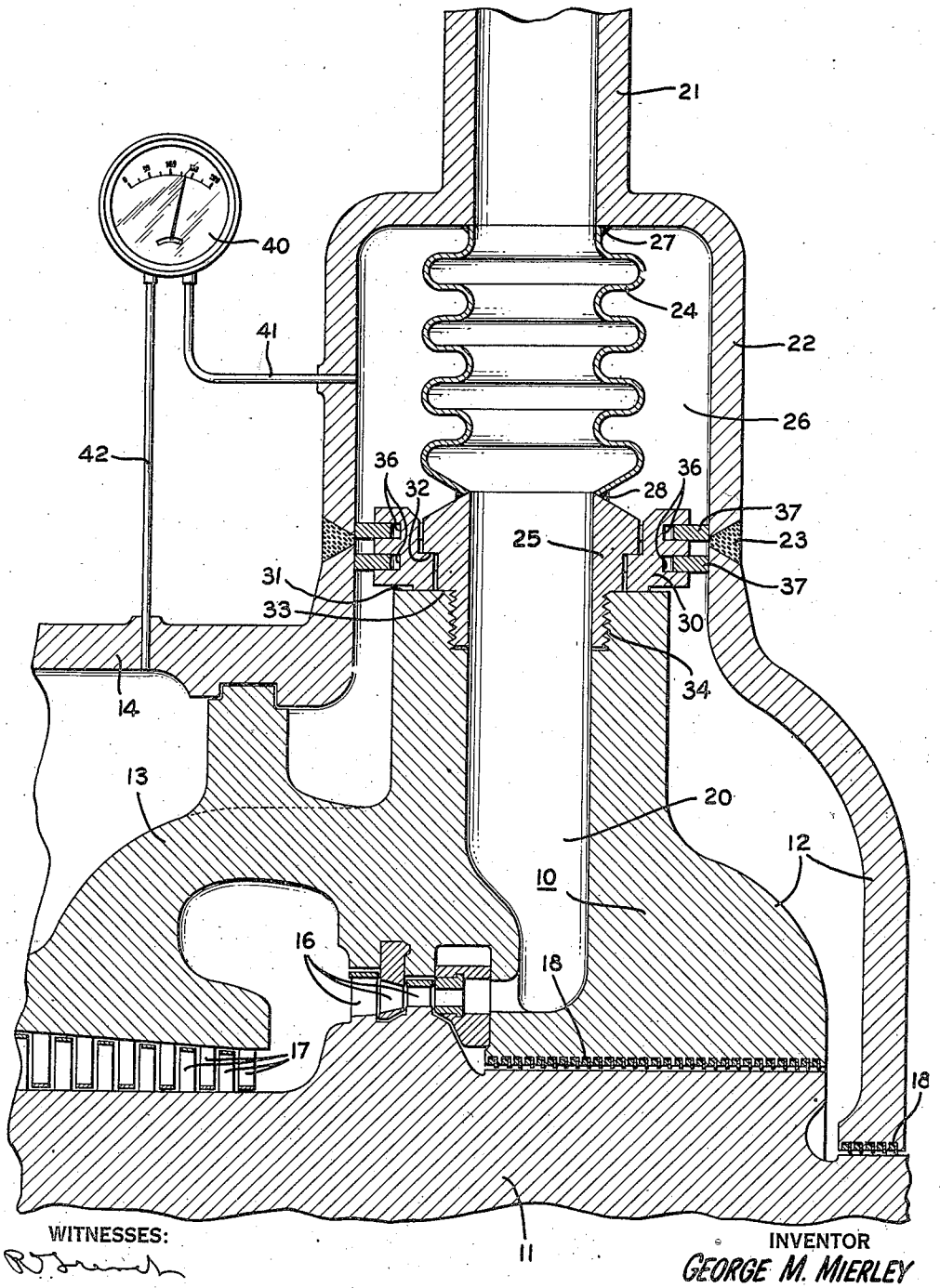
Jan. 9, 1945. G. M. MIERLEY 2,367,134

STEAM CHEST CONSTRUCTION

Filed May 29, 1943



WITNESSES:

INVENTOR

GEORGE M. MIERLEY

BY

ATTORNEY

Patented Jan. 9, 1945 2,367,134

UNITED STATES PATENT OFFICE

2,367,134

STEAM CHEST CONSTRUCTION

George M. Mierley, Upper Darby, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application May 29, 1943, Serial No. 489,091

4 Claims. (Cl. 253—39)

This invention relates to elastic fluid turbines, more particularly to turbines of double-wall construction, and has for an object to provide novel means for indicating leakage of elastic fluid to the space between the double walls.

Another object of the invention is to provide means for indicating the amount of leakage of motive fluid from a conduit located at an inaccessible and unobservable place.

With steam turbines operating at high temperatures, it is common practice to admit the steam to the turbine cylinder through a number of inlets spaced circumferentially of the latter. Where a plurality of such inlets are provided, it frequently results that there is not sufficient room for the usual bolted flanged connections between the inlet conduits and the cylinder. In such cases, the inlet conduits must be welded to the cylinder, with the result that their removal and replacement is difficult, expensive, and to be avoided wherever possible.

With double-wall cylinders, it is necessary to provide a resilent conduit for conducting steam from the inlet connection at the outer wall to the inlet connection at the inner wall, communicating with the steam admission chamber in the inner wall construction. Such flexible conduits may develope leaks and, because of their inaccessibility, it is important to know when such leaks occur and the extent of such leakage. The present invention relates to means for providing this information.

These and other objects are effected by the invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which the single figure is a fragmentary sectional view of a portion of a steam turbine embodying the present invention.

Referring now to the drawing more in detail, a turbine is indicated, in its entirety, by the reference character 10, and comprises a rotor 11 and a cylinder structure 12, surrounding the rotor and comprising inner and outer spaced walls 13 and 14, respectively. A plurality of stages 16 and 17 of blading are carried by the rotor and the cylinder construction, and the usual sealing means 18 is provided between the rotor and cylinder parts.

The inner wall 13 is provided with the usual steam admission chamber 20 for supplying motive fluid to the first stage 16 of the blading, and a steam supply pipe 21 conducts steam to the extension portion 22 of the outer wall 14, the extension 22 being connected to the outer wall 14 by welding, as at 23.

Suitable flexible conduit means, herein shown as bellows 24, provides communication between the steam supply pipe 21 and the inlet connection 25 to the chamber 20, and bridges the space 26 between the inner wall 13 and the outer wall extension 22. Preferably, the bellows 24 is permanently secured to the steam supply pipe 21 and the inlet connection 25, by suitable means, such as the weld connections 27 and 28, respectively.

In order to prevent excessive leakage of steam in the event of failure of the bellows 24, there is provided a seal ring construction 30, isolating the space 26, surrounding the bellows, from the remaining space between the inner and outer walls of the turbine cylinder. Preferably, the sealing ring 30 is movably retained between the surface 31, formed on the inner wall 13, and an opposed shoulder 32, formed on the inlet connection 25. A second shoulder 33 on the inlet connection is so spaced from the shoulder 32 that, when the inlet connection 25 is secured into place by the screw thread connection 34, the sealing ring 30 will be free to move radially a limited distance to provide for expansion and contraction effects of the inner and outer wall construction. The seal ring 30 is provided, in its outer periphery, with a plurality of annular grooves 36, in each of which is positioned a split seal ring 37, bearing against the inner surface of the outer wall extension 22 or the corresponding adjacent surface of the outer wall 14. These seal rings 37 will permit of relative movement of the inner and outer wall structures, resulting from expansion and contraction effects thereof, and, at the same time, will prevent excessive leakage of steam from the space 26, about the bellows 24, to the remaining space between the inner and outer walls at the other side of the seal ring structure, in the event of bellows failure.

In order to indicate the occurrence of any such failure of the bellows, there is provided a pressure differential gauge 40, communicating, through conduits 41 and 42, with the space 26 surrounding the bellows and the remaining space between the inner and outer walls, respectively. It will be apparent that, with no leakage occurring through the bellows, the gauge 40 would indicate an approximate zero reading. Upon occurrence of leakage through the bellows to the space 26 thereabout, the increase of pressure within the space 26, relative to the space at the other side of the sealing ring 33, will be indicated

by the gauge 40, and the reading of this gauge will also serve as a measure of the amount of leakage at the bellows, inasmuch as a larger leak would produce a higher reading on the gauge than would a relatively small leak.

It should be noted that, even if complete failure of the bellows 24 should occur, the seal ring construction 30 would prevent excessive leakage of elastic fluid therepast, with the result that operation of the turbine could be continued until it was convenient to shut it down.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What is claimed is:

1. In an elastic fluid turbine; a rotor; a cylinder structure surrounding said rotor and including spaced inner and outer walls; blading carried by the rotor and the cylinder structure, said inner wall providing a chamber for admission of elastic fluid to the blading and having an inlet opening therethrough to said chamber, and the outer wall having an inlet opening therethrough aligned with the opening in the inner wall; means providing a conduit connecting said openings for flow of elastic fluid to the chamber from externally of the outer wall; and means for indicating leakage of elastic fluid from said conduit to the space between the inner and outer walls, said means comprising sealing means separating the space about the conduit from the remainder of the space between the inner and outer walls, and a differential pressure device sensitive to pressure differences across said sealing means.

2. In an elastic fluid turbine; a rotor; a cylinder structure surrounding said rotor and including spaced inner and outer walls; blading carried by the rotor and the cylinder structure; said inner wall providing a chamber for supplying elastic fluid to the blading and having an inlet opening therethrough to said chamber and the outer wall having an inlet opening aligned with the opening in the inner wall; means providing a resilient conduit connecting said openings for flow of elastic fluid to the chamber from externally of the outer wall; means partitioning off the space between the inner and outer walls adjacent the resilient conduit from the remaining space; and means for indicating any change in pressure within said partitioned-off space resulting from leakage through said resilient conduit.

3. Structure as specified in claim 2, wherein the means for indicating any change in pressure within the partitioned-off space comprises a differential pressure device in communication with opposite sides of the partitioning means.

4. Structure as specified in claim 2, wherein the means for indicating any change in pressure within the partitioned-off space comprises a differential pressure device communicating with opposite sides of the partitioning means and providing a reading which is a measure of the amount of the leakage.

GEORGE M. MIERLEY.