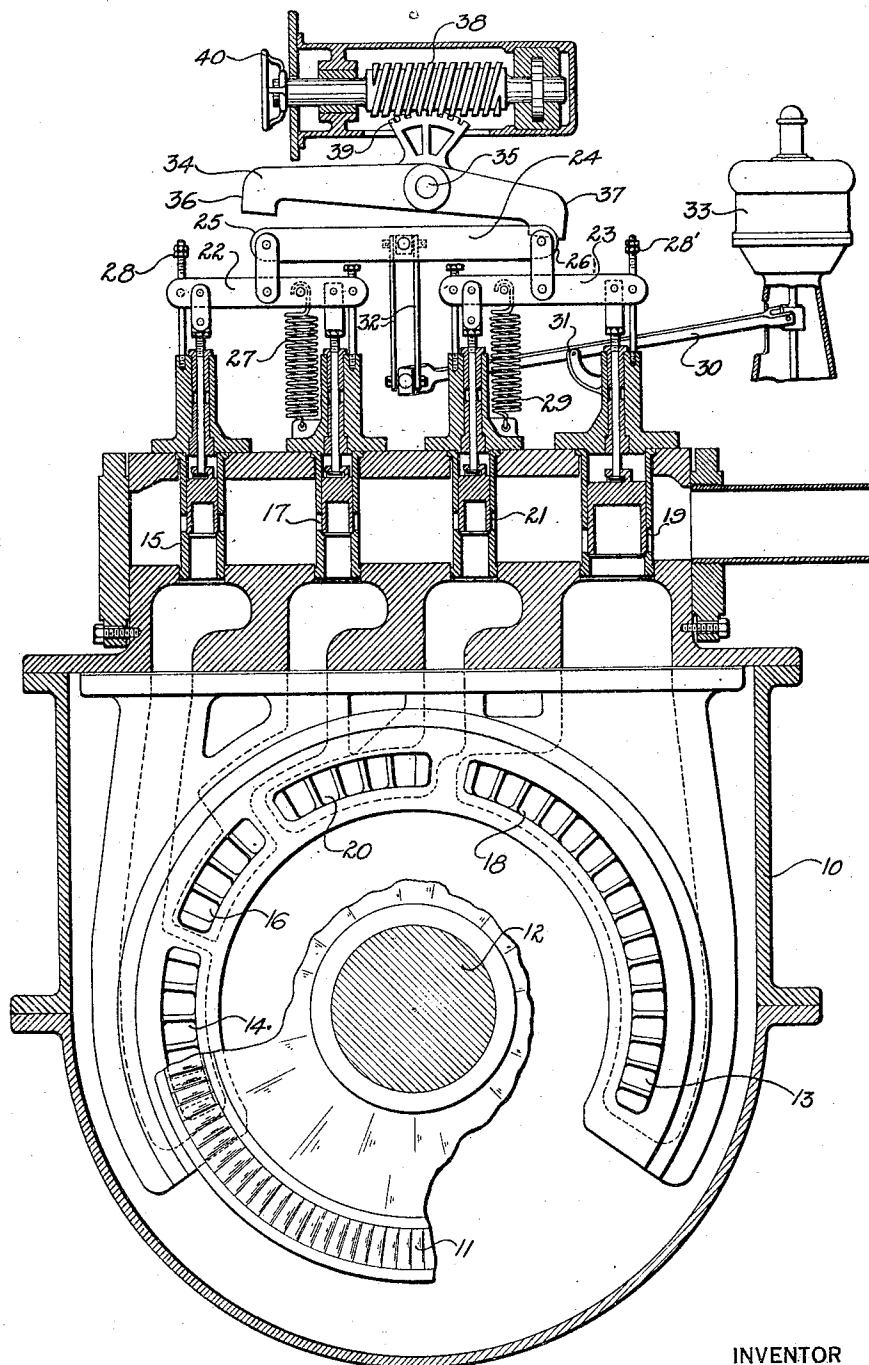


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ELASTIC FLUID TURBINE
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ELASTIC-FLUID TURBINE

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My invention relates to an elastic fluid turbine, more particularly to a turbine having, in the initial or only stage, a set of expansion nozzles and admission valve means therefor designed for relatively light loads, and having a second set of expansion nozzles in said stage and admission valve means therefor designed for relatively greater loads, and it has for its object to provide mechanism whereby either of said valve means may be opened by the turbine governor.

A further object is to provide mechanism of the character set forth whereby either, but not both, of said valves may be fully opened by the governor.

The above and other objects are effected by my 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 view, partly in section and partly in elevation, of apparatus embodying my invention.

Referring to the drawing more in detail, I show an elastic fluid turbine indicated generally at 10. This turbine embodies, either as the single stage of the turbine or as the initial stage, an impulse stage including a row of blades 11 carried by the rotor 12, and nozzles 13 for directing motive fluid against the moving blades 11. The nozzles are divided into two sets, one set consisting of a group of nozzles 14 controlled by a valve 15 and a second group of nozzles 16 controlled by a valve 17. The other set consists of a group of nozzles 18 controlled by a valve 19 and a second group of nozzles 20 controlled by a valve 21.

The nozzles in the groups 14 and 16 are designed to provide maximum efficiency at relatively light loads. They are, therefore, designed for relatively small steam flow, and for greater expansion ratios. The nozzles in the groups 18 and 20 are greater in number to pass greater quantities of steam, and their expansion ratios are less. They are therefore designed for greatest efficiency at the higher loads.

The stems of the valves 15 and 17 are connected to a lever 22 adjacent the opposite ends thereof, and the stems of the valves 19 and 21

are likewise connected to a similar lever 23 at its ends. A lever 24 is provided for controlling the levers 22 and 23, one end, 25 of the lever 24 being connected to the lever 22 intermediate the ends of the latter, and the other end, 26, being connected to the lever 23 intermediate its ends.

A spring 27 is connected to the lever 22 near the stem of the valve 17, and an abutment 28 limits upward movement of the end of the lever connected to the valve 15, so that, upon upward movement of the lever 22 by the lever 24, the valve 15 is first moved in opening direction until the lever strikes the abutment 28, after which the valve 15 is opened against the force of the spring 27. A spring 29 is likewise connected to the lever 23 near the valve stem of the valve 21 and a similar abutment 28' is provided, whereby the valve 19 is opened prior to the valve 21.

The lever 24 is actuated at an intermediate point by a governor mechanism in any suitable manner. In the illustrated embodiment, one end of a lever 30, fulcrumed at 31, is connected to the lever 24 by means of a link 32. The other end of the lever 30 is connected to and controlled by a governor mechanism 33. This governor mechanism may be responsive to the speed of the turbine, or to any other operating condition in response to which it is desired to control the admission of motive fluid to the turbine, and may include power actuating mechanism as is well understood in the art.

At 34 is shown a lever which is pivoted at 35. This lever has one end 36, which is adapted to abut the end 25 of the lever 24 when rotated to the left, and a second end 37, which is adapted to abut the end 26 of the lever 24 when rotated to the right. The lever 34 is rotated about the pivot 35 by means of a worm 38 meshing with a gear sector 39 carried by the lever 34. A hand wheel 40 or other suitable means may be provided for rotating the worm 38.

The operation of the above described embodiment is as follows:

Assume that it is desired to carry a relatively light load. The worm 38 is operated to rotate the lever 34 in clockwise direction

until the end 37 thereof abuts the end 26 of the lever 24 at its lowermost position, thereby retaining the valves 19 and 21 in closed position. The operation of the governor 33 in the direction for providing motive fluid admission is transmitted through the lever 30 and the link 31 to move the lever 24 upwardly at the central point thereof. The end 26 of the lever 24 being held stationary, this upward movement is transmitted to the end 25, which, in turn, raises the lever 22. The lever 22 thereupon opens the valve 15 to admit motive fluid to the group of nozzles 14 until the end of the lever strikes the end of the abutment 28, whereupon the other end of the lever 22 is raised to open the valve 17.

When it is desired to operate at greater loads than can be carried by the groups of nozzles 14 and 16, the lever 34 is rotated in counter-clockwise direction to retain the end 25 of the lever 24 in its lowermost position, maintaining the valves 15 and 17 in closed position. The upward movement of the central point of the lever 24 transmitted from the governor mechanism is thus transmitted to the end 25. The central point of the lever 23 is thereupon raised effecting first opening movement of the admission valve 19 and then opening of the admission valve 21. Motive fluid is thus conveyed to the groups of nozzles 18 and 21, which are designed for effective utilization of motive fluid for higher loads.

From the above description, it will be seen that I have provided one set of nozzles and valve means which are designed to secure the most efficient utilization of motive fluid at relatively light loads, and a second set of nozzles and valve means therefor for securing the most efficient utilization of motive fluid at greater loads. It will also be seen that I have provided mechanism whereby the governing mechanism may selectively operate the valve means of either set of nozzles.

While I have shown my invention 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 I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. The combination with an elastic fluid turbine having one set of nozzles designed for greatest efficiency at relatively light loads and a second set of nozzles designed for greatest efficiency at relatively heavy loads, of means for selectively admitting motive fluid to either of said sets of nozzles and shutting off admission of motive fluid to the other set, and a governing mechanism responsive to an operating condition of the prime mover for governing the admission of motive fluid to

the set of nozzles to which admission is permitted by said means.

2. In a steam chest for an elastic fluid turbine, the combination of a first valve means adapted to admit the required amount of motive fluid for carrying a relatively light load, a second valve means adapted to admit the required motive fluid for a relatively greater load, governor mechanism responsive to the speed of the turbine, and means whereby the governor mechanism may be selectively caused to operate either valve means.

3. The combination with an elastic fluid turbine having one set of nozzles whose expansion ratios are adapted for relatively light loads and a second set of nozzles whose nozzle ratios are adapted for relatively greater loads, of means for controlling the supply of motive fluid to said nozzle sets comprising a valve means for each set, governor mechanism for the turbine, and means whereby the governor mechanism may be caused to operate either valve means.

4. The combination with an elastic fluid turbine having one set of nozzles whose expansion ratios are adapted for relatively light loads and a second set of nozzles whose nozzle ratios are adapted for relatively greater loads, of means for controlling the supply of motive fluid to said nozzle sets comprising a valve means for each set, governor mechanism responsive to the speed of the turbine, means whereby the governor mechanism may be caused to operate either valve means and the other valve means held closed.

5. The combination with an elastic fluid turbine having one set of nozzles designed for relatively light loads and a second set of nozzles designed for a relatively greater load, of valve means for the respective sets, a lever, means controlled by the position of one point of said lever for controlling one valve means, means controlled by the position of a second point of said lever for controlling the other valve means, governing mechanism for the turbine, means controlled by the governing mechanism for actuating said lever at a third point, and means for holding said lever against movement at either the first-mentioned or the second-mentioned point, whereby the lever will be fulcrumed at the point which is held and the valve means controlled by the point of the lever not held will be actuated in response to control of the governor.

In testimony whereof, I have hereunto subscribed my name this 13th day of September, 1929.

LINDSEY C. FLETCHER.