

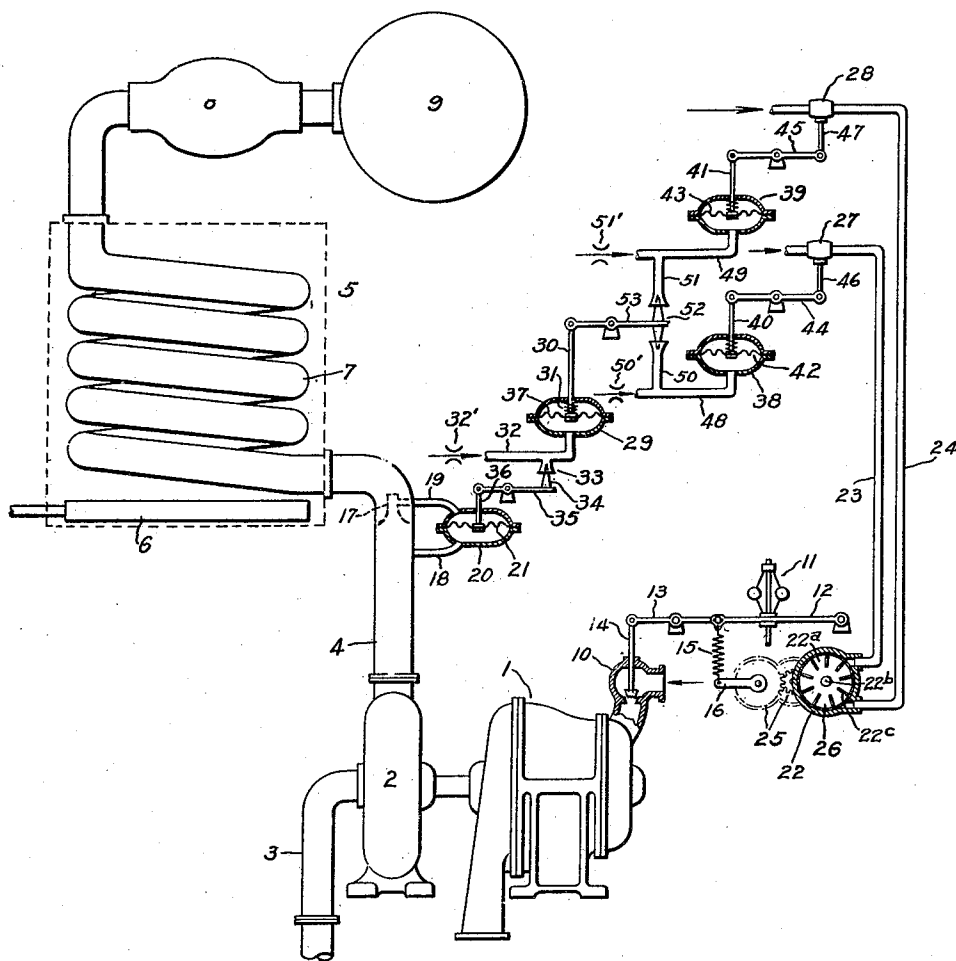
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TURBINE PLANT

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UNITED STATES PATENT OFFICE

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TURBINE PLANT

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The present invention relates to engine driven pumps, for example, elastic fluid turbine driven pumps wherein the supply of actuating fluid to the engine is controlled in accordance with an operating condition of the pump, for example, the rate of flow of fluid from the pump or the pressure delivered by the pump.

The object of my invention is to provide an improved arrangement for controlling the admission of elastic fluid to an engine driving a pump in terms of an operating condition of the pump, and for a consideration of what I believe to be novel and my invention attention is directed to the following specification and the claims appended thereto.

In the drawing, the figure is a diagrammatic view of an engine driven pump provided with a regulating mechanism embodying my invention, the pump being shown arranged to supply liquid to a distilling apparatus.

Referring to the drawing, 1 indicates an elastic fluid turbine, in the present instance coupled with a pumping means 2 which has an inlet conduit 3 and an outlet conduit 4 and is adapted to convey a fluid to a distilling apparatus 5. The latter comprises a heating means 6, a coiled tube 7 having one end connected to conduit 4 and the other end connected in series to a settling chamber 8 and a condenser 9. 10 represents an admission valve of the turbine which is controlled by means of a speed governor 11, in the present instance diagrammatically indicated as an ordinary flyball governor, provided on a fulcrumed lever 12, the left end of which is pivotally connected to another fulcrumed lever 13. Pivoted to the left end of lever 13 is stem 14 of the admission valve. 15 is a spring for adjusting the setting of the speed governor having its one end connected to the pivot of levers 12 and 13 and its other end connected to an arm 16 of a motor, described hereafter. 17 represents a restriction provided in conduit 4, and 18 and 19 are two conduits having one end connected to the lower and upper parts of said restriction respectively and their other ends connected to a casing 20 which comprises a lower and

upper part separated from each other by a diaphragm 21. It will be readily understood that a change in the rate of flow causes a movement of the diaphragm in either direction.

The apparatus so far described may be considered as typical of any arrangement in which the admission of elastic fluid to an engine is to be regulated in response to the rate of flow of a fluid conveyed by a pumping means or the like.

According to my invention I provide a fluid motor, in the present instance shown as an air motor, comprising a casing 22 in which is arranged a fan or impeller comprising a disk 22^a mounted on a shaft 22^b and provided with vanes 22^c. Connecting to casing 22 at spaced points are two fluid supply pipes 23 and 24 for controlling the tension of synchronizing spring 15 through reducing gears 25. Air is supplied through tubes 23 and 24 whereby fan 26 will be rotated in either direction in accordance with the amount of air supplied through each of said tubes. 27 and 28 represent two valve means which are actuated in response to the position of diaphragm 21 of the flow meter 20. These two valves may be controlled directly by said flow meter. Owing to the great sensitiveness of the latter however, it is desirable to interpose two more pressure responsive devices between valves 27 and 28 and flow meter 20.

This has been shown in the present instance by the provision of a pressure responsive device 29 comprising a casing and a diaphragm therein which is connected to a stem 30 and normally forced in a downward direction by a spring member 31. The lower part of the casing is connected to a tube 32 to which air is supplied, as indicated by the arrow, and with respect to which a valve means 33 is provided. 32' is an orifice, diagrammatically indicated for maintaining constant the pressure of air supplied to tube 32. 34 represents a valve disk secured to the right arm of a fulcrumed lever 35 which has its left end pivoted to a stem, fastened at its lower end to diaphragm 21 of the flow meter. Under balanced condition a definite amount of air is passed through the tube 32 and valve 33

whereby a pressure is exerted on diaphragm 37 of pressure responsive device 29.

If the rate of flow changes, diaphragm 21 of the flow meter moves in either direction and thereby causes closing or opening of valve 33 to the effect that the pressure in device 29 increases or decreases respectively and accordingly changes the position of stem 30. 38 and 39 are two further pressures responsive devices similarly constructed as device 29, having stems 40 and 41 connected to their diaphragms 42 and 43 respectively. The upper ends of these stems are connected to the left ends of fulcrumed levers 44 and 45 respectively which have their right ends pivoted to stems 46 and 47 of valves 27 and 28 respectively. The lower casing parts of pressure responsive devices 38 and 39 are connected to pipes 48 and 49 respectively through which air is supplied to said devices and which are provided with branched conduits 50 and 51 respectively. 50' and 51' are two orifices arranged before said branched conduits for maintaining constant the pressure of the supplied air. 52 represents a double valve member secured to the right end of a fulcrumed lever 53 having its left end connected to stem 30 of pressure responsive device 29. Under balanced condition air is supplied through tubes 48 and 49 and causes definite pressures against the diaphragms of pressure responsive devices 38 and 39. If the rate of flow changes, an up or downward movement of double valve member 52 will be caused, to the effect that the pressures exerted on the diaphragms of the devices 38 and 39 change in opposite direction. With respect to their operation the part 50-53 may be termed a differential valve means.

The operation of my mechanism is as follows: Assume that the arrangement as shown is in balanced condition. If now for any reason the rate of flow in conduit 4 increases it will cause an upward movement of diaphragm 21 of the flow meter. This effects an opening actuation of valve means 33, resulting in a decreased pressure in device 29 and a downward movement of stem 30 and the left end of fulcrumed lever 53. This causes a closing actuation of branched conduit 51 and an opening actuation with respect to branched conduit 50 to the effect that the pressure in device 39 increases and the pressure in device 38 decreases. The increase of pressure in device 39 causes an upward movement of left end of fulcrumed lever 45 and accordingly an opening actuation of valve means 28, and the decrease in pressure in device 38 correspondingly causes in a similar manner a closing actuation of valve means 27. This operation results in an increased flow of air in tube 24 and a decreased flow of air in tube 23 to the effect that fan 26 is rotated in clockwise direction and causes an actuation of the

synchronizing spring 15 to the effect that closing of admission valve 10 is initiated.

If the rate of flow decreases, similar actuation of the different means will take place but in opposite direction, resulting in an opening actuation of admission valve means 10 of the elastic fluid turbine.

Having described the method of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination, a motive power agency, a pump driven thereby, a means responsive to a change in condition of a fluid delivered by the pump, a regulator for the agency, a reversible, rotary motor for modifying the action of the regulator on the agency, conduits for admitting fluid to the motor to cause rotation in either direction, and valve means controlled by said responsive means for differentially controlling the passage of fluid through the conduits to the motor.

2. In combination, a motive power agency, a pump driven by the agency, a flow meter responsive to the flow of fluid delivered by the pump, a differential valve means controlled by the flow meter, a speed regulator for the agency, means for modifying the action of the regulator comprising a reversible, rotary motor, and conduits for supplying a fluid to the motor to cause rotation in either direction, the fluid supply through said conduits being controlled by the differential valve means.

3. In combination with a fluid conveying apparatus, of means for regulating the fluid conveyed by the apparatus comprising a fluid motor having a rotor, a pair of conduits through which fluid is continuously supplied in form of two separate streams acting on the rotor whereby the rotor is normally maintained stationary, and means responsive to a condition of the fluid conveyed by said apparatus for relatively changing the amount of fluid flowing through the conduits to cause turning of the rotor.

4. The combination with an elastic fluid engine, a pumping means driven by the engine and a conduit connected to the pumping means through which a fluid is conveyed by the pumping means, of a valve means and a speed governor for controlling the admission of an elastic fluid to the engine, a fluid motor for setting the speed governor, means for passing a fluid to the motor whereby rotation is caused in either direction, and means for controlling the flow of fluid to the fluid motor in response to a condition of the flow in said circuit.

5. The combination with an elastic fluid engine, a pumping means driven by the en-

gine and a conduit connected to the pumping means through which a fluid is conveyed by the pumping means, of a valve means and a speed governor for controlling the amount of elastic fluid supplied to the engine, a fluid motor for controlling the setting of the speed governor, the fluid motor comprising a fan-like member and means for supplying a fluid to said fan member to cause rotation in either direction, and means for controlling the amount of fluid supplied to the motor in terms of rate of flow in the conduit.

6. The combination with an elastic fluid engine, a pumping means driven by the engine and a conduit connected to the pumping means through which a fluid is conveyed by the pumping means, of a valve means and a speed governor for controlling the amount of fluid supplied to the engine, an air motor comprising a fan-like member and two pipe connections, means for supplying air to the pipe connections to cause rotation of the fan-like member in either direction, gear means for transferring the rotation of said fan-like member to the speed governor, and means for controlling the amount of air supplied to the pipe connections in response to the rate of flow in the conduit.

7. The combination with an elastic fluid engine, a pumping means driven by the engine and a conduit connected to the pumping means through which a fluid is conveyed by the pumping means, of a valve means and a speed governor for controlling the amount of fluid supplied to the engine, an air motor comprising a fan-like member and two pipe connections, means for supplying air to the pipe connections to cause rotation of the fan-like member in either direction and means for transferring the rotation of the fan-like member to the setting of the speed governor, valve means provided in the pipe connections for regulating the air supplied to the motor, pressure responsive means for regulating the last named valve means, a flow meter connected to said conduit for regulating said pressure responsive means in terms of rate of flow in the conduit whereby said elastic fluid admission valve means is operated in terms of rate of flow in the conduit.

8. The combination with an industrial plant comprising an elastic fluid turbine, a pumping means driven by the turbine, a conduit connected to the pumping means through which a fluid is conveyed to a distilling apparatus, of a valve means and a speed governor for controlling the amount of elastic fluid passed to the turbine, a flow meter connected to the conduit, a pressure responsive device having a conduit through which air is passed, a valve means in the last named conduit controlled by the flow meter, two other pressure responsive devices having conduits through which air is passed, each of the last mentioned conduits having an outlet, a valve

means cooperating with the outlets for regulating the pressure in the last named pressure responsive devices, an air motor comprising a fan-like member, two pipes for supplying air to the fan-like member to cause rotation thereof in either direction, valve means for controlling the amount of air supplied to the pipes, means for regulating the last named valve means in response to conditions existing in the last named pressure responsive devices, and means for controlling the speed governor in response to the rotation of the air motor.

In witness whereof I have hereunto set my hand.

REGINALD G. STANDERWICK.

CERTIFICATE OF CORRECTION.

Patent No. 1,874,136.

August 30, 1932.

REGINALD G. STANDERWICK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 97, after "stem" insert 36; page 2, line 9, for "pressures" read pressure; line 29, for "condition" read conditions; and line 128, claim 4, for "circuit" read conduit; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of November, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.