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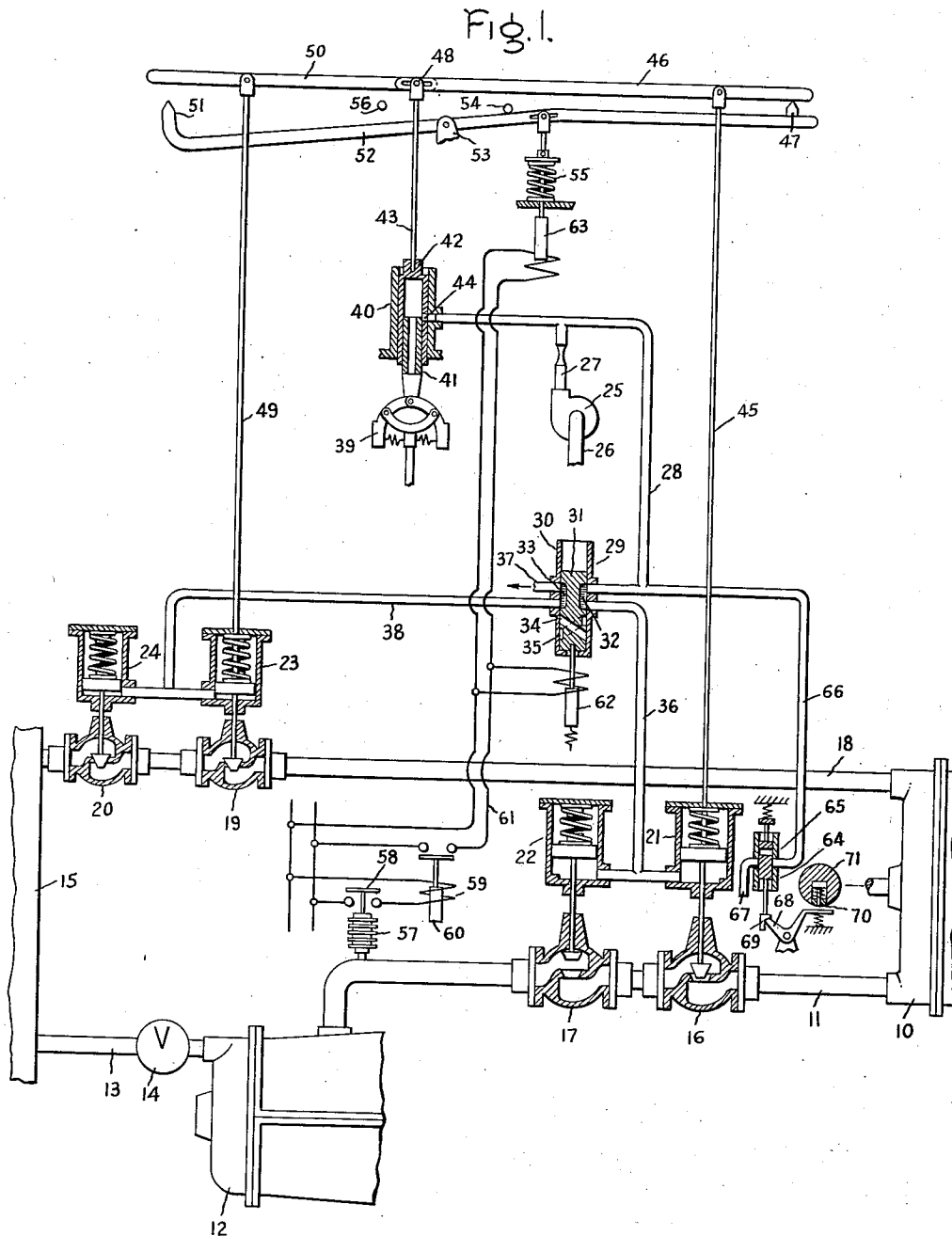
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2,294,753

ELASTIC FLUID TURBINE ARRANGEMENT

Filed Nov. 28, 1940

2 Sheets-Sheet 1



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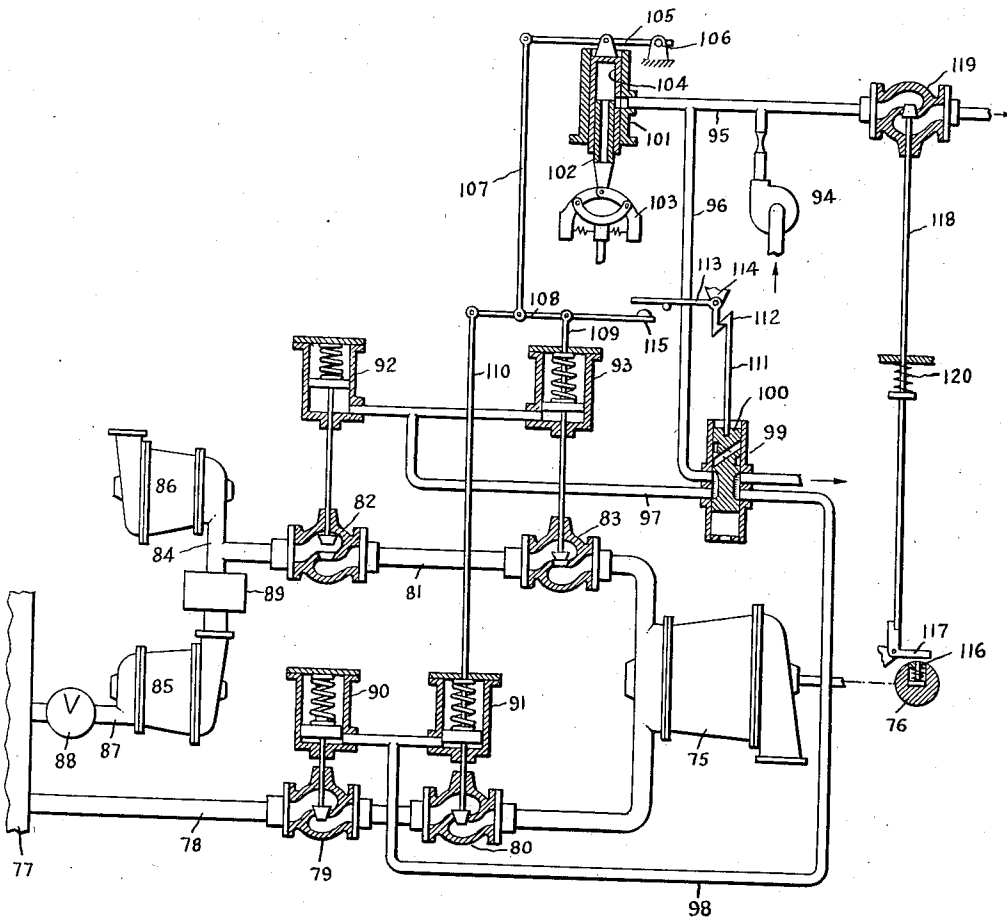
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2 Sheets-Sheet 2

Fig. 2.



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UNITED STATES PATENT OFFICE

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ELASTIC FLUID TURBINE ARRANGEMENT

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9 Claims. (Cl. 137—158)

The present invention relates to elastic fluid turbine arrangements or power plants in which a stage of an elastic fluid turbine normally is supplied with elastic fluid from a low pressure source and during abnormal conditions such as upon failure of the low pressure source is connected to a high pressure source. More specifically the invention relates to an improved governing mechanism for controlling the flow of elastic fluid from either of two sources of different pressure to an elastic fluid turbine and for transferring the turbine from operation with low pressure fluid to operation with high pressure fluid upon certain operating conditions.

The general object of my invention is to provide an improved construction and arrangement of the type above specified.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawings.

In the drawings Fig. 1 illustrates an elastic fluid turbine arrangement embodying my invention, and Fig. 2 shows a modification according to my invention.

The arrangement as shown in Fig. 1 comprises an elastic fluid turbine 10 having a stage with an inlet chest and a low pressure inlet conduit 11 for receiving elastic fluid from a source of low pressure. In the present instance the conduit 11 is connected to a lower stage of a high pressure turbine 12 which latter has an inlet conduit 13 with a valve 14 connected to a source of high pressure fluid such as an elastic fluid generator or boiler 15. The conduit 11 includes governing valve means, in the present example shown as a single throttle valve 16 for controlling the flow of elastic fluid to the turbine and a stop valve 17 arranged ahead of the valve 16 as regards the direction of flow of fluid therethrough. The turbine 10 is also directly connected by a conduit 18 to the source of high pressure fluid or boiler 15. The conduit 18 includes governing valve means in the present instance shown as a single throttle valve 19 for controlling the flow of high pressure fluid to the turbine and a stop valve 20 arranged ahead of the valve 19 as regards the direction of the flow of fluid therethrough. During normal operating conditions the valves 19 and 20 are closed and the valves 16, 17 opened as shown in the drawings whereby the turbine 10 is connected to receive low pressure fluid from the intermediate stage of the turbine 12. Upon certain operating conditions, such as upon failure

or shut down of the turbine 12 or in case the fluid received from the turbine 12 is insufficient to carry the load on the turbine 10, the valves 16, 17 are closed and the valves 19, 20 are opened to connect the turbine 10 directly to the boiler 15. The transfer from low pressure operation of the turbine 10 to high pressure operation is effected automatically by means of a hydraulic governing mechanism in response to a predetermined operating condition.

In the present example the hydraulic governing mechanism includes hydraulic motors 21, 22, 23 and 24 for operating the valves 16, 17, 19 and 20 respectively. Fluid under pressure is supplied to the motors by means including a pump 25 having an inlet 26 for connection to a source of fluid, such as oil, not shown, and a discharge conduit 27 connected by a conduit 28 to a multi-way valve, in the present example a 4-way valve 29. The latter serves for conducting fluid under pressure to one of the pairs of motors 21, 22 and 23, 24 and simultaneously draining fluid from the other pair of motors.

The 4-way valve has a casing 30 with a movable valve member 31 therein forming four connecting grooves or channels 32, 33, 34 and 35. In the drawings the valve member 31 is shown in a lower end position in which the channel 32 connects the supply conduit 28 with a conduit 36 for conducting operating fluid to the motors 21 and 22. In this position the channel 33 connects a drain conduit 37 to a conduit 38 for draining operating fluid from the pair of motors 23, 24. In normal operating position the valves 19, 20 are closed and the valves 16, 17 open, permitting the supply of fluid from the low pressure source 12 to the turbine 10. If the position of the movable valve member 31 of the 4-way valve 29 is reversed, the supply conduit 28 is connected through the channel 35 to the conduit 38 to supply operating fluid under pressure to the pair of motors 23, 24 and at the same time the conduit 36 is connected through the channel 34 to the drain conduit 37 to drain fluid from the pair of motors 21, 22. In this case the valves 16, 17 are closed and the valves 19, 20 are opened, thus connecting the turbine to the source of high pressure elastic fluid of the boiler 15.

The hydraulic motors 22 and 24 are designed to open with lower oil pressure than the hydraulic motors 21 and 23. Therefore, the stop valves 17 and 20 will in general be either wide open or shut as required. The valves 16 and 19, however, which are governing or throttle valves will be positioned in response to changes of an operating

condition of the turbine 10, in the present example by means of a speed governing mechanism including a speed governor 39 driven from the turbine 10 and connected to control a known type pilot valve 40. The latter has a valve sleeve 41 connected to the governor 39 and a bushing 42 connected by a link 43 to a follow-up mechanism described hereafter. The sleeve 41 and the bushing 42 form a restriction 44 to the flow of operating fluid from the pump 25. This restriction is controlled by movement of the sleeve 41 by the governor 39, and change of the restriction causes oil to flow in or out of the hydraulic motor on the governing valve, thus positioning the governing valve in response to movement of the sleeve 41 and the governor 39.

During operation an increase in speed of the turbine 10 due to decreasing demand for load causes downward movement of the pilot valve sleeve 41 by the governor 39, thus reducing the restriction to flow and thereby causing operating fluid to be discharged from the hydraulic motor 21. This results in downward movement of the piston of the motor 21 and closing movement of the valves 16 to effect a reduction in speed of the turbine.

A follow-up mechanism is provided in order to restore the pilot valve sleeve and bushing to their normal relative position in response to movement of the hydraulic motor. To this end the piston of the motor 21 is connected by a link 45 to an intermediate point of a follow-up lever 46. The right-hand end of the lever 46 engages a fulcrum 47 and the left-hand end of the lever 46 is connected by a pivot 48 to the aforementioned link 43. With this arrangement, downward movement of the piston of the hydraulic motor 21 effects downward movement of the link 45 and counterclockwise movement of the follow-up lever 46 about the pivot 47, resulting in downward movement of the link 43 and the bushing 42, thus restoring the latter to its normal position relative to the sleeve 41.

A drop in speed of the turbine 10 causes upward movement of the pilot valve sleeve 41 whereby the pressure of the operating fluid conducted to the motor 21 is increased to effect upward movement of its piston and opening of the valve 16. Upward movement of the piston of the motor 21 causes clockwise turning movement of the lever 46 on the fulcrum 47 whereby the bushing 42 is moved upward to restore the relative position between the bushing 42 and the sleeve 41.

The hydraulic motor 23 is similarly connected by a follow-up mechanism to the bushing 43. This mechanism comprises a link 49 connected to an intermediate point of a follow-up lever 50 which has a right-hand end connected by the aforementioned pivot 48 to the link 43 and a left-hand end arranged in cooperative relation with a fulcrum 51. The fulcrums 47 and 51 are formed on the ends of a lever member 52 which has an intermediate point held on a fulcrum 53. The lever 52 is normally biased towards a stop 54 by the action of a spring 55 so that the fulcrum 47 engages the follow-up lever 46. During operation of the turbine 10 with high pressure elastic fluid the fulcrumed lever member 52 is turned clockwise about the fulcrum 53 into engagement with another stop 56. In this position the fulcrum 51 engages the left-hand end of the follow-up lever 50.

In order to change from operation of the turbine 10 with low pressure fluid to operation with

high pressure fluid it is necessary to turn the fulcrum lever 52 and also to reverse the 4-way valve 29. This is accomplished automatically in response to certain operating conditions, in the present instance such transfer of operation is effected as the pressure in the conduit 11 drops to a predetermined low value. The transfer mechanism comprises a device responsive to a condition of the fluid in the conduit 11, such as a pressure responsive device 57 connected to the conduit 11 near the turbine 10 and carrying a contact-making member 58 for closing a relay circuit 59 for a relay 60. During operation the contact 58 closes the relay circuit 57 as the pressure in the conduit 11 drops to a predetermined low value. Energization of the relay 60 causes closing of a relay circuit 61 for energizing two parallel-connected relays, a relay 62 for reversing the 4-way valve 29 and a relay 63 for reversing the position of the fulcrumed lever member 52. Energization of the relay 62 causes upward movement, that is, reversing of the position of the 4-way valve 31, and energization of the relay 63 causes clockwise turning movement of the fulcrumed lever member 52 until the latter engages the stop 56. Reversing of the 4-way valve and of the fulcrumed lever member transfers operation of the turbine 10 from low pressure to high pressure operation. As stated before, the motors 21, 22 are connected through the channel 34 to the drain conduit 37 and the motors 19, 20 are connected through the channel 35 of the 4-way valve to the supply conduit 28. During high pressure operation an increase in turbine speed causes downward movement of the pilot valve sleeve by action of the governor 39, thus reducing the pressure of operating fluid in the conduit 28 and effecting the discharge of fluid from the motor 23, whereby the latter moves the governing valve 19 towards closing position. Downward movement of the piston of the motor 23 effects downward movement of the link 49 and of the follow-up lever 50 about the fulcrum 51 to restore the pilot valve bushing 42 towards its normal position relative to the pilot valve sleeve 41. During drop in turbine speed the operation is similar, the different elements moving in a direction opposite to that just described.

The arrangement also includes an emergency governing mechanism for completely disconnecting the turbine 10 from its source of fluid during emergency condition. The emergency governing mechanism in the present example includes a valve 64 with a movable valve member 65. The valve has an inlet connected by a conduit 66 to the supply conduit 28, and a drain conduit 67. The movable valve member 65 is normally held in the position shown in the drawings in which it prevents the draining of fluid from the conduit 66 by means of a latch 68 engaging a catch 69 on the stem of the movable valve member 65. The latch 68 has a right-hand portion in cooperative relation with an emergency speed governor 70 held on a shaft 71 which may form part of the shaft of the turbine 10. During operation the flyweight of the governor 70 is forced out with increasing speed and at a certain predetermined high speed engages the latch 68 to effect disengagement between the latch 68 and the catch 69. This causes downward movement of the movable valve member 65 to connect the conduit 66 with the drain conduit 67, thereby discharging oil from the supply conduit 28 and the hydraulic motor or motors to cause closing of the latter. The operation of the emergency

governing mechanism is the same for both pairs of motors 21, 22 and 23, 24.

The arrangement shown in Fig. 2 comprises a turbine or elastic fluid consumer 75 corresponding to the turbine 10 of Fig. 1 and having a shaft 76. Elastic fluid may be conducted to the turbine 75 from a boiler 77 through a conduit 78 including a stop valve 79 and a throttle or governing valve 80 or through a conduit 81 including a stop valve 82 and a throttle or governing valve 83. The conduit 81 is connected to a cross-over conduit 84 between a high pressure turbine 85 and a low pressure turbine 86. The high pressure turbine 85 is connected by a conduit 87 including a throttle valve 88 to the boiler 77. The cross-over conduit 84 between the high pressure turbine 85 and the low pressure turbine 86 includes a preheater 89 provided ahead of the connection between the conduits 84 and 81 as regards the direction of flow of fluid through the conduit. The valves 79, 80, 82 and 83 are controlled by a hydraulic governing mechanism including hydraulic motors 90, 91, 92 and 93 respectively, the motors 90, 91 being connected in parallel and the motors 92, 93 likewise being connected in parallel. Operating fluid is supplied to the motors by means of a pump 94 corresponding to the pump 25 of Fig. 1 and conduits 95, 96. The conduit 96 may be connected to a conduit 97 for the motors 92, 93 or to a conduit 98 for the motors 90, 91 by means of a 4-way valve 99 corresponding to the 4-way valve 29 of Fig. 1 and having a movable valve member 100. The pressure of the operating fluid conducted to the hydraulic motors is controlled by a control member or pilot valve 101 with a sleeve 102 connected to a speed governor 103 driven from the turbine shaft 76 and a bushing 104 connected to a follow-up lever 105. The hydraulic motors 91, 93 for the governing valves 80, 83 are designed so that they require a higher oil pressure to position them than the hydraulic motors 90, 92 for the stop valves 79, 82 respectively. Therefore, at all times when the governing valves are being positioned in terms of oil pressure the stop valves 78, 82 will be wide open. Only upon dumping of oil pressure from the hydraulic motors 90, 92 will the stop valves 79, 82 close.

The mechanism so far described and its operation is similar to that described above in connection with Fig. 1 except that the present arrangement has a single follow-up lever 105 corresponding to the two follow-up levers 46, 50 in Fig. 1. The right-hand end of the follow-up lever 105 engages a fulcrum 106 and the left-hand end of the lever 105 is connected by a link 107 to an intermediate point of a follow-up lever 108 for the motors 91 and 93. The lever 108 is connected to a piston stem 109 of the motor 93 and to a piston stem 110 of the motor 91.

The transfer of the turbine 75 from low pressure to high pressure operation in the present example is effected automatically by mechanical means in response to a predetermined load condition on the turbine 75. The transfer is accomplished by reversing the position of the 4-way valve 99. To this end the movable valve member 100 has a stem 111 which forms a catch 112 at its upper end. The catch is normally held by a latch 113 supported on a fulcrum 114. An arm of the latch is in cooperative relation with an extension or end portion 115 of the follow-up lever 108. Upward movement of the end portion 115 causes unlatching of the latch 113

whereby the movable valve member 100 drops downward to its lower end position in which the fluid supply conduit 96 communicates with the conduit 98 for the motors 90, 91, and a drain conduit of the 4-way valve 99 communicates with the conduit 97 for the motors 92, 93.

The arrangement also includes an emergency governing mechanism comprising a known type emergency flyweight governor 116 associated with the turbine shaft 76 in cooperative relation with a latch 117. The latch 117 normally engages the lower end of a valve stem 118 holding the latter in an upper end position in which a trip valve 119 in the oil conduit 95 is closed.

During operation the emergency governor 116 at a predetermined speed unlatches the latch 117, thereby permitting the valve stem 118 to move downward by the action of a spring 120, causing opening of the valve 119 with a consequent drop of oil pressure in the system, thereby effecting closing the hydraulic motors and the valves connected thereto. During normal operation with the valves 82, 83 in open position, as shown in the drawings, low pressure fluid is conducted from the cross-over conduit 84 to the turbine 75. An increase in speed, due to a drop in load on the turbine 75, causes downward movement of the pilot valve sleeve 102, thereby reducing the oil pressure in the conduits 96, 97 and effecting the discharge of oil from the motor 93. This causes closing movement of the latter and of the throttle valve 83. Downward movement of the piston stem 109 of the motor 93 causes downward movement of the follow-up lever 108 about its left-hand end as a fulcrum whereby the link 107 turns the follow-up lever 105 downward, moving the pilot valve bushing 104 into its original position relative to the sleeve 102. During a decrease in speed the various elements move in the direction opposite to that just described, effecting opening of the valves 82, 83 and an increased supply of elastic fluid to the turbine 75.

With an increase in load on the turbine 75 the throttle valve 83 is moved until they approach the fully open position. If then the load demand on the turbine 75 increases further, the piston of the motor 93 is moved further upward until at a predetermined position the right-hand end portion 115 of the follow-up lever 108 unlatches the latch 113 and thus causes reversing of the position of the 4-way valve 99. As the movable valve member 100 is moved to its lower end position, operating fluid is drained from the motors 92, 93 and simultaneously operating fluid is conducted to the motors 90, 91 for operating the stop valve 79 and the throttle valve 80 respectively in the high pressure line 78. During high pressure operation the motors 90, 91 are under the control of the speed governing mechanism. Increasing load demand causes opening of the valve 80 and decreasing load demand causes closing thereof. The follow-up action between the motor 91 and the bushing 104 of the pilot valve is effected through the link 110, the follow-up lever 108, the link 107 and the follow-up lever 105. During follow-up action the lever 108 in this case turns about its pivotal connection with the piston stem 109 of the motor 93.

The arrangement shown in Fig. 2 operates automatically with regard to the transfer from low pressure operation of the turbine 75 to high pressure operation, but in contrast to the arrangement shown in Fig. 1 the present arrangement has to be reset manually in order to transfer the

turbine 75 from high pressure to low pressure operation. The manual resetting is accomplished by lifting the movable valve member 100 of the 4-way valve 99 to engage the catch 112 with the latch 113.

Thus, with my invention I have accomplished an improved elastic fluid turbine or prime mover arrangement in which a turbine or prime mover is normally supplied with elastic fluid from a low pressure source and upon insufficient supply from such source is supplied with elastic fluid from a high pressure source. A system for supplying elastic fluid to a prime mover in accordance with my invention briefly includes a first conduit with a first throttle valve for conducting low pressure elastic fluid to a stage of the prime mover and a second conduit with a second throttle valve for conducting high pressure elastic fluid to said stage. The arrangement for controlling the throttle valves includes a source of controlled operating fluid and means responsive to an operating condition of said prime mover to vary the pressure of the operating fluid supplied by the source. Each of the throttle valves is positioned by separate hydraulic motor means in accordance with the variation in pressure of the operating fluid from the source. The system in addition includes reversible means for selectively connecting either of the motor means to the source which means is normally positioned to effect supply of operating fluid from the source to the motor means controlling the first throttle valve. The reversible means is actuated by means responsive to a condition indicating insufficiency of supply of elastic fluid to the prime mover by the low pressure source so that upon such insufficiency, communication is established between the source and the motor means for positioning the second throttle valve.

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. A system for supplying elastic fluid to a prime mover comprising means including a first conduit with a first throttle valve for conducting low pressure elastic fluid to a stage of the prime mover, a second conduit with a second throttle valve for conducting high pressure elastic fluid to said stage, a source of controlling fluid, means responsive to an operating condition of such prime mover to vary the pressure of the controlling fluid supplied by said source, hydraulic motor means for each throttle valve to position the valves in accordance with the variation in pressure of the controlling fluid from said source, means for selectively connecting either of the motor means to the source being normally positioned to effect the supply of controlling fluid from the source to the motor means controlling the first throttle valve, and means responsive to a condition indicating inability of the low pressure supply to meet the demands of the prime mover for actuating said selective means to establish communication between the source and the motor means for positioning the second throttle valve.

2. Elastic fluid prime mover arrangement comprising a prime mover having a stage, means including a first conduit with a first throttle valve for conducting low pressure elastic fluid to said

stage, means including a second conduit with a second throttle valve for conducting high pressure elastic fluid to said stage, separate hydraulic motor means for positioning the throttle valves, a source of controlling fluid for the motors, reversible means for connecting the source to either of the motors being normally positioned to connect the source to the motor for the first throttle valve, means for automatically reversing the position of the reversible means in response to a condition indicative of inability of the low pressure supply to meet the demands of the prime mover to effect connection of the source to the motor for the second throttle valve, and means responsive to changes of an operating condition of the prime mover to vary the pressure of the fluid supplied from said source to the motors.

3. Elastic fluid turbine arrangement comprising an elastic fluid turbine having a stage, means including a first conduit with a first valve for conducting low pressure fluid to said stage, means including a second conduit with a second valve for conducting high pressure fluid to the same stage, and a hydraulic governing mechanism for controlling the valves comprising a first and a second hydraulic motor for the first and the second valve respectively, means for controlling the flow of operating fluid to and from the motors comprising a source of fluid pressure, conduit means including a 4-way valve connected between the source and the motors, said 4-way valve in one position conducting fluid to the first motor and draining fluid from the second motor to open the first valve and to completely close the second valve and in another position draining fluid from the first motor and conducting fluid to the second motor to completely close the first valve and to open the second valve, a speed governor driven from the turbine, a pilot valve operated by the speed governor and connected to said conduit means to control the fluid pressure in the motors in response to speed changes, and means responsive to a fluid condition in one of the conduits for automatically reversing the 4-way valve.

4. Elastic fluid turbine arrangement comprising an elastic fluid turbine, means including a first conduit with a first valve for conducting low pressure fluid to the turbine, means including a second conduit with a second valve for conducting high pressure fluid to the turbine, and a hydraulic governing mechanism for controlling the valves comprising a source of operating fluid under pressure, a first and a second hydraulic motor for the first and the second valve respectively, means for controlling the flow of operating fluid from the source to and from the motors to open and close them respectively comprising conduits including a 4-way valve connected between the source and the motors, a speed governor driven from the turbine, a pilot valve connected to the conduits including the 4-way valve and actuated by the governor to control the fluid pressure in the motors in response to speed changes of the turbine, said 4-way valve in one position conducting fluid to the first motor in accordance with the pilot valve position and draining fluid from the second motor and in another position draining fluid from the first motor and conducting fluid to the second motor at a pressure dependent upon the pilot valve position, and means responsive to a fluid condition in one of the conduits for automatically reversing the 4-way valve, said last named means including a pressure responsive device connected to the low pressure conduit, a relay connected to the 4-way valve and a relay

circuit for the relay actuated by the pressure responsive device.

5. Elastic fluid turbine arrangement comprising an elastic fluid turbine, means including a first conduit with a first valve for conducting low pressure fluid to the turbine, means including a second conduit with a second valve for conducting high pressure fluid to the turbine, and a hydraulic governing mechanism for controlling the valves comprising a source of operating fluid under pressure, a first hydraulic motor for the first valve, a second hydraulic motor for the second valve, conduit means including a 4-way valve connected between the source and the motors to conduct in one position operating fluid to the first motor and drain fluid from the second motor and in another position to conduct operating fluid to the second motor and drain fluid from the first motor, a pilot valve connected to the conduit means for controlling the fluid pressure in the motors, a governor for actuating the pilot valve in response to changes of an operating condition of the turbine, means including separate follow-up levers connecting the pilot valve to the motors, a fulcrumed lever member forming in one position a fulcrum for one of the follow-up levers and in another position a fulcrum for the other follow-up lever, and means for transferring the turbine from high pressure operation to low pressure operation and vice-versa upon a predetermined operating condition comprising relays for actuating the lever member and reversing the 4-way valve.

6. Elastic fluid turbine arrangement comprising an elastic fluid turbine, means including a first conduit with a first valve for conducting low pressure fluid to the turbine, means including a second conduit with a second valve for conducting high pressure fluid to the turbine, and a hydraulic governing mechanism for controlling the valves comprising a source of operating fluid under pressure, a first hydraulic motor for the first valve, a second hydraulic motor for the second valve, means including conduit means and a 4-way valve connected between the source and the motors to conduct in one position operating fluid to the first motor and drain fluid from the second motor and in another position to conduct operating fluid to the second motor and drain fluid from the first motor, a pilot valve connected to the conduit means for controlling the motors, governor means for actuating the pilot valve in response to changes of an operating condition, means including separate follow-up levers connecting the pilot valve to the first and second motors, a fulcrumed lever member forming in one position a fulcrum for one of the follow-up levers and in another position a fulcrum for the other follow-up lever, and means for transferring the turbine from the high pressure operation to low pressure operation and vice-versa comprising relays for actuating the lever member and reversing the 4-way valve, a relay circuit for the relays and a device responsive to a fluid condition in one of the conduits for actuating the relay circuit.

7. Elastic fluid turbine arrangement comprising an elastic fluid turbine, means including a first conduit with a first valve for conducting low pressure fluid to the turbine, means including a second conduit with a second valve for conduct-

ing high pressure fluid to the turbine, and a hydraulic governing mechanism for controlling the valves comprising a first hydraulic motor for the first valve, a second hydraulic motor for the second valve, means including a 4-way valve for conducting in one position fluid to the first motor and draining fluid from the second motor and in another position for conducting fluid to the second motor and draining fluid from the first motor, and means cooperatively associated with the first motor and the 4-way valve for automatically reversing the 4-way valve in response to a predetermined position of the first motor in which position the first valve is substantially fully open and the supply of low pressure fluid is insufficient to carry the turbine load.

8. Elastic fluid turbine arrangement comprising an elastic fluid turbine, means including a first conduit with a first valve for conducting low pressure fluid to the turbine, means including a second conduit with a second valve for conducting high pressure fluid to the turbine, and a hydraulic governing mechanism for controlling the valves comprising a first motor for the first valve and a second motor for the second valve, means for controlling the flow of fluid to and from the motors including a governor driven from the turbine, a pilot valve operated by the governor, a multi-way valve connecting the pilot valve to the motors for conducting in one position fluid to the first motor and draining fluid from the second motor and in another position for conducting fluid to the second motor and draining fluid from the first motor, a follow-up mechanism between the pilot valves and the motors including a lever connected to the first motor, and means for reversing the 4-way valve in a predetermined position of said lever caused by a turbine load demand which cannot be satisfied by the low pressure elastic fluid supply, said means including a latch normally holding the 4-way valve in one position and having an arm in cooperative relation with said lever.

9. Elastic fluid turbine arrangement comprising an elastic fluid turbine, means including a first conduit with a first valve for conducting low pressure fluid to the turbine, means including a second conduit with a second valve for conducting high pressure fluid to the turbine, and a hydraulic governing mechanism for controlling the valves comprising a source of operating fluid under pressure, a first motor for the first valve and a second motor for the second valve, means responsive to predetermined operating conditions and including a multi-way valve with a supply conduit and a drain conduit connected to the motors for conducting in one position fluid from the source to the first motor to open the first valve and draining fluid from the second motor and to close the second valve in another position for conducting fluid from the source to the second motor to open the second valve and draining fluid from the first motor to completely close the second valve, and an emergency governing mechanism responsive to an emergency condition of the turbine to effect closing of the valves, said mechanism including a conduit with a trip valve connected to said supply conduit and an emergency governor driven from the turbine for actuating the trip valve.

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