No. 826,980. PATENTED JULY 24, 1906.

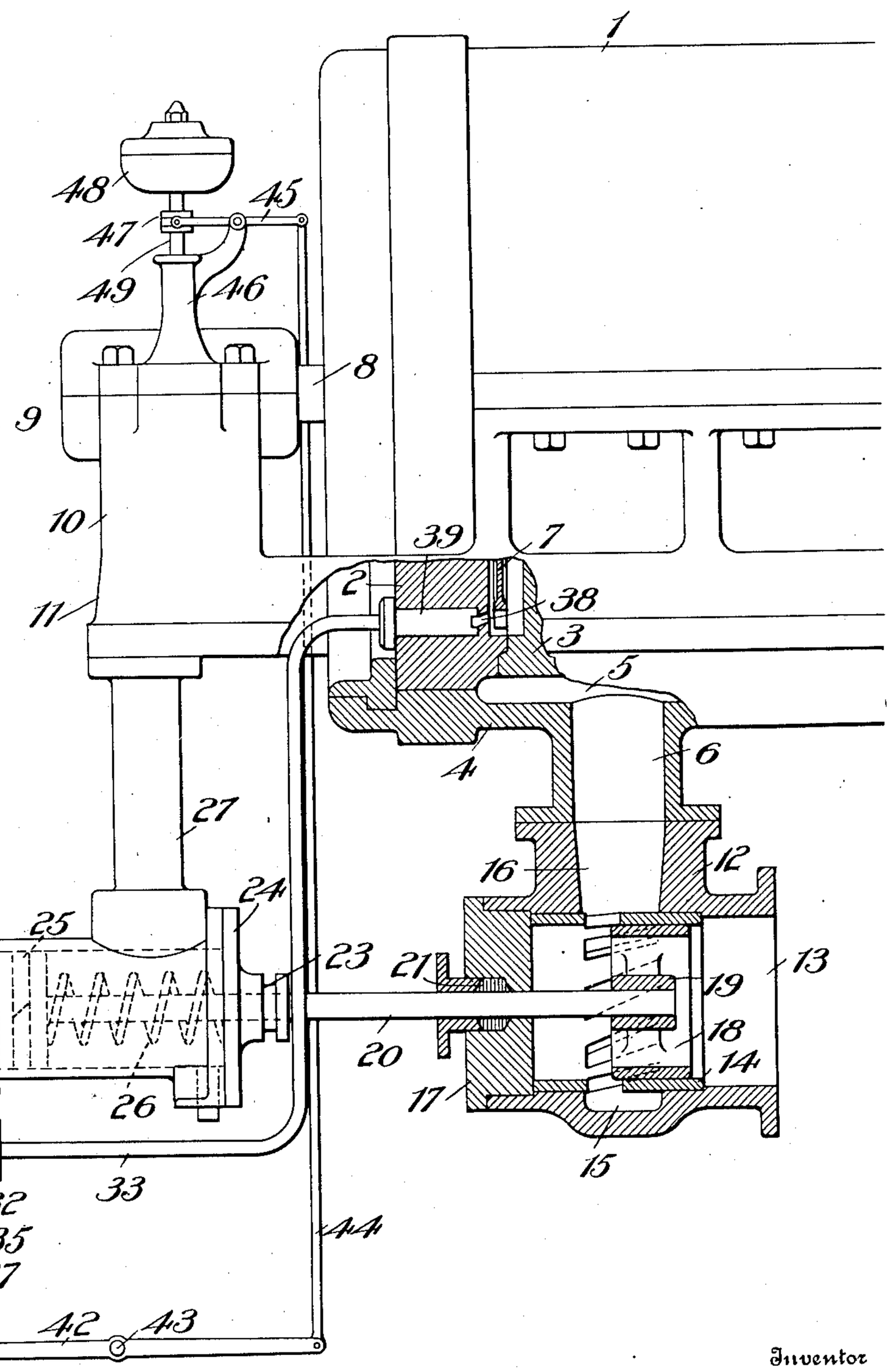
J. WILKINSON.

TURBINE GOVERNING MECHANISM.

APPLICATION FILED SEPT. 7, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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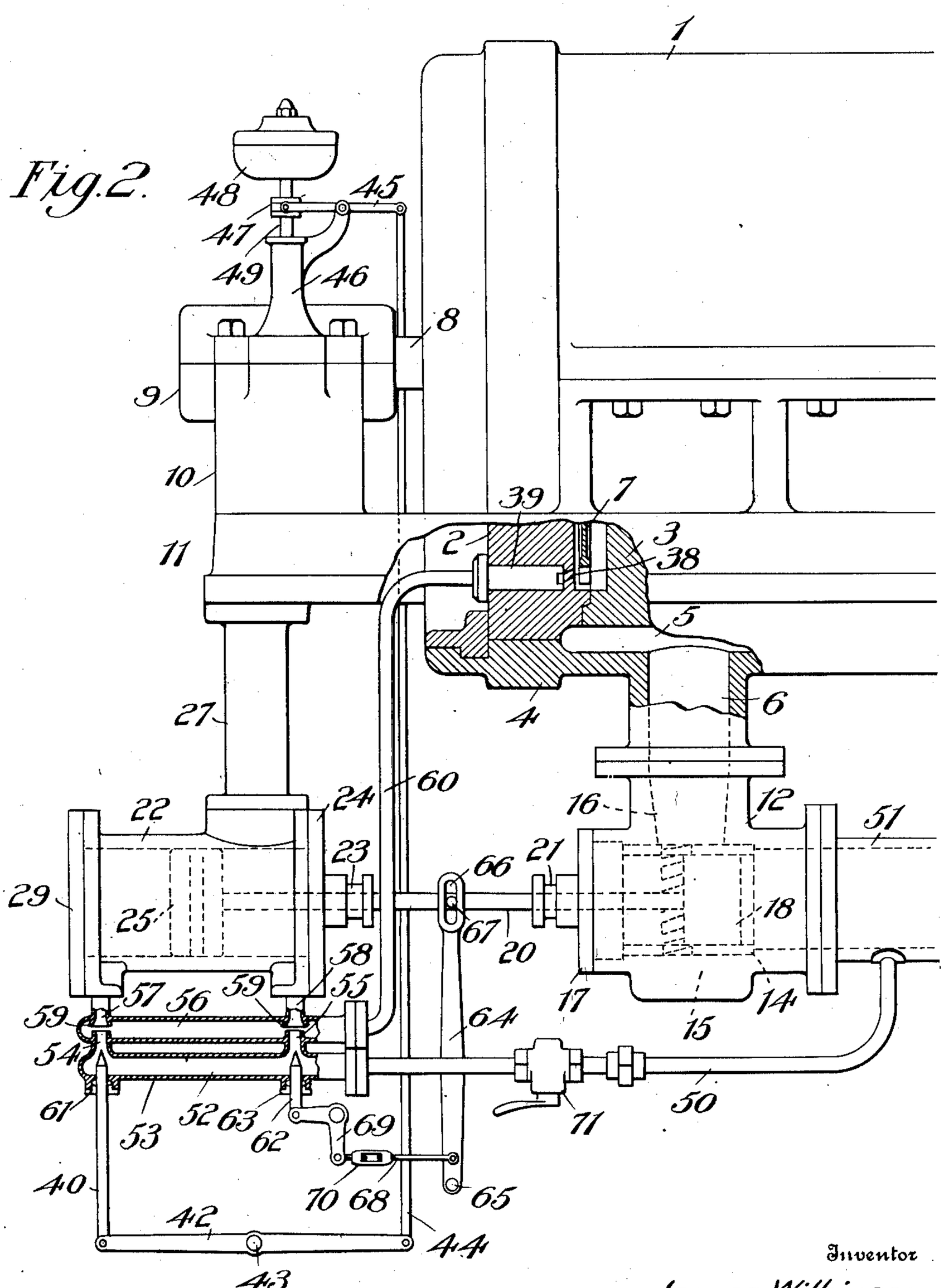
Fig. 2.



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UNITED STATES PATENT OFFICE.

JAMES WILKINSON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO WILKINSON TURBINE COMPANY, A CORPORATION OF ALABAMA.

TURBINE-GOVERNING MECHANISM.

No. 826,980. Specification of Letters Patent. Patented July 24, 1906.

Application filed September 7, 1905. Serial No. 277,349.

To all whom it may concern:

Be it known that I, JAMES WILKINSON, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Turbine-Governing Mechanism, of which the following is a specification.

My invention relates to controller means for fluid-motors; and it consists in utilizing a jet or stream of fluid or liquid under pressure which is so controlled as to create variable pressures utilized to operate or control the operation of valve means for regulating the fluid-pressure supply to the motor.

In Letters Patent heretofore issued to me I have shown and claimed the use of a jet of fluid-pressure to control the operation of motor-supply valves, but I there contemplated obtaining a variable controlling pressure by a relative movement of the jet-orifice and the passage or port into which it was adapted to discharge, whereby the impact effect of the jet in creating a static pressure in said passage could be varied at will.

It is the principal object of my present invention to produce such a variable controller-pressure by throttling the jet and to apply such pressure to controlling the supply valve or valves of a motor.

More particularly my present invention comprises a jet-orifice disposed so as to discharge into a port leading to the cylinder of a valve-operating motor and a needle-throttle device adapted to enter said orifice, and by reducing its cross-sectional area and that of the jet of fluid to raise or lower the volume of the latter, and thereby vary its impact effect in the port. As applied to a turbine to which my invention is particularly adapted the throttle is preferably actuated by a speed-governor, which thereby controls the potential of the fluid-pressure utilized to move the valve-piston against a variable resistance, such as a spring or an opposing fluid-pressure controlled by the movement of the valve itself in the manner described and claimed in a pending application, Serial No. 268,203.

My invention also comprises the details of construction and arrangement of parts hereinafter more particularly described by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a turbine provided with my invention, the turbine-supply valve and the controller mechanism being shown in vertical section. Fig. 2 is a similar view of a modification of my invention in which a variable pressure is provided as a substitute for a spring to resist the action of the controller-pressure against the valve-piston.

Similar reference-numerals refer to similar parts throughout the drawings.

Though applicable to motors of various types, I have illustrated my invention in connection with a turbine 1 of the horizontal type having a supply-head 2 and diaphragm-partitions 3, which are connected together and held in place by a surrounding shell or jacket 4. A chamber 5 is provided between the shell and inner casing of the turbine formed by the abutting peripheries of the diaphragms, and into this chamber the motor fluid-pressure is admitted through a port 6. As shown, this supply-port is disposed beneath the turbine and near one end thereof. The fluid-supply in the chamber 5 is admitted to nozzle-passages (not here shown) which discharge it against a bucket-wheel 7. The fluid-pressure flows through the turbine in the usual manner, acting against bucket-wheels in the several compartments which are keyed to a shaft 8, supported at its forward end in bearings 9, mounted upon a standard 10, resting upon the bed-plate 11, to which the turbine-shell is connected.

The motor fluid-pressure is supplied to the port 6 through a valve-casing 12, having an inlet-port 13. A slotted bushing 14 is inserted in the casing having its slots disposed opposite an annular chamber 15 in the casing which communicates with the outlet-port 16, registering with the port 6. A plug 17 closes the end of the casing opposite the port 13 and holds the bushing securely in place therein. A hollow slide-valve 18 is disposed within the casing and provided with a spider 19, to which a stem 20 is connected. This stem passes through a packing-gland 21 in the plug 17 and enters a cylinder 22 through a packing-gland 23 in one of its heads 24. The stem is connected to a piston 25 within the

cylinder, which is engaged by a coiled spring 26, tending to move the piston to the left and close the valve 18. The cylinder is connected to the bed-plate 11 by a standard 27, which holds it rigidly in position relative to the valve-casing 12.

To control the operation of the piston 25, and accordingly the valve 18, I provide a casing 28, connected to or formed integral with the cylinder or its head 29 and provided with a chamber 30, which communicates through a passage 31 with the left-hand end of the cylinder and through a passage 32 with a conduit 33, which leads upwardly to the turbine. Fluid-pressure is admitted through a port 34 to a chamber 35, which communicates with the chamber 30 through a jet-orifice formed in a jet-nozzle 36, which projects into the chamber 30 in line with the passage 31, leading to the cylinder. This jet-nozzle is preferably formed by an externally-threaded plug adapted to be inserted through an opening in the casing closed by a plug 37, suitable threads being provided within the casing, into which the plug may be threaded.

The controller mechanism as thus far described would produce a constant high pressure in the left end of the cylinder due to the unvarying impact action of the jet of fluid in the passage 31, the pressure in the cylinder being substantially equal to that in the chamber 35. The jet of fluid after exerting its impact effect flows out of the chamber 30 and through the pipe 33 to the turbine, where it may be used for any suitable purpose. As shown, it is discharged through a nozzle-passage 38 against the bucket-wheel in the first wheel-compartment, the pipe 33 being shown connected to a hollow plug 39, mounted in the supply-head 2 and communicating with the nozzle 38. This pipe 33 may be led to any desired point, as the controller-pressure may be utilized in various ways.

To vary the controller-pressure in the cylinder acting against the piston 25, I provide a throttle device 40 in the form of a stem having a needle end. The stem projects through the plug 37, being suitably packed at 41 to prevent the leakage of pressure from chamber 35. The needle end of the throttle device is adapted to enter the jet-nozzle 36, and it follows that in the same proportion that the throttle reduces the volume of jet flowing through the nozzle it will reduce the impact effect of the jet in the passage 31 and will correspondingly lower the pressure in the left end of the cylinder. A number of tests have conclusively shown that the substantially static pressure in the cylinder end and passage 31 responds directly to and simultaneously with any throttling of the controller-jet, so that by adjusting the throttle I can obtain any desired pressure in the left end of the cylinder. It will be evident that this construction is more simple than those where the jet itself is moved and at the same time as efficient in its action.

Though the throttle device may be moved by hand or in any other manner, I prefer to operate it through the instrumentality of a lever 42, pivoted at 43 and swivelly connected to a vertically-disposed rod 44. This rod is swivelly connected to one end of a lever 45, journaled in a standard 46, mounted on the shaft-bearing 9, the other end of said lever being operatively connected to the sliding collar 47 of a speed-governor 48, mounted upon a shaft 49, driven by the turbine-shaft. As the governor moves responsive to speed changes, it acts through the instrumentalities described to move the needle end of the throttle 40 into or out of the nozzle 36, thereby causing the pressure in the left end of the cylinder to rise or fall. The spring 26 presents a variable resistance to this actuating pressure, and it follows that when the latter is lowered the spring will move the valve toward its closed position until the power of the spring and the controlling pressure counterbalance each other, when the piston will be held stationary. As the controller-pressure rises it will move the piston inwardly until the spring action counterbalances it. The tension of the spring is preferably so adjusted that under friction-load conditions it will move the piston against the controller-pressure to close the valve and under full-load conditions it will be compressed sufficiently by the controller-pressure to permit the latter to fully open the valve.

Referring now to Fig. 2, I provide a fluid-pressure means to take the place of the spring. In this construction the controller fluid-pressure is conducted through a pipe 50 from the supply-pipe 51, entering the valve-casing 12, to a chamber 52, formed in a compound controller-casing 53. Two jet-nozzles 54 and 55 act to discharge pressure from the chamber 52 into a controller-chamber 56, which communicates at its ends through passages 57 and 58 with the ends of the cylinder 22. The jet 54 is disposed opposite the passage 57, and the jet 55 is disposed opposite the passage 58, these passages being provided with flaring induction ends formed by the annular flanges or lips 59, preferably formed integral with the casing 53. At one end the controller-chamber 56 communicates with a pipe 60, corresponding with pipe 33 in Fig. 1 and discharging fluid-pressure into the turbine. The governor-controlled throttle 40 enters the chamber 52 through a packing-gland 61 and acts to throttle the nozzle 54. A similar throttle 62 passes through a gland 63 and acts to throttle the nozzle 55. This latter throttle is adjusted by the movement of the piston by means of a lever 64, pivoted at 65 and provided with an elongated slot 66 at its

upper end, which engages a pin 67 on the valve-stem 20, so that the lever moves with the stem. Near its lower end this lever is connected by an adjustable rod 68 to the lower end of a bell-crank lever 69, the other end of which is swivelly connected to the throttle 62. A turnbuckle 70 in threaded engagement with the two parts of the rod 68 enables an adjustment to be effected which will cause the throttle 62 to raise and lower the pressure in the right end of the cylinder in a manner corresponding with the varying power exerted by the spring. I provide a valve 71 in pipe 50 to cut off the supply of controller fluid-pressure. Similar means may be used in the construction shown in Fig. 1.

The application which I have first specifically described embodies my invention in its preferred form; but as it may be variously modified within the broad scope of my invention I do not desire to be limited to the details shown.

Having thus described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a valve-controlling mechanism, the combination of a valve, means for operating said valve by fluid-pressure, means to create said valve-operating pressure by discharging a jet of fluid-pressure into a closed chamber, and means to vary the volume of said jet to control said operating pressure.

2. In a fluid-motor, the combination of valve means to vary its supply of fluid-pressure and fluid-pressure-controller means for said valve comprising devices for delivering and throttling a jet of fluid, and means coöperating with said jet to produce variable pressures which control the operation of said valve means.

3. In a fluid-motor having a supply-valve, the combination therewith of a fluid-motor to control the operation of said valve, means utilizing the impact action of freely-flowing fluid under pressure against a substantially static body of fluid in said motor to establish pressure therein, and means to vary said latter pressure by regulating the volume of the controller fluid-pressure.

4. In a fluid-motor, the combination with a valve, of a motor for operating said valve comprising a piston and cylinder, fluid impact means utilizing a jet of fluid to create pressure in said cylinder, means to throttle said jet, and means to present a variable resistance to the action of said pressure against said piston.

5. In a fluid-motor, the combination of a piston-actuated valve, a cylinder for the piston, a single port at one end of said cylinder, means to discharge a jet of fluid through said port into said cylinder, means to throttle said jet, and means, such as a spring, against which said cylinder-pressure acts in moving said piston.

6. In a fluid-motor, the combination of a valve, a piston operatively connected to said valve, a cylinder for said piston, means to create pressure in one end of said cylinder by the impact action of a jet of fluid-pressure, governor-controlled means to throttle said jet, and means to resist with variable power the action of said cylinder-pressure on said piston.

7. In a fluid-motor, the combination of a fluid-pressure-controlled valve, means utilizing the impact effect of a jet of fluid under pressure to control the operation of said valve, said means comprising a stationary jet-nozzle, and means to vary the cross-sectional area of said nozzle, as and for the purposes described.

8. A controller mechanism for a motor-valve comprising a cylinder, a piston operatively connected to the valve, a controller-chamber communicating with an end of said cylinder, a stationary nozzle adapted to discharge a jet of fluid into said chamber which jet acts with impact effect to create pressure in said cylinder, a device adapted to throttle said nozzle, and governor means to actuate said device.

9. A controller mechanism for a motor-valve comprising a cylinder, a piston operatively connected to the valve, a controller-chamber communicating with an end of said cylinder, a stationary nozzle adapted to discharge a jet of fluid into said chamber which jet acts with impact effect to create a pressure in said cylinder, a device adapted to throttle said nozzle, governor means to actuate said device, and variable-power means to resist the action upon said piston of the pressure in said cylinder.

10. In a turbine, a fluid-supply passage, a valve to regulate the admission of pressure to the turbine, a fluid-motor to operate said valve, a controller-nozzle to create a valve-actuating pressure in said motor, a governor-controlled throttling device coöperating with said jet to regulate the said actuating-pressure, and a coiled spring which acts as a variable resistance to oppose the action of the motor in operating said valve.

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

JAMES WILKINSON.

Witnesses:
WILLIAM P. NOLAN,
JAMES H. NOLAN.