

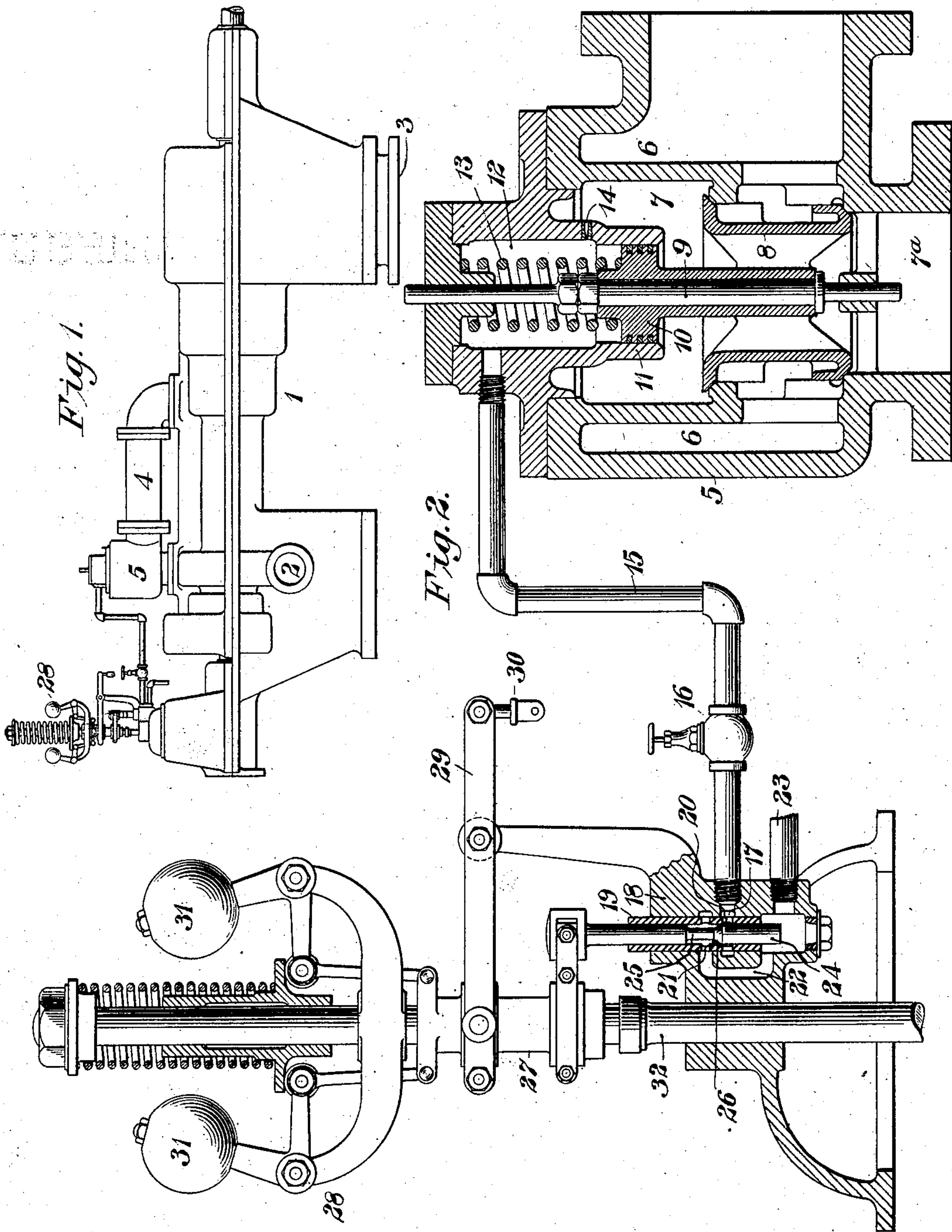
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F. HODGKINSON.
VALVE CONTROLLING MECHANISM.

APPLICATION FILED MAY 24, 1902.

NO MODEL.



WITNESSES:

C. L. Belcher
J. L. Morse.

INVENTOR

Francis Hodgkinson

BY

Wesley C. Carr
ATTORNEY.

UNITED STATES PATENT OFFICE.

FRANCIS HODGKINSON, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO
THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENN-
SYLVANIA.

VALVE-CONTROLLING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 751,510, dated February 9, 1904.

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To all whom it may concern:

Be it known that I, FRANCIS HODGKINSON, a
subject of the King of Great Britain and Ire-
land, residing at Wilkinsburg, in the county
5 of Allegheny and State of Pennsylvania, have
invented a new and useful Improvement in
Valve-Controlling Mechanism, of which the
following is a specification.

My invention relates to valves and valve-
10 controlling mechanism for regulating or con-
trolling a supply of fluid to a steam-engine
or other machine or apparatus; and it has for
its object to provide a device of this character
which shall be comparatively simple in con-
15 struction and effective and certain in opera-
tion.

My invention is primarily designed for use
in connection with steam-turbines, and it will
be illustrated and described in connection
20 with engines of this character, but without
intention of limiting it, so far as the struc-
tural features of the valve and its operating
and controlling mechanism are concerned, to
this specific relation.

25 It has heretofore been customary to pro-
vide fluid-pressure turbines of the multice-
llular or Parsons type with what has been
termed "by-pass valves," which serve to take
steam from the high-pressure part of the en-
30 gine, usually at a point after it has passed the
speed-regulating valve controlled by the gov-
ernor and before entering the first set of guide-
blades of the turbine, and supplying such
high-pressure steam directly to a point in the
35 turbine where the steam is normally at a lower
pressure and of greater volume, for the pur-
pose of insuring the development of a greater
amount of power under certain conditions of
operation. While such increase of power is
40 obtained at some sacrifice of economy, the
exigencies of operation of power plants render
it occasionally desirable to obtain an increase
of power even at a sacrifice of economy.

Valves for the use above indicated have
45 heretofore been operated by hand after the
manner of an ordinary throttle-valve, as oc-
casion demanded, and it is one of the objects
of my present invention to provide means

whereby such a valve may automatically open
when the load on the engine exceeds a nor- 50
mal maximum and will automatically close
when the load returns to the normal.

In the accompanying drawings, Figure 1
is a side elevation of a steam-turbine provided
with my improvement; and Fig. 2 is a ver- 55
tical sectional view, on an enlarged scale, of
the automatic valve and its operating means.

The turbine 1, which is shown in outline,
receives steam through the inlet-port 2 and
exhausts through the port 3, high-pressure 60
steam being also supplied to an intermediate
point from any suitable point or source
through a pipe or other conduit 4 by means
of my valve mechanism, to be hereinafter de-
scribed, when the load on the engine exceeds 65
the normal.

The valve casing or chamber 5 is provided
with an outer chamber 6, which is in open
communication with the pipe 4, and with an
inner chamber 7, which is in open communi- 70
cation with an inlet-port 7^a through a hollow
valve 8. The valve 8 when seated cuts off com-
munication between the outer chamber 6 and
both the inner chamber 7 and the inlet-port
7^a, said inner chamber and port being in open 75
communication with the inlet-port of the tur-
bine. The stem 9 of the valve 8 is provided
with a piston 10, fitted to operate in a cylin-
der 11, above which is a chamber 12, contain-
ing a coil-spring 13, which acts normally to 80
hold the valve 8 to its seat. The chamber 12
is in communication with the chamber 7 by
means of a small hole 14, so that the steam
may gradually leak through into the chamber
12, and thus equalize the pressures upon the 85
two ends of the piston 10. The chamber 12
is also connected with a pipe or conduit 15,
which may be provided with a hand-operated
throttle-valve 16, and which terminates in a
small annular chamber 17 in a casting 18. A 90
cylindrical bushing 19 is located in the cast-
ing 18 and is provided with ports 20, which
open into the annular chamber 17, and with
ports 21, which open into a chamber 22 in
the casting, which is provided with an exhaust 95
pipe or conduit 23. The bushing 19 is pro-

vided with a piston-valve 24, having an intermediate portion 25 of reduced diameter and of such length that the ports 21 are always open. Between the reduced portion 25 and the portion that normally closes the ports 20 the opposite sides are beveled, as indicated at 26, so as to insure a gradual opening of the ports 20. The valve 24 is connected to the reciprocating sleeve 27 of a fly-ball governor 28, which may be either the main governor of the engine or a special governor for this valve. As here shown, however, it is utilized for controlling both the speed of the turbine and the valve 24, the lever 29 and link 30 being employed for connecting the governor to a regulating-valve (not shown) in the usual manner, so that an increase of speed causing the governor-balls 31 to fly outward will effect a closing movement of the regulating-valve, and vice versa.

It will be understood that the main regulating-valve, which is operated by the lever 29 and the link 30, is capable of sufficient movement beyond that necessary for supplying full pressure to the inlet end of the turbine to permit movement of the governor-balls inwardly to a position beyond that which corresponds to normal maximum load.

When the engine is running at normal speed and under full load, the governor-balls 31 will be in substantially the positions indicated in the drawings, and if the load increases so as to decrease the speed the balls will move inward toward the governor-shaft 32, and thus lower the valve 24 sufficiently to partially open the ports 20, and thus permit a slight flow of steam from the chamber 12 through the pipe 15, chamber 17, ports 20 and 21, chamber 22, and exhaust-pipe 23. This action correspondingly reduces the pressure in the chamber 12, and thus permits the pressure in the chamber 7 to open the valve 8 slightly, and thus supply steam through the pipe 4 to the intermediate point of the turbine. A further movement of the valve 24 will serve to produce a further fall of pressure behind the piston 10, and thus insure further movement of the valve 8 against the pressure of the spring 13, which assists in making the valve movement steady and uniform.

In case the valve 24 opens to its full extent substantially atmospheric pressure will be produced in the chamber 12, since the hole 14 is so small that the leakage through it takes place slowly, and consequently the valve 8 will be opened to its full extent.

While my invention is primarily intended for use in connection with the automatic regulation of steam-turbines, it is my intention to include within its scope both non-automatic and partially-automatic mechanism, in so far as there may be a demand therefor in connection with the control of a fluid-pressure supply to any machine or apparatus. It will be also un-

derstood that the apparatus may be so constructed and arranged that the main valve shall be normally held to its seat by unbalanced fluid-pressures and be moved from its seat by a spring or equivalent means when the fluid-pressure at the side having the greater area is relieved by means of the auxiliary valve, such operation being substantially a reversal of that already described.

The form, location, and relative arrangement of the valves and connecting and operating means may also be otherwise varied within considerable limits without departing from the invention, as will be readily understood by those skilled in the art.

I claim as my invention—

1. In an engine, the combination with a main valve, a spring tending to hold it to its seat and means for subjecting it to normally balanced fluid-pressures, of a normally closed auxiliary valve and a governor connected to said auxiliary valve and actuating the same to exhaust the fluid-pressure which supplements the action of the spring upon the main valve when more steam is required by the engine.

2. The combination with a main valve having a piston and a casing having chambers at the respective ends of the piston between which is a small leakage-passage that is always open, of a spring acting upon said piston and tending to hold the valve to its seat and an automatically-acting auxiliary valve for reducing the fluid-pressure which supplements the action of the spring.

3. The combination with a main valve having a casing provided with two chambers connected by a permanently-open restricted passage and the fluid-pressures in which act in opposite directions upon the valve, of a spring acting in conjunction with the fluid-pressure in one of said chambers and an auxiliary valve for relieving the pressure which acts in conjunction with said spring.

4. The combination with a valve and a casing having two chambers connected by a restricted but always-open passage and within which fluid-pressure acts in opposite directions upon the valve, of an auxiliary valve for relieving the pressure which tends to hold the main valve to its seat and means for automatically opening the auxiliary valve when the demand for fluid-pressure from the source controlled by the main valve attains a predetermined value.

5. The combination with a valve embodying or provided with a piston, a casing having two chambers connected by a restricted but always-open passage and a cylinder for the said piston, of a spring tending to hold the valve to its seat and an auxiliary valve the opening of which relieves the fluid-pressure which acts in the cylinder and in the chamber communicating with or forming a part thereof to supplement the action of the spring.

6. In an engine, the combination with a main valve embodying or provided with a piston, a casing having two chambers connected by a restricted passage, one of which is an extension of the cylinder for said piston, and a spring tending to hold the valve to its seat, of an auxiliary valve, an engine-governor and connections between said auxiliary valve and said governor whereby the exhaust-passage from the cylinder is opened and closed in accordance with the demand of the engine.

7. The combination with a steam-turbine having an inlet-port at one end and an exhaust-port at the other and provided with a steam-conduit leading to an intermediate point, of a normally seated valve in said conduit, a casing for said valve having two chambers connected by a restricted passage and containing steam which acts in opposite directions upon the valve, of an exhaust-valve for the chamber in which the steam acts in a direction tending to close the main valve, a speed-governor and connections between said governor and the exhaust-valve.

8. The combination with a steam-turbine provided with a steam-conduit leading to a point between its main inlet and exhaust ports and a normally seated valve in said conduit, of an auxiliary governing-valve for said main valve, a speed-governor and connections between said speed-governor and said governing-valve whereby the opening and closing of said main valve is dependent upon the speed of the engine.

9. The combination with a steam-turbine, a steam-conduit connected to a point between the inlet and exhaust ports of the turbine and a valve in said conduit which is normally subjected to oppositely-acting bodies of steam un-

der pressure, of a controlling-valve for partially or wholly exhausting the body of steam which tends to hold the valve closed, a governor and connections between the same and the controlling-valve and operating to open said controlling-valve when the speed of the engine falls below a predetermined limit.

10. The combination with a steam-turbine provided with a steam-conduit leading to a point between its main inlet and exhaust ports, of a valve in said conduit, a casing for said valve comprising two chambers connected by a restricted passage and normally containing steam under pressure which acts in opposite directions upon the valve, a controlling-valve for exhausting steam-pressure from the chamber in which the steam tends to close the valve and means for automatically opening the controlling-valve when the speed of the engine falls below a predetermined limit.

11. The combination with a steam-turbine provided with a steam-conduit connected to the engine at a point between the main inlet and exhaust ports and a valve in said conduit subjected to oppositely-acting bodies of steam having a limited communication each with the other, of a controlling piston-valve for exhausting the body of steam which tends to hold the main valve closed and provided with beveled operating-surfaces whereby its movement with reference to the exhaust-port tends to gradually open or close said port.

In testimony whereof I have hereunto subscribed my name this 20th day of May, 1902.

FRANCIS HODGKINSON.

Witnesses:

DAVID WILLIAMS,
W. H. MEREDITH.