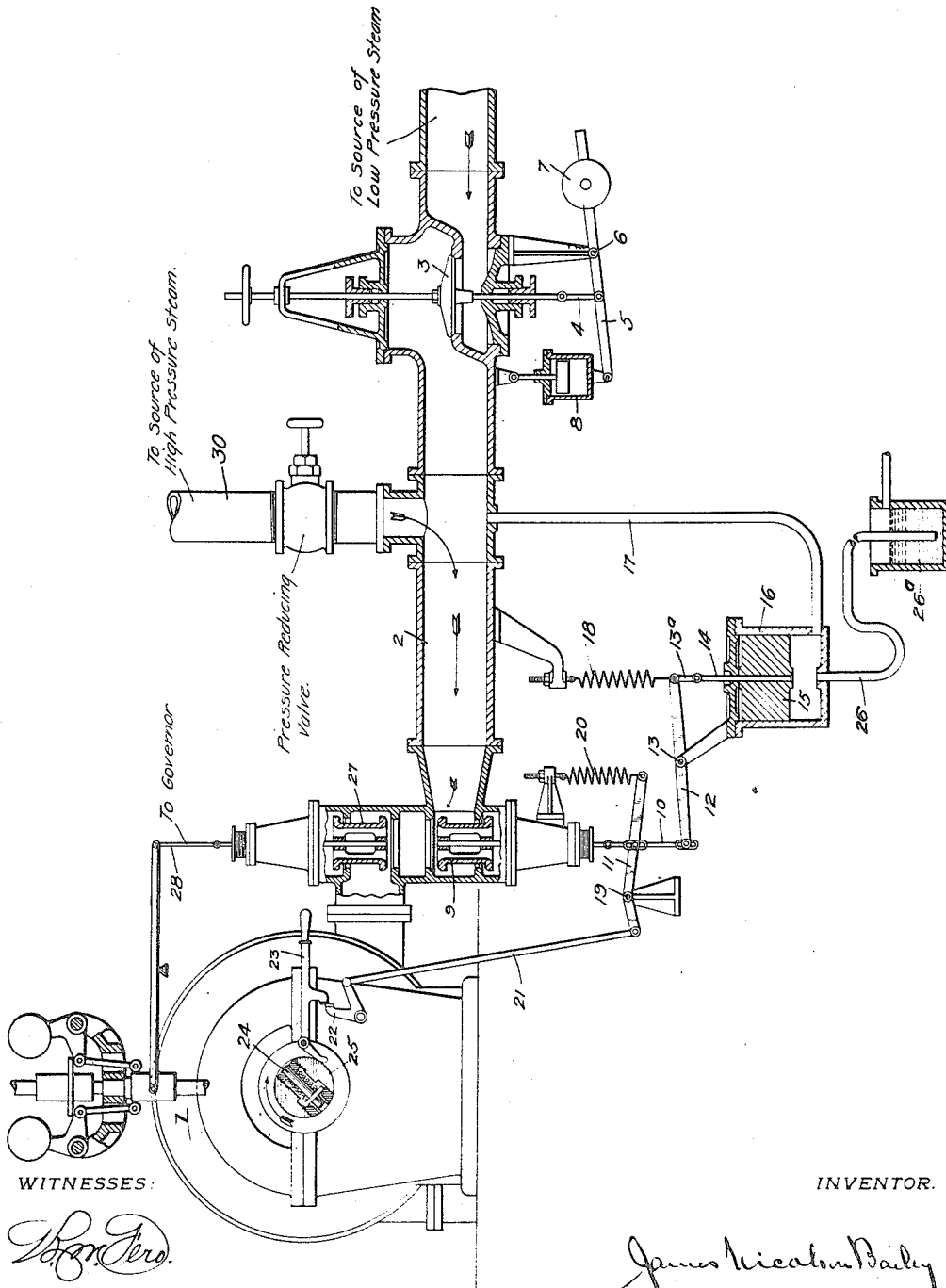


J. N. BAILEY.
 FLUID PRESSURE ENGINE.
 APPLICATION FILED MAY 17, 1909.

1,213,791.

Patented Jan. 23, 1917.



WITNESSES:

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FLUID-PRESSURE ENGINE.

1,213,791.

Specification of Letters Patent.

Patented Jan. 23, 1917.

Application filed May 17, 1909. Serial No. 496,621.

To all whom it may concern:

Be it known that I, JAMES NICOLSON BAILEY, a subject of the King of Great Britain, and a resident of Stretford, Eng-
land, have made a new and useful Invention
in Fluid-Pressure Engines, of which the fol-
lowing is a specification.

My invention relates to fluid pressure en-
gines and in particular to valve mechanism
for use in connection with machines of this
description adapted to be driven by motive
fluid supplied at relatively low pressure. In
cases in which the exhaust steam of a tur-
bine or other machine, adapted to be driven
by steam at high pressure, is utilized, it is
desirable that the connection between the
turbine and the exhaust main feeding the
low pressure engine should be broken if the
steam pressure in this main falls below a
predetermined value, otherwise the vacuum
which exists in the low pressure engine will
work back into the supply mains, and when
the pressure in the supply mains is below
the pressure of the atmosphere there is likely
to be a considerable leakage of air into these
mains. This air impairs the vacuum in the
condenser so that the turbine calls for more
steam and the pressure in the mains is still
further reduced. Moreover, in cases in
which the exhaust steam from a reciprocating
engine is utilized it is possible that, if
a vacuum exists in the reciprocating engine
exhaust, that is to say in the mains leading
to the low pressure machine, the engine may
continue to run after the steam is cut off,
thus rendering it impossible to obtain good
intermittent working of the engine and
cause damage by not stopping when antici-
pated.

According to this invention, I provide a
system of valves interposed between the low
pressure engine and the exhaust mains lead-
ing from the exhaust of the high pressure
turbine or reciprocating engine, so arranged
that the inlet of steam to the low pressure
engine depends upon the pressure existing
in the supply mains and a fall in the steam
pressure below a predetermined limit op-
erates to cut off connection between the low
pressure engine and the exhaust mains of
the high pressure turbine or reciprocating
engine, thus obviating the disadvantages be-
fore explained.

The accompanying drawing is a diagram-

matic view of a system of valve gear con-
trolling the admission of steam to a low
pressure engine arranged in accordance with
my invention.

The low pressure engine 1 is shown sup-
plied with fluid under pressure from the
supply mains 2 leading to the exhaust of a
high pressure engine. A stop valve 3 con-
trols the supply of steam to the low pres-
sure engine and preferably operates as a
non-return valve. For this purpose the
stem of the valve 3 is connected by means
of a link 4 to a lever 5 fulcrumed at 6 and
adapted by means of a weight 7 attached
to one end of said lever to normally balance
and maintain the valve 3 in an open posi-
tion when the pressure before the valve 3
exceeds the pressure on the delivery side.
The opposite end of the lever 5 is attached
to the movable member of a dash pot 8 to
prevent chattering of the valve. Located
in the supply mains 2 between the valve 3
and the low pressure engine 1 is a valve 9
preferably of the two-seated type, so that
the pressure existing on the underside of
said valve does not interfere with its opera-
tion. The stem of the valve 9 is pivotally
connected to a double slotted link 10 con-
nected by means of pins to two levers 11,
12 adapted to control the operation of said
valve. The lever 12 is fulcrumed at 13 and
is connected at one end to a link 13^a attached
to the stem 14 of a weighted piston 15 slid-
ing within a cylinder 16. The lower por-
tion of the cylinder 16 is connected by means
of pipe 17 to the low pressure mains 2 so
that the pressure existing on the under side
of said piston corresponds to the pressure
existing in the supply mains 2. The lever
12 is normally retained in an inoperative
position, that is to say in a position in
which the valve 9 will be permitted to open,
by reason of the pressure existing on the
underside of the piston 15 and the weight
of the piston 15 is so determined that under
normal conditions the pressure on the un-
derside of said piston is sufficient to main-
tain the piston 15 in a raised position.

In order to obtain a variation in the de-
gree of pressure necessary to raise the piston
15 and permit the valve 9 to open, a spring
18 is provided adapted to increase or de-
crease the weight imposed upon the end of
the lever 12. The lever 11 is fulcrumed at

19 and under the action of a spring 20 attached to the opposite end of said lever is adapted to retain the valve 9 in a closed position. The lever 11, however, is connected by means of a link 21 to one arm of a bell crank lever 22 adapted to engage with a trigger 23 which will maintain the lever 11 in an inoperative position against the action of the spring 20. The trigger 23 is adapted to be tripped when the speed of the low pressure engine has exceeded a predetermined degree by reason of the movable member 24 of a centrifugal governor 25 being brought into engagement therewith. Leading into the lower portion of the cylinder 16 in which the piston 15 works is a pipe 26 forming a siphon leading into a receptacle 26^a with a sufficient head of water to prevent the pressure from the low pressure supply mains 2 escaping through the pipe 26, at the same time permitting the condensed steam to be withdrawn from said cylinder. Between the valve 9 and the low pressure engine 1 is a similar valve 27 the stem of which is connected by means of a link 28 to a governor (not shown) adapted to control the position of valve 27 and so to vary the amount of steam admitted to the low pressure engine in accordance with the load in the well known manner. Live steam from a reducing valve may be admitted to the mains 2 through a branch pipe 30.

The operation of the apparatus is as follows: When the pressure in the supply mains 2 has fallen to an extent sufficient to enable the piston 15 to fall to the bottom of the cylinder 16, the lever 12 will be rotated and acting through the double slotted link 10 will close the valve 9. A similar closure of the valve 9 will follow when the speed of the low pressure engine has reached a predetermined rate sufficient to bring the movable member of the governor 25 into engagement with the trigger 23 the arm 22 will be released and permit the lever 11 to be rotated on its pivot under the action of the spring 20 which, as before explained, is normally maintained under tension, and the valve 9 will be closed. It will thus be seen that the valve 9 has two separate and distinct functions, viz: to cut off the supply of steam to the low pressure engine when the pressure in the supply mains falls a predetermined amount, and also when the speed of the engine exceeds a predetermined limit.

The invention is specially intended for application to low pressure turbines driven by exhaust steam, but may also be used in the case of reciprocating engines and also with turbines designed to utilize both high and low pressure steam either separately or simultaneously but in the latter case the non-return valve 3 and stop valve may be dispensed with.

In the case in which live steam is admitted to the supply mains 2 through the pipe 30 and the reducing valve, the increase of pressure in the supply mains will close the non-return valve 3, thus preventing the waste through condensation of the live steam in the exhaust mains of the high pressure engine.

The term fluid pressure engine used in the specification is intended to mean either a turbine or a reciprocating engine whether referring to the low pressure engine or to the engine supplying the steam to be used in the low pressure engine.

It will be understood that the particular construction of the valves is immaterial and various forms of valves and means for operating the same may be used without exceeding the scope of the invention.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In combination with a turbine, a supply main, a valve for delivering motive fluid to the turbine, a governor for controlling the operation of the valve, a second valve between the main and the first mentioned valve, and means responsive to fluid pressure within the supply main for controlling the operation of the second valve.

2. In combination with a turbine, a supply valve for delivering motive fluid to the turbine, a governor for controlling the operation of said valve, and a pressure responsive valve for controlling the delivery of motive fluid to said first mentioned valve.

3. In a low pressure turbine two independently actuated valves and their casings, the casing of one being in communication with the other, means for actuating one of the valves in response to the speed of the turbine, and means for causing the other valve to cut off the supply of fluid to the turbine when the pressure falls below a determined value.

4. In combination with a low pressure turbine, two independently actuated valves, the casings of which communicate with each other, means for actuating one of the valves in response to variations in the speed of the turbine, and means for causing the other valve to cut off the supply of fluid to the speed responsive valve when the pressure falls below a determined pressure.

5. In a fluid pressure turbine, a supply main, a valve, a speed responsive device for controlling said valve to determine the amount of steam admitted to said turbine, another valve normally unseated, and means for seating said last named valve when the pressure in the main falls below a determined value.

6. In a low pressure turbine, a supply main, a cut off valve in the supply main, a

speed responsive device controlled valve for governing the amount of steam admitted to the turbine, and a valve in the main having a closing movement when the pressure in the main falls below a determined value.

7. In combination with a low pressure turbine, two independently actuated valves for controlling the delivery of motive fluid to the turbine, a speed responsive governor for controlling the operation of one of said valves, a pressure responsive mechanism and an independent speed responsive device for controlling the operation of the other valve.

8. In combination in a turbine, a fluid supply main, a load responsive valve for proportioning the delivery of fluid from said main to said turbine, a pressure actuated valve responsive to variations in the fluid pressure within said main for controlling the delivery of motive fluid to said first mentioned valve.

9. In combination with a turbine, a motive fluid supply main, a load responsive valve for proportioning the delivery of motive fluid from said main to said turbine, a second valve for controlling the delivery of fluid from said main to said first valve, a system of operating mechanisms for actuating said second valve, a pressure responsive device for actuating said mechanisms, and a speed responsive device for actuating said mechanisms.

10. In combination in a turbine, a fluid

supply main, a load responsive valve for controlling delivery of fluid from the main to the turbine, a valve responsive to the pressure of fluid within the main for cutting off the supply of fluid to the turbine when the pressure in the main falls below a determined pressure, a source of high pressure motive fluid communicating with the main, a source of low pressure motive fluid communicating with the main, and a non-return valve in the main between the point of communication with the source of high pressure motive fluid and the point of communication with the source of low pressure motive fluid.

11. In combination with a low pressure turbine, a supply main communicating with the turbine, a load responsive valve for controlling the delivery of motive fluid from the main to the turbine, a cut-off valve for closing communication between the main and the turbine when the turbine exceeds a determined speed, a high pressure main communicating with the supply main, and a non-return valve in the supply main, between the point of communication with the high pressure main and the source of low pressure fluid.

In testimony whereof, I have hereunto subscribed my name this 30th day of April, 1909.

JAMES NICOLSON BAILEY.

Witnesses:

JAS. EDGE,

JAS. STEWART BROADFOOT.