(No Model.) 2 Sheets—Sheet 1.

J. A. BOURGEAT.

BALANCED VALVE.

No. 523,969. Patented Aug. 7, 1894.

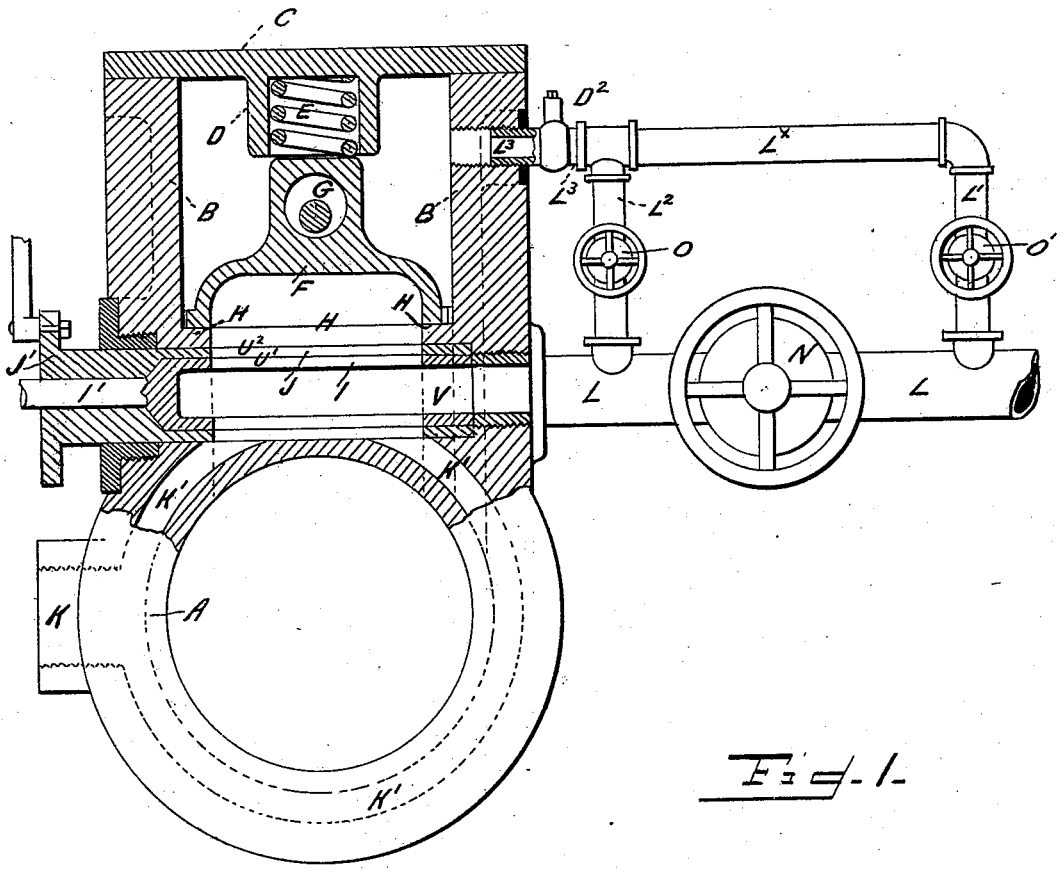

Fig. 1.

WITNESSES:

Ira R. Steward.

Frederic Carragan

INVENTOR

J. Adolphe Bourgeat

BY

Ernest Webb

ATTORNEY

THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

J. A. BOURGEAT.

BALANCED VALVE.

No. 523,969. Patented Aug. 7, 1894.

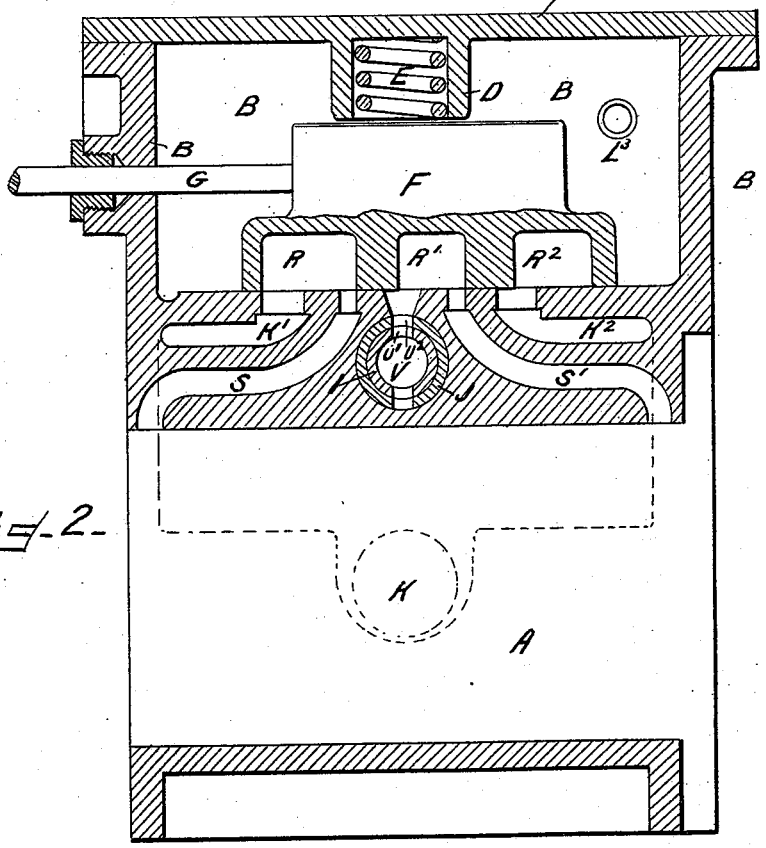

Fig. 2.

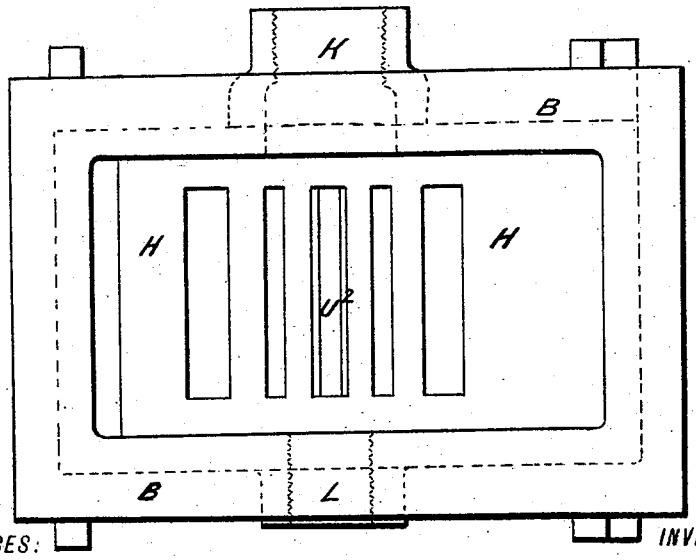

Fig. 3.

WITNESSES:

Ira R. Steward.

Frederic Carnagan

INVENTOR

J. Adolphe Bourgeat

BY Munn & Co

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH ADOLPHE BOURGEAT, OF NEW YORK, N. Y.

BALANCED VALVE.

SPECIFICATION forming part of Letters Patent No. 523,969, dated August 7, 1894.

Application filed October 29, 1890. Serial No. 369,712. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH ADOLPHE BOURGEAT, a citizen of the French Republic, (who have heretofore declared my intention to become and am about to become a citizen of the United States,) and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Balanced Valves for Engines, of which the following is a specification.

My invention relates to improvements in balanced valves for engines operated by fluid pressure, such as steam, water, gas or compressed air.

In the following specification I shall describe my invention as applied to an engine operating by steam pressure, it being understood, however, that it will apply equally well to any other form of fluid pressure engine. Heretofore balanced valves of this description have required that the steam pressure admitted to the engine should be kept constant, the valve being out of balance should any variation take place in this initial pressure, and it is the object of my invention to so arrange the steam inlet pipes of the engine that the pressure of the steam in the steam chest used to balance the valve against the pressure of the steam in the steam cylinder, shall vary in exact ratio with the pressure of the steam in the steam cylinder and that both shall vary proportionately with the pressure of steam admitted through the throttle valve to the engine. In this way the valve will be in balance at all pressures of steam admitted through the throttle valve, and the steam pressure may vary within wide limits without affecting the balance of the valve. This I accomplish by placing two pipes, each containing an auxiliary hand valve, in connection with the main steam pipe, one on each side of the main throttle valve and then joining both, above their respective valves, to a pipe which leads directly into the steam chest and above the valve to be balanced, this pipe first passing through a suitable pressure reducing valve. Before starting the engine the valve in the pipe outside of the throttle valve is opened and the valve in the pipe inside the throttle valve is closed, thus allowing steam at boiler pressure to enter the steam chest through the reducing valve. The main throttle valve is then opened and the engine started. After the engine is under way, the valve in the pipe outside the main throttle valve is closed and the valve in the pipe inside the main throttle valve is opened thus shutting off steam from the steam chest which comes direct from the boiler and only allowing steam to enter the steam chest through the reducing valve at the pressure at which it comes through the main throttle valve, and at which it enters the steam cylinder of the engine. As the steam pressure which comes through the main throttle valve varies, so will the steam pressure in the steam chest and steam cylinder vary, and in the same ratio at which they were arranged at the start, and the valve will be in balance under all these varying pressures. All of which will be hereinafter more fully pointed out and described, reference being had to the accompanying drawings forming part of this application, in the several figures of which like parts are designated by similar letters of reference.

Figure 1 is a vertical cross sectional view of my improved valve. Fig. 2 is a vertical longitudinal section, and, Fig. 3 is a horizontal longitudinal section of the same.

In the figures A is the main steam cylinder. B B the walls of the steam chest within which the balanced valve F works.

C is the cover of the steam chest. On the lower side of cover C is the cup shaped projection D carrying within it a spring E which presses upon the top of the balanced valve F tending to keep it to its seat H H. This spring prevents the valve F from lifting from its seat when the engine is turned by hand, when no steam is on, and is independent in its action of the balancing of the valve F. The cover C is hermetically fastened to the walls of the steam chest B in any suitable manner. The balanced valve F is shown in the form of a "D" valve, and is ground to fit its seat H so as to make a steam tight joint. It is divided on its under side into three compartments R R′ and R″, (as shown in Fig. 2,) and is moved to and fro by the valve stem G, which is operated in the usual manner by the engine.

K K′ and K″ are the usual exhaust ports, one for each end of the cylinder A.

S and S′ are steam inlets one for each end of the cylinder A.

V is the main steam inlet from the pipe L which connects with the boiler, and N is the main throttle valve located in the same.

I is an auxiliary throttle valve operated by the stem I′. It is cylindrical in form and hollow so that steam entering by inlet V may pass into its interior. It is provided with a port U′. Encircling the valve I is the governor valve J which is operated by the connector J′ to the governor valve. J also has a port U^2 which when the engine is in operation is more or less coincident with the port U′ in valve I, according as the engine is loaded or running light. The valve I may also act as an automatic cut off if so desired, by suitable mechanism attached to stem I′.

Located one on each side of the throttle valve N and connected to the main steam pipe L are the pipes L′ and L^2 in each of which is located small valves O and O′. These two pipes are connected above these valves, as shown in Fig. 1, by a pipe $L^\times$ which is provided with a nipple L^3 which contains a reducing valve D^2 of any suitable construction. The nipple L^3 enters the upper part of the chest B beyond the reducing valve.

The object of the reducing valve D^2 is to so vary the pressure of steam admitted to the steam chest as to allow for the variation of surface area exposed by the upper and lower sides of the valve F, the upper side exposing a much larger area than the under side, as shown in Fig. 2, and requiring a less steam pressure acting upon it to balance the main pressure on the under side. Now if the steam pressure in the main pipe is reduced or increased the steam pressure admitted to the steam chest B is in like proportion reduced or increased by the reducing valve D^2, so that the valve is always balanced no matter what the steam pressure in the pipe L may be.

When the engine is started valve O is closed and valve O′ is opened, admitting steam at proper pressure to the steam chest B through the reducing valve D^2, and after this is done, the main throttle valve is opened admitting steam to cylinder A and starting the engine in motion, in the usual manner, which is so well known as to need no description in this place. After the engine has started and is running, the valve O′ is closed and the valve O is opened and kept open as long as the engine is running, the steam admitted to the reducing valve D^2 being at the same pressure as that admitted to the engine through throttle valve N and not at the pressure which would be admitted were a valve O′ used for this purpose, in which case the pressure would be that of the boiler and the pressure of steam in the steam chest B would not vary with the pressure delivered to the steam cylinder A, but would remain at that due to boiler pressure and the valve might in consequence at one time be over-balanced and at another under-balanced. But by using pipe L^2 and valve O and shutting valve O′, the steam admitted to the reducing valve will always vary in pressure in proportion to the variations of the pressure admitted through valve N to the steam cylinder and consequently in proportion to the pressure of the steam acting against the under side of the balanced valve F. By this arrangement the valve F is automatically in balance at all times while the engine is running, no matter what the variations in steam pressure delivered to the steam cylinder A may be.

The operations of valves I and J have not been particularly described as I intend them to form the subject matter of another application.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the admission valve, valve chest, working cylinder, and main steam pipe and its throttle valve, of two independently valve-controlled pipes connected to the main steam pipe, one on each side of the throttle valve and communicating through a reducing valve with the interior of the valve chest, substantially as and for the purposes hereinbefore set forth.

2. In an engine operating by fluid pressure, the combination of a working cylinder, an admission valve, a pressure chest surrounding and covering the admission valve, a throttle valve, two pipes, one on each side of the throttle valve and connected to the main pressure inlet pipe, in each of which pipes is located a hand valve, said pipes being joined together beyond said valves, and a reducing valve, through which the pipe joining the two pipes before mentioned passes into the pressure chest, substantially as described.

Signed at New York, in the county of New York and State of New York, this 22d day of October, A. D. 1890.

J. ADOLPHE BOURGEAT.

Witnesses:
EDWARD R. KNOWLES,
E. IRVING CARR.