No. 701,574.

Patented June 3, 1902.

G. W. KING.

THROTTLE VALVE.

(Application filed Aug. 12, 1901.)

(No Model.)

2 Sheets—Sheet 1.

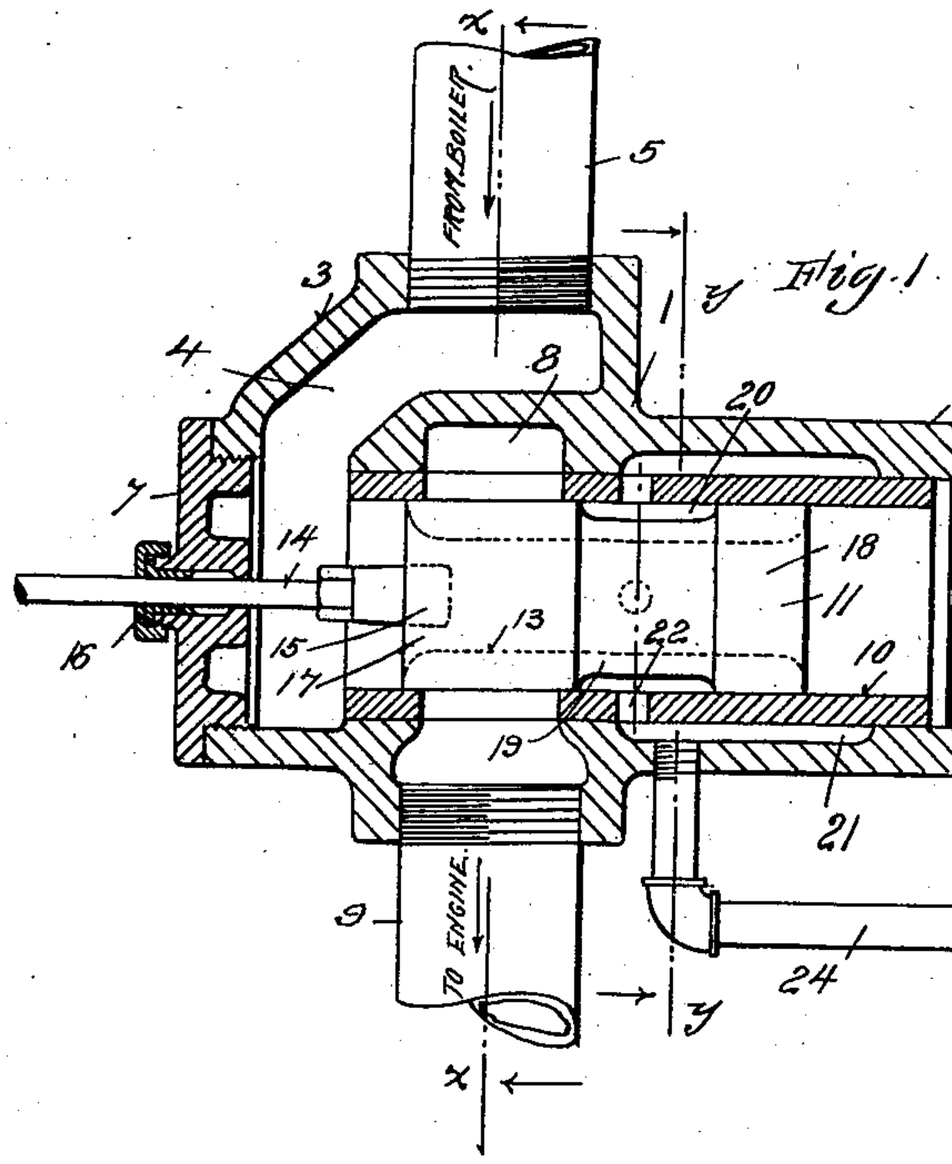


Fig. 1

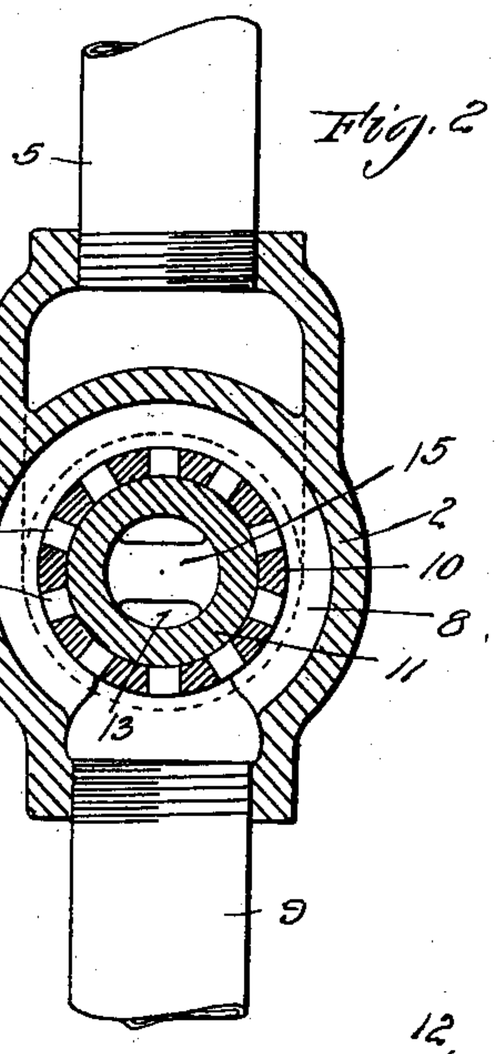


Fig. 2

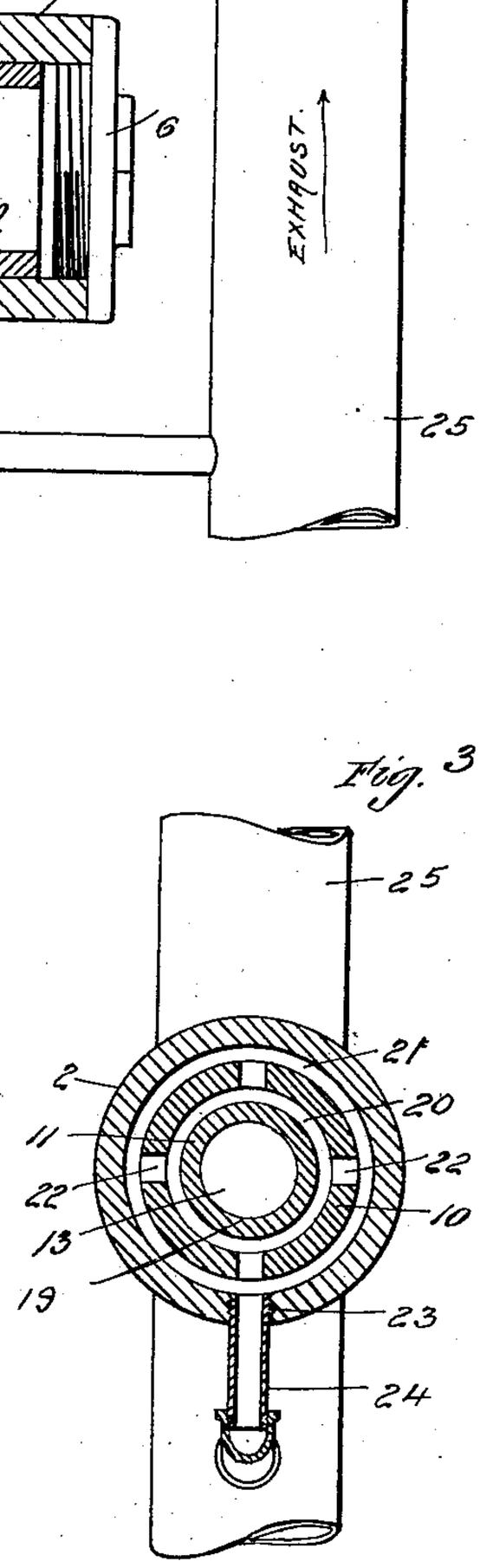
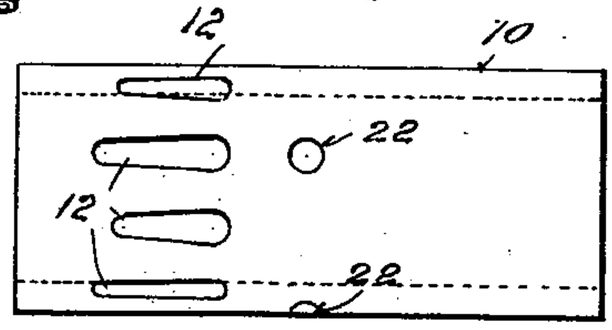


Fig. 3.

Fig. 4.



WITNESSES:

J. C. Dawley.

Will O'Laughlin

INVENTOR.

George W. King

BY

N. W. Toulmin.

ATTORNEY.

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THROTTLE VALVE.

(Application filed Aug. 12, 1901.)

(No Model.) 2 Sheets—Sheet 2.

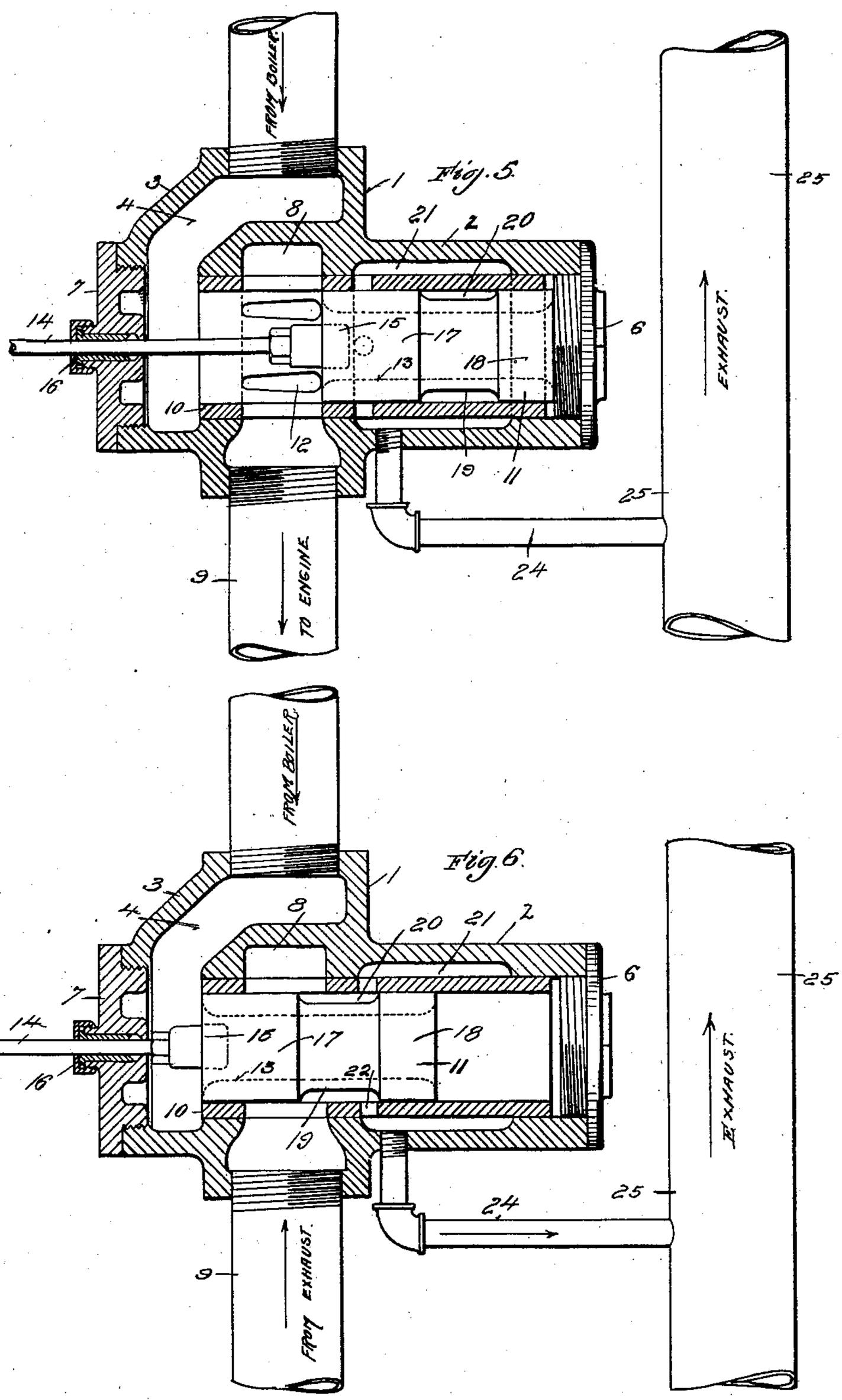

Fig. 5.

Fig. 6.

WITNESSES:
J. C. Dowling.
Wm. O'Laughlin

INVENTOR.
George W. King
BY
A. G. Southmayd
ATTORNEY.

UNITED STATES PATENT OFFICE.

GEORGE W. KING, OF MARION, OHIO, ASSIGNOR TO THE MARION STEAM SHOVEL COMPANY, OF MARION, OHIO, A CORPORATION OF OHIO.

THROTTLE-VALVE.

SPECIFICATION forming part of Letters Patent No. 701,574, dated June 3, 1902.

Application filed August 12, 1901. Serial No. 71,672. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. KING, a citizen of the United States, residing at Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Throttle-Valves, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to throttle-valves for steam-engines, and has for its objects, first, to produce a throttle-valve which while so far balanced as to be easy of operation is subject to an unbalanced pressure which tends to close the valve, and thus prevents accidental opening thereof; second, to provide for a gradual admission of steam to the engine, so as to prevent sudden starting thereof and consequent jerking of the load; third, to provide against accidental starting of the engine through leakage of steam past the valve, provision being made to permit the exhaust of such steam leakage without permitting it to accumulate in the engine to a sufficient extent to start the same; fourth, to provide a single valve by means of which a hoisting-engine may be so controlled that the load may be gradually or rapidly raised or gradually or rapidly lowered or held in any desired position by the throttle-valve alone.

To these and other ends my invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of a construction embodying my invention in one form, the valve being shown in a position in which both the steam-supply passage to the engine and the by-pass to the exhaust are closed. Fig. 2 is a vertical sectional view taken on the line $x\,x$ of Fig. 1 and looking in the direction of the arrows. Fig. 3 is a vertical sectional view taken on the line $y\,y$ of Fig. 1 and looking in the direction of the arrows. Fig. 4 is a detail elevation of the shell or bushing. Fig. 5 is a view similar to Fig. 1, showing the valve in a position such that the passage from the boiler to the engine is open, while the by-pass is closed; and Fig. 6 is a view similar to Fig. 1, but showing the valve in a position where the passage from the boiler to the engine is closed, while the by-pass is open from the engine to the exhaust.

In the particular form of construction shown 1 indicates a valve-casing having a cylindrical body portion 2, in which the valve travels, said cylindrical body portion being provided at one end with a hood 3, forming an inlet-chamber 4, with which the steam-supply pipe 5 from the boiler is connected. The opening of the cylindrical body 2 communicates at one end with the inlet-chamber 4 and is closed at the other end, preferably by means of a screw-plug 6. A corresponding screw-plug 7 is located in the hood 3 in line with the cylindrical body 2, so as to give access to the interior of the valve-casing from either end. Within the cylindrical body 2 there is formed, near one end thereof, an annular chamber 8, with which communicates the steam-supply pipe 9, which connects with the engine.

10 indicates a bushing or shell which I prefer to employ as a lining for the valve-chamber and within which the valve 11 is adapted to move longitudinally. That portion of the bushing 10 which forms the inner wall of the chamber 8 is provided with openings 12, by means of which steam may be permitted to pass from the interior of the valve-chamber into the chamber 8 and thence to the engine. These openings 12 are preferably in the form of slots of comparatively small width at their initial receiving ends, increasing in width in the direction of the opening of the valve. It will also be observed that the openings are not of uniform length, some being longer and others shorter, so that the valve in moving to open exposes them successively and not simultaneously.

The valve 11 is preferably circular in cross-section, the bushing being of similar form to fit the valve and the valve being of less length than the chamber in which it moves. An opening 13 extends entirely through the valve from end to end to permit the steam to have at all times access to both ends of the valve, and thereby partially balance the same, so as to render it easy of movement. The valve-stem (indicated at 14) is connected to a bridge-piece 15 of the valve or is secured thereto in any suitable manner and passes out through a stuffing-box 16 in the plug or head 7. It will

thus be observed that the valve is unbalanced by an amount equal to the sectional area of the piston-rod, and since, as hereinafter pointed out, the closing movement of the valve is in the direction of minimum resistance the steam-pressure will tend to hold the valve closed and will consequently counteract any tendency which the valve might have to fly open, and thus accidentally start the engine. The valve is provided with an enlarged portion 17 of a length somewhat in excess of the length of the openings 12, so that in the position of the parts shown in Fig. 1 the valve will close said openings and cut off all communication between the boiler and engine. At its other end the valve is provided with an enlarged portion 18, which, like the enlarged portion 17, fits snugly within the bushing 10. Between these two enlarged portions the body of the valve is reduced, as indicated at 19, so as to form an annular space 20 between the valve and bushing. There is formed in the cylindrical body 2 of the valve-casing an annular space 21, which communicates with openings 22 through the bushing adjacent to the openings 12. From the space 21 an opening 23 extends outward through the valve-casing and is preferably connected by means of a pipe 24 with the exhaust-pipe 25 of the engine. This opening may, however, be connected with any suitable point of discharge.

Referring now to the several positions of the parts shown in Figs. 1, 5, and 6, it will be seen from an examination of Fig. 1 that the parts are there in such a position that passage of steam from the boiler to the engine is prevented, and it will also be observed that the enlarged body portion 17 of the valve closes all communication between the ports 12 and the by-pass formed by the annular space 20, openings 22, and annular space 21 with its outlet-opening 23. When it is desired to start the engine, the valve is moved into the position shown in Fig. 5, and in this movement the valve successively uncovers the smaller ends of the openings 12, thus allowing only a comparatively small amount of steam to enter the engine at first, and thereby preventing too quick starting of the engine and jerking of the load. A uniform rate of opening movement of the valve results in a much more rapid increase in the total area of the openings 12 through which steam is admitted to pass, so that the engine is quickly brought to its maximum efficiency, although not with too great suddenness. Of course the amount of steam admitted may be regulated by the extent of movement of the valve. When the parts are in the position shown in Fig. 5, the valve is completely open and the maximum amount of steam is being admitted from the boiler to the engine. At the same time the by-pass is closed and no steam escapes through the throttle-valve to the exhaust. When, on the other hand, the parts are moved into the position shown in Fig. 6, communication between the boiler and engine is closed, but in such a way that if any steam should leak past the valve instead of accumulating in the engine, which it might do to an extent sufficient to cause it to turn or start unexpectedly, and thus possibly do great damage, it will escape through the by-pass to the exhaust without doing any damage.

My improved throttle-valve thus constructed while capable of general application is designed more particularly for use in connection with hoisting-engines, and I have found it particularly advantageous for this purpose for the following reasons: In such engines it is customary to lower the load by controlling the same by means of a foot-brake operating on the hoisting-drum. The load is, however, at times too heavy to be thus efficiently controlled; but I have found that by placing the valve in approximately the position shown in Fig. 6, so that the engine is in communication with the exhaust or with the outer air through the by-pass of the throttle-valve, the steam that is in the engine and in the steam-pipe below the throttle may be controlled through the medium of the valve by allowing a portion of it to escape through the by-pass, thus allowing the engine to turn backward, thereby gradually lowering the load. The amount of steam thus allowed to escape may obviously be controlled by the position of the valve, and the rate of lowering may be thus regulated. It will therefore be seen that by the use of a single valve the engineer may either raise or lower the load and do so either slowly or rapidly or may hold the load in any desired position. This is manifestly advantageous and enables me to dispense with the use of the usual brake.

Although I have described and illustrated one specific embodiment of my invention, I do not wish to be understood as limiting myself to the precise details of construction set forth, as they may be obviously varied without departing from the principle of my invention. For instance, although I have shown the valve proper as of the type known as "piston-valves," yet it is obvious that my invention in its main features is equally applicable to other forms of valve—as, for instance, the slide-valve. Again, although I have illustrated the valve-casing as provided with a lining or bushing this particular feature may be omitted. Furthermore, although the openings through which the steam passes on its way to the engine have been shown in the form of slots the same result may be obtained by employing a number of holes, using smaller holes and fewer in number at that end which is first uncovered by the valve in its opening movement.

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

1. The combination, with the steam-supply pipe of a steam-engine, of a throttle-valve comprising a casing having a port communicating with that portion of the steam-supply

pipe connected with the source of supply, a second port connected with that portion of the steam-supply pipe which is connected with the engine, said valve-casing being also provided with an exhaust-passage, and a valve controlling said ports and adapted to connect the engine-port and exhaust-passage and simultaneously close the port connected with the steam-supply, whereby the steam from the engine may be permitted to return through the steam-supply pipe and escape through the valve and exhaust-passage under control of the valve, substantially as described.

2. A throttle-valve comprising a casing provided with ports communicating with the steam-supply and engine and with an exhaust-passage, and a valve controlling said ports and provided with a by-pass adapted to connect the engine-port and exhaust-passage, said valve being movable to three operative positions; first, to close both the engine-port and exhaust-passage and prevent all movement of the steam; second, to close the steam-supply and open communication between the engine-port and exhaust-passage; and third, to open communication between the steam-supply and engine-port and close the exhaust-passage, substantially as described.

3. A throttle-valve comprising a casing provided with ports communicating with the steam-supply and engine and with an exhaust-passage, and a valve controlling said ports and provided with a by-pass adapted to connect the engine-port and exhaust-passage, said valve being movable to three operative positions; first, to close both the engine-port and exhaust-passage and prevent all movement of the steam; second, to close the steam-supply and open communication between the engine-port and exhaust-passage; and third, to open communication between the steam-supply and engine-port and close the exhaust-port, said valve being also movable in its second and third positions to regulate the passage of steam, substantially as described.

4. A throttle-valve comprising a valve-casing having a valve-chamber closed at one end and opened at the other end for the admission of steam, said casing having an intermediate chamber communicating with the engine and with the valve-chamber, in combination with a valve controlling communication between the valve-chamber and the intermediate chamber, said valve having a steam-passage therethrough, whereby both ends of the valve are subjected to steam-pressure to partially balance the same, and a valve-rod connected to said valve and passing through the inlet end of the casing, said valve being adapted to close the valve-ports by a movement toward the said inlet end, whereby the unbalanced pressure on said valve tends to close the same, substantially as described.

5. A throttle-valve comprising a casing having a cylindrical valve-chamber closed at one end and connected at the other end with a steam-supply, said casing being provided with an annular chamber having ports connecting with the valve-chamber and also connected with the engine, and a second annular chamber having an exhaust-opening and ports connecting with the valve-chamber, in combination with a piston-valve having a longitudinal opening and a body portion adapted to control the ports communicating with the engine, and a reduced portion adapted to establish communication between the engine-ports and the ports communicating with the exhaust-chamber, substantially as described.

6. A throttle-valve comprising a valve-casing having a cylindrical body portion closed at one end and connected with the steam-supply at the other, said casing having an annular chamber communicating with the engine and provided with ports opening into the valve-chamber, and a second annular chamber also provided with ports opening into the valve-chamber and connected with the exhaust, and a valve having a cylindrical body provided with a longitudinal opening to balance the valve and with a reduced intermediate portion, whereby communication may be established between the engine-ports and the ports of the exhaust-chamber, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. KING.

Witnesses:
F. H. KING,
GEO. A. CHENEY.