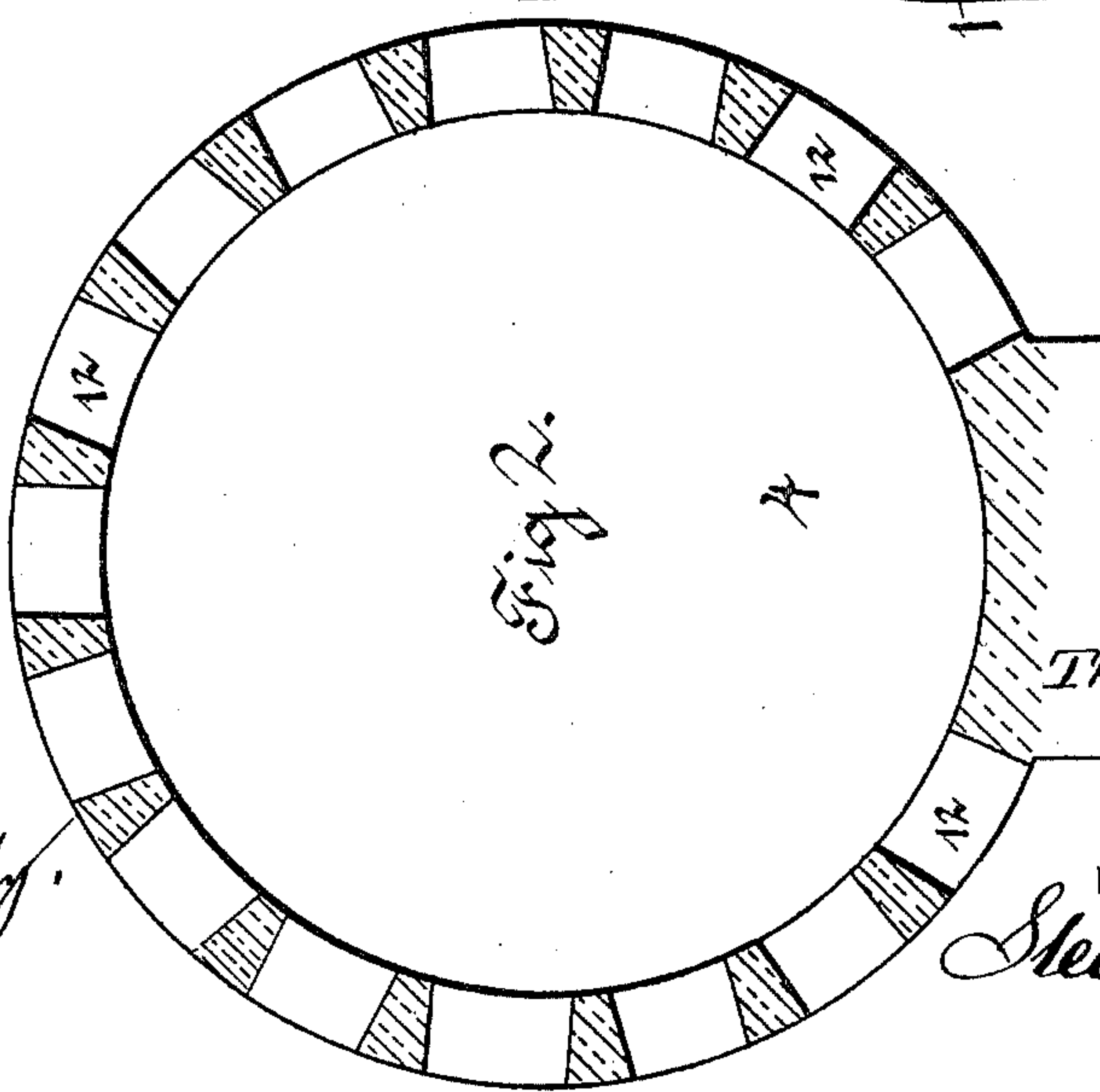
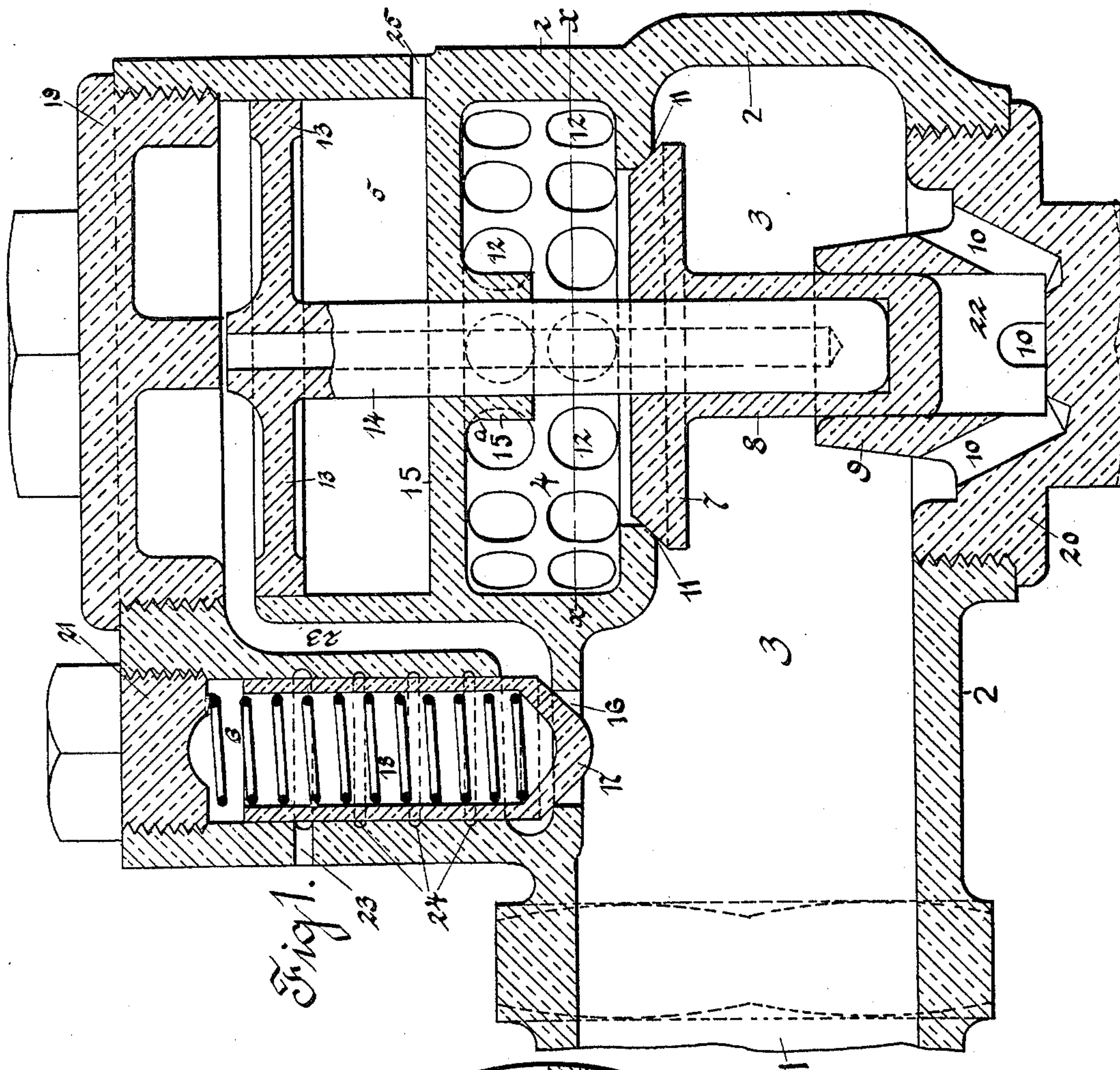


(No Model.)

T. H. SYMINGTON.
SAFETY VALVE.

No. 581,790.

Patented May 4, 1897.



WITNESSES:

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UNITED STATES PATENT OFFICE.

THOMAS HARRISON SYMINGTON, OF RICHMOND, VIRGINIA.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 581,790, dated May 4, 1897.

Application filed September 2, 1896. Serial No. 604,629. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HARRISON SYMINGTON, a citizen of the United States, and a resident of Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Safety-Valves, of which the following is a specification.

The object of my invention is primarily to secure a prompt and sufficient opening for the escape of steam from a closed vessel when the pressure rises to a very few pounds above the maximum allowed for, and also to provide means for preventing the formation of a vacuum in the said vessel.

The ordinary form of valve held shut against pressure by a spring opens slightly when the force of the spring is overcome by pressure, but to get a large opening to take care of a large volume of steam the pressure must rise very much above the pressure necessary to overcome the resistance of the spring, because as the spring is compressed its resistance increases, and the valve can therefore only be opened wide by a large increase of pressure.

My invention consists of a valve intended to be used on the steam-chest connected with the low-pressure cylinder of a locomotive for preventing any undue pressure in said chest, and also to prevent the formation of a vacuum therein when the engine is running without steam. This valve is constructed in such a way as to open automatically when the throttle is closed and stay open while the engine is running under this condition, and also to close instantly and stay closed as soon as the throttle is opened. It is also constructed to open when the pressure in the steam-chest exceeds a certain value. In other words, this valve serves the double function of preventing an excessively-low and excessively-high pressure in the steam-chest and cylinder.

The following is a specification of the construction and operation of this valve, reference being had to the accompanying drawings.

Figure 1 is a vertical sectional view of the valve, and Fig. 2 a plan view taken on line *x x* of Fig. 1.

Referring to Fig. 1, 2 is the valve-casing, having a portion 1 threaded on the outside to admit of the valve being screwed into the

steam-chest. The threaded portion is not shown in the drawings.

19 is a cap for closing the top of the casing, and 20 a cap for closing the bottom. The lower cap 20 contains a recess 22, in which slides the valve-stem 8.

7 is the valve. The chamber 3 is in direct communication with the steam-chest, and when the valve falls away from its seat 11, 3 is connected with the atmosphere through the chamber 4 and holes 12.

17 is a valve held to its seat by means of the spring 18, which should be set to open at the desired pressure. The cap 21 closes the valve-chamber 6.

24 are packing-rings, and 23 a hole through the valve-casing through which any steam which has leaked past the packing-rings may escape.

13 is a piston working in the cylinder 5.

14 is a piston-rod connected thereto.

15 is a diaphragm separating chamber 4 from chamber 5 and having a central perforation through which passes the piston-rod 14.

15^a is a boss on the under side of the diaphragm around its central perforation, which serves as a guide for the piston-rod.

The piston-rod 14 projects through the chamber 4 and into a recess in the center of the valve 7.

10 10 are holes bored through the base of the valve-socket 9, so as to establish a connection between the steam-space 3 and the space 22 below the valve-stem. This space is provided in order to have an excess of area on the lower surface of the valve 7 exposed to steam-pressure sufficient to return it to its seat against pressure exerted upon its upper surface.

The combined area of the under surface of the valve 7 and that part of it which projects into the space 22 is, however, less than the area of the piston 13.

In operation the action of the valve is as follows: Under ordinary conditions, with the throttle open, the valve 7 is held up against its seat by steam-pressure on its lower surface. If, however, due to the engine being suddenly reversed or other causes, the pressure in the steam-chest should rise above a certain value, the valve 17 would be pushed up, steam admitted through opening 16 and

by way of port 23 to the upper side of piston 13, and since the area of piston 13 is greater than the area of valve 7 on its lower side the said valve would be pushed down away from its seat by the rod 14, thus opening a large passage for the escape of steam from the chamber 3 into chamber 4 and to the atmosphere through holes 12. As soon as the pressure is sufficiently reduced by the escape of steam to the atmosphere the spring 18 presses the valve 17 back to its seat and shuts off the steam from piston 13 and the pressure on the under surface of the valve 7 returns it to its seat, and communication with the atmosphere is closed.

If the throttle is closed and the engine run without steam, all pressure will be removed from the under surface of the valve 7, which will fall away from its seat by gravity and allow free access of air into steam-chest by holes 12 and chambers 4 and 3, thus preventing the formation of a vacuum in the steam chest and cylinder. As soon as the throttle is again opened and steam admitted into chambers 3 and 22 the valve 7 will be returned to its seat immediately and communication with the atmosphere cut off.

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

1. In a relief-valve, the combination of a main valve closing a pressure-chamber and opening to exhaust a cylinder and piston therein with means connecting the piston with the main valve to open it, a supply-port connecting the pressure-chamber with the cylinder, a spring-actuated pressure-valve closing said port, and an opening under the main-valve stem for the purpose of admitting steam and raising the said valve, substantially as described.

2. In a relief-valve the combination of a main valve closing a pressure-chamber and opening to exhaust, with a cylinder and piston therein, a piston-rod actuated by said piston and bearing upon the main valve to open it, a steam-port connecting the cylinder with the pressure-chamber, a pressure-valve closing said port, and an opening under the

main-valve stem for the purpose of admitting steam and raising the said valve, substantially as described.

3. In a relief-valve, the combination of a pressure-chamber, connected with steam-pressure, an exhaust-chamber connected by large apertures to the atmosphere, a cylinder, a piston in said cylinder, a steam-port connecting the pressure-chamber with the cylinder and closed by the pressure-valve, a main valve closing the communication between the pressure-chamber and exhaust-chamber and opened by the motion of the piston in the cylinder, and an opening under the main-valve stem for the purpose of admitting steam and raising the said valve, substantially as described.

4. In a relief-valve the combination of a pressure-chamber, an exhaust-chamber provided with large peripheral perforations, a main valve separating these chambers, a means for opening the valve against pressure, a means for opening it to prevent the formation of a vacuum in the pressure-chamber, and means for closing the said valve when steam is again admitted to the pressure-chamber, substantially as described.

5. In a relief-valve the combination of a pressure-chamber and an exhaust-chamber, the exhaust-chamber having large peripheral openings, a main valve separating the chambers, a cylinder and piston therein, and piston-rod, passing through the piston and bearing upon the main valve, the area of the piston being larger than the valve, a port admitting steam from the pressure-chamber to the cylinder, a pressure-valve closing said port, and an opening under the main-valve stem for the purpose of admitting steam and raising the said valve, substantially as described.

Signed at Baltimore, in the State of Maryland, this 20th day of May, A. D. 1896.

THOMAS HARRISON SYMINGTON.

Witnesses:

J. HENRY STROHMEYER,
M. G. STEUART.