(No Model.)

2 Sheets—Sheet 1.

F. SCHREIDT.

SAFETY VALVE.

No. 538,703. Patented May 7, 1895.

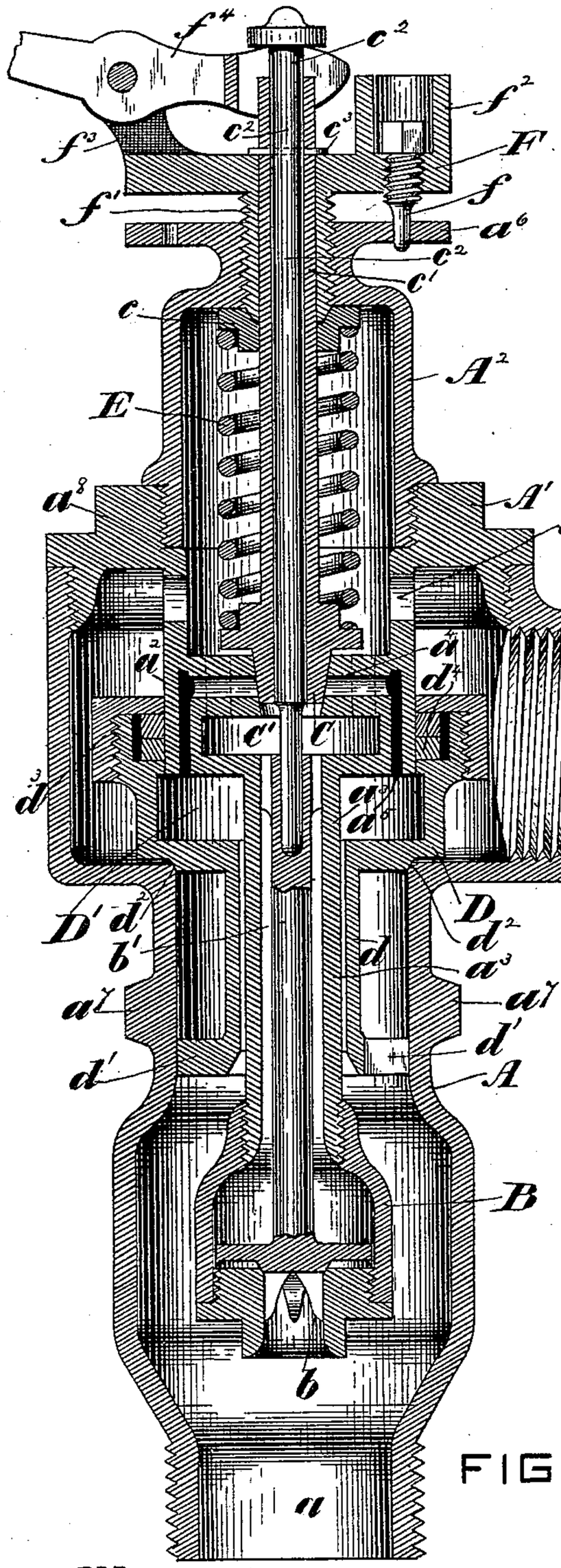

FIG. 1.

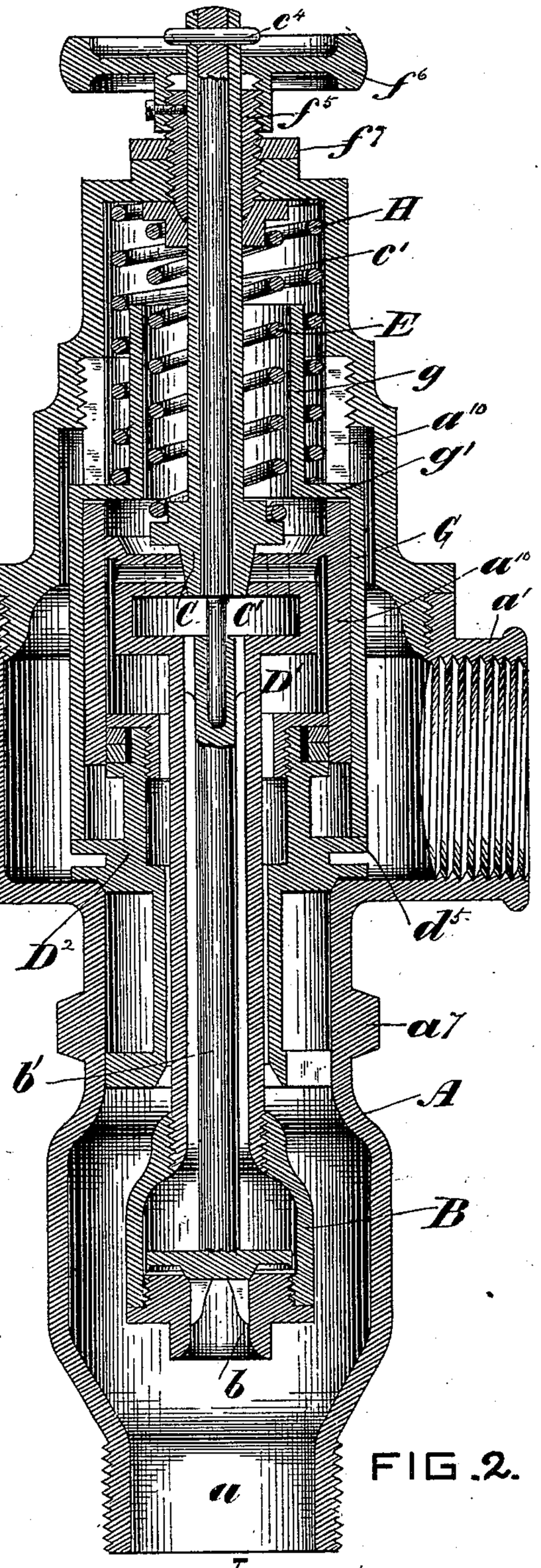

FIG. 2.

Witnesses:
Frank L. Davis
Emma Lyford

Inventor:
Frank Schreidt
By Geo. Murray Atty

(No Model.) 2 Sheets—Sheet 2.

F. SCHREIDT.

SAFETY VALVE.

No. 538,703 Patented May 7, 1895.

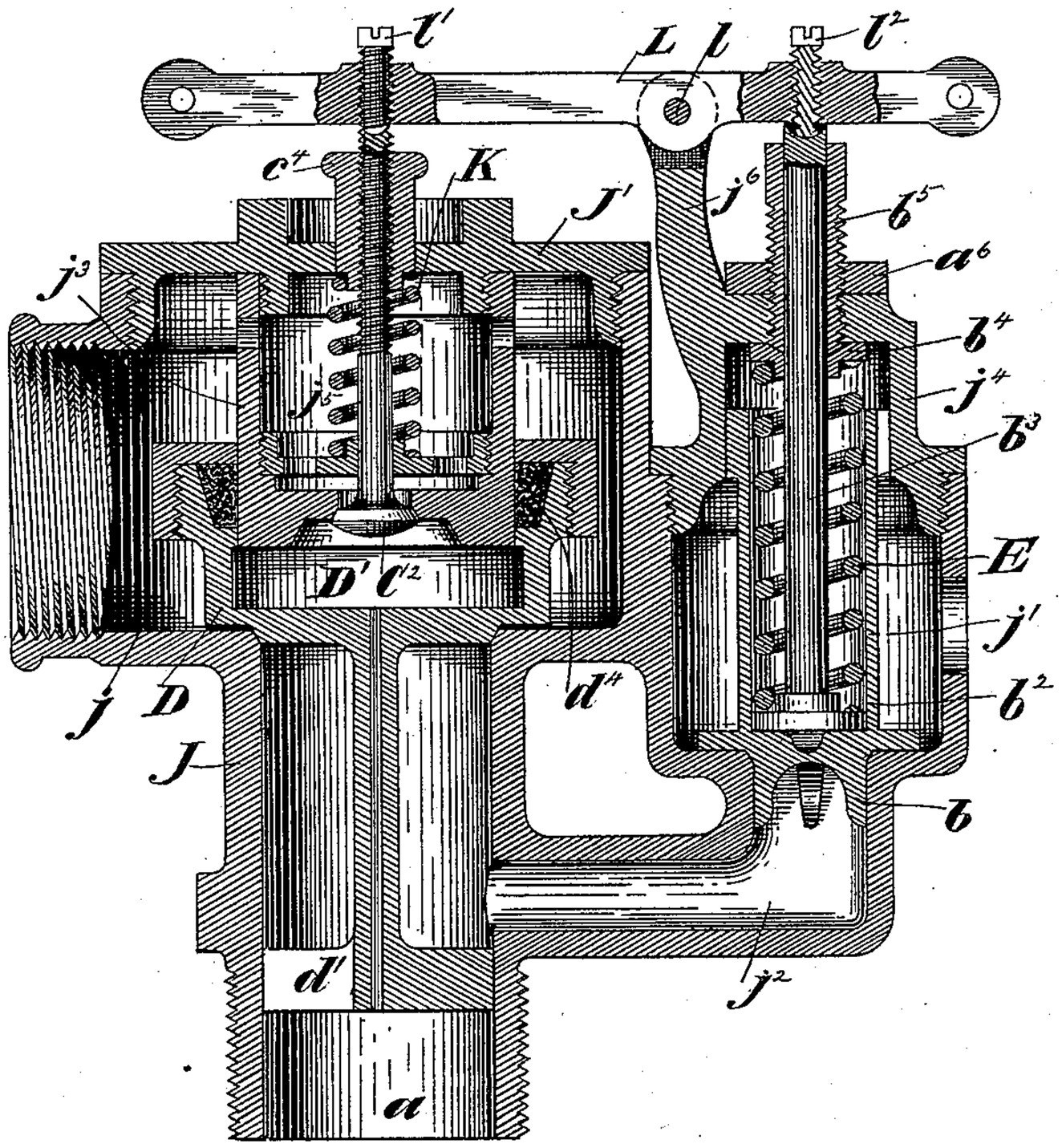

FIG. 3.

Witnesses:
Frank L. Davis.
Emma Lyford

Inventor:
Frank Schreidt
By Geo. J. Murray
Atty

UNITED STATES PATENT OFFICE.

FRANK SCHREIDT, OF MANSFIELD, OHIO.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 538,703, dated May 7, 1895.

Application filed September 22, 1894. Serial No. 523,777. (No model.)

To all whom it may concern:

Be it known that I, FRANK SCHREIDT, a citizen of the United States, and a resident of Mansfield, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Safety-Valves, of which the following is a specification.

My invention relates to safety and relief valves and particularly to that class popularly known as "pop safety valves."

The object is to provide a valve that will be thrown wide open so as to provide a free discharge the full area of an unobstructed pipe of the diameter of the valve the instant the pressure with which the valve is set is reached, and as quickly close the valve when the pressure is reduced.

To this end it consists in providing what I term a trigger valve and balance chamber in connection with the main valve, whereby a much smaller valve and much lighter spring may be employed to accomplish the results aimed at and partially attained by the larger valves now in common use, all of which will be fully understood from the following description of the accompanying drawings illustrating the preferred form of my invention and the two modifications of the same adapting the safety valve for use as a cylinder relief valve, my invention being particularly intended for use as a pop safety valve, and the modifications illustrate its use in other positions.

Referring to the drawings, in which like parts are indicated by similar reference-letters wherever they occur throughout the different views, Figure 1 is a longitudinal central sectional view of my preferred form of valve for use as a pop safety-valve for a steam-boiler. Fig. 2 is a modified form of the same, which may be used for the same purpose, but is more especially adapted for a relief-valve. Fig. 3 is another modification, in which the trigger or setting-valve is placed alongside of instead of in the same axial plane as the main valve.

Referring first to Fig. 1: A is the main case of the valve, provided with induction port or branch, a, for attachment to a steam boiler, and an eduction branch, a', to be connected to a pipe leading to the open air, or to a waste or bilge pipe to carry the steam discharged outside of the boiler room. This case, A, is covered by a cap, A′, which has a screw threaded neck to enter the screw threaded upper portion of the valve chamber proper, and A^2, is the neck or spring chamber which is screwed into the cap, A′, the parts A, A′, and A^2, forming the valve case proper. The cap, A′, has a downwardly depending branch, a^2, terminating in the downwardly extending tubular portion, a^3, the lower end of which is screw threaded exteriorly to receive the case, B, of the trigger valve, b. The upper or enlarged tubular portion, a^2, has a partition, a^4, which is centrally perforated to furnish a seat for the relief valve, C, and a groove, a^5, forming an annular chamber around the lower portion of the shell, a^2, the partition, a^4, being radially perforated to form a communication between said chamber and a central cone shaped opening which forms the valve seat in the partition, a^4.

The main valve, D, consists of a hollow shell with a depending tubular neck, d, having laterally projecting wings or guides, d', to snugly fit within the reduced portion of the case shell, A, the contact surfaces being the beveled lower edges of the valve which meet the interior beveled surfaces, d^2, of the valve case, A, and the cap, d^3, which is screwed onto the upper end of the valve case, the cap and inwardly projecting portions of the case fitting snugly around the depending neck, a^2, of the cap, A′.

d^4, represents metal packing rings interposed between the cap and the main shell of the valve to prevent the escape of steam from the chamber, D′.

There is a free opening from the branch, a, between the tubular neck, d, of the main valve and the depending tubular projection, a^3, of the cap, A′, to allow a free access of steam from the boiler into the chamber, D′. The bottom of the chamber being of greater area than the under exposed surface of the valve, the pressure of steam will hold the valve to its seat until the pressure in the chamber, D′, is relieved.

The trigger valve, b, and the relief valve, C, are both held to their seats by the pressure of the spring, E, which is compressed between an outwardly projecting flange on the valve,

C, and the follower, *c*, which is fitted to slide over the tubular stem, *c'*, of the relief valve, C. Within this tubular stem, *c'*, is a rod, c^2, which is coupled to the tubular stem by a pin, c^3, passing through both of them. The lower end of this rod, c^2, extends below the relief valve, C, and enters a perforation in the stem, *b'*, of the trigger valve, *b*, so that the trigger valve and the relief valve are practically coupled to move together. The stem, *b'*, of the trigger valve passes loosely through the downward extension, a^3, and has guide wings at its upper end to permit the passage of steam into the chamber, C', when the trigger valve is thrown from its seat.

The part, A^2, of the valve case has an annular flange or disk, a^6, at its upper end, which has a series of perforations to receive the pointed end of the regulating screw, *f*, which projects down from a cross head, F, which crosshead has a downward tubular extension, *f'*, tapped through the upper portion, A^2, of the case to bear upon the follower, *c*, for the purpose of regulating the tension of the spring, E, and setting the valve to any desired pressure. To accomplish this, the screw, *f*, is backed out, the follower forced down until the spring has received the tension required, when the screw, *f*, is screwed back into one of the perforations in the disk, a^6, which prevents the cross head from turning and fixes the tension of the spring. The set screw, *f*, is tapped through one arm of the cross head, F, and its head incased in the tubular extension, f^2. On the opposite side of the crosshead are upwardly projecting lugs, f^3, between which is fulcrumed a lever, f^4, the shorter arm of which is bifurcated to pass upon each side of the relief valve stem, *c'* and c^2, the upper end of the stem, *c'*, being provided with a nut or collar. By this means the relief valve may be lifted by hand at any time it is desired to test the valves or see whether they are free to move from their seats.

The case, A, is provided with an angular key seat, a^7, and the cap, A', with a similar seat, a^8, by which the parts are secured firmly together.

The operation of the device in use is as follows: The valve being applied to a steam boiler, the tension of the spring, E, is adjusted to open the trigger valve, *b*, at any pressure desired. This can be determined by the engineer by adjusting the valve to let go or open at any pressure indicated by the steam gage when the screw, *f*, is turned down into any one of the perforations in the disk, a^6. It will be seen that the pressure of the steam will hold the main valve to its seat unaided by any spring so long as the trigger valve, *b*, keeps its seat. The under side of this valve having but a small area, a very light spring will hold it to its seat under a heavy pressure of steam in the boiler, but the instant it leaves its seat, it will force up the relief valve, C, relieve the pressure from the chamber, D', and therefore from the main valve, the pressure in the chamber, D', passing from the annular chamber, a^5, through the perforations in the relief valve seat and out through the perforations, a^9, in the shell, a^2, to the open air. The instant the pressure in the boiler is reduced below the tension of the spring, E, the trigger valve will again close and the pressure of steam in the chamber, D', instantly force the main valve to its seat.

It will be seen that my valve is easily constructed, requires but little fitting and is readily put together for use, and that, owing to the auxiliary or trigger valve being of small area, and allowing free access of steam to hold the main valve to its seat until the trigger valve is released and, when released, throw the full pressure of steam under the main valve, it will rapidly open, allowing a discharge the full area of the pipe, and as rapidly close when the trigger valve closes. I am thus enabled to use a smaller valve and a much lighter spring to accomplish all that has heretofore been accomplished by a heavy spring and a very large valve.

The modification shown in Fig. 2, which is intended especially for a relief valve, differs from that in Fig. 1 mainly in providing a shell, G, around the branch containing the relief valve, the upper end of the shell having a reduced neck, *g*, surrounding the spring, E, and forming a shoulder upon which the auxiliary spring, H, rests, the upper end of the spring bearing against the top of the case. The lower edge of the case, G, rests upon the outwardly projecting flange, d^5, projecting from the main valve, D^2. The purpose of this arrangement is to add the assistance of the spring, H, to the pressure of the steam in holding the main valve to its seat. The shoulder portion, *g'*, of the case, G, has a series of segmental slots cut through it to pass the upper slotted end of the shell, a^{10}. In this case the tension of the spring, E, is regulated by a tubular screw piece, f^5, to which the hand wheel, f^6, is secured and the tension is held by a lock nut, f^7. The operation of the device is the same as that of Fig. 1, with the exception that the spring, H, is used in addition to the steam pressure, to hold the valve to its seat, especially when shipping, and also to prevent the valve from leaking when raising steam in the boiler. A spanner may be also used underneath the transverse pin, c^4, to temporarily throw the valves from their seats, to relieve the cylinder when the device is used as a cylinder relief valve, or to test the valves when used as a safety valve.

In the modification shown in Fig. 3, the trigger valve and relief valve, C^2, are arranged in parallel cases instead of one above the other. The shell, J, has two chambers, *j* and *j'*, side by side, both connecting with the exhaust port, *a*, through a channel, j^2. The main valve, D, is substantially the same as in Fig. 1, its upper end fitted to slide over a branch, j^3, screwed on to the projection in the under side of the cap, J', of the case, and packed with metal

packing rings, d^4. Its lower tubular extension has laterally projecting wings, d', guided in the port, a, and the tubular stem is perforated to admit steam into the chamber, D′, to hold the valve to its seat until the pressure within the chamber is relieved. The tubular stem, b^2, of the trigger valve, b, has guide ribs at its upper end to guide it in the neck or cap, j^4. The rod, b^3, passes through the tubular stem, b^2, has a fixed collar or flange at its lower end, and a movable collar or follower, b^4, between which and the lower flange of the rod is compressed the set spring, E′. The tension of the spring is regulated by a tubular screw, b^5, which passes through the cap, j^4, and is held by a lock nut, b^6.

The relief valve, C^2, is seated in the lower end of the tubular piece, j^3. Its stem passes up through the case and is screw threaded at the top to receive the follower, c^4, which is fitted to play freely through the top, J′, of the case.

j^5, is a perforated disk screwed into the shell, j^3, and K is a spring coiled around the stem of the relief valve, resting upon the perforated disk, j^5, and pressing upwardly against the tubular piece, c^4, to hold the relief valve, C, to its seat. The arm, j^6, projects upwardly from the cap, j^4, and has bifurcated lugs at its upper end to receive the lever, L, which is fulcrumed upon a pin, l, passing through said lugs. The lever has set screws, l' and l^2, which pass through bosses formed on the bar, one of which bears upon the stem or rod, b^3, which holds the valve, b, to its seat, and the other bears upon the top of the stem of the relief valve, C^2.

It will be seen that when the trigger valve, b, is thrown from its seat, the short end of the lever will be thrown up, the opposite end thrown down, throwing open the relief valve, C^2, and relieving the chamber, D′, from pressure when the pressure on the under side of the valve, D, will quickly throw it from its seat until the pressure is reduced and the trigger valve, b, returns to its seat, when the steam again filling the chamber, D′, will rapidly throw the main valve closed.

As the main feature of my invention is a chambered main valve in direct communication with the boiler or generator, by which the main valve is held to its seat by the pressure in the generator until the pressure in the main valve chamber is relieved, and a relief valve for the main chamber, controlled by a small valve, the under side of which is also exposed to the direct pressure from the generator, and the relief and the controlling or trigger valve being connected or coupled to move in unison, whereby a small controlling valve and a light spring may be employed to control the pressure in the boiler or regulator, it is obvious that many structural or mechanical changes may be made in the case and valves without departing from the spirit or scope of my invention and hence, without limiting myself to the specific details of construction shown.

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

1. In a safety valve, the combination of the case, the main valve having interior steam chamber communicating with the generator or boiler, a spring loaded relief valve controlling the escape of steam from said chamber, and a trigger valve exposed to the pressure from a generator and connected to the relief valve so that the trigger and relief valve move simultaneously in opening or closing, controlled by the pressure in the generator, substantially as shown as described.

2. The combination of the case, having downwardly extending branch to connect to the generator or boiler, and the laterally extending branch leading to the open air or to a waste pipe, an enlarged chamber having at its lower end a seat for the main valve, the main valve seated in said chamber, having a downwardly extended tubular neck, and a steam chamber within said main valve in communication with the generator through said tubular neck, the spring loaded relief valve above the main valve, the trigger or controlling valve below the main valve, the stems of the controlling and relief valves being connected together and passing through the main valve, the stem of the relief valve passing through the top of the case, a follower fitted to slide on the stem of the relief valve within the case, and a regulating tubular screw tapped through the head of the case and bearing upon the follower to regulate the tension of the spring by which the relief valve is held to its seat, substantially as shown and described.

3. The combination, substantially as hereinbefore set forth, of the valve case, having an enlarged chamber for the main valve, the cap, A′, covering said chamber, having a downwardly extending branch, a^2, and a reduced tubular extension, a^3, the branch, a^2, having within it a seat for the relief valve, the chambered main valve fitted at its upper end to slide over the part, a^2, and having a tubular neck through which the part, a^3, passes, leaving a steam space between the two leading to the chamber of the main valve, the tubular neck, A^2, of the case fitted into the cap, the valve case, B, secured to the lower end of the extension, a^3, the controlling valve, b, within said case and having its stem extending through the reduced part, a^3, the relief valve, C, having its stem fitted into the stem of the controlling valve, the follower, c, fitted to slide upon the stem of the relief valve, a spring compressed between said follower and relief valve, and a tubular screw, f', tapped through the head of the case to adjust the follower, c, and regulate the tension of the spring upon the relief valve.

4. The combination, as hereinbefore set forth, of the case, the main valve having in-

terior steam chamber communicating with the generator or boiler, a spring loaded relief valve controlling the escape of steam from said chamber, a trigger valve exposed to pressure of steam from the generator and coupled to move with the relief valve, a sliding shell housing the main and relief valves and bearing upon the main valve, and a spring bearing upon said shell to assist the steam pressure in the chamber to hold the main valve to its seat.

FRANK SCHREIDT.

Witnesses:
NELLIE MCCLELLAND,
I. S. DONNELL.