E. F. MILLER.

SAFETY VALVE.

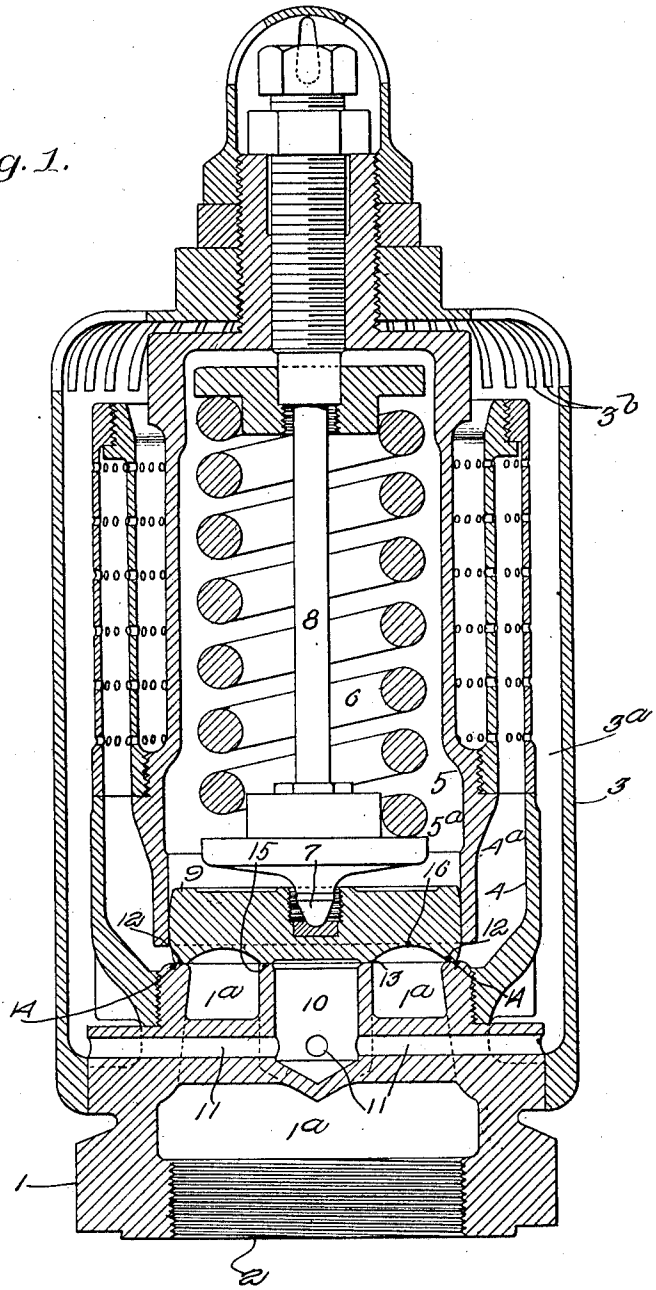
APPLICATION FILED OCT. 27, 1910.

1,020,921.

Patented Mar. 19, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

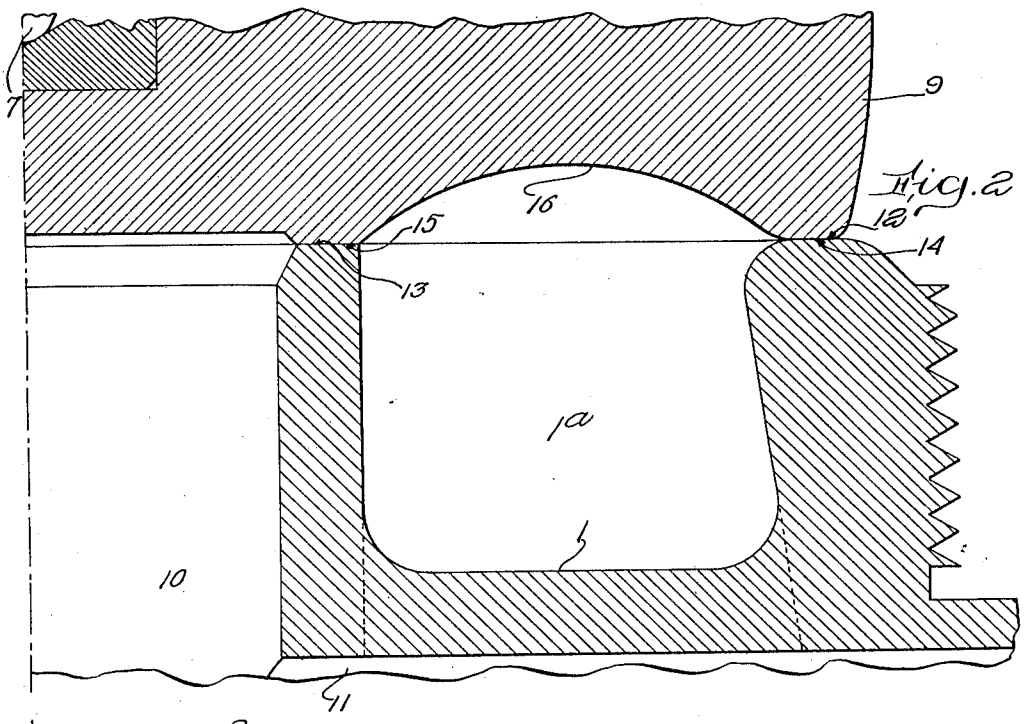

Fig. 2.

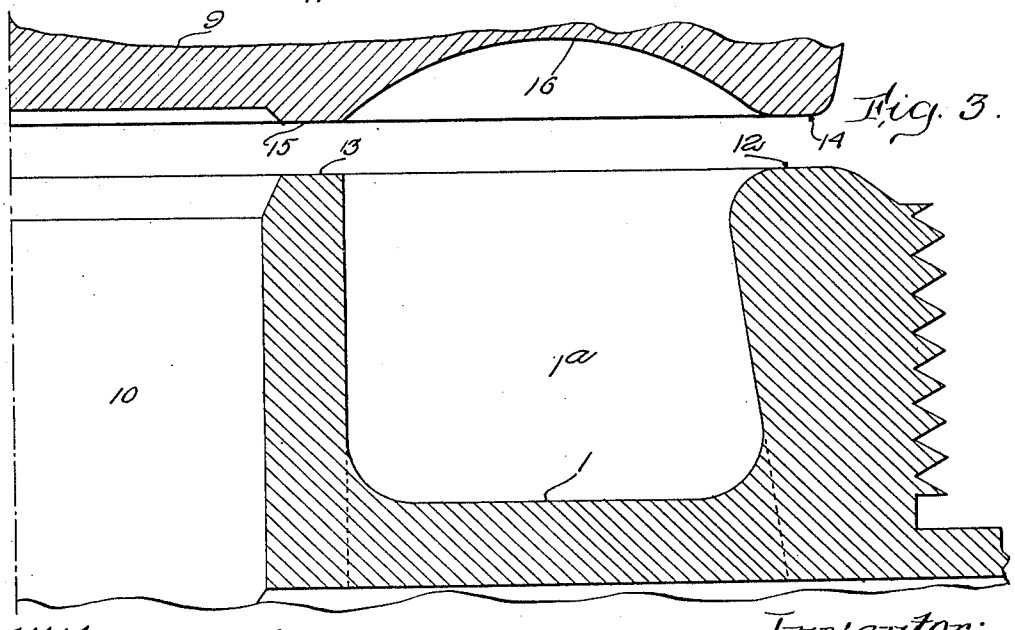

Fig. 3.

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UNITED STATES PATENT OFFICE.

EDWARD F. MILLER, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO CROSBY STEAM GAGE AND VALVE COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

SAFETY-VALVE.

1,020,921. Specification of Letters Patent. Patented Mar. 19, 1912.

Application filed October 27, 1910. Serial No. 589,424.

To all whom it may concern:

Be it known that I, EDWARD F. MILLER, a citizen of the United States, and resident of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Safety-Valves, of which the following is a specification.

This invention relates to safety valves for discharging air, gas, steam or other vapor, liquids, or fluids, and its object is to provide means for securing the free escape of the fluid on opening the valve and thereby increase the efficiency of the valve, which object is accomplished by providing the valve proper, hereinafter called the disk, and its seat, or seats, with curvilinear walls, or approaches, as about to be described.

It is illustrated by the accompanying drawings in which—

Figure 1 is a vertical central section, partly in elevation, of a well known type of muffled safety valve. Fig. 2 is an enlarged detailed view of the lower portion of Fig. 1 showing the disk seated. Fig. 3 is a view similar to that shown in Fig. 2 showing the disk raised from its seat.

Similar characters refer to similar parts throughout the several drawings.

The valve base 1 is threaded at 2 for attachment to a boiler or other receptacle (not shown); the main valve casing 3, inclosing the main valve chamber 3^a, is mounted on the spring casing 5 and is furnished with openings 3^b leading to the open air; the muffler casing 4, inclosing the muffler chamber 4^a, is fixed to the base 1 and opens upwardly into the main valve chamber 3^a; the spring casing 5, inclosing the spring chamber 5^a, is fixed to the muffler casing 4 and opens downwardly into the muffler chamber 4^a. Within the spring chamber is arranged the spring 6 engaging the pintle 7, which is mounted upon the vertically movable rod 8 and engages the disk 9, which disk forms a movable bottom for the spring chamber 5^a. The valve base 1 is practically a pipe partially inclosing a space or chamber 1^a and arranged therein is a chamber 10 open at its upper end and furnished with passages 11 leading therefrom to the main valve chamber 3^a. The annular upper surface 12 of the valve base 1 and the annular upper surface 13 of the chamber 10 form valve seats for the disk 9, which is furnished with corresponding seats 14 and 15 and which is normally seated, being held on its seats by spring 6 and being thereby prevented from rising until a predetermined pressure of steam is reached sufficient to overcome the power of the spring. The lower face of the disk between the annular seats 14 and 15 is arched or domed as shown at 16.

The operation of the valve, although familiar, may be briefly described.

When the valve is attached to a steam boiler, steam enters the space or chamber 1^a, surrounds the chamber 10 and presses against the arched outer annulus 16 of the lower face of the disk 9. When the steam pressure reaches a predetermined point, for example, 200 pounds, it raises the disk 9 thereby compressing the spring 6 and the steam escapes between the outer annular valve seats 12 and 14 into the muffler chamber 4^a and thence to the open air, and escapes also between the inner annular valve seats 13 and 15 into the chamber 10 and thence through passages 11 to the open air. When the pressure of the steam is by this action lowered to a predetermined pressure, say 196 pounds, the spring returns the disk to its seat, where it remains until again raised by the increased pressure of steam in the boiler, in the manner described. To obtain the best results, that is, to make a valve most efficient, it is necessary that, when the disk is raised from its seats, the steam should escape as freely as possible and to secure this freedom of escape is the object of the present invention.

In valves of the character described it has been customary heretofore to furnish the base chamber 1^a with a vertical wall, terminating in the annular horizontal seat 12 and forming therewith substantially a right angle; and to furnish the disk 9 with a similar, corresponding wall terminating in its annular seat 14, the result being that, when the disk is raised from its seat, the steam, flowing through this annular passage with its rectangular entrance, forms in such passage a vena contracta, thereby using but a part of the capacity of the passage, and retarding greatly the flow of steam therethrough. To overcome this difficulty I curve the walls of the base chamber 1^a and the corresponding walls of the disk 9, thereby providing for the flow of steam to the extent of the full capacity of the passage.

The increased efficiency of the valve secured by this improvement is very considerable and valuable. The best results are

obtained by inclining the interior wall of the valve base inwardly toward its axis and then giving said wall an upward smooth curve terminating at the inner edge of the seat substantially tangentially thereto and having a mean radius equal to the lift of the valve, which is the width of the maximum opening between the seat of the disk and the seat of the valve base, as determined by the capacity of the spring, usually about one tenth of an inch; and by similarly curving the lower face of the disk with reference to its seat; all as shown in the drawings. When it is desired to have the pressure beyond the throat, or smallest section of discharge between the seats, drop as rapidly as possible, the outer edge of the valve and disk may be curved to give extra area of discharge; substantially as shown.

The drawings show what is known as a double flat-seated valve in which there are two annular valve seats 12 and 13 and two corresponding annular disk seats 14 and 15, and I have shown the improvement as applied to the entrance to and exit from the passage formed by the outer annular seats 12 and 14; but it is perfectly apparent that the improvement may be applied to the inner annular seats 13 and 15 as well and that it is adaptable to any form of valve, whether the valve has one or more seats and whether it is what is known as flat-seated or has seats in other than horizontal positions.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a safety valve, a tubular base and an annular valve seat; said seat being of conventional interior diameter; the upper inner face of the wall of said base comprising a smooth curve terminating approximately at the inner edge of said seat without altering said interior diameter of the seat.

2. In a safety valve, a tubular base and an annular valve seat; said seat being of conventional interior diameter; the upper inner face of the wall of said base comprising a smooth curve terminating approximately at the inner edge of said seat and tangentially thereto without altering said interior diameter of the seat.

3. In a safety valve, a tubular base having an annular valve seat and with the upper inner face of its wall comprising a smooth curve of a mean radius substantially equal to the lift of the valve and terminating substantially at the inner edge of and tangentially to said seat; and with the upper outer face of its wall comprising a smooth curve of a mean radius not less than the lift of the valve and terminating substantially at the outer edge of and tangentially to said seat.

4. In a safety valve, a disk concaved on its under-side and having an annular seating portion thereon, such concavity terminating substantially at the inner edge of and tangentially to said seating portion with a reverse smooth curve of a mean radius substantially equal to the lift of the valve.

5. In a safety valve, a disk concaved on its under-side and having an annular seating portion thereon, such concavity terminating substantially at the inner edge of and tangentially to said seating portion with a reverse smooth curve of a mean radius substantially equal to the lift of the valve; the peripheral face of said disk having a smooth curve of a mean radius not less than the lift of said valve and terminating substantially at the outer edge of and tangentially to said seat.

6. In a safety valve, a tubular base and a disk having oppositely disposed and co-engaging annular seating portions, the upper inner face of the wall of said tubular base comprising a smooth curve of a mean radius substantially equal to the lift of the valve and terminating substantially at the inner edge of and tangentially to its seating portion; said disk being concaved on its under side, such concavity terminating substantially at the inner edge of and tangentially to the seating portion of said disk with a reverse smooth curve of a mean radius substantially equal to the lift of the valve.

7. In a safety valve, a tubular base and a disk having oppositely disposed and co-engaging annular seating portions; the upper inner face of the wall of said tubular base comprising a smooth curve of a mean radius substantially equal to the lift of the valve and terminating substantially at the inner edge of and tangentially to its seating portion; the upper outer face of the wall of said tubular base comprising a smooth curve of a mean radius not less than the lift of the valve and terminating substantially at the outer edge of and tangentially to its seating portion; said disk being concaved on its under side, such concavity terminating substantially at the inner edge of and tangentially to the seating portion of said disk with a reverse smooth curve of a mean radius substantially equal to the lift of the valve; the peripheral face of said disk having a smooth curve of a mean radius not less than the lift of the valve and terminating substantially at the outer edge of and tangentially to its seating portion; substantially as and for the purpose set forth.

In testimony whereof I have affixed my signature, in presence of two witnesses.

EDWARD F. MILLER.

Witnesses:

RALPH W. FOSTER,

FRANCIS H. BLACKWELL.

Correction in Letters Patent No. 1,020,921.

It is hereby certified that in Letters Patent No. 1,020,921, granted March 19, 1912, upon the application of Edward F. Miller, of Newton, Massachusetts, for an improvement in "Safety-Valves," an error appears in the printed specification requiring correction as follows: Page 2, after line 33, insert the following paragraph:

Safety valves of the character described have a tubular base furnished with an annular valve seat of conventional interior diameter and are designated in the trade as of a certain size corresponding to the size of such diameter; the conventional interior diameter of the seat being the diameter of the tubular base measured at the inner edge of the seat; for instance, what is known in the trade as a 3″ valve is a valve having a seat of the conventional interior diameter of 3″, which is the diameter of the tubular base measured at the inner edge of the seat; while what is known in the trade as a 4″ valve is a valve having a seat of the conventional interior diameter of 4″, which is the diameter of the tubular base measured as just described, etc.;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of April, A. D., 1912.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.