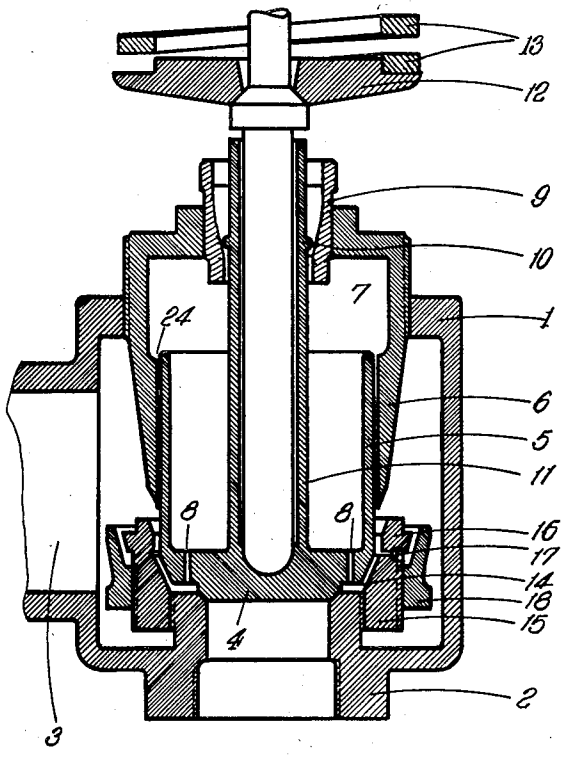
Sept. 4, 1934. G. ACKERMANN 1,972,435

SAFETY VALVE

Original Filed Oct. 30, 1930




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Patented Sept. 4, 1934 1,972,435

# UNITED STATES PATENT OFFICE

1,972,435

## SAFETY VALVE

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Original application October 30, 1930, Serial No. 492,320. Divided and this application September 28, 1931, Serial No. 565,632. In Great Britain September 16, 1930

1 Claim. (Cl. 137—53)

This invention relates to safety valves for steam boilers and other pressure medium containers of the kind in which a back pressure chamber in the valve casing is on the opening of the valve filled with the pressure medium, which in the closing movement of the valve aids the closing force of the spring or other closing means, and it relates particularly to safety valves in which the opening movement takes place in successive stages, the valves being so arranged that on the maximum pressure permissible for the boiler being exceeded they open to a definite height, and when in spite of the raised safety valve the boiler pressure still increases, they open still further, that is, open a larger outlet area.

An object of the invention is to provide a valve of this kind in which there is a continuously open outlet and a throttling device co-operating with the said outlet and controlled by the valve to damp or check the movement of the valve. The throttling of the outlet is increased on the closing stroke so that the increasing pressure in the chamber overcomes with certainty the resistance to the closing stroke which is caused by the steam cushion forming under the lower surface of the valve, the two influences, viz: the steam cushion and the pressure in the chamber here maintaining practically an equilibrium, so that a forcible application of the valve on its seat cannot take place. Other objects and advantages of the invention will be understood from the following description read in conjunction with the accompanying drawing, which illustrates in central vertical section a safety valve exemplifying the invention.

The valve casing 1 is connected by the socket 2 with the steam boiler or other pressure medium container, 3 indicating the outlet leading to the atmosphere. The valve body 4 has a bell-shaped guide projection 5 which extends into a sleeve 6 of the valve casing. Between the guide projection 5 and the sleeve 6 a narrow gap 24 may be provided which is adapted to serve both as an inlet and an outlet of the back pressure chamber 7. Narrow bores 8 also serve as inlets to this chamber 7. The sleeve 9 forms the outlet, and has a conical bore widening upwardly, in which bore the valve spindle 11 has an enlargement 10. 12 indicates a spring plate, and 13 the valve spring. The valve has an annular supplementary under surface 14, under which a steam cushion forms when the valve rises. The ring 15 is provided with an upward extension 16.

When the permissible maximum pressure in the boiler is exceeded, the valve 4 lifts, then steam flows through the holes 8, or through the gap 24, or through both into the back pressure chamber 7. When the valve 4 has reached a level corresponding with a certain definite pressure, if the pressure continues to rise, then in consequence of the shape of the inner outline of the extension 16, no widening of the outflow area takes place, and the valve must therefore lift further until its inclined lower surface rises into a position opposite the widened outlet part at the top of the ring 16, when the outlet area is larger, and thus a graduated opening of the valve is obtained. In order to be able to vary at will the difference of pressure which is necessary for the further movement of the valve from the first to the second raised position as above mentioned, auxiliary outlet holes 17 may be made in the extension 16, which holes 17 may be more or less throttled by means of upward adjustment of the ring 18, which is screw threaded on the ring 15.

When the boiler pressure has fallen so far that the expansive force of the spring 13, combined with the pressure in the chamber 7, can force back the valve 4 onto its seat, the outlet from the chamber 7 through the sleeve 9 is throttled more and more by the downward movement of the enlargment 10 on the valve spindle 11, the pressure in the chamber 7 rises, and combines with the decreasing action of the spring 13 to effect the overcoming of the back pressure of the steam cushion acting from underneath on the surface 14, so that the valve is closed without a heavy shock, in spite of the increased pressure in the chamber 7.

This application is a division of application, Serial No. 492,320, filed October 30, 1930, which has since matured into Patent No. 1,952,646.

What I claim and desire to secure by Letters Patent of the United States is:—

In a safety valve apparatus, a casing comprising a valve seat and an exhaust port, a movable valve body, means tending to press said body on said seat, said casing and body conjointly forming a back pressure chamber of variable capacity, means to admit the pressure medium to said chamber, an outlet sleeve on said casing to provide communication between said chamber and the atmosphere, said sleeve having a tapered opening widening outwardly and provided at the inwardly reduced end thereof with a cylindrical extension, and a stem movable with said valve body and provided with an annular throttling enlargement intermediate its ends, said enlargement being positioned within and adjacent the inner reduced end of the sleeve and spaced from the said sleeve to provide a passage around the enlargement when the valve is seated and movable toward the outer end of the sleeve when the valve is unseated to increase the passage progressively with the entire opening stroke of said valve body.

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