

No. 871,775.

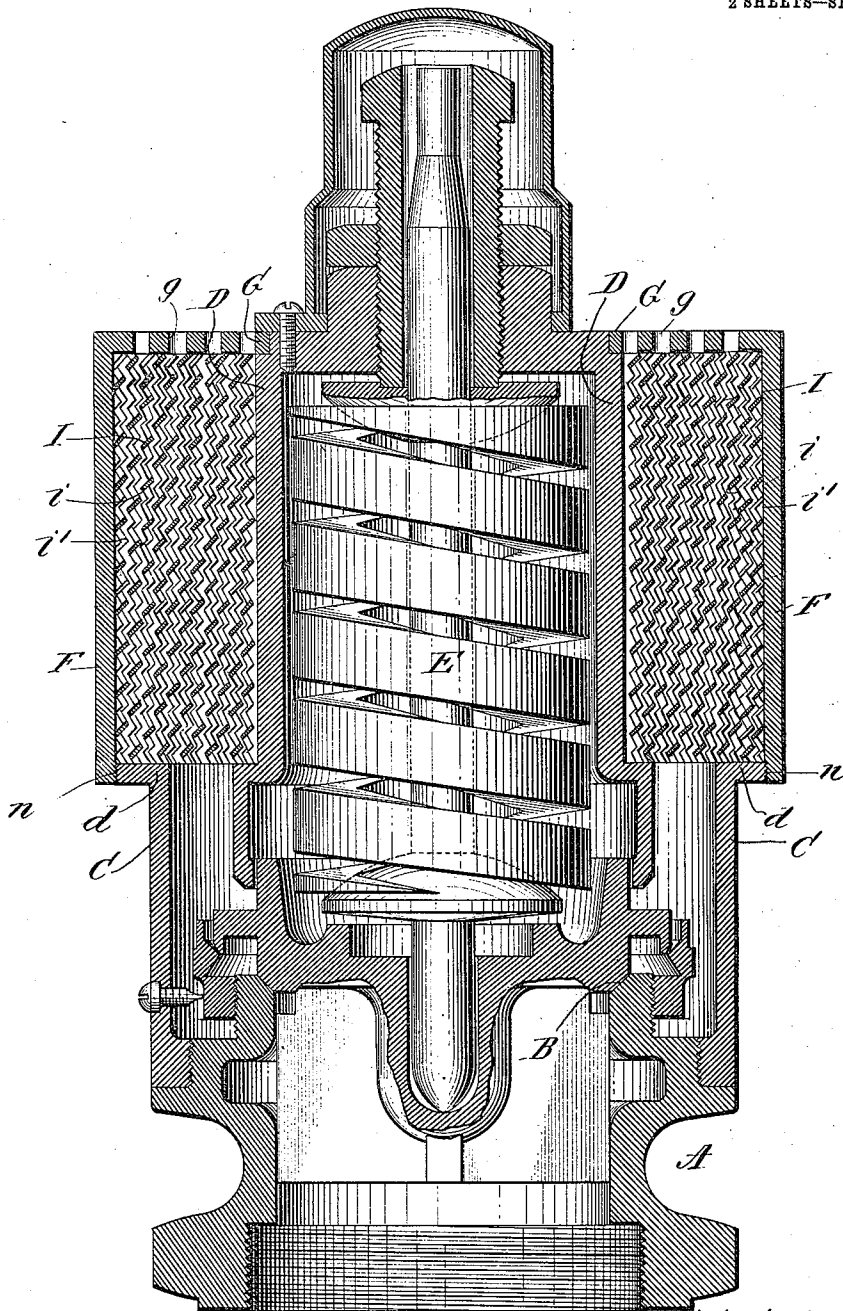
PATENTED NOV. 26, 1907.

F. C. BLANCHARD & E. B. CROCKER.

MUFFLER.

APPLICATION FILED JULY 22, 1907.

2 SHEETS—SHEET 1.



WITNESSES=

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Josephine H. Ryan

INVENTORS=
FIG. 1. *Frederick C. Blanchard*
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2 SHEETS—SHEET 2.

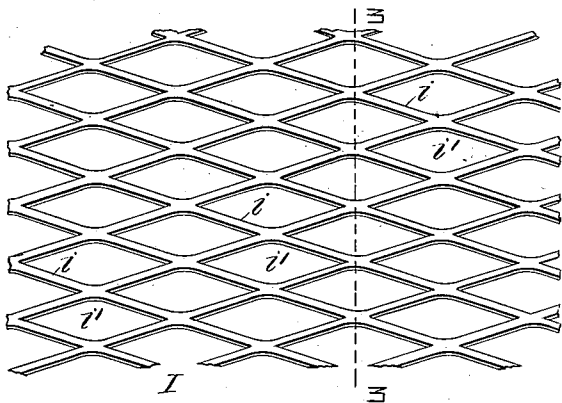


Fig. 2.



Fig. 3.

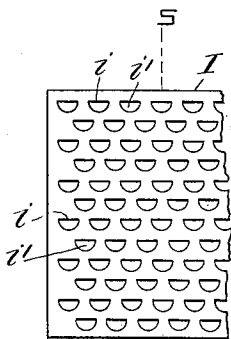


Fig. 4.

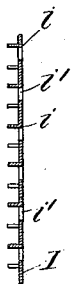


Fig. 5.

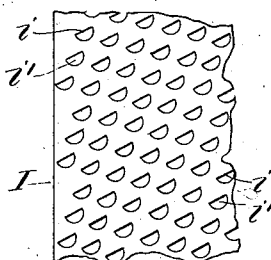


Fig. 6.

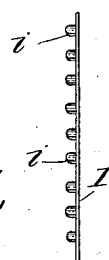


Fig. 7.

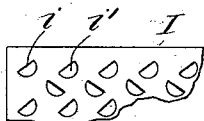


Fig. 8.

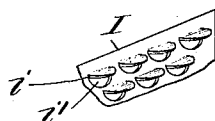


Fig. 9.

WITNESSES:

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UNITED STATES PATENT OFFICE.

FREDERICK C. BLANCHARD AND ERNEST B. CROCKER, OF BRIDGEPORT, CONNECTICUT,
ASSIGNORS TO THE CONSOLIDATED SAFETY VALVE COMPANY, A CORPORATION OF
CONNECTICUT.

MUFFLER.

No. 871,775.

Specification of Letters Patent.

Patented Nov. 26, 1907.

Application filed July 22, 1907. Serial No. 384,898.

To all whom it may concern:

Be it known that we, FREDERICK C. BLANCHARD and ERNEST B. CROCKER, citizens of the United States, and residents of Bridgeport, in the county of Fairfield and State of Connecticut, have invented new and useful Improvements in Mufflers, of which the following is a specification.

My invention relates to the construction of mufflers such as are employed to deaden the noise of exhausting steam or other gases, and consists in improvements in the muffling devices, whereby the efficiency of mufflers is improved and their effective operation facilitated.

In particular, I have contrived my improved muffler for steam-escape and safety valves, though my improvements are adapted to other situations and may be used for muffling purposes wherever it is desired to suppress the noise of escaping gases.

I am aware that safety valve and other mufflers have been designed and manufactured, wherein several contrivances for breaking up, baffling, and distributing the steam of escaping gas have been suggested or employed. Baffle plates, inclosed in a shell or drum through which the gases pass to the atmosphere, are an old device, and transverse baffle plates have been employed in which a multitude of perforations performed the muffling function. I am informed also, that mufflers using rolls or cylinders of woven wire fabric, others using a mass of metal chips or lathe turnings, others using a mass of small fragments of stone, glass or other solid material, and still others using coiled springs, spirally coiled in the muffler drum, have been suggested or used, and I am personally familiar with some of the practices mentioned. While any or all of these muffling devices serve in some measure to perform the essential function of breaking up and baffling the stream of escaping steam or other gas, they do not, so far as I am aware, serve the purpose as well as is desirable. The irregularities of coiled wire springs, or woven wire fabric, are not sufficiently pronounced to obtain the best effect, and mufflers composed of masses of fragments are liable to become matted and practically impervious in some portions, leaving other portions much too free and unob-

structed to perform the muffling function properly, as they leave the steam or other gases free to follow a course of least resistance, which is precisely what a muffler should not do. On the other hand should a muffler be too closely restricted in its subdivided passages, it will restrict the escape of gases unduly, and possibly interfere, by creating back pressure, with the proper operation of the instrument as a whole. I have observed, in experiments with broken-fragment mufflers, that the fragments where-with the muffler shell is filled become chipped and comminuted by the agitation produced by a blast of gas, and deliver quantities of dust and grit, produced by the breaking up of the fragments in the muffler shell. Thus, little by little the muffler so constructed becomes deteriorated and more and more inefficient.

I have determined by experiment and trials, that essentially the best instrument for retarding and breaking up a stream of gas, is a flat plate, since the effect of a plate on the impinging stream is to "explode" it, so to speak, by spattering it in all directions.

I have further determined that if a large number of small separated baffle plates are opposed to the passage of the stream of steam or other escaping gas, so that the gas must inevitably impinge repeatedly against the surfaces of these plates and be obliged to find its way over the edges thereof the effect is still further improved. I believe that this improvement in the muffling effect in case a multitude of small thin baffle plates is employed is due to the fact that not only is the stream of gas scattered by impinging upon the surfaces of the plates, but also to the fact that in passing over the edges of the plates to the farthest sides thereof it is broken up into eddies, so that at each plate further expansion of the gas has to begin from a starting point.

In the drawings hereto annexed, which illustrate an embodiment of my invention, as applied to the safety valve of a steam boiler. Figure 1, is a vertical cross-section of a safety valve muffler; Fig. 2, is a detail in elevation, showing the form of muffling device which I employ by preference; Fig. 3, is a side view of the detail shown in Fig. 2; Figs. 4, 5 and 8 are elevations showing the details;

Figs. 6 and 7 are side views, and Fig. 9, a perspective of modified forms of muffling devices.

In Fig. 1, A represents a safety valve casing in which the valve B is seated, the valve being held to its seat in the usual manner by the spring E. The upper part D is mounted in the usual way on the upper portion of the valve casing from which the segmental passages C lead and are inlets to the muffler space. The muffler space is inclosed between the outer shell F and the inner cylindrical portion of the top casting D this shell F being provided with an upper inturned flange G, which is filled with perforations *g*; the shell is seated at the top of the casting D, and at the bottom of the outer edge of the flange or rim *d* whereto the shell is secured into place, as at *n*.

My improved muffling contrivance is shown at I, in Fig. 1, and is contained within the muffler space between the top casting D and shell F.

While I have shown in Figs. 1, 2 and 3 the form of muffling device which I have selected by preference, the principle of construction is perhaps better illustrated by Figs. 4 to 9 inclusive, which show alternate modes of constructing my improved muffling device. In Fig. 4, for instance, there is shown a fragment of a thin metal sheet in which semi-circular holes *i'* are cut, leaving the material uncut along the diameter of each of the holes so that fins or shelves *i* are formed standing out at an angle from the sheet I. This angle may be a right angle or any other angle desired; I prefer to turn the said shelves out at substantially right angles for the reason that I believe the muffling effect is best attained in this manner. In Figs. 4 and 5 the shelves *i* are shown as lying in planes parallel to the upper edge of the sheet I, but if desired the shelves *i* may be formed so that they stand not only at an angle to the general surface of the sheet but are also slightly inclined in relation to the upper edge, as shown in Fig. 6 or as shown in Fig. 8, the shelves *i* may some of them be inclined in one direction and others in the opposite direction. I prefer the last mentioned construction and, as shown in Fig. 9, prefer to stagger the holes *i'*; and to make the inclination of the shelves *i* alternate from row to row horizontally. In no case, however, do I consider it advisable to incline the shelves much more than 30 degrees from the upper edge of the sheet.

I take a sheet I of such height as to extend from top to bottom of the space within the muffler shell and of such length that when the plate is rolled into a helix so that the shelves of each turn touch the back of the plate at the next turn or convolution, the entire helix will substantially fill the muffler space. In punching the holes *i'* and forming

the shelves *i* it is desirable to make as many perforations and shelves as the material of the sheet I will accommodate, because the larger the number of shelves the more effectively will the muffling function be performed and the larger the number of perforations the more freely will the stream of gas pass through the entire muffler.

In Figs. 2 and 3 I have shown in plan and edge view, respectively, a fragment of so-called expanded metal, which by virtue of its peculiar construction brings the aggregate aperture surface to a maximum, and likewise presents the largest possible number of laterally projecting fins or shelves. By preference, therefore, and for convenience in manufacture I select for my muffling device a helically rolled sheet of expanded metal and have shown such a sheet at I in Fig. 1. The expanded metal provides by its mesh the requisite large number of baffling shelves which stand out at an angle closely approaching a right angle from the sheet as a whole and which affords also the largest possible measure of apertures through the sheet.

Steam or other escaping gases passing from the inlet of the muffler shell, as at C in Fig. 1, to the outlet, thereof as provided by the perforations *g*, which scatter the gas stream in every direction and which by reason of their thin sharp edges and flat upper surfaces also break the gas up into a multitude of eddies and by this mode of operation effectively deaden the noise which otherwise would be made by the escaping gas. The stream of steam or other gas is as a whole subjected to so little interruption by this muffling device that no appreciable back pressure is created thereby.

Mechanically considered the muffling device shown and described has also this advantage that while abundantly perforated it is nevertheless a rigid and continuous sheet which resists any tendency to alteration in the size or distribution of the apertures.

What I claim and desire to secure by Letters Patent is:

1. In a muffler, a shell provided with an inlet and an outlet and a muffling element, inclosed in and substantially filling the shell, consisting of layers of apertured sheet metal laid parallel to the course of gases passing from the inlet to the outlet and formed with shelves standing out at an angle from the layers of sheet metal.

2. In a muffler, a shell provided with an inlet and an outlet and a muffling element, inclosed in and substantially filling the shell, consisting of layers of apertured sheet metal laid parallel to the course of gases passing from the inlet to the outlet and formed with shelves standing out at an angle from the sheet metal layers, the shelves also inclined to the axis of the shell.

3. In a muffler, a shell provided with an

inlet and an outlet and a muffling element, inclosed in and substantially filling the shell, and consisting of a helically coiled apertured metal sheet formed with shelves standing out at an angle from the sheet, the axis of the coil substantially parallel to the course of the gases passing from the inlet to the outlet.

4. In a muffler, a shell provided with an inlet and an outlet and a muffling element, inclosed in and substantially filling the shell, and consisting of a helically coiled apertured metal sheet formed with shelves standing out at an angle from the sheet, the axis of the coil substantially parallel to the course of gases passing from the inlet to the outlet, the said shelves also inclined to the axis of the coil.

5. In a muffler, a shell provided with an inlet and an outlet and a muffling element, inclosed in and substantially filling the shell, consisting of layers of apertured sheet metal laid parallel and formed with shelves standing out an angle from the sheet metal layers.

6. In a muffler, a shell provided with an inlet and an outlet and a muffling element,

inclosed in and substantially filling the shell, consisting of layers of apertured sheet metal laid parallel and formed with shelves standing out at angle from the sheet metal layers, the said shelves also inclined to the axis of the shell.

7. In a muffler, a shell provided with an inlet and an outlet and a muffling element inclosed in and substantially filling the shell, consisting of parallel layers of expanded metal.

8. In a muffler, a shell provided with an inlet and an outlet, a muffling element inclosed in and substantially filling the shell consisting of a helical coil of expanded metal, the axis of the coil parallel to the course of gases from the inlet to the outlet of the shell.

Signed by us at Bridgeport, Fairfield county, Connecticut, this 12th day of July 1907.

FREDERICK C. BLANCHARD.
ERNEST B. CROCKER.

Witnesses:

W. R. CLARKE,
WM. R. STROUD.