H. G. ASHTON.

Safety-Valve Attachment to Utilize the Escape Steam.

No. 197,073. Patented Nov. 13, 1877.

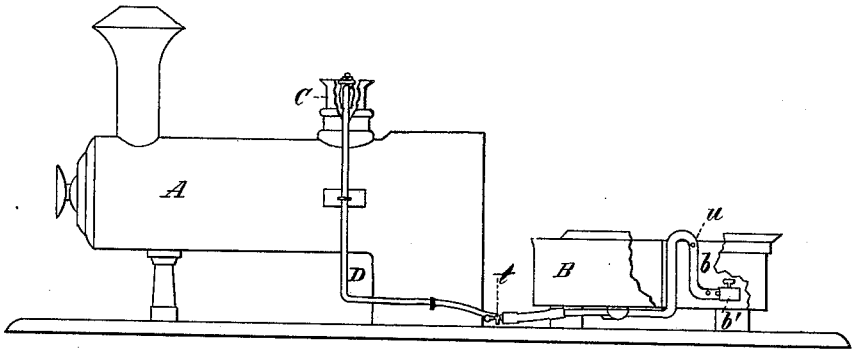

Fig.1.

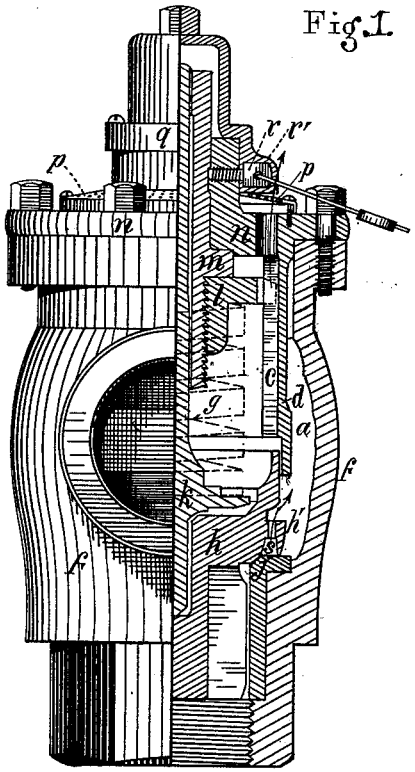

Fig.2.

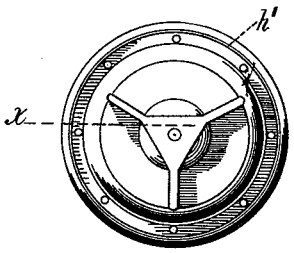

Fig.3.

George O. G. Coale
E. H. Slade.

Henry G. Ashton
by J. E. Maynadier
his atty.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY G. ASHTON, OF SOMERVILLE, MASSACHUSETTS.

IMPROVEMENT IN SAFETY-VALVE ATTACHMENTS TO UTILIZE THE ESCAPE STEAM.

Specification forming part of Letters Patent No. **197,073**, dated November 13, 1877; application filed September 27, 1877.

To all whom it may concern:

Be it known that I, HENRY G. ASHTON, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Apparatus for Utilizing the Escape Steam from Safety-Valves, of which the following is a full, clear, concise, and exact description, taken in connection with the accompanying drawings, making a part hereof.

The main object of my present invention is to get rid of the back pressure on the valve, due to the confining of the steam in the pipe which leads to the feed-water in the tender or tank, and in the chamber from which it leads, and also to keep this pipe free from water.

In the drawings, A represents a locomotive-boiler; B, its tender; C, a safety-valve, and D the pipe through which the escape steam from the safety-valve passes into the feed-water in the tender. Figures 2 and 3 show the details of construction of the safety-valve C, which will form the subject-matter of another application, and is here shown because it is the best form known to me for practicing my present invention.

In my improved apparatus this pipe D opens into a chamber, *a*, at one end, and into the feed-water tank *b* at the other end; and the chamber *a* is separated from the chamber *c* by the cylinder *d*, so that the steam which escapes past the valve is confined mainly to the chamber *a*, and issues from that chamber through the pipe D into the feed-water tank.

It is obvious that if steam at, say, one hundred and twenty pounds pressure to the square inch, escaped past the valve it would fill the whole of the casing *f*, if it were not for the partition-cylinder *d*, which separates the interior of this casing into two chambers, *a* and *c*, and that its pressure in the single chamber would tend to aid the spring *g* in closing the valve.

This pressure (called above "back pressure") is always objectionable, and sufficient, unless counteracted in some way, to make the apparatus practically inoperative.

After having spent much time and money in perfecting means to counteract this back pressure, it occurred to me that the better way would be to connect the pipe D at its forward end with a chamber which was partitioned off from the chamber in which the valve rises, and thereby relieve the valve from this back pressure.

In carrying out this part of my invention, I partition the casing *f* into two chambers, one of which, *c*, is open to the air, and in which the upper part of the valve fits, but not closely enough to retard its upward movement materially; and into the other, *a*, the forward end of the pipe D opens, the other end of which opens into the feed-water tank.

The valve is marked *h*, and its bushing or seat *j*. Its spindle *k* supports one end of the spring *g*, the other end of which is pressed upon by the nut *l*, which is controlled by the screw *m*, a shoulder on which bears against the under side of the cover *n*. The load of the valve is increased by turning the screw *m*, and thereby forcing the nut *l* nearer to the valve, and shortening the spring *g*. The stress of this spring is exerted upon the valve through the spindle *k*.

The cover *n* is firmly secured to the casing *f*, and it is preferred to form the cylinder *d* in one piece with the cover *f*, so that when the cover is put in place the cylinder *d* will be in the right relation to the valve.

Besides the central hole in the cover *n* (through which the upper part of the screw *m* passes) I provide other holes, in order to give a free outlet to the air in the chamber *c*, and to such steam as passes into that chamber while the valve is rising.

In order to prevent cinders and dirt from getting through these holes I use the perforated cover *p*. I prefer to make the lower end of cylinder *d* a little larger in diameter than the rest of it, as shown, in order to form a shoulder or cap.

Another feature of my invention relates to the use of small apertures in the pipe D, one of them, *t*, at the lowest point of the pipe, and the other, *u*, above and nearer the surface of the water. The purpose of these apertures is to keep the pipe D free from water. When used together, the aperture *t* may be very small—so small that the quantity of steam which escapes through it is practically nothing.

When the steam in the pipe D condenses, the water of condensation collects, of course,

at the lowest part of the pipe, and escapes through the aperture *t*. The condensing of the steam also causes a partial vacuum in the pipe D, and the air rushes from chamber C between valve *h* and cylinder *d* into chamber *a* and into the upper part of pipe D; but inasmuch as the water in the tender is often only a few inches below the bend of pipe D, the partial vacuum in pipe D will frequently be great enough to cause the water in the tender to flow over this bend before air enough can enter the pipe D through the channel above described, and it is for this reason that I use the aperture *u*, which can be made large enough—say one-eighth of an inch in diameter—to supply all the air required.

Another feature of my invention relates to the distributer used in the tender. The pressure in the chamber *a* depends upon the pressure in the boiler, the volume of steam which escapes from the boiler, the area of the pipe D, the number of elbows in that pipe, the area of the outlets from that pipe, and also the depth of the water in the tender; but this last is of so little consequence that it may be disregarded.

If no distributer be used—that is, if the end of the pipe D be open—the steam will make a loud rumbling noise in the tender, which is so loud as to be very objectionable. This is the case whenever the end of the pipe is open, whether there be holes in the pipe or not.

This part of my invention consists in the combination, with the safety-valve and the pipe D, of a pipe closed at its outer end and perforated with numerous small holes, the total area of these holes being sufficient to allow the proper escape of the steam. I commonly make these holes sixty in number, each about three-eighths of an inch in diameter. Their number depends upon their size, the size of the pipe D, and the volume and pressure of the steam which escapes from the valve.

For convenience, and because of the difficulty of properly determining the number of these holes of given size without a test, I prefer to make a greater number than can be required, and to use a sleeve or cap, *b'*, by which enough of them can be covered for the proper adjustment.

What I claim as my invention is—

1. The combination, with a safety-valve having a chamber, *a*, partitioned off, as described, from the top of the valve, so that the outer surface of the valve is exposed to atmospheric pressure, and with the feed-water tank of the pipe D, one end of the pipe opening into the chamber *a*, and the other into the feed-water tank, all substantially as described.

2. In combination with the safety-valve and the feed-water tank, the pipe D, having an orifice, *u*, in it near the surface of the water in the feed-water tank, as shown.

3. In combination with the safety-valve and the feed-water tank, the pipe D, having an orifice, *t*, in it at the lowest part of it, as shown.

4. In combination with the feed-water tank and the safety-valve, having an opening in it through which the air can enter the steam-chamber *a*, the pipe D, having the two orifices *t* and *u*, one at the lowest part of the pipe and the other near the surface of the valve in the tank, whereby, when its steam in the chamber *a* and pipe D condenses, the air can enter the pipe D through the orifice *u* in one direction, and through the chamber *a* in the other direction, without preventing the water of condensation escaping from orifice *t*, all as shown.

5. In combination with the feed-water tank and the safety-valve, the pipe D, closed at its rear end and provided with a series of small holes, as set forth.

HENRY G. ASHTON.

Witnesses:
J. E. MAYNADIER,
GEORGE O. G. COALE.