Feb. 25, 1930. C. G. HAWLEY 1,748,067

ENTRAINMENT DISCHARGE VALVE FOR STEAM DRIERS

Filed Dec. 1, 1927

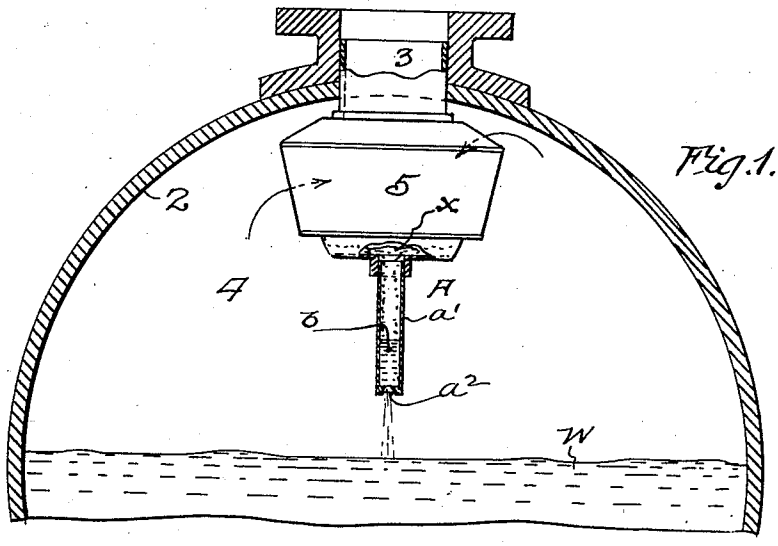

Fig. 1.

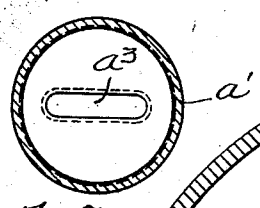

Fig. 7.

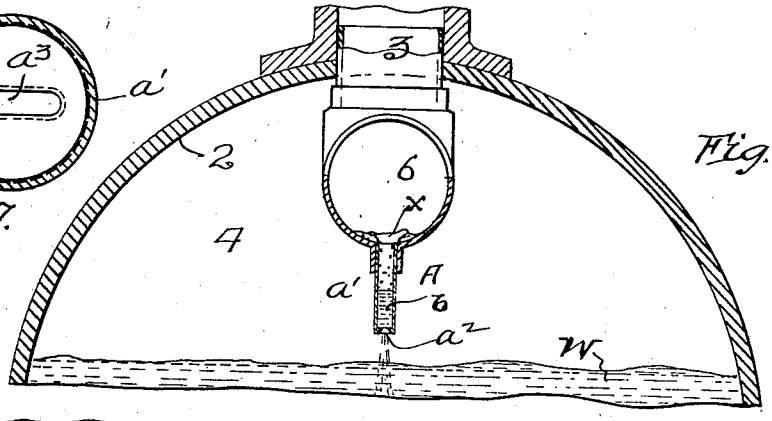

Fig. 2.

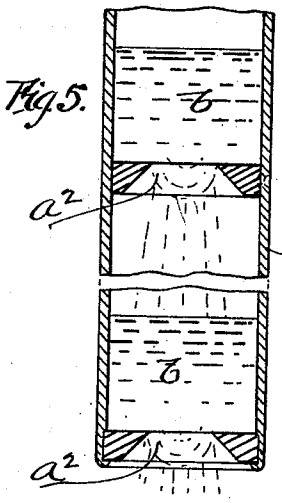

Fig. 5.

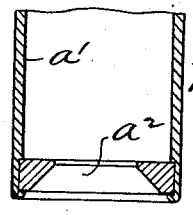

Fig. 4.

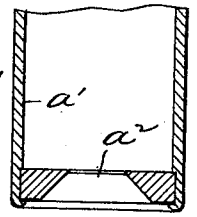

Fig. 3.

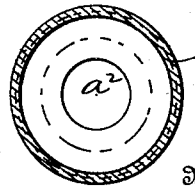

Fig. 6.

Inventor

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1,748,067

UNITED STATES PATENT OFFICE

CHARLES GILBERT HAWLEY, OF CHICAGO, ILLINOIS, ASSIGNOR TO CENTRIFIX CORPORATION, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

ENTRAINMENT DISCHARGE VALVE FOR STEAM DRIERS

Application filed December 1, 1927. Serial No. 236,968.

This invention relates to improvements in dry pipes, separators or purifiers employed at the nozzles of steam boilers and the like for intercepting the moisture which otherwise, except for the presence of such a device, would be entrained by the steam and discharged therewith through the nozzle. In some cases it is permissible to get rid of the separated moisture by discharging it through a pipe leading to a trap outside the boiler, but in many cases it is desirable to return the separated moisture directly into the boiler, to the end that both the liquid and its content of heat shall be saved. The object of the present invention is to provide simple and efficient means to that end and which shall be adapted to return the separated liquid not only into the interior of the pressure vessel but actually into the steam space, that is into the space above the liquid level in the boiler; the better to insure immunity from the incrusting effects of the boiler water.

The invention is of simple character and of easily demonstrated value and will at once be understood on reference to the accompanying drawings and the following detailed description.

In said drawings: Fig. 1 depicts a steam and water drum having at its nozzle or steam outlet a steam purifier or drier which is equipped with a discharge trap or valve embodying this invention; Fig. 2 shows its application to an ordinary "dry pipe" form of purifier; Figs. 3, 4 and 5 are vertical sections showing different details and modifications of the discharge valve proper; and Figs. 6 and 7 are transverse sections showing two different forms of the valve orifice.

The part 2 represents a pressure vessel in which a liquid is evaporated and 3 represents the vapor outlet or nozzle thereof. A steam boiler presents a common example and will be used in explaining this invention. At the nozzle, that is hanging in the top of the steam space 4, is a purifier or drier of any sort, represented by the device 5 of Fig. 1 or by the device 6 of Fig. 2. Any drier serves to throw down and collect a considerable quantity of steam entrained moisture and, lest the drier fill up, this moisture must be got rid of. As stated it is desirable to save this collected moisture and that function is performed by a valve device A which hangs from the drier, forming the discharge conduit for the moisture.

The device A comprises a vertical tube a', at the top, opening fully into the moisture collecting trough or pocket x of the drier and at the bottom partially closed, there containing a smaller hole a^2. The latter is usually central and round, as in Fig. 6, but may be of any other shape as suggested at a^3 in Fig. 7. The tube is short, so that its lower end is considerably above the water, W, in the boiler 2.

Any drier somewhat opposes the passage of the steam and hence the pressure therein is considerably less than it is in the steam space 4. The tube a' as stated is short but nevertheless, when used with any reasonably operating drier, is long enough to contain a liquid column, b, of sufficient weight to compensate for the difference in the pressure inside and outside of the drier. Thereby the steam is prevented from rushing upward through the tube. However in order that this shall be fully understood it must be explained that the hole a^2 (or a^3) is of drop size or width and hence always occupied by a drop of water. Obviously, as the water flows into the top of the tube a' and tends to build the column to a greater than compensating height the drop will be displaced and a stream of water will fall from the device, and will continue to run as long as the supply continues at the top of the tube a'. Thus the drier is effectively emptied. Furthermore the retention of water at the foot of the tube is so brief and the agitation at that point so great that the tube is kept clean even when the boiler water entrained is very dirty. So it has proven in practice.

The device may be made in many forms and variously adapted and its simplicity recomends it. It seems properly termed a valve although only what corresponds to a valve seat is provided thereby. The water drop forms the movable valve proper very effectively. The drop size of the bottom orifice of the device may and should be varied to

suit the viscosity of the liquid being handled; an advantage to be looked for in sugar evaporators and the like. The device constitutes a water-check valve of very general utility.

Whenever desired the liquid column may be divided into two or more shorter balancing columns, by the employment of more than one drop orifice in the tube, as represented in Fig. 5.

Having thus described my invention I claim as new and desire to secure by Letters Patent:—

1. A vapor drier comprising an avenue for the reception and passage of vapor and adapted to separate entrained moisture from the passing vapor, in combination with an entrainment discharge tube depending therefrom and adapted to contain a pressure compensating liquid column, and the bottom of said tube containing a constantly open liquid discharge hole of substantially liquid drop size.

2. An evaporating vessel and its nozzle, in combination with a vapor drier through which the vapor must pass to reach said nozzle, said drier having an entrainment space in its bottom, a discharge tube extending from said space downward to a point normally above the liquid level in said vessel, and said tube having a bottom which contains a discharge hole smaller than the tube and of substantially liquid drop size.

In testimony whereof, I have hereunto set my hand this 29th day of November, A. D. 1927.

CHARLES GILBERT HAWLEY.