

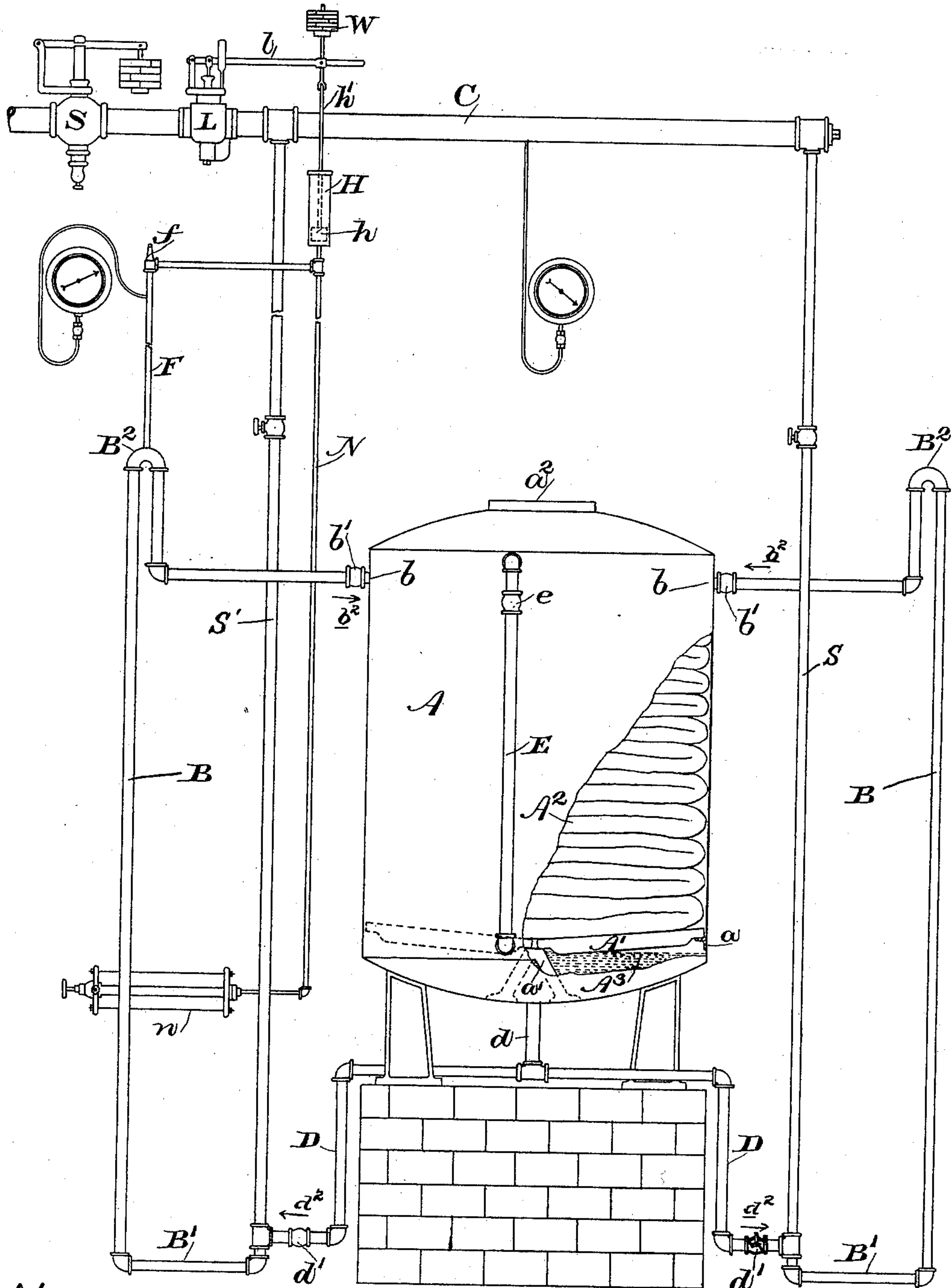
No. 612,874.

Patented Oct. 25, 1898.

C. S. SHEPARD & E. D. JEFFERSON.
VOMITING KEIR.

(No Model.)

(Application filed Apr. 14, 1897.)



WITNESSES

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UNITED STATES PATENT OFFICE.

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VOMITING-KEIR.

SPECIFICATION forming part of Letters Patent No. 612,874, dated October 25, 1898.

Application filed April 14, 1897. Serial No. 632,096. (No model.)

To all whom it may concern:

Be it known that we, CHARLES S. SHEPARD and EUGENE D. JEFFERSON, citizens of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have
5 invented certain new and useful Improvements in Vomiting-Keirs; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as
10 will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to that type of bleaching apparatus in which the bleaching liquid is intermittently discharged by steam-
15 pressure upon the material to be bleached, which is contained in a tank or keir, said apparatus being commonly known in the art as a "vomiting-keir."

The object of the present invention is to
20 insure the positive operation of the vomiting devices without the great waste of steam occurring when the keir exhausts to the atmosphere; also, to effect a saving in the amount of steam required to successfully operate the
25 apparatus by delivering the liquid in relatively small quantities at the top of the keir, and generally to improve the construction and mode of operation of apparatus of this class.

30 To the above end the present invention consists of the devices and combination of devices hereinafter more specifically described in this specification and defined in the claims.

35 A preferred embodiment of the present invention is illustrated in the accompanying drawing, which shows in side elevation and elevational section an apparatus embodying the same.

40 In the drawing, A represents the tank or keir proper, which, as shown, consists of the usual cylindrical tank, the form of which, however, may be varied without any departure from the present invention.

45 The keir A, except at the openings or ports hereinafter described, is entirely closed.

A' represents a grate of any usual and suitable construction, which may be conveniently peripherally supported by the brackets a,
50 centrally supported upon suitable frames

or braces a', which rest upon the bottom of keir A.

The keir A is filled through a suitable opening or manhole a², conveniently centrally located in the top of the keir A and closed to
55 prevent the escape of steam from the keir by means of a suitable cover. (Not shown.)

The material to be bleached rests upon the grate A', substantially as shown at A², a space being left in the keir A above the material A²
60 and below the grate A'. The space below the grate A' is filled with a bleaching liquid, substantially as shown at A³.

B represents a series of vomiting-pipes, each of which is connected with a keir A at
65 its top and bottom. In each of these vomiting-pipes there is a trap or pocket B', which is formed by extending the pipe from the bottom of the keir downward for a certain distance, so that when the liquid shall flow into
70 this pocket it will seal the same. These vomiting-pipes are connected with the bottom of the keir preferably by means of one pipe d, preferably located centrally in the bottom thereof, and several pipes D; but it is obvi-
75 ous that the vomiting-pipes might make independent connections with the lower end of the keir at any point therein below the level of the liquid. On the keir side of the trap there is connected to the vomiting-pipe a steam-
80 pipe S, fed from the steam-supply pipe C, which supplies the steam for all the vomiting-pipes. We have shown the steam-pipe S as being connected to the vomiting-pipe at a position slightly above the bottom of the trap
85 or pocket B'; but it is only important that it should be connected to the vomiting-pipe at some point on the keir side of the major portion of the trap. In other words, the lowest part of the trap should be more distant from
90 the bottom of the keir than the steam-entrance, so that when steam enters the vomiting-pipe it will move the contents of the trap away from the bottom of the keir and into the top thereof in the manner hereinafter
95 more fully described. The vomiting-pipe must also be provided with a check-valve d', located therein between the steam connection and the bottom of the keir, it being immaterial at what point in this portion of the vom-
100

iting-pipe the check-valve be placed. One of the check-valves d' is shown in section and the other is the same in construction, but opening in the opposite direction, as indicated by the arrow d^2 thereover. This check-valve may be and conveniently is of some suitable commercial form, and I have therefore in the drawing merely indicated a conventional form thereof and by the arrow d^2 thereover indicated the direction in which the liquid is permitted to pass through it.

From the trap or pocket B' the vomiting-pipe B leads upward and communicates with keir A through a suitable opening or port at b , adjacent the top of the keir A and above the material A^2 in the keir A .

In each of the pipes B is preferably provided a check-valve b' , like the check-valve d' , opening, as indicated by the arrows b^2 , toward the keir A or other suitable device arranged to prevent the passage of liquid or steam from the upper portion of the keir A into the pipe B , and thus prevent what we have herein termed a "back pressure" from the keir A to the vomiting-pipe B . The check-valve b' is located adjacent to the point of connection of pipe B with keir A and may be and conveniently is of a suitable commercial form. Each of the pipes B is preferably provided with a vertically-disposed loop B^2 , projected above the point of connection of the pipe B with the keir A , the arrangement being such that the liquid standing in the branch of the loop B^2 adjacent to the keir A will have sufficient head to insure the opening of the valve b' when the steam-pressure within the keir A has been reduced, as hereinafter described.

We have found that the check-valve b' is necessary when a series of vomiting-pipes B are used; but when only one pipe is used this check-valve is not needed.

E represents what we have herein termed an "equalizing-pipe," which communicates at its upper end with the space in keir A above the material A^2 and at its lower end with the space in the keir A below the grate A' , the function of the pipe E being to equalize the steam-pressure in the space above the material and upon the liquid in the space below the grate A' , a result which we find of great importance as insuring the successful operation of the apparatus and which cannot be positively secured where the steam is compelled to force its way through the cloth, as in the forms of keir heretofore proposed in the art.

In practice we prefer to provide in the pipe E a check-valve e , like the check-valve d' , opening downward, which prevents any backward flow of steam or liquid from the base to the top of keir A ; but we do not regard the same as essential.

The operation of that portion of the apparatus of the drawing heretofore described is as follows: Assuming that the material A^2 has been placed in the keir upon the grate A'

and suitably warmed up by means of a pipe (not shown) communicating directly with the keir or by other suitable means, and assuming that the space below the grate A' has been filled with the bleaching liquid A^3 said liquid A^3 will flow through the pipe D , opening the check-valve d' , and seek its level in the pipe B , filling the pocket or trap B' and sealing the pipe B . Steam from the pipe S is now let into the pipe B at the initial pressure and exerting such pressure upon the liquid which seals the pipe B , since said pressure is greater than the pressure within the keir A , closes the check-valve d' , forces the liquid within the pipe B up through the pipe B , and discharges it upon the material from the top of the keir, and steam continues to pass through the pipe B into the keir A until the pressure on the keir side of the check-valve d' exceeds the initial steam-pressure on the other side of the check-valve, when the check-valve will be opened and liquid will flow from the bottom of the keir into the trap or pocket of the vomiting-pipe. This condition will exist when the pressure in the keir added to the pressure on the check-valve d' due to the head of liquid above it exceeds the initial steam-pressure. In short, the check-valve is opened against the initial pressure of the steam when the keir-pressure plus the pressure due to the head of liquid above the check-valve overbalances the initial steam-pressure. The liquid flowing into the trap or pocket seals it and shuts off steam from the keir. The condensation of steam in upper portion of the vomiting-pipe B reduces the pressure therein and conduces to the flow of liquid from the bottom of the keir into said pipe, so that the amount of liquid drawn into the vomiting-pipe during each cycle of operations is greater than it would be if the vomiting-pipe B were lagged or covered with heat-non-conducting substance, and for this reason we prefer that the vomiting-pipe should be naked, although it is apparent that the apparatus will operate successfully if the condensation be entirely restricted to the keir proper, the only difference being that in the preferred construction the amount of liquid carried to the top of the keir at each vomit will be greater than in the other form suggested. The rapid condensation of the steam in the keir now reduces the pressure therein until when added to the pressure on the check-valve d' , due to the head of liquid, the total pressure on the keir side of the check-valve is less than the pressure of the steam on the other side, and the check-valve is closed by the steam and the liquid in the trap or pocket B' is carried up and discharged into the top of the keir, and the cycle of operations hereinbefore described is repeated. It should be said in this connection that the liquid within the pipe B while being discharged, as above stated, becomes sufficiently heated for the purposes required. It will be also noted that the discharge into the keir of the liquid oper-

ates to a certain extent on the principle of a spray-condenser and facilitates the condensation of the steam within the keir. It will be further noted that in our improved apparatus a comparatively small quantity of liquid is discharged into the keir by each vomiting operation, and the quantity of steam required is therefore much less than in those forms of apparatus for a similar purpose in which a high column of liquid must be raised at each vomiting operation.

While in practice we have been able to secure good results with the apparatus heretofore described, yet where the keir is to be run at a high pressure we find it desirable to provide means for positively preventing an equilibrium of pressure within the keir and vomiting-pipe which would tend to prevent the regular recurrence of the vomiting operation.

To the above end in the apparatus of the drawing we have connected the pipe B, preferably at the top of the loop B², by means of a pipe F, with a cylinder H, within which works a piston *h*, the rod *h'* of which is connected with the lever *l* of a controlling-valve L in the supply-pipe C, through which the steam passes to the pipe B. The passage of steam from the pipe B through the pipe F to the cylinder H is controlled by a valve *f*, conveniently a suitable commercial form of a pop safety-valve, which is set to open and allow the passage of steam from the pipe B through the pipe F to the cylinder H when the pressure within the pipe B is substantially equal to the initial steam-pressure.

N represents a drip-pipe which communicates with the pipe F immediately below the cylinder H, the lower end of which is conveniently provided with a suitable steam-trap *n*.

The above-described arrangement is such that when the steam-pressure within the pipe B is substantially equal to the initial steam-pressure or has risen to a predetermined pressure the valve *f* opens and allows steam to pass through the pipe F into the cylinder H and exerts a pressure on the piston *h* to raise said piston and its rod *h'*, and thereby to raise the lever *l* and close the controlling-valve L. As the pressure within the pipe B falls below the initial steam-pressure the valve *f* closes and prevents a further passage of steam into the cylinder H, and the condensation of the steam within the cylinder H allows the pressure therein to fall, and the weight W, which acts upon the lever *l*, moves said lever downward and opens the valve L, said opening occurring gradually as the condensation within the cylinder H allows the piston *h* to be depressed, the water of condensation escaping through the drip-pipe N.

The controlling-valve L is not illustrated in detail herein, as in itself it forms no part of the present invention, but may be and conveniently is of suitable commercial form.

In practice we prefer to provide a reducing-valve S, which may also be of a suitable commercial type and by means of which the pres-

sure within the pipe C, which has heretofore been referred to as the "initial" pressure, may be regulated as desired.

Having thus described our invention as embodied in the apparatus of the drawing and its mode of operation, we desire to say that we consider our invention in several of its features of a generic nature and not limited to the specific details of construction heretofore described; but

We claim as novel and desire to secure by Letters Patent of the United States—

1. In a vomiting-keir, the combination with a keir, of a vomiting-pipe connecting the top and bottom of the keir extending from the bottom of the keir downward below the level of the liquid in the keir to form a trap or pocket adapted to be filled with liquid from the bottom of the keir, a steam-pipe connected to the vomiting-pipe at the keir side of the trap or pocket, said vomiting-pipe having means between the steam-pipe connection and keir-bottom for preventing back pressure from the vomiting-pipe toward the keir-bottom, whereby liquid from the trap or pocket and live steam will alternately be forced into the top of the keir, substantially as described.

2. In a vomiting-keir, the combination with a keir, of a vomiting-pipe connecting the top and bottom of the keir extending from the bottom of the keir downward below the level of the liquid in the keir to form a trap or pocket adapted to be filled with liquid from the bottom of the keir, a steam-pipe connected to the vomiting-pipe at the keir side of the trap or pocket, said vomiting-pipe having means between the steam-pipe connection and keir-bottom for preventing back pressure from the vomiting-pipe toward the keir-bottom, and means for equalizing the pressure at the top and bottom of the keir, whereby liquid from the trap or pocket and live steam will alternately be forced into the top of the keir, substantially as described.

3. In a vomiting-keir, the combination with a keir, of a vomiting-pipe connecting the top and bottom of the keir extending from the bottom of the keir downward below the level of the liquid in the keir to form a trap or pocket adapted to be filled with liquid from the bottom of the keir, a steam-pipe connected to the vomiting-pipe at the keir side of the trap or pocket, means between the steam-pipe connection and keir-bottom for preventing back pressure from the vomiting-pipe toward the keir-bottom, said vomiting-pipe having means near the entrance to the top of the keir, for preventing back pressure from the keir toward the vomiting-pipe, whereby liquid from the trap or pocket and live steam will alternately be forced into the top of the keir, substantially as described.

4. In a vomiting-keir, the combination with a keir, of a vomiting-pipe connecting the top and bottom of the keir extending from the bottom of the keir downward below the level

of the liquid in the keir to form a trap or pocket adapted to be filled with liquid from the bottom of the keir, a steam-pipe connected to the vomiting-pipe at the keir side of the trap or pocket, said vomiting-pipe having means between the steam-pipe connection and keir-bottom for preventing back pressure from the vomiting-pipe toward the keir-bottom the upper portion of the vomiting-pipe extending above the entrance to the top of the keir, whereby liquid from the trap or pocket and live steam will alternately be forced into the top of the keir, substantially as described.

5. In a vomiting-keir, the combination with a keir, of a vomiting-pipe connecting the top and bottom of the keir, extending from the bottom of the keir downward below the level of the liquid in the keir to form a trap or pocket adapted to be filled with liquid from the bottom of the keir, a steam-pipe connected to the vomiting-pipe at the keir side of the trap or pocket, said vomiting-pipe having means between the steam-pipe connection and keir-bottom for preventing back pressure from the vomiting-pipe toward the keir-bottom, the upper portion of the vomiting-pipe extending above the entrance to the top of the keir and means near the entrance of the top of the keir for preventing back pressure from the top of the keir toward the vomiting-pipe, whereby liquid from the trap or pocket and live steam will alternately be forced into the top of the keir, substantially as described.

6. In a vomiting-keir, the combination with a keir, of a vomiting-pipe connecting the top and bottom of the keir extending from the bottom of the keir downward below the level of the liquid in the keir to form a trap or pocket adapted to be filled with liquid from

the bottom of the keir, a steam-pipe connected to the vomiting-pipe at the keir side of the trap or pocket, said vomiting-pipe having means between the steam-pipe connection and keir-bottom for preventing back pressure from the vomiting-pipe toward the keir-bottom and means controlled by the variation of pressure in the vomiting-pipe to regulate the admission of steam into said vomiting-pipe, whereby liquid from the trap or pocket and live steam will alternately be forced into the top of the keir, substantially as described.

7. In a vomiting-keir, the combination with a keir, of a vomiting-pipe connecting its top and bottom, extending from the bottom of the keir downward to form a trap or pocket adapted to be filled with liquid from the bottom of the keir and a steam-pipe connected to the vomiting-pipe at the keir side of the trap or pocket, said vomiting-pipe having means between the steam-pipe connection and the keir-bottom for preventing back pressure from the vomiting-pipe toward the keir-bottom, located far enough below the level of the liquid in the keir-bottom to give sufficient head to open the means for preventing back pressure when the steam-pressure rises in the keir above a certain predetermined point, whereby liquid from the trap or pocket and live steam will alternately be forced into the top of the keir, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

CHARLES S. SHEPARD.
EUGENE D. JEFFERSON.

Witnesses:

JAMES STUART MURPHY,
EDITH M. RIPLEY.