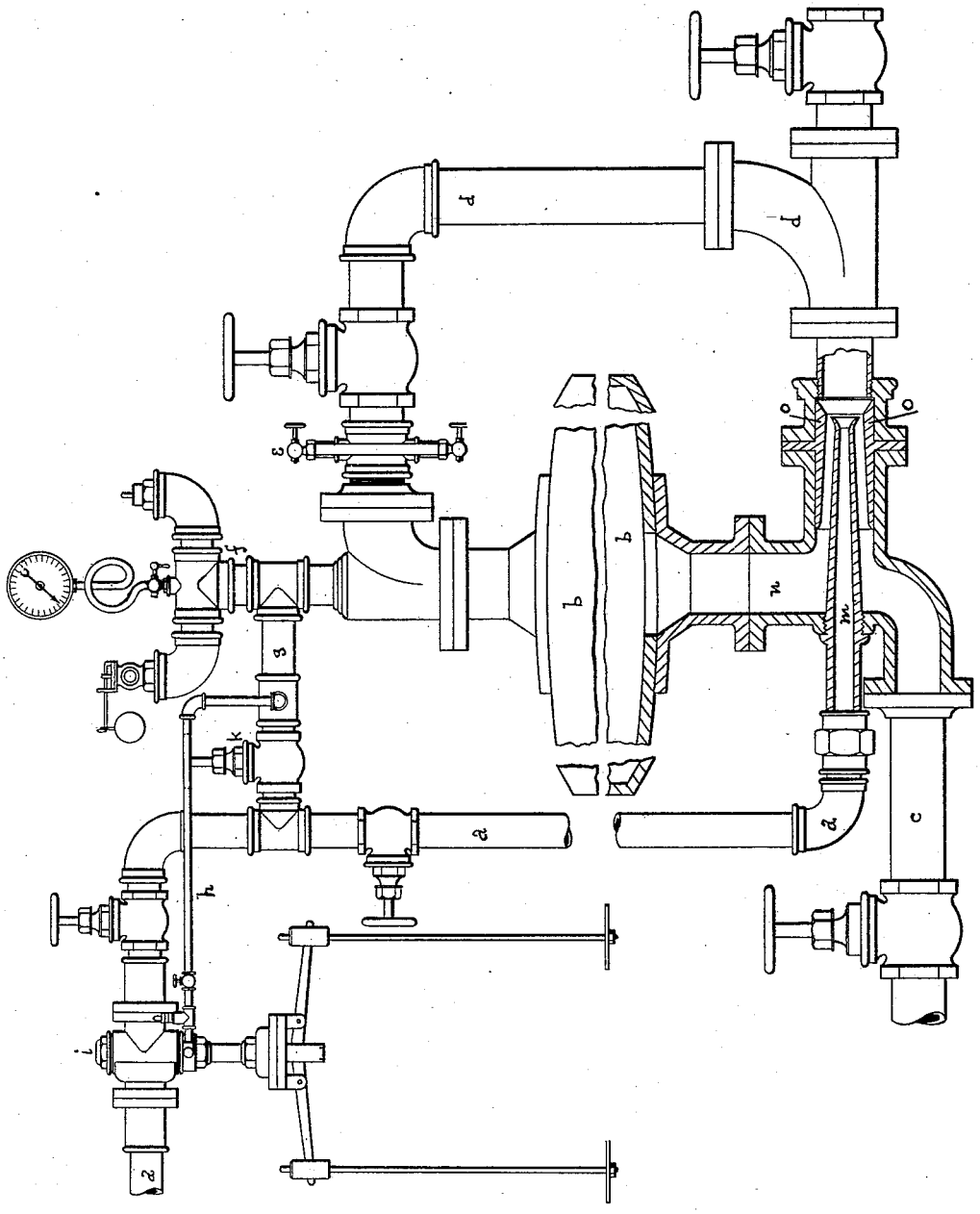
(No Model.)

T. BOARDMAN.

AUTOMATIC CIRCULATOR FOR BLEACHING KIERS.

No. 489,361. Patented Jan. 3, 1893.



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UNITED STATES PATENT OFFICE.

THOMAS BOARDMAN, OF WAREHOUSE POINT, CONNECTICUT.

AUTOMATIC CIRCULATOR FOR BLEACHING-KEIRS.

SPECIFICATION forming part of Letters Patent No. 489,361, dated January 3, 1893.

Application filed July 9, 1892. Serial No. 439,447. (No model.)

To all whom it may concern:

Be it known that I, THOMAS BOARDMAN, a citizen of the United States, residing at the post-office of Warehouse Point, in the town of East Windsor, in the county of Hartford and State of Connecticut, have invented a new and useful Automatic Circulator for Bleaching-Keirs, of which the following is a specification.

My invention relates to improvements in machines which have for their object the circulation of bleaching solutions in keirs, and it may be used as well to effect the circulation of any liquid used in closed tanks or vats.

The objects of my invention are, first, to make the movement of the liquid continuous by automatic pulsations thus allowing a constancy of chemical action; second, to secure a completeness of action by accomplishing the thorough permeation of the cloth or other substance and rendering it certain that all portions will be infiltrated; and thirdly, to accomplish these results without danger of overheating or otherwise injuring the fabric. I attain these results by the mechanism indicated in the accompanying drawing, in which—

a indicates the high pressure steam pipe coming from the boiler.

b is the keir, broken sections being given to avoid the necessity of drawing the entire structure. Through the pipe *c* is admitted the bleaching liquid in such quantity as may be needed, running freely into the pipes *c* and *d*, its location in the latter being indicated by the test-glass *e*. The pipe *d* connects, by a downward opening, with the upper portion of the keir and also with a tube *f* upon which are affixed an indicator gage, a safety pressure valve and a vacuum valve.

The tube *f* is connected with the steam pipe by the pipe *g*, and in this is inserted a small low-pressure pipe, *h* which runs thence to a regulator *i* in the steam pipe. The valve *k* may be used to great advantage for admitting steam to the keir for heating purposes when the bleaching process is commencing, but it is kept closed after the keir is sufficiently heated. When the bleaching is finished, the solution is ejected at the blow-off *l*.

The keir being now filled with cloth, and sufficient bleaching solution in the pipes *c* and *d*, steam is admitted from the boiler. As it advances through the nozzle *m* it finds before it the solution, nearly filling the tube *d* and it forces the solution up the pipe and over into the upper portion of the keir and above the cloth. This steam pressure is felt equally in *f* and *g*, and carried to the regulator *i* where it cuts off the supply. The keir then is in a condition where there is a pressure of steam on and over the liquor which is above the cloth, and, in the bottom of the keir, below the cloth, there is a partial vacuum. The solution is therefore drawn easily and thoroughly through the cloth, trickling into the lower part of the keir and partly filling the tube *d* as at the first. The natural cooling of the upper part of the keir, with the escape of the liquid, reduces the pressure there, the regulator opens the steam valve, steam is again admitted into the steam pipe, the solution again forced to the top of the keir, and the operation repeats itself by regular pulsations once in two or three seconds, and continues automatically as long as may be needed to thoroughly bleach the cloth. This, however, would not be done except for the peculiar method by which the steam is forced against the solution.

The steam pipe *a* terminates in a tapering nozzle *m* which nozzle ends in a bell-shaped flange. The nozzle runs some little distance past the bottom of the keir *n* into the solution pipe. This solution pipe, at that place is contracted by a sleeve *o* which is so beveled at its end nearest the blow-off that the bevel of the sleeve exactly corresponds in angle and direction, with the flange on the mouth of the nozzle. The flange and nozzle do not touch as the opening is required for the free passage of the solution. By this peculiar shape of flange and bevel the steam, at that point, is spread into a continually expanding stream until it reaches the full size of the inner diameter of the tube. A solid plug of steam is thus forced against the solution and it easily carries the whole body of it along until it is emptied into the keir.

The sleeve *o* contracts the diameter of the pipe in which it is placed, so that the space between the sleeve and flange is not more than one eighth of an inch. Ejection of the steam through the nozzle and the small dimension

of this space makes a vacuum chamber the length of the sleeve. The vacuum chamber communicating with the bottom of the keir assists greatly in drawing the liquid through the fabric, until the bottom of the keir is filled with liquid that has worked completely through the cloth.

The arrangement here presented allows the use of steam of any pressure from the boiler, and even of super-heated steam. At no stage of the bleaching process does steam alone touch the fabric. It must be always in presence of the bleaching solution and the fabric itself be always wet with the liquid.

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

The combination, in a bleaching keir, of the tapering nozzle *m*, ending in a flanged mouth, corresponding in angle and direction with the sleeve of an inclosing tube contracted to nearly the size of the nozzle, which it approaches but does not touch, substantially as shown in the accompanying drawings, the nozzle being open at the other end to a steam supply, and the inclosing tube being connected with, and forming part of, a chamber at the bottom of the keir in which the solution collects, the chamber and tube being extended to the upper portion of the keir, while the keir itself is air tight, and has a connection at its upper part with a steam regulator by which, as the pressure falls in the upper portion of the keir, steam is admitted into the nozzle aforesaid, and shut off as the pressure rises.

THOMAS BOARDMAN.

Witnesses:
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