E. D. JEFFERSON.

METHOD OF BLEACHING CLOTH.

APPLICATION FILED APR. 9, 1902.

992,133.

Patented May 9, 1911.

2 SHEETS—SHEET 1.

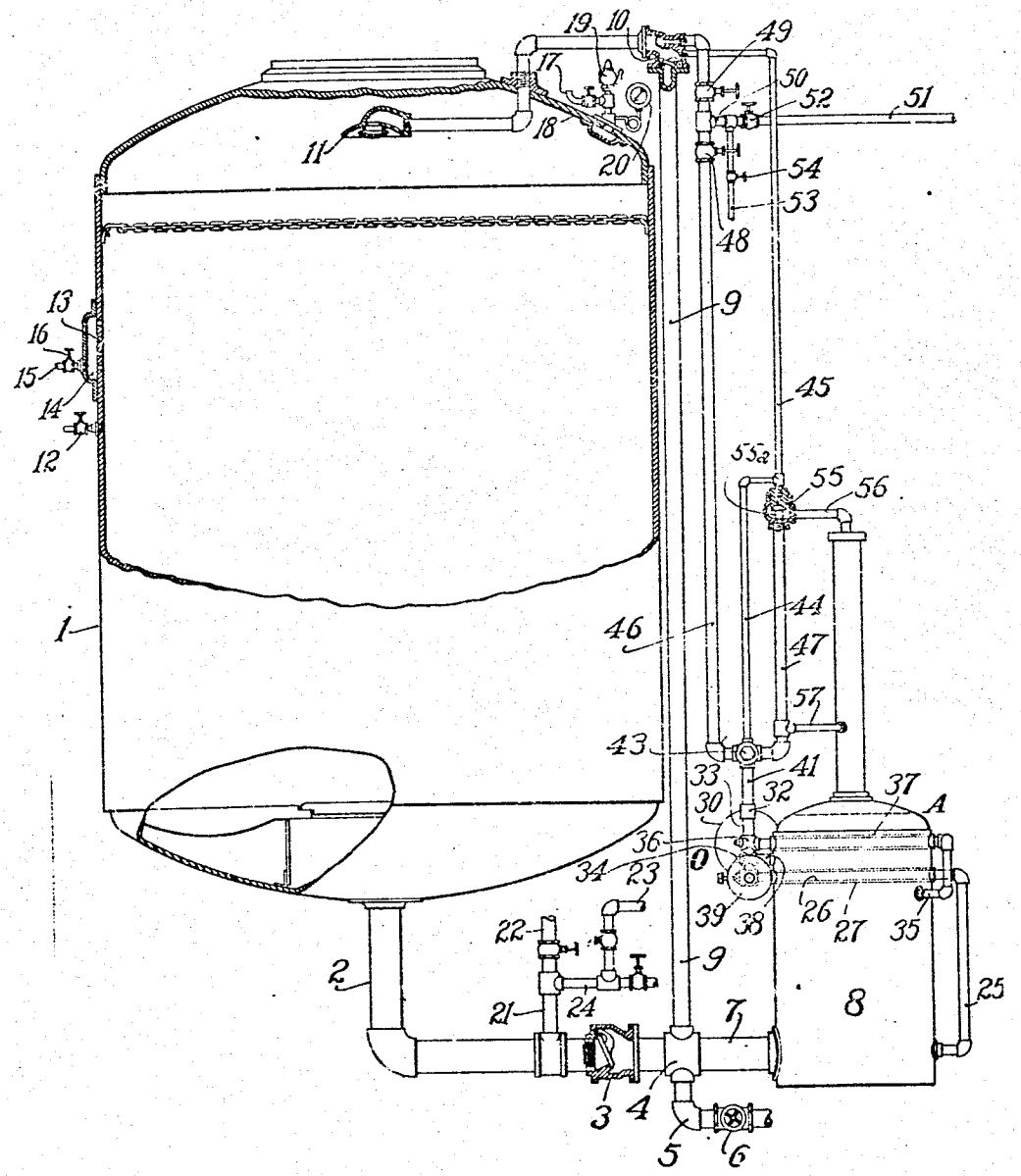

FIG. 1

WITNESSES

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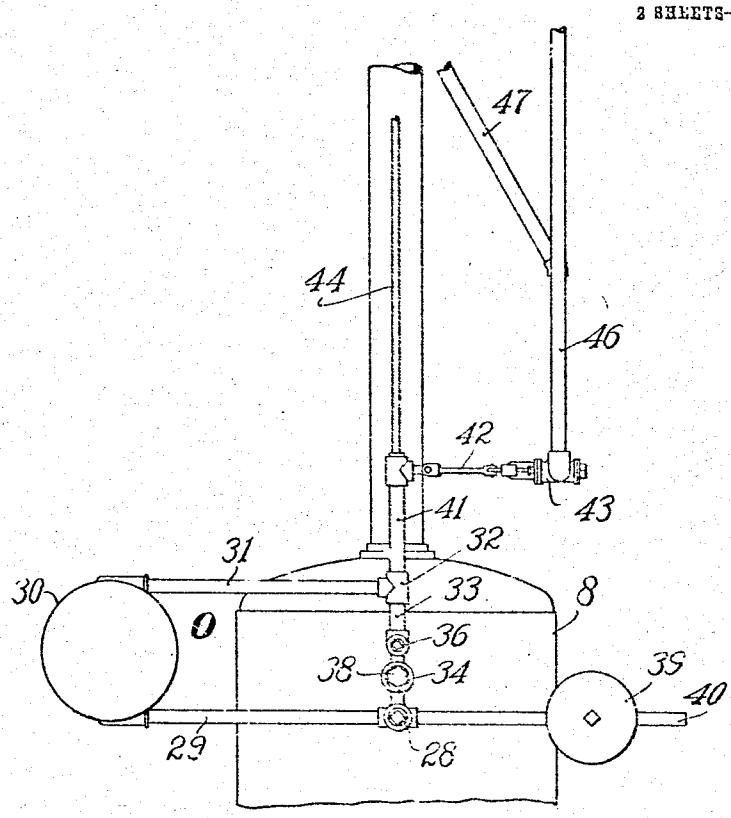

FIG. 2.

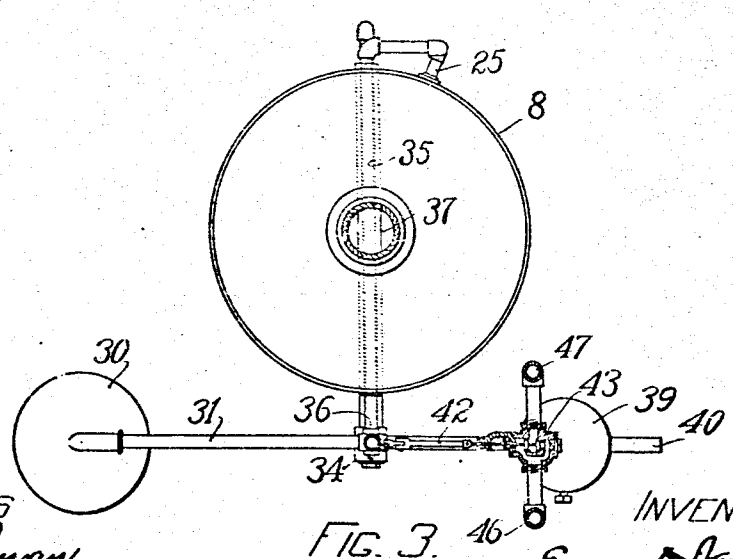

FIG. 3.

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METHOD OF BLEACHING CLOTH.

992,133. Specification of Letters Patent. Patented May 9, 1911.

Application filed April 9, 1908. Serial No. 426,053.

To all whom it may concern:

Be it known that I, EUGENE D. JEFFERSON, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Methods of Bleaching Cloth; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to an improvement in methods of bleaching cloth, and particularly for bleaching cotton fabrics.

The object of the invention is to decrease the time required in and the expense of bleaching, and at the same time to improve the quality of the work done.

It consists in the method hereinafter described and particularly defined in the claims.

In the accompanying drawings illustrating an apparatus for carrying out the method, Figure 1 is an elevation partially in section, and Figs. 2 and 3 are respectively an elevation and a plan of the motive fluid valve operating mechanism.

The apparatus will first be described, as an understanding of the same is necessary to a description of the method.

The keir proper 1 consists of a large vessel provided near its bottom with a grid or grating, and at its top with a man-hole through which the cloths to be treated are introduced and removed. The cover of the man-hole is not shown. Connected with the bottom of the keir is a pipe 2 which may be called the bottom pipe. It is provided with a check valve 3 which opens away from the keir. The bottom-pipe 2 is connected at the cross 4 with the draw-off pipe, with the trap or well, and with the top of the keir. The draw-off pipe 5, by means of which the keir may be emptied, is provided with a draw-off valve 6. The pipe 7 leads from the cross 4 to the trap or well. The pipe 9 leads from the cross 4 to the top of the keir, being provided with the injector check-valve 10 near its point of entrance into the keir and at its discharge end in the keir with the spray head 11. The pipes 2, 7 and 9 constitute the vomiting pipe through which liquor is conveyed from the bottom of the keir to the top and vomited in upon the fabric. The keir is provided with a test cock 12 located in its side at what for convenience will be termed the "normal level" and which is the level at which the operator desires to have the liquor in performing certain operations. The keir is also provided with a series of overflow openings at 13 through which the liquor may flow under certain conditions of use. The liquor flows from these openings into an overflow chamber 14, and a pipe 15 is provided to carry away the liquor, a cock 16 affording means for closing this pipe. This provision of openings for overflow it will be convenient to refer to as the "washing overflow". At the top of the keir a filling overflow and vent pipe 17 is provided, having a cock 18 for closing the same when desired. Here also is provided a safety valve 19 and a pressure gage 20. A filling pipe 21 is connected with a tee in the bottom-pipe 2, and affords means for introducing liquors into the keir. The water admission pipe 22 is connected with this filling pipe 21. So also the chemic pipe 23 and acid pipe 24. These pipes are provided with valves which may conveniently be referred to respectively as the water supply valve, chemic supply valve and acid supply valve. The trap or well 8 constitutes part of the apparatus for causing the liquor to be withdrawn from the bottom of the keir and vomited intermittently into the top. It comprises a tank into which the liquor from the keir flows through the pipes 2 and 7. When the liquor rises in the trap 8 to about the level A, the liquor rising in the pipe 25 enters the pipe 26 which leads to the motive fluid valve operating mechanism, indicated in a general way by the reference character 0. The trap 8 is provided with a passageway pipe 27 which is secured at each end in the opposite walls of the trap. It therefore provides a passageway for the pipe 25 to the regulator. The fact that it passes through the trap is of significance only as affording a compact construction. The pipe 25 connects with the regulator at 28, and the liquor passes thence through the lower ball-pipe 29 to the ball 30. The ball 30 is provided with an upper ball-pipe 31 which leads back to the tee 32 and thence through the pipe 33 to the pivot casting 34 to which the pipe 35 is connected at 36. The pipe 35 passes through a passageway pipe 37 in the same manner as the pipe 25. The pivot casting 34 is mounted upon a stud 38 secured to the trap 8. The pipes 29, 31 and 33, the ball 30, and

the pivot casting 34 constitute a frame which is pivotally mounted at 38 and capable of oscillating about such pivot. A counterweight 39 on the arm 40 which is secured to the pivot casting affords means for lifting the ball 30 when it is emptied. From the tee 32 extends upward a pipe 41 which is connected by means of a link 42 with a motive fluid controlling valve 43. The upper end of the pipe 41 is connected by the air pipes 44 and 45 with the injector check above the check valve 10.

The pipes 44 and 45 afford a vent for the ball 30 while the liquor is flowing into it. They also afford communication between the ball and the top of the keir when the level of the liquor falls in the trap 8 below the level of the ball so as to permit the liquor to run out of the ball. It is to be observed that with this valve regulating apparatus the pipes 27, 37 and 44, yield, owing to their elasticity, and the use of stuffing glands and the like is avoided.

The motive fluid supply pipe 46 leads to the motive fluid controlling valve 43 and the pipe 47 leads from the valve 43 to the top of the trap or well 8. The pipe 46 conveniently leads to the injector nozzle of the injector check valve 10 and is provided with two valves 48 and 49 respectively below and above the steam and air pipe junction therewith. This steam and air pipe 50 is connected with a steam supply pipe 51, provided with a steam supply valve 52, and an air supply pipe 53, provided with an air supply valve 54.

The opening of the air valve 54 permits air to flow down through the pipe 46, pipe 47, check 55 and pipe 56, into the top of the trap, thereby forcing the contents of the trap out through the pipe 7 and up through the pipe 9 into the top of the keir. The check valve 55 consists of a casting provided with a ball 55ª adapted to engage upper and lower valve seats. When the motive fluid is vomiting the contents of the trap or well into the top of the keir, the ball will be held against its upper seat and the communication afforded by the pipes 44 and 45 between the ball 30 and the top of the keir will not be disturbed by the passage of motive fluid into these pipes. Moreover, the loss of motive fluid flowing through this small pipe to the top of the keir is by this means prevented. When the motive fluid is cut off, the ball 55ª falls against its lower seat and permits the pipe 45 to vent the trap or well to the top of the keir, thereby affording a free admission of the liquor to the trap. The brace or strut 57, conveniently made of piping, is a support for the pipes 46 and 47, but it affords no communication between the pipe 47 and the trap 8.

While this apparatus constitutes an improvement on the apparatus of my Patent No. 775,450, dated November 22, 1904, it is not claimed herein as it forms the subject-matter of another application for Letters Patent filed May 1, 1908, Serial No. 430,335.

We proceed now to a description of my method. Heretofore, while the boiling processes have been performed in closed keirs, the practice has not obtained of subjecting the textiles to the action of bleaching liquor in a closed keir, in withdrawing the bleaching liquor from the keir, and in thoroughly aerating the textiles in the keir by saturating them with air, or of subjecting the textiles to the action of a bleaching liquor which is aerated as it is introduced into the keir. This has heretofore necessitated the removal of the cloth from the keir after the boiling operation, when it was subjected to tedious washing and wringing operations, to say nothing of the large amount of time lost in taking the fabric out of the keir and transferring it to bins, and time lost in allowing it to remain in the bins, etc. According to the present invention the operations of boiling and bleaching are preferably carried on in the same vessel without removal therefrom, and securing all the advantages of scouring and contact of the air with the fabric during the bleaching operations. In carrying out this method the operations performed are as follows:—The fabric is run into the keir and trodden down in the usual way, after which the chains are put in place and the manhole is closed. Thereupon the boiling operations are performed substantially as described in said patent.

For convenience the whole series of operations of boiling and bleaching with the present apparatus will be described in detail. It is as follows: First, caustic liquor is introduced through the pipe 21 and brought to a proper level in the keir. The pressures in the top and bottom of the keir are maintained in equilibrium through the connection afforded by the pipes 45 and 56, so that, as the liquor rises in the keir, the liquor will flow through the pipes 2 and 7 and the check valve 3 into the trap 8 and will rise in the trap until it reaches the level A, when it will flow into the ball 30 and cause the ball to fall, thereby opening the valve 43. After a sufficient amount of caustic liquor is introduced into the keir, the valve admitting the caustic liquor is closed, the cock 49 is closed, the cock 48 is opened, and the steam cock 52 is opened, admitting steam from the steam pipe 51 into the pipe 46. The steam will flow through the pipe 46, through the valve 43 (which is now held open by the falling of the ball 30), through the pipe 47, through the check valve 55, and through the pipe 56, into the top of the trap 8. The pressure of the steam will force the ball 55ª of the check valve 55 against its upper seat, thereby closing the passage be-

tween the vent pipe 45 and the top of the keir, and the steam will force the liquor in the trap out through the pipe 4, thereby closing the check valve 3, and the liquor will then flow up through the pipe 9 and be vomited into the top of the keir. After the trap 8 has been emptied the ball 30 will rise, the valve 43 will thereby be closed, the steam will be cut off from the trap 8, and the connection will be reëstablished between the top and bottom of the keir through the pipes 45 and 56, owing to the fall of the ball 55ª in the check valve 55; the liquor will then gradually flow out of the keir through the pipes 2 and 4 into the trap 8 until it reaches the lever A, whereupon the liquor will again fill the ball 30 which will fall and open the valve 43, admitting the steam, and the operations will thus automatically continue. This boiling operation will be continued from seven to ten hours.

At the completion of the boiling operation the washing process is performed. First, the caustic liquor is drawn off through the draw-off pipe 5. Clean water is then run in from the water admission pipe through the filling pipe 21, and allowed to flow through the fabric and out through the washing overflow pipe 15, the valve 16 being opened for this purpose. This washing process will be continued for about an hour and a half. The time of washing will depend somewhat upon the pressure of water used, as with higher pressures more water will be passed through the cloth in a given length of time than with lower pressures. At this stage, according to the old methods of bleaching, the cloth would be ready to be removed from the keir, but according to the present invention, and in the practice of my improved method of bleaching, the bleaching will now be begun without removal of the cloth from the keir.

The washing process having been completed to the extent usual in the washing of goods after the caustic or boiling operation, the water admission valve is closed, and the washing overflow valve 16 is closed, and the draw-off valve 6 is opened, and the water is drawn down to the normal level. This will be ascertained by opening the test valve when the draw-off valve is opened; then the cessation of the flow of water therefrom indicates that the normal level has been reached. The final washing of the cloth, preparatory to the bleaching process, is now accomplished by closing the valve 49, opening the valve 48, and opening the compressed air valve 54 which admits compressed air to the apparatus. The operation of the apparatus when operated by compressed air differs from its operation when operated by steam, in that while in the operation by steam the condensation of the steam keeps the liquor hot and secures the intermittent or vomiting operation of the apparatus, when operated by compressed air the air will blow the water from the trap 8 into the top of the keir until it blows air out through the relief or safety valve 19, by which time the ball 30 will have fallen, and the valve 43 will have been closed, thereby reëstablishing communication between the top and bottom of the kier, and permitting the water to flow out of the bottom of the keir into the trap. This washing or scouring operation is continued for about an hour, to remove the last traces of caustic from the fabric. The compressed air is now shut off, and clean water is again run into the keir, driving out the water which has been used through the washing overflow as before. The water is now drawn off from the kier. This is conveniently accomplished by opening the draw-off valve 6 to allow the water to flow out at the bottom, and at the same time opening the cock 49, closing the cock 48, and opening the compressed air valve 54, so that the compressed air being forced into the top of the keir drives the water out at the bottom. The fabric is now ready for the chemic. Chemic is now run into the keir from the chemic tank through the chemic pipe 23, until the level of the chemic in the keir rises to the normal level. The supply of chemic liquor is then cut off, and the compressed air is turned on, and the cloth is subjected to the operation of the chemic liquor, which is drawn out at the bottom and vomited in at the top for about five hours. A peculiar operation of the apparatus during this operation under compressed air and with a limited amount of liquor in the keir arises from the fact that the cloth opens up when the liquor level rises, and closes down as it falls, thereby causing the chemic to flow into the interstices between the cloth, and to be squeezed out of such interstices again, as a result of which a very thorough and effective contact of the chemic with all parts of the cloth is secured. In this connection it is to be observed that the chemic when it is vomited into the keir is thoroughly aerated by passage through the compressed air which is being expelled by the entering liquid. This aeration of the chemic enables the operation to be performed in a closed keir. Without the air the operation would be impracticable. It may be said, therefore, that an important feature of the invention resides in the use of air with the chemic in a closed keir. The feature of the opening up and closing down of the cloth during the scouring operation is also of importance.

At the completion of the chemic operation the chemic is blown back into the chemic tank, or into another keir that may be ready to receive it. This leaves the cloth saturated with air. This is of advantage, as it secures the thorough aeration of the

cloth. The fabric is then subjected to a washing operation such as has been hereinbefore described, for about one and one half to two hours under ordinary circumstances, after which the water is drawn off, and the acid pipe is opened and the acid is run into the keir up to the normal level, and the air is turned on, and the scouring operation as before described is again repeated. This scouring operation is continued for about two hours. Then the acid is blown back into the acid tank, or into another keir, ready to receive it. The bleaching operations having been completed, the goods are again washed with water for about two hours. The cloth is then ready for starching and the cloth is, therefore, run out of the keir preparatory to the starching, and inasmuch as it will not occupy any additional time, it may be found convenient to run it through a washing machine before running it into the bin ready for the starching machine.

The use of compressed air as the motive fluid for moving the treating liquors is of advantage over steam for certain purposes, inasmuch as it permits the operation of the liquors at any desired low temperature.

The method of bleaching cloth herein described is adapted for use in bleaching warp or filling or other textiles. The method is also adapted for use in other processes than bleaching within the scope of the claims. It is also to be remarked that other apparatus than that described herein may be employed for carrying out this method, although such apparatus is the best known of which I am aware for this purpose.

Having thus described the invention, what is claimed is:—

1. The method of bleaching textiles which consists in subjecting them to the intermittent action of treating liquor in a closed vessel in the presence of air, the circulation of the treating liquor being accomplished by the air, substantially as described.

2. The method of treating textiles which consists in subjecting them to the action of treating liquor and air in a closed vessel, and causing the level of the liquor in the keir to be intermittently raised and lowered by withdrawing it from the bottom of the keir and vomiting it into the top of the keir, substantially as described.

3. The method of treating textiles which consists in subjecting them to the action of treating liquor in a closed vessel in the presence of air, and causing the level of the liquor in the keir to be intermittently raised by the air and lowered, substantially as described.

4. The method of bleaching textiles which consists in subjecting them to the action of bleaching liquor in a closed vessel in the presence of air and utilizing the air to produce an intermittent circulation of the liquor through the textiles, substantially as described.

5. The method of bleaching textiles which consists in subjecting them to the action of bleaching liquor in a closed vessel and aerating the liquor during the operation, the air being utilized to cause an intermittent circulation of the bleaching liquor through the textiles, substantially as described.

6. The method of bleaching textiles which consists in subjecting the textiles to the action of a bleaching liquor in a closed keir, in withdrawing the bleaching liquor from the keir, and in thoroughly aerating the textiles in the keir by saturating them with air, substantially as described.

7. The method of treating textiles which consists in placing the matter to be treated in a closed keir, and subjecting it to the action of a treating liquor which is aerated as it is introduced into the keir, substantially as described.

8. The method of treating textiles which consists in subjecting the textiles to the successive and repeated action of a treating liquor and air in a closed keir, substantially as described.

9. The method of bleaching textiles which consists in subjecting them to the separate, successive and repeated action of a bleaching liquor and air in a closed vessel, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

EUGENE D. JEFFERSON.

Witnesses:

HORACE VAN EVEREN,

ANNIE C. RICHARDSON.