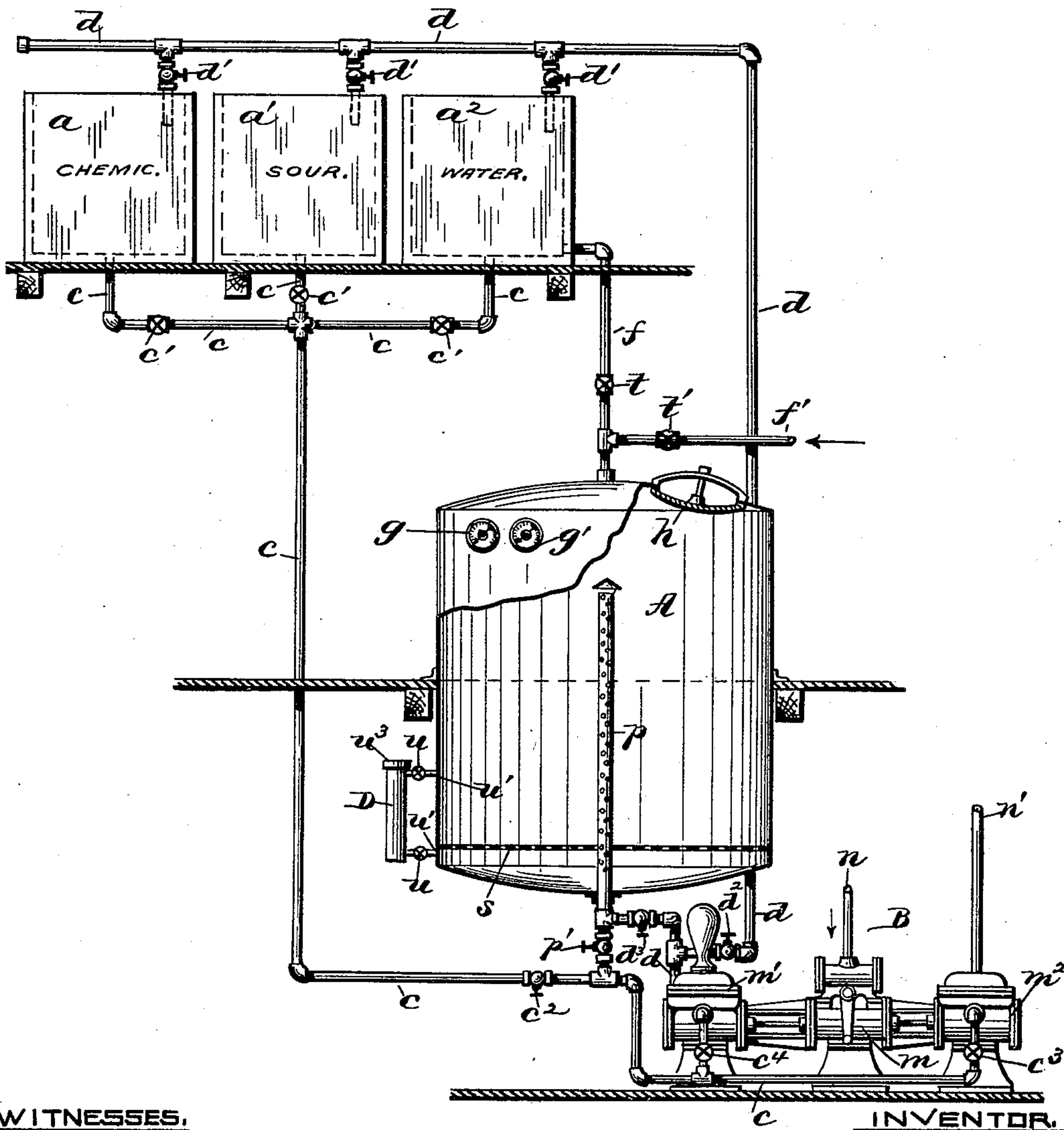


(Specimens.)

S. D. KEENE.  
PROCESS OF BLEACHING.

No. 480,102.

Patented Aug. 2, 1892.



WITNESSES.

*Charles Hannigan.*  
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# UNITED STATES PATENT OFFICE.

SAMUEL D. KEENE, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF THREE-FOURTHS TO HERBERT N. FENNER, OF SAME PLACE, EDWARD G. BLODGETT, EDMUND W. ORSWELL, OF PAW-TUCKET, RHODE ISLAND, AND THE HOLYOKE MACHINE COMPANY, OF HOLYOKE, MASSACHUSETTS.

## PROCESS OF BLEACHING.

SPECIFICATION forming part of Letters Patent No. 480,102, dated August 2, 1892.

Application filed August 23, 1889. Serial No. 321,778. (Specimens.)

*To all whom it may concern:*

Be it known that I, SAMUEL D. KEENE, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Bleaching and Dyeing Fibrous Materials; 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, reference being had to the accompanying drawing, and to letters of reference marked thereon, which form a part of this specification.

In the methods usually employed heretofore in bleaching and dyeing fibrous materials, more especially vegetable fiber, as cotton, flax, &c., as well as the yarn and textile product, it has been a comparatively long and correspondingly expensive process to properly treat such material, the processes involving a series of somewhat complicated steps. One great disadvantage of former methods is the difficulty experienced in attempting to properly bleach or color the yarn or goods in bulk, from the fact that the chemicals employed failed to permeate the fibers uniformly, the product having a cloudy appearance. This defect is particularly true where the treatment of the goods has been attempted in partly-closed keirs, because such former methods employed a continuous circulation of air or liquid as one of the steps in the process, the result being that the liquid, say, in its travel (more or less rapid, according to the pressure exerted upon it) through the goods, seeks the freest and most direct passage or outlet from the keir, and consequently, in case some of the goods are considerably compressed or compacted—as, for example, being wound upon perforated spools or bobbins or in the form of balls—the liquid fails to act upon them uniformly, thereby producing, as before stated, inferior or imperfectly-treated goods. This also holds true to a considerable extent even though a minus pressure or vacuum be first produced in the keir holding the

goods and the bleaching or coloring liquids subsequently passed through them and the keir's outlet simultaneously by gravity or pressure. It is due to this fact, in my opinion, that such former methods have not been more successful.

The object I have in view is to overcome the disadvantages above referred to.

By means of my improvement the yarn as spun upon the cop in the "gray" may be subjected to the process constituting my invention and after a few hours' treatment the yarn will be found perfectly and uniformly bleached, as may be verified by cutting the cops in halves. The yarn can be as readily dyed, if desired, by simply substituting the proper chemicals. By means of my improvement the time and labor required for "skeining" and "quilling" yarn may be to a great extent saved.

My improved process or method of bleaching and dyeing yarn and textiles consists in first exhausting the air from a closed vessel or keir containing the material or goods to be treated—as, for example, yarn in a loose state, or yarn on cops, spools, or bobbins—to form a vacuum, thereby also extracting the air from the yarn, next closing the exhaust-air passage leading from the keir, and admitting to the vessel the bleaching or coloring compound in a fluid state, which almost immediately completely fills the interstices formed in the yarn. After the liquid under a normal pressure fills the keir the inlet is closed, followed by subjecting the said liquid to a much greater pressure by means of a force-pump or compressed air, thereby forcing the liquid into and through the yarn and insuring its uniform action upon the material thus treated. In case compressed air is employed, it is then only necessary to admit to the keir an amount of liquid sufficient to completely immerse the goods, after which the liquid supply is shut off and the air, compressed to several atmospheres, corresponding to the nature of the materials under treatment, admitted, which, acting upon the sur-



face of the liquid, forces it into and through the yarn, the action being substantially the same as just stated when the liquid itself is forced in under great pressure. After being

5 thus subjected to great pressure a proper length of time while confined in the closed keir, the yarn is removed from the vessel and dried, it now being ready for use, as in "beaming," weaving, &c.

10 In order to more clearly set forth my invention, I have prepared the accompanying drawing, illustrating an apparatus embodying the improved process forming the subject of this specification, a detailed description

15 thereof being as follows:

A designates a closed vessel or keir of ordinary construction provided with a manhole  $h$  at the top, through which the goods to be treated are passed. A perforated false bot-

20 tom  $s$  is located near the lower end of the keir,  $p$  being a vertical perforated stand-pipe passing up into the center of the keir.

B indicates a steam-pump, the center cylinder  $m$  being for steam, the cylinder  $m^2$  at

25 the right being to exhaust the air from the keir to form a vacuum, while the opposite or left cylinder  $m'$  is employed to force the bleaching or dyeing liquids into the keir and to exhaust it therefrom.

30  $a$   $a'$   $a^2$  indicate a series of tanks containing compounds or solutions employed in bleaching or dyeing. The several tanks may be connected by short pipes  $c$ , each provided with a stop-valve  $c'$ , the whole communicating with

35 the vertical main pipe  $c$ , which in turn communicates with the inlet side of said pump-cylinders  $m'$  and  $m^2$  and the stand-pipe  $p$ . To the rear or opposite side of the cylinder  $m'$  is connected the delivery-pipe  $d$ , by means of

40 which the keir is emptied of its liquid chemicals or water, which are discharged into the respective tanks, as desired, by simply opening the corresponding valve  $d'$ . For flushing the keir with water a pipe  $f$  passes from the water-

45 tank to the top of the keir, the flow being controlled by the interposed valve  $t$ . By means of a branch pipe  $f'$  and valve  $t'$  compressed air from some external source may be admitted into the keir—that is to say, a pipe  $f'$  of

50 suitable size may be connected with the delivery or outlet passage of an air-compressor capable of producing the pressure required, the compressed air being introduced into the keir through the medium of said pipe, first

55 closing the valve  $t$  and opening the interposed valve  $t'$ , all other passages communicating with the keir being closed meanwhile.

Assuming now that the yarn on the cop or bobbin is to be bleached, the cops are first de-

60 posited within the empty keir, the cover  $h$  is replaced, and the air exhausted from the keir through the medium of the exhaust-cylinder  $m^2$ , in which case the several valves  $t$ ,  $t'$ ,  $c^2$ ,  $d^3$ , and  $c^4$  would be closed, the valves  $p'$  and

65  $c^3$  being open. After a sufficient vacuum has been formed, as may be ascertained by an inspection of a vacuum-gage  $g$ , located at the

top of the keir, the valve  $c^3$  is closed and the valves  $c^2$  and  $c'$ , communicating, say, with the "chemic tank," opened, thereby allowing

70 the chemic to flow into the keir until the cops are entirely submerged and practically filling it. The valve  $p'$  is then closed and valves  $c^4$  and  $d^3$  opened, the action of the cylinder  $m'$  of the pump being to force the

75 chemic into the cops under a much greater pressure than that due to gravity alone, the corresponding internal pressure being indicated by a gage  $g'$ . The same result can be accomplished by means of a small hand-pump

80 or test-pump communicating with both the pipe  $c$  and keir, a few strokes of the pump serving to maintain the pressure required. After thus maintaining the cops or goods under a continuous high pressure a proper

85 length of time—say one hour or more, according to the nature of the materials being treated—the pump  $m'$  is started, thereby discharging the chemic from the keir into the chemic-tank  $a$  through the pipe  $d$  by first

90 closing the valves  $c'$ ,  $c^2$ , and  $d^3$ , at the same time opening the valve  $p'$ ,  $d^2$ , and the upper valve  $d'$ , which discharges the chemic into the respective tank.

The operation above described is substantially repeated with the "sour" liquid, which

95 latter in turn is admitted into the tank A and after acting upon the cops is returned to the sour-tank  $a'$ , when, finally, water, if necessary, may be circulated through the material

100 lying in the keir to thoroughly wash out any trace of the bleaching agents. The water may be conducted into the keir directly from the water-tank  $a^2$  by means of the pipe  $f$ , first opening the valve  $t$ .

105

Certain fabrics or yarn require during the dyeing operation that the coloring-matter be heated. Therefore I provide a branch pipe

110  $f^2$  for the introduction of steam, the same freely passing into the keir from a boiler or other generator of steam by closing the valves  $t$  and opening the valve  $t^2$ .

To the lower portion of the keir is secured a "test-tube" D, which communicates with the interior of the keir by means of pipes  $u'$ ,

115 provided with a stop-valves  $u$ , a cap  $u^3$  being secured to the top of the tube. By means of this arrangement (the valves  $u$  being open) a cop, &c., placed within the tube is subjected to the same treatment as those within

120 the keir. Upon closing the valves and removing the cap  $u^3$  the cop may be withdrawn from the tube for inspection at any time during the bleaching or dyeing process.

Obviously the number of liquid-holding

125 tanks employed may be increased or diminished according to the character and degree of treatment required. In some cases one or more of the steps employed, as in bleaching, would be successively repeated upon the material placed within the keir before removing it therefrom to be dried.

130

In some cases where a keir having a comparatively-small diameter is used, the entire



head or top may be removable, the same being secured to the keir by a screw-thread or by a series of bolts.

5 My improved process may be employed for treating other substances or materials having a somewhat fibrous or porous character—as, for example, certain kinds of wood, paper, leaves, flowers, &c.

10 I do not claim, broadly, as my invention the treatment of fibrous materials while under pressure, as cops of yarn mounted upon hollow perforated bobbins or cop-tubes (closed at one end) have heretofore been subjected to bleaching or dyeing liquids under internal and  
15 external pressure to cause such liquids to circulate through the cops in one or both directions; but

What I do claim as my invention, and desire to secure by United States Letters Patent, is—

1. The process of bleaching or dyeing fibrous or porous materials or substances herein described, the same consisting in, first, placing the material or substance, in a dry condition,  
25 in a suitable keir; second, creating a vacuum within said keir; third, admitting the liquid bleaching or dyeing agent to the keir at atmospheric pressure, with the outlets to the keir closed; fourth, creating an artificial pressure  
30 much greater than that of the atmosphere

upon the stationary body of liquid within the keir; fifth, removing said liquid agent from the keir, and, finally, repeating said second, third, fourth, and fifth steps in connection with the liquid agents to which the material or substance is subsequently subjected in the ordinary bleaching or dyeing processes. 35

2. The process of bleaching fibrous or porous materials or substances herein described, the same consisting in, first, placing the material or substance, in a dry condition, within a keir; second, exhausting the air from the keir to form a vacuum; third, admitting the bleaching-chemic to the keir at atmospheric pressure; fourth, creating a considerably-increased  
45 artificial pressure upon the stationary body of chemic within the keir; fifth, removing the chemic from the keir; sixth, repeating the second, third, fourth, and fifth steps in connection with the sour; seventh, repeating said second, third, fourth, and fifth steps in connection  
50 with the washing liquid, and, finally, removing the material or substance from the keir and drying the same.

In testimony whereof I have affixed my signature in presence of two witnesses. 55

SAMUEL D. KEENE.

Witnesses:

CHARLES HANNIGAN,  
GEO. H. REMINGTON.