

No. 635,248.

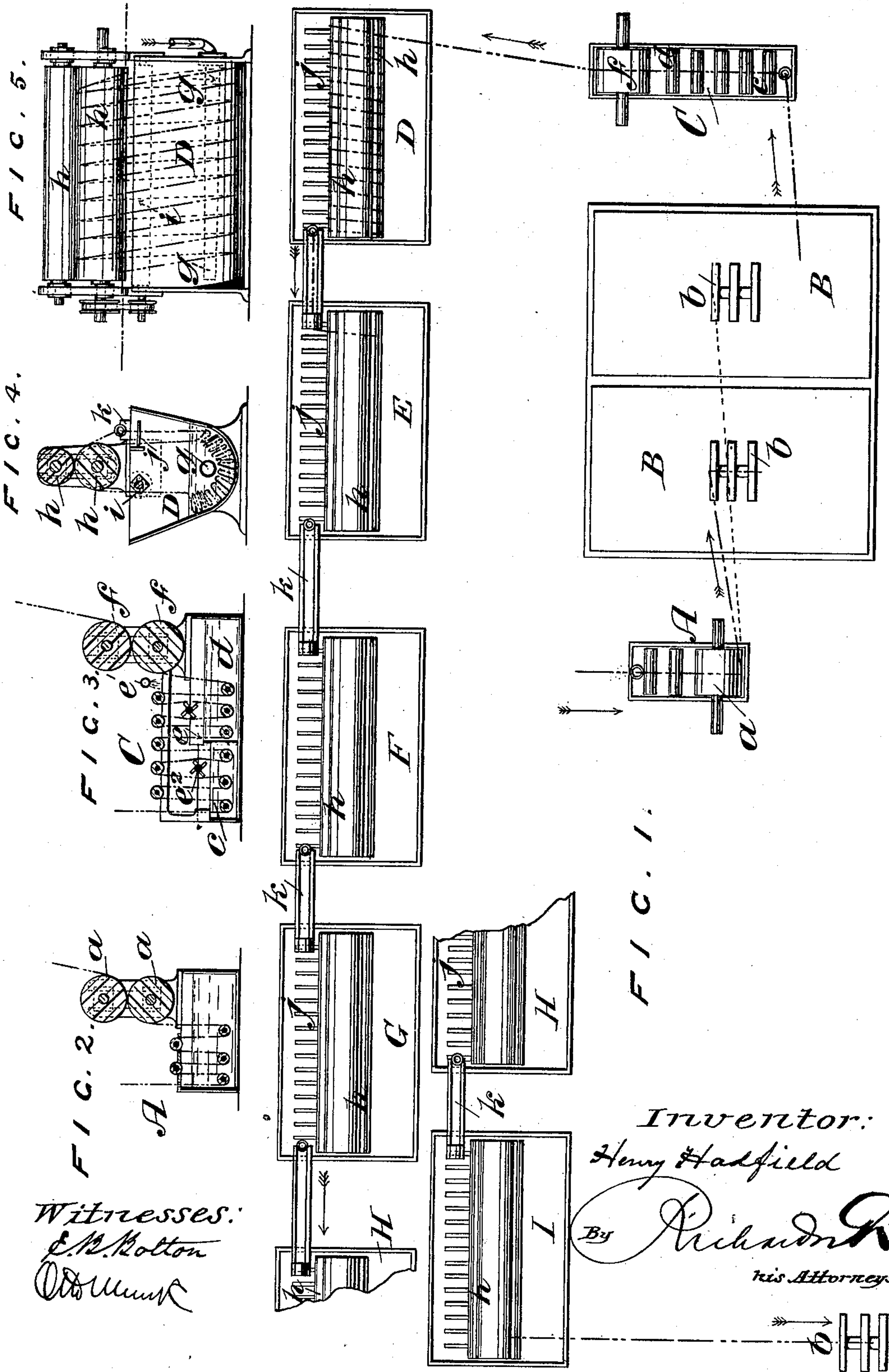
Patented Oct. 17, 1899.

H. HADFIELD.  
PROCESS OF BLEACHING.

(Application filed Dec. 21, 1897.)

2 Sheets—Sheet 1.

(No Model.)



Witnesses:  
E. B. Molton  
O. Munk

Inventor:  
Henry Hadfield

By *Richard R.*  
his Attorneys.

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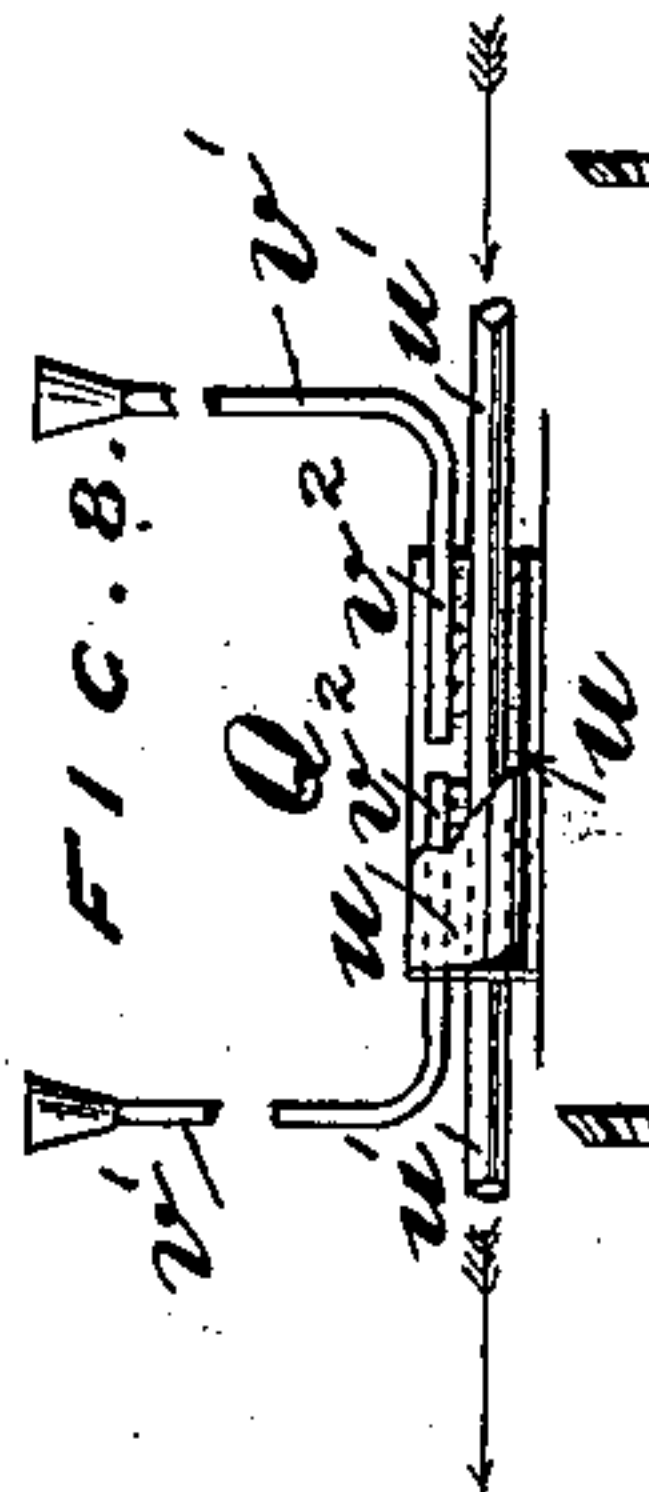
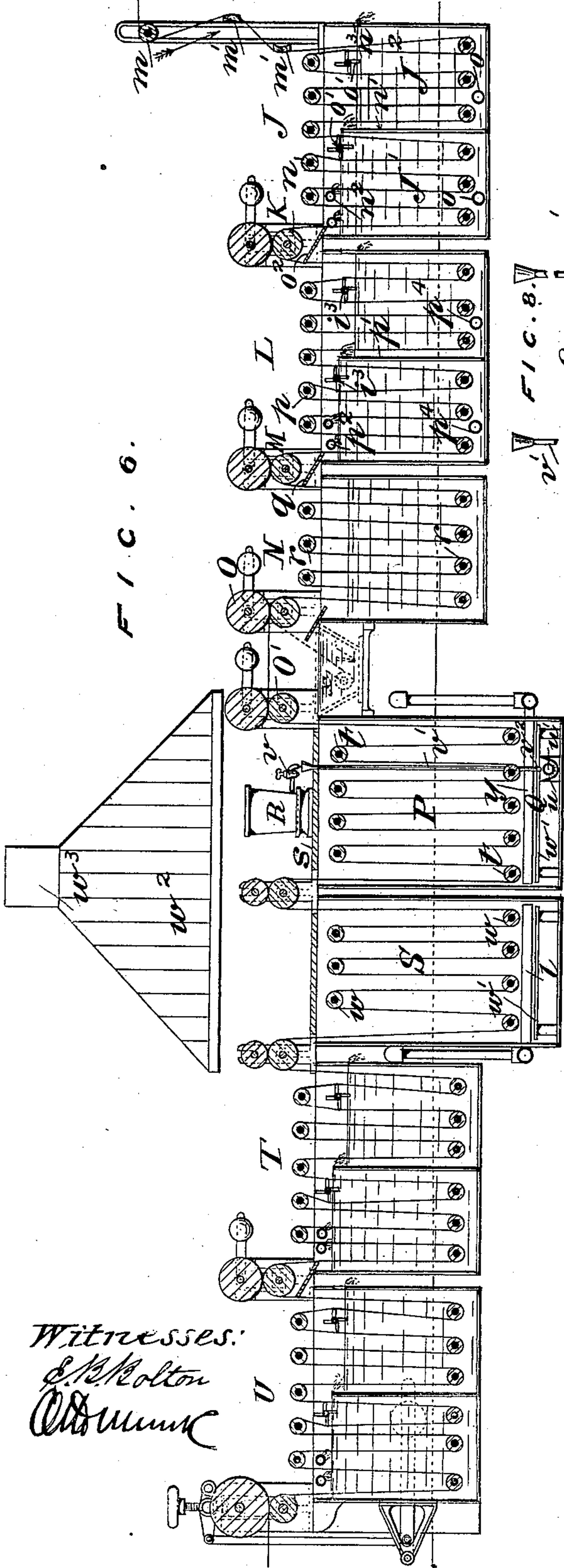
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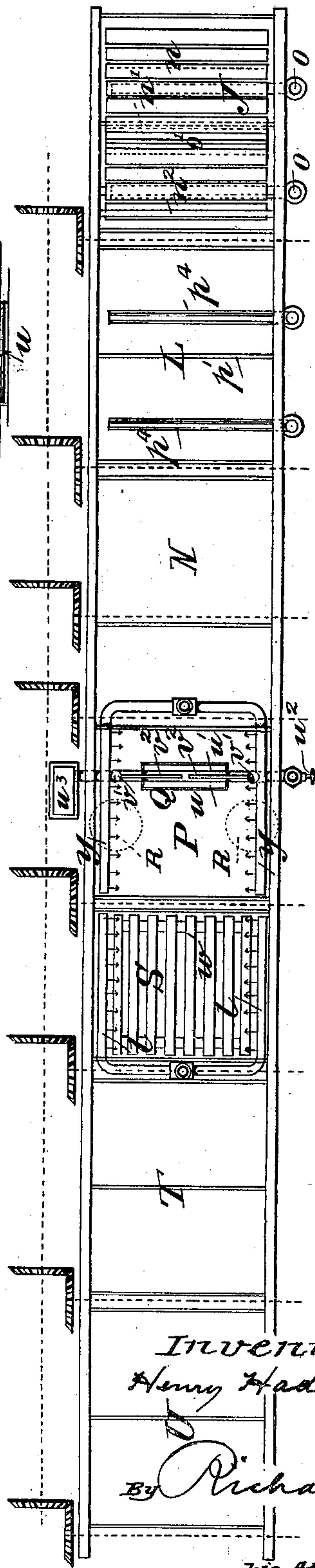
(Application filed Dec. 21, 1897.)

(No Model.)

2 Sheets—Sheet 2.



F I C . 7 .



Witnesses:  
E. B. Kolton  
C. M. Mum

Inventor:  
Henry Hadfield  
By Richard R.  
his Attorneys.



# UNITED STATES PATENT OFFICE.

HENRY HADFIELD, OF STOCKPORT, ENGLAND, ASSIGNOR OF TWO-THIRDS  
TO JOSEPH JOHNSON SUMNER AND WILLIE HADFIELD, OF FURNESS VALE,  
ENGLAND.

## PROCESS OF BLEACHING.

SPECIFICATION forming part of Letters Patent No. 635,248, dated October 17, 1899.

Application filed December 21, 1897. Serial No. 662,862. (No specimens.)

*To all whom it may concern:*

Be it known that I, HENRY HADFIELD, a subject of the Queen of Great Britain, residing at Fern Bank, Furness Vale, near Stockport, county of Chester, England, have invented certain new and useful Improvements in Methods for Use in Bleaching and Washing Goods in the Piece, as set forth in the following specification.

My said invention relates to improvements in the method for use in bleaching and washing woven goods in the piece, and has for its object not only to dispense with the usual keirs used for the lye-boil, but also to continuously effect the bleaching of the goods without handling the same; and in order that my invention may be fully understood I have attached hereto two sheets of explanatory drawings, to which I will now refer.

In the said drawings, on Sheet 1, Figure 1 represents in plan view the apparatus used by me in carrying out my method. Fig. 2 is a sectional side elevation of the souring-bath. Fig. 3 is a sectional side elevation of the washing-cistern. Fig. 4 is a sectional end elevation of one of the series of becks. Fig. 5 represents a side elevation of one of the becks. On Sheet 2, Fig. 6 is a sectional side elevation of the apparatus for continuously bleaching the fabric. Fig. 7 is a plan of the same, and Fig. 8 is a side view of one of the parts.

As is well known, the preliminary treatment of the fabrics in the keirs consumes considerable time, and extensive handling of the material is required before it leaves the keir. The apparatus to effect this is shown on Sheet 1 of the drawings, to which I will first refer.

In the drawings the material under treatment is shown in rope form, although the open formation may also be treated.

According to my invention the material, after being singed in the usual manner and moistened when required, is passed through a "pot-eye" into a weak hydrochloric-acid souring-bath A of about 2° Twaddell. A sectional side elevation of the bath A is shown in Fig. 2. The material is carried over and under top and bottom carrying-rollers and out between squeezing-bowls *a a*, the lower

one of which is driven by a belt or suitable gearing to feed the material forward. From the bath A the material is drawn onto a stillage B by a wince *b* and allowed to stand for a few hours, say from about three to six. The stillage B is shown in the drawings in duplicate, so that as the material is being led from the souring-bath and standing for the requisite time in one the material in the other is being conducted through the after processes. From the stillage B the material, after being allowed to stand for the requisite length of time, is then passed into a cistern C, containing cold or warm water. Fig. 3 shows a sectional elevation of the washing-cistern C. This cistern is divided into two compartments *c d* by a partition *e*, and the material is passed over and under top and bottom carrying-rollers, as plainly shown in Fig. 3, to provide for the requisite length of immersion. A spurt-pipe *e'* supplies water to the compartment *d*, which overflows into the compartment *c*, so that the fabric meets the cleaner water as it is passing out of the cistern. Revolving beaters *e<sup>2</sup> e<sup>2</sup>* are also mounted in the cistern C. Squeezing-bowls *f f* express the water from the material as it leaves the cistern C. One of these bowls *f* is driven so as to pull the fabric through the cistern. From the washing-cistern C the material is drawn through a series of becks D E F G H I. The becks are six in number; but I do not limit myself to this, as more or less may be employed. The becks contain a weak solution of boiling caustic soda of about, say, 2° Twaddell. The caustic-soda solution may also contain about three per cent. of petroleum. The caustic soda is heated by means of perforated steam-pipes *g*. Squeezing-bowls *h h* are mounted above the becks, one of which is driven so as to pull forward the fabric, and a revolving beater *i* may also be employed. The roped fabric as it enters the beck is coiled, folded, or compacted at the bottom of the beck, as shown in Fig. 4. It is then conducted between the squeezing-bowls and again coiled at the bottom of the beck, and so on, being passed between the pegs or guides *j*, so as to travel through the beck between the squeezing-bowls *h h* in a spiral fashion. The becks are placed



in communication with each other by means of conduits  $k$ , along which the material is passed from one to the neighboring beck. The material being passed spirally through the becks and coiled or folded along the bottom, as shown in Fig. 4, each of the becks is capable of containing about eight or nine hundred yards of fabric.

The material is constantly in motion, and being passed continually between the various squeezing-bowls the sizing and other matters contained in the material and which are destroyed and loosened by the souring-bath and caustic soda are constantly being expressed and the process is naturally expedited. The cloth, moreover, is left in a more perfect condition for the after process of bleaching. If desired, the becks may be divided into compartments of decreasing levels of liquid, the liquid from one flowing into the other, so that as the material advances it meets comparatively cleaner solutions of caustic soda.

On leaving the last of the series of becks I the material is drawn by the wince  $b$  and thoroughly washed. This further treatment is shown in Sheet 2 of the drawings, which illustrates my method for the continuous bleaching of woven goods in the open form; but it will be understood that goods may also be treated in the rope formation. The material after leaving the last beck I is passed over the guide-roller  $m$  and stenting-bars  $m' m'$  to the washing-vat J, as indicated by the arrows, the water contained therein being preferably hot. The vat or cistern J is provided with top and bottom guide-rollers  $n$ , above and below which the fabric is led. The cistern J is divided into two compartments by a partition  $n'$  in such a manner that two different levels of water are maintained in the cistern. Spurt-pipes  $n^2$  deliver water into the compartment J' of the cistern J, which then overflows into the compartment J<sup>2</sup>. An opening  $n^3$  is provided within the side of the compartment J<sup>2</sup>, so as to maintain a constant level of liquid within, as indicated in the drawings. Steam-pipes  $o o$  are provided to heat the contents of the cistern J. Revolving beaters or dashers  $o' o'$  are also mounted in the sides of the cistern to agitate the water and direct the same upon the surface of the fabric. It will be noted that as the clean water is delivered to the compartment J' only the incoming fabric will first meet the dirtier water in the compartment J<sup>2</sup>, proceeding from thence into the cleaner water in the compartment J' of the cistern. The material under treatment is led from the cistern J between squeezing-bowls K, the moisture expressed from the fabric being returned to the compartment J' by the inclined plate or board  $o^2$ . Leaving the squeezing-bowls K the fabric is subjected to a second wash in a cistern L. The cistern L is similar in construction to the cistern J, being provided with top and bottom guiding-rollers  $p$ , a central partition  $p'$ , spurt-pipes  $p^2$ , beaters

$v^3$ , and steam-pipes  $p^4$ . I may, if desired, employ only one washing-cistern divided into any convenient number of compartments by partitions and having therein decreasing water-levels, although I prefer the arrangement shown in the drawings. From the second wash in the cistern L the goods are again passed between squeezing-bowls M, the expressed liquid being returned by the inclined plate or board  $q$  to the cistern L. The material then passes in a "chemicking-vat" N, which is also provided with top and bottom guide-rollers  $r$ . This chemicking-bath is the usual chloride-of-lime bath. After treatment in the chemicking liquid the material is conducted again between squeezing-bowls O and O', from whence it passes into a closed chamber P, having a removable top or cover  $s$ , within which heat is applied to the fabric to liberate the chlorine. The bottom of the chamber P is provided with perforated steam-pipes  $y$ , as shown more clearly in the plan view, Fig. 7, from which steam enters into and heats the chamber and acts on the passing fabric. In passing through the chamber P the fabric is again led over and under top and bottom guide-rollers  $t$  and is thoroughly steamed to liberate the chlorine.

The liberation of the chlorine leaves in the cloth a certain proportion of insoluble lime, which I render soluble in the following manner: The steaming or heating chamber P is provided with a heated vaporizer Q. (Shown more clearly in the separate view, Fig. 8.) The vaporizer consists of a metallic, earthenware, or other tank or trough  $u$ , along the bottom of which is arranged a steam or other heated pipe  $u'$ . Steam is admitted to the pipe  $u'$  and controlled by a suitable valve  $u^2$ . The pipe  $u'$  is also in connection with a steam-trap  $u^3$  to remove the water of condensation from the pipes.

Upon the top of the steam-chamber P, I mount two vessels R, containing acetic acid and provided with stop-cocks  $v$ . A small quantity of the acetic acid is directed into the funnels of two bent tubes  $v'$ , the lower projecting parts  $v^2$  of which are perforated so as to discharge the acid upon the heated pipe  $u'$ , disposed along the bottom of the trough  $u$ . The acetic acid is thus vaporized by contact with the heated pipe  $u'$ , and the vapors mingle with the steam, and while assisting to remove the chlorine from the cloth also render the residual lime in the cloth soluble.

To further complete the bleaching action of the chlorine and acetic-acid vapors upon the cloth, I now pass the cloth into a second steaming-chamber S, where it is subjected to the action of steam alone. The second steaming-chamber is also provided with top and bottom guide-rollers  $w$  and steam-pipes  $l$ . As indicated in the drawings, the chambers P and S are provided with slatted wooden bottoms or trestles  $w'$ . A canopy  $w^2$  and chimney  $w^3$  collect and remove the vapors from the steaming-chambers, as indicated by



the arrows. The cloth is then led from the steaming-chamber S to the final washing-cisterns T and U, where the material is subjected to a final wash of hot or cold water and is conducted through squeezing-rollers to the usual drying-cylinders to be dried.

The washing - cisterns T and U are constructed in a manner similar to the washing-cisterns J L, and therefore do not need to be described in detail.

If necessary I might interpose a weak souring-bath between the second steaming-chamber S and the final washing-cisterns T U.

The requisite heat might be applied to the fabric otherwise than by steaming. For example, I might admit or force hot air into the chambers P S or lead the fabric between or over heating-boxes or over steam or other heated rollers.

The various squeezing - bowls might be driven by suitable bevel-gearing, as indicated in the plan view, Fig. 7.

As a modification, instead of vaporizing the acetic acid in the steaming-chamber P, as described, I might pass the fabric through a separate bath of acetic acid preliminary to its treatment within the steam chamber or chambers. In this case a trough V (shown in dotted lines in the drawings and containing acetic acid) is mounted or disposed between the chemicking - vat and the steam-chamber P. The fabric is led from the squeezing-bowl O into the trough V and below the roller *x*, and from thence after immersion in the acetic acid it is passed between the squeezing-bowls O' and conducted to the steaming-

chambers P, where it is subjected to the action of steam alone and finally washed in the cisterns T U, as already described. Instead of a separate bath of acetic acid I may apply the acetic acid along with the chlorine in the cistern N.

Under the hereinbefore-described continuous bleaching process the cloth does not require to be handled after leaving the becks and the bleaching is both expedited and cheapened.

I declare that what I claim is—

1. The improved method or process of continuously bleaching and washing woven goods in the piece, in which the goods are first subjected to a hot wash or washes, passed through a chemicking-bath, and then subjected to the simultaneous action of steam and acetic-acid vapor in a suitable chamber from whence they pass to a chamber where they are subjected to the action of steam alone and are finally washed, substantially as described.

2. The herein-described process consisting in passing the goods through a hot wash, then through a chemicking-bath, then subjecting the goods to the simultaneous action of acetic acid and steam and then washing the goods, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HENRY HADFIELD.

Witnesses:

JOSHUA ENTWISLE,  
THOMAS LATHAM.