(No Model.) 4 Sheets—Sheet 1.

E. A. RUSDEN.

BLEACHERY KEIR.

No. 408,991. Patented Aug. 13, 1889.

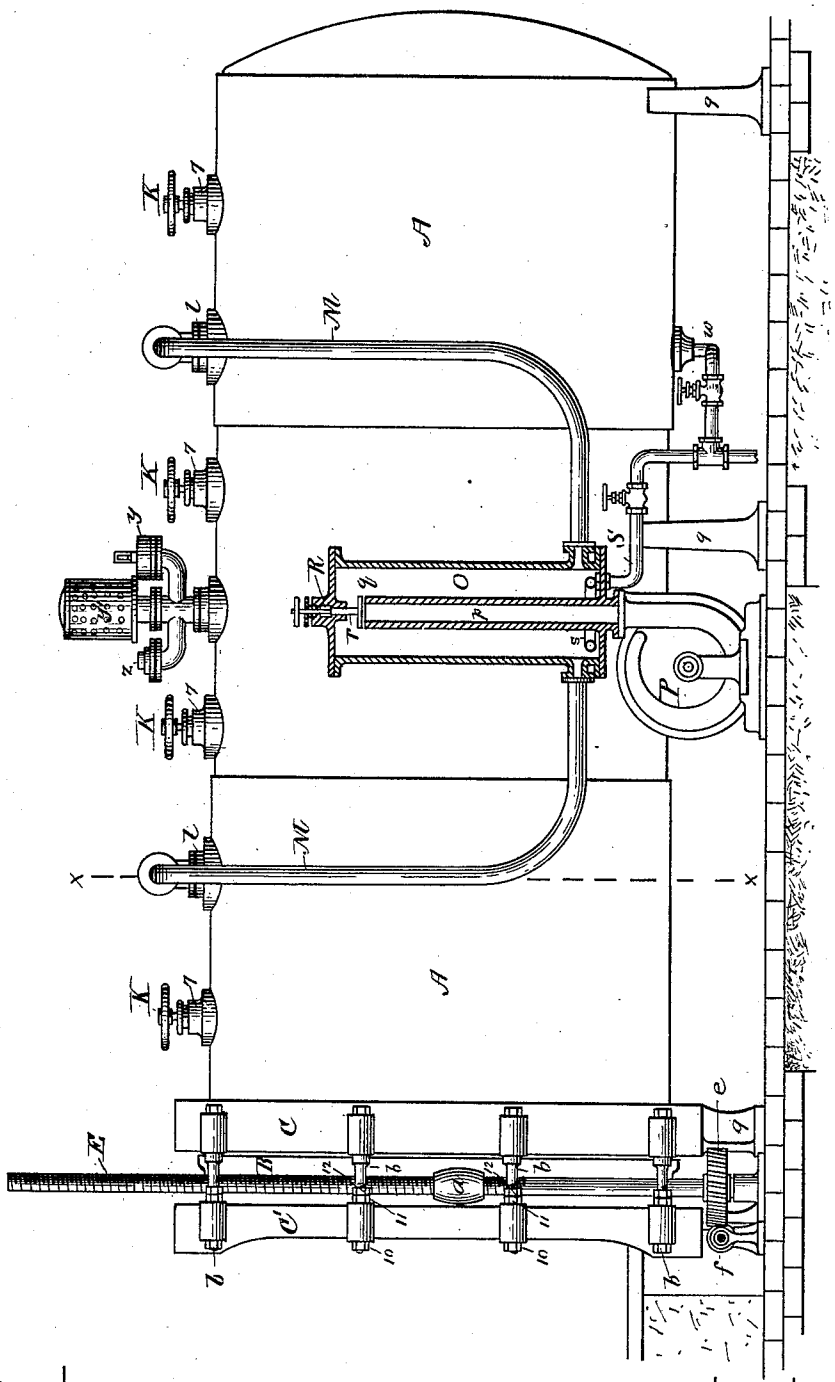


Fig. 1.

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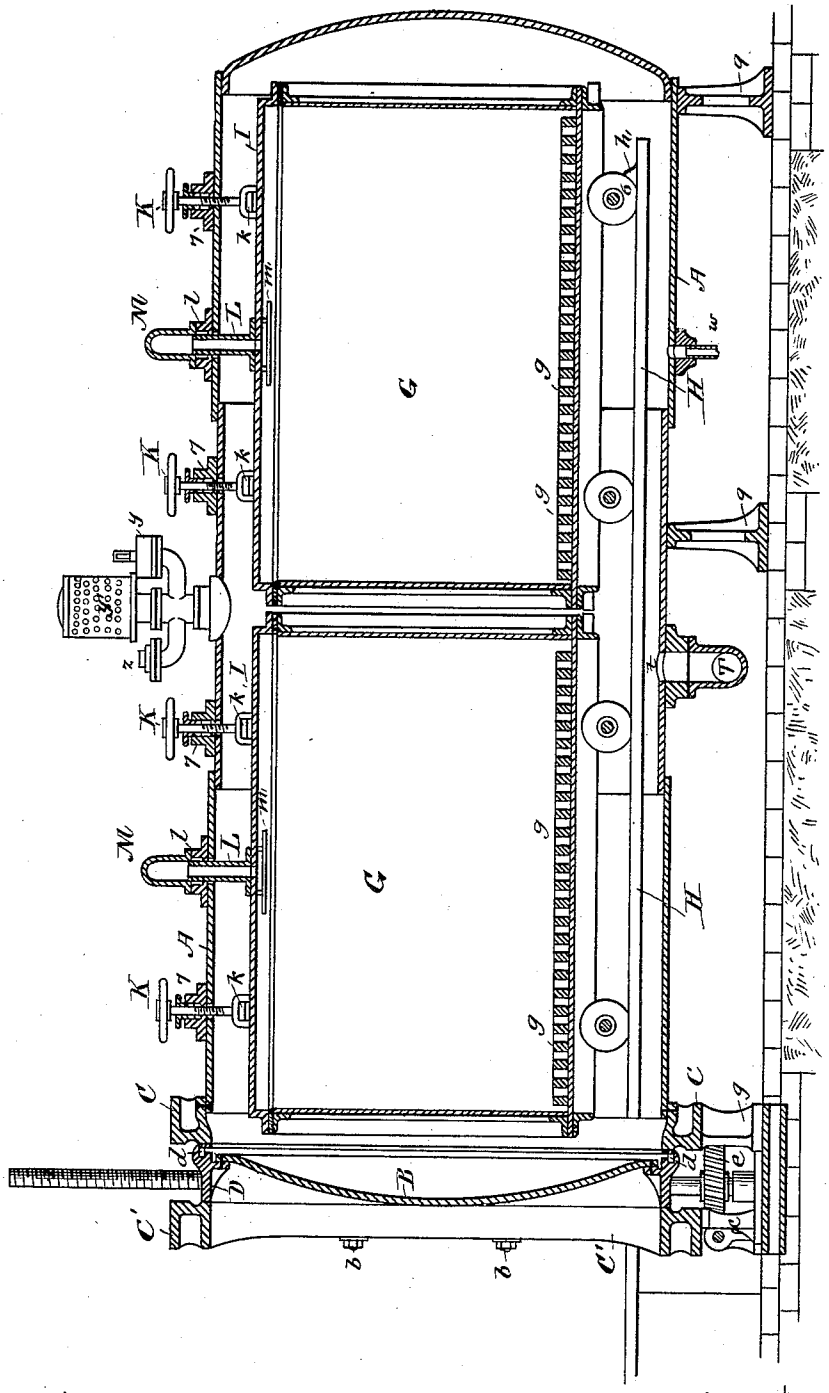


Fig. 2.

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BLEACHERY KEIR.

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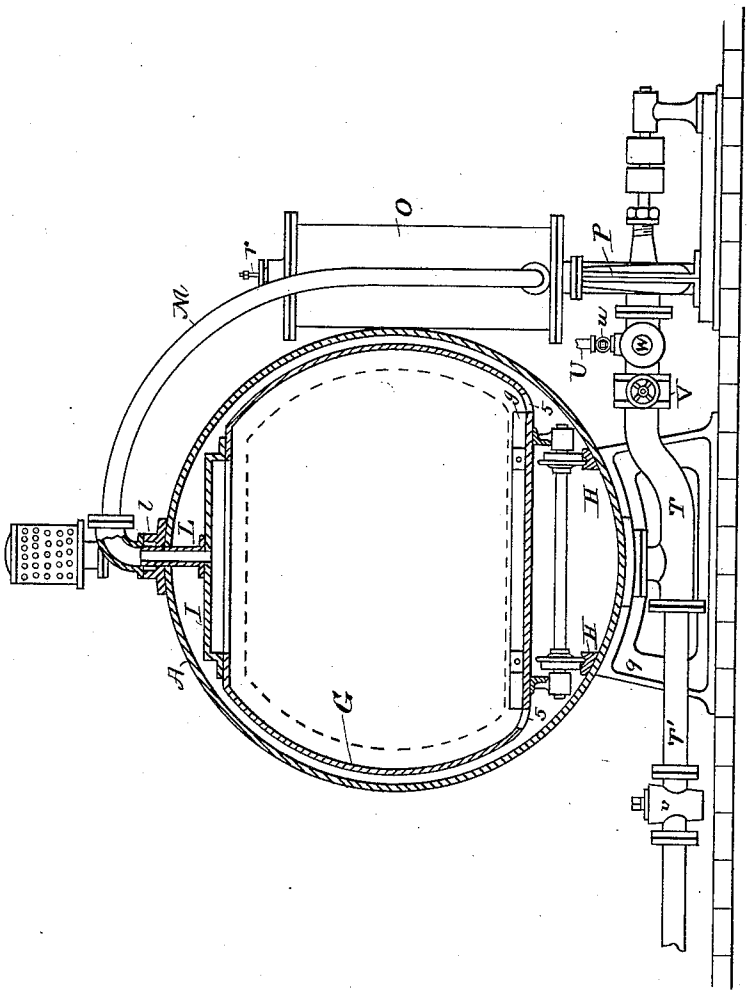


Fig. 5.

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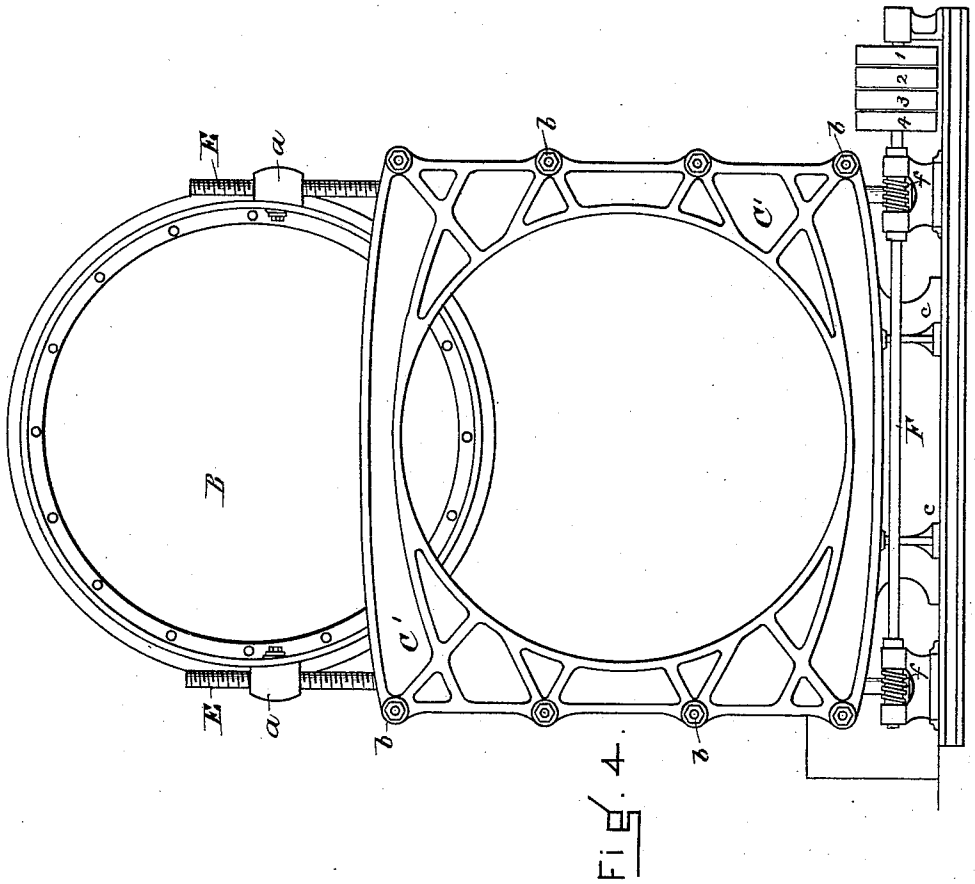


Fig. 4.

WITNESSES.
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UNITED STATES PATENT OFFICE.

ETHELBERT A. RUSDEN, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

BLEACHERY-KEIR.

SPECIFICATION forming part of Letters Patent No. 408,991, dated August 13, 1889.

Application filed May 18, 1889. Serial No. 311,221. (No model.

To all whom it may concern:

Be it known that I, ETHELBERT A. RUSDEN, a citizen of England, residing at Manchester, England, in the Kingdom of Great Britain, have invented certain Improvements in Bleachery Keirs or Apparatus for Boiling, Bleaching, Steaming, and Dyeing Fibers and Fabrics, of which the following is a specification.

My invention relates to improvements in apparatus used for bleaching, boiling, steaming, soaking, and dyeing fibers and fabrics, commonly called "keirs" when used in bleacheries, consisting of a boiler-iron chamber, into which cars or trucks containing the material to be treated are trundled, and the bleaching or washing liquor admitted into the chamber upon the material. I will hereinafter in this specification refer to the apparatus as a "keir" and to the materials to be operated upon as the "fabric."

Heretofore in keirs of this kind the cars for holding the fabric to be treated have been open at the top, and the sides and bottom have been slatted or thickly perforated with holes, so that the liquor was caused to pass through the material by gravity chiefly, and unless the chamber in which the cars were placed was filled sufficiently full of liquor to entirely submerge all of the material contained in them, the streams of liquor forced in at the top of the chamber, striking upon the upper layers of fabric, would tend to injure it by displacing the fibers and wearing them away, and also such upper layers would be continually exposed to the direct action of the steam, which is another cause for injury. With keirs of such construction, therefore, a very large quantity of liquor must be employed, and pumps of great capacity are necessary to circulate it through the keir, and besides only a small percentage of this large quantity of liquor will pass through the fabric or act directly upon it.

My invention consists in the improved construction of the doors of keirs; the cars in which the fabrics are placed run into the keirs, treated with the bleaching or other liquors, and removed from the keirs; the arrangement of the supply-pipes and their connection with the said cars, and in the construction of other parts of the apparatus, hereinafter described and specified, by which the liquors are kept hot and circulated through the same.

In the drawings forming a part of this specification, Figure 1 is a side elevation of the apparatus viewed upon the pump side, with the liquor-heating chamber connected therewith in section. Fig. 2 is a vertical central longitudinal section of the keir and the cars contained therein. Fig. 3 is a vertical cross-section on line *x x*, Fig. 1. Fig. 4 is a front elevation of the open frame which holds the door to the end of the keir, and with the door raised nearly to the position required to allow the cars to be run into the keir or to withdraw them from it.

Similar letters and figures indicate the same or similar parts of the apparatus in the several views.

A is the keir or chamber into which the cars containing the fabric to be treated are placed; 9, the supports for the keir, which is preferably made of plate-iron and in cylindrical form.

B is the door of the keir. In the drawings I have shown a door at one end only; but when a keir is employed which is capable of containing more than two or three cars it may be found advantageous to have a door at each end of the keir.

C is a frame fastened to the end of the keir, against which the door rests when closed, and C′ an independent adjustable open frame outside of the door, which is held in proper position and forced against the door-frame D by bolts *b* when it is desired to close the keir. The outer frame C′ is supported upon standards *c*, Fig. 4, upon which it is moved in and out by the action of the bolts *b* when fastening and releasing the door. In order to make a steam-tight joint, I employ a packing *d*, of india-rubber or other proper material, inserted in an annular groove upon the inner face of the door-frame.

E indicates screw-rods, each having a worm-gear *e* at its lower end, and working through a screw-threaded lug *a*, fastened upon the side of the door-frame. By means of worms

f upon the shaft F, Fig. 4, the screw-rods E are operated, and thus the door B is raised and lowered. For instance, in Fig. 4, by means of a cross-belt on pulley 1 upon the shaft F, the door may be raised, and by means of an open belt upon pulley 4 the door may be lowered, the belts being shifted onto the loose pulleys 2 and 3 when not required to operate the screw-rods E. It will be obvious that beveled gears may be used in place of the worm and gear. Any well-known automatic shipping device may be employed to shift the respective belts from the fixed to the loose pulleys when the door has been raised to the requisite height for introducing or removing the cars, or lowered to the proper position for closing the keir.

G indicates the cars for holding the fabrics to be bleached or otherwise treated, having wooden slats g upon their bottom to allow the liquor to readily run off through openings 5 at the bottom of the car along each side. These cars I preferably make of plate metal, with suitable angle-iron frames at the ends and bottoms to give strength; and to prevent corrosion of the metal and keep the fabrics from contact therewith the inside of the cars may be lined with wood, india-rubber, or any other material which will not be affected by the liquors used for treating the fabrics. These cars are run into the keir upon tracks or rails H, fastened along the bottom, and a stop h is attached to each rail, near the inner end of the keir, against which the trucks 6 of the first car introduced will strike, and thus stop the car in the proper position to receive the cover I, suspended from the top of the keir by adjusting-screws K. The other covers must be located in proper relation to the length of the cars. The screws K have collars k at their lower ends upon which the covers are hung, and they pass up through the metal plates forming the keir and have a hand-wheel at their upper end by which to operate them. To prevent any leakage of steam from the keirs they are also provided with packing-boxes 7. The covers I are made of the same size as the opening in the top of the cars and the upper surface of the frame of the cars, and the lower surface of the edges of the covers which meet when the covers are lowered are planed, so as to produce a tight joint when they are brought together.

In order to introduce the liquor, steam, or water into the cars when they are closed, I attach pipes L to the top of the covers, and to allow the covers to be raised and lowered, as described, I provide packing-boxes l, through which the ends of the pipes L can slide, and to which also the liquor-supply pipes M are attached. Upon the under side of each cover I, immediately beneath the opening of the pipe L, I bolt a plate m, to act as a spreader for the liquor as it enters through the pipe L, leaving a space between the plates m and the cover sufficient to permit a free flow of liquor, but so as to spread it and cause it to to fall in sheets or broken streams upon a large portion of the upper layer of fabric in the car, instead of in a solid stream at one place.

In order that the liquor may circulate rapidly through the material placed within the cars, I employ a pump (preferably a centrifugal pump) P and direct its discharge through a vertical pipe p within the chamber O, and as a tell-tale to show that the pump is in operation, and to indicate approximately the volume of the stream of liquor delivered by it, I employ a puppet-valve consisting of a disk q over the opening in the end of the pipe p, and attach to this disk a spindle r, which extends out of the chamber O through a packing-box R. The motion of this spindle above the packing-box will indicate the working of the pump in throwing liquor into the chamber O, and from it through the supply-pipes M, leading therefrom into the closed cars G within the keir. The liquor which is thus forced into the cars is kept at the proper degree of heat by means of steam from a pipe S entering the bottom of the chamber O; or, instead of injecting the steam directly into the liquor, it may be heated by radiation from a coil of steam-pipe s within the chamber.

To an opening t in the bottom of the keir a pipe T is connected, leading to the suction-pipe of the pump P, so that while the fabrics in the cars within the keir are being treated the liquor delivered by the pump through the pipe L in the covers is forced through the material and runs out of the openings 5 at the bottom of the car into the bottom of the keir, and is drawn off by the pump through the pipe T, and is again forced through the pipe p, and thence, by the chamber O and pipes M, into the top of the cars within the keir. Thus the liquor is kept in circulation through the fabric until it is sufficiently bleached or otherwise treated.

When beginning the operation, a sufficient quantity of liquor for treating the fabrics is obtained from the tank, where it has been prepared, through a pipe U, connected with the pipe T, Fig. 3, by a valve u. While this operation is going on a valve V in the pipe T should be closed and the valve u closed and the valve V opened when it is desired to circulate the liquor through the fabric. After the liquor has performed its work it may be drawn off through the pipe T′ by opening the valve v.

Clear water for washing the materials may be obtained through a pipe connected with the pipe T at W, (see Fig. 3,) and steam for heating the keir prior to beginning the operation may be introduced through the pipe w. I also place safety-valves upon the top of the keir, usually a lever-valve y and a weighted puppet-valve y', and also a vacuum-valve z.

The intermediate chamber O, having the discharge-pipe from the pump near the top and the supply-pipes leading to the keir open-

ing from the bottom, gives an equal quantity of liquor through each supply-pipe, whether two or more are employed, and there should be as many as there are cars within the keir. In keirs heretofore in use the supply-pipes have branched directly from the discharge-pipe of the pump, and the result has been that, whichever supply-pipe first filled that one would continue to discharge its full capacity into the keir and tend to draw the liquor out of the other pipes, causing them to deliver a much smaller quantity to the cars in the keir beneath their discharge, and, as a consequence, when a keir contained more than one car, the fabric in one would receive more liquor than that in the others, and thus the goods would be unequally treated; also heretofore the liquor has been kept hot by introducing steam to it immediately after it has passed from the fabric, usually while it was in the bottom of the keir and before it passed through the pump. By my improved construction the liquor is heated in the distributing-chamber interposed between the discharge-pipe of the pump and the keir, so that very little heat is lost before the liquor is in contact with the fabric under treatment, and also the introduction of steam between the discharge of the pump and the outlet of the pipe within the close car in the keir tends to assist the action of the pump in carrying the liquor forward.

The benefits and advantages of my improved construction of cars are that, being made whole with a close-fitting cover, a less quantity of liquor is needed in the operation than in other keirs, for all of the liquor which is introduced at the top through the covers must pass through the material in the car, because there is no outlet except at the bottom of the car; and for the same reason the liquor can be passed through under pressure produced, not only by the force of the pump, but also by the steam, which may be introduced into the intermediate heating-chamber, and the steam there introduced into the liquor cannot escape into the keir until it has passed through the fabric in the car.

My improved construction of covers for the cars and the novel manner of combining them with the keir, will be found very convenient and advantageous, as they are always in position ready to be closed firmly over the car when in place within the keir, and can readily be removed from the car, and thus relieve it of considerable weight when it is to be withdrawn.

The doors of keirs of this kind have heretofore been suspended upon chains with a counter-balance to assist in raising them or in swinging them to one side. My construction of screw-rods at each side of the door to raise and lower it is more convenient and positive in action, besides being more compact, and the independent adjustable frame C′, having an opening corresponding in size and shape to the opening into the keir, remains in place in front of the keir at all times, with a space between it and the frame C just sufficient to allow the frame of the door to move freely up or down; and when down, in the position requisite to cover the opening into the keir, the frame C′ can be set firmly against the door-frame D by means of the nuts 10 upon the outer ends of the bolts *b*, thus forcing the door to its seat against the frame C, and by means of the compressible bearing or packing *d* a steam-tight joint will be made. The amount of pressure between the door and the frame C can be regulated by the position of the nuts 11 upon the bolts *b*, which may be retained in place by the jam-nuts 12. The frame C′ being rigid will produce an equal pressure upon the frame of the door throughout its circumference, which is not readily effected where the bolts are applied directly to the door.

The liquors ordinarily employed in the operation of bleaching can be used in my keir the same as in those of prior construction, but more effectively, as the liquor is not so rapidly diluted by the condensation of steam, particularly when I heat the liquor in the chamber O by radiation instead of by the injection of steam.

I claim—

1. In a bleachery-keir, the combination of a closed car or receptacle provided with a cover having a liquid-inlet through it, which is connected with the discharge-pipe of a pump, and liquid-outlets at the bottom of said car, with an enveloping steam-tight chamber connected at the bottom with the suction-pipe of said pump, whereby liquor may be circulated under pressure through material placed in said car, substantially as described.

2. In a bleachery-keir, the combination of a steam-tight enveloping-chamber and a closed car or receptacle having discharge-openings at the bottom and a liquid-inlet at the top, which is connected with a pump to deliver liquor within said car and force it through the material contained therein, substantially as described.

3. In a bleachery-keir, the combination, with an enveloping steam-tight chamber, of a closed car or receptacle having liquid-discharge openings at the bottom, and an adjustable cover therefor provided with a liquid-induction pipe and suspended within said chamber above the car, substantially as described.

4. In a bleachery-keir, the combination of an enveloping steam-tight chamber, a closed car to contain fabric, and an adjustable cover for said car suspended above it within the chamber and provided with an inlet-pipe having a sliding connection with a liquor-supply pipe, substantially as described.

5. In combination with a liquid-circulating pump for a bleachery-keir, a liquid heating and distributing chamber interposed between said pump and keir and having the discharge-

outlet from the pump near the top of said chamber, and the outlets of the supply-pipes for the keir near the bottom thereof, substantially as described, and for the purpose specified.

6. In combination with a liquor-circulating pump for a bleachery-keir, an intermediate liquor-distributing chamber having the discharge-outlet from the pump, near the top thereof, and a puppet-valve to cover said outlet, having its stem projecting without the chamber, in the manner substantially as described.

7. In combination with a bleachery-keir, a door provided with a compressible bearing upon the side next to the kier and supported upon vertical screw-rods engaging therewith at each side, and an independent adjustable frame to force the door to its seat when it has been lowered to the position requisite to cover the opening into the keir, substantially as described.

8. In combination with a steaming or boiling tank, a door supported and operated by vertical screw-rods engaging therewith at each side, and an independent adjustable open frame, by which the door, when in a position to cover the filling-opening in the tank, may be forced to a steam-tight bearing therewith, substantially as described.

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Witnesses:

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