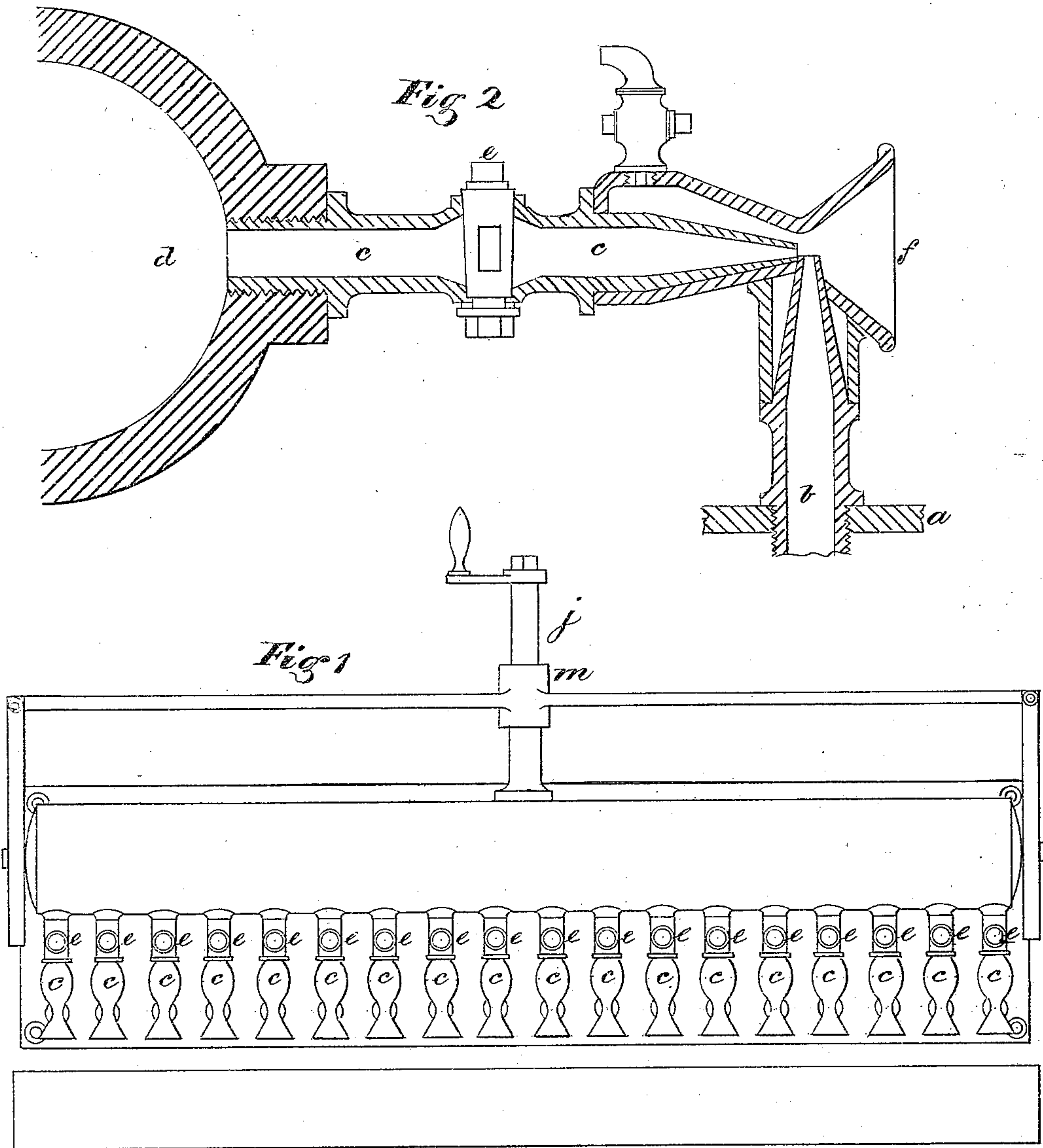


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Improvement in Apparatus for Bleaching, Dyeing,
and Finishing Textile Fabrics.
No. 125,897. Patented April 23, 1872.



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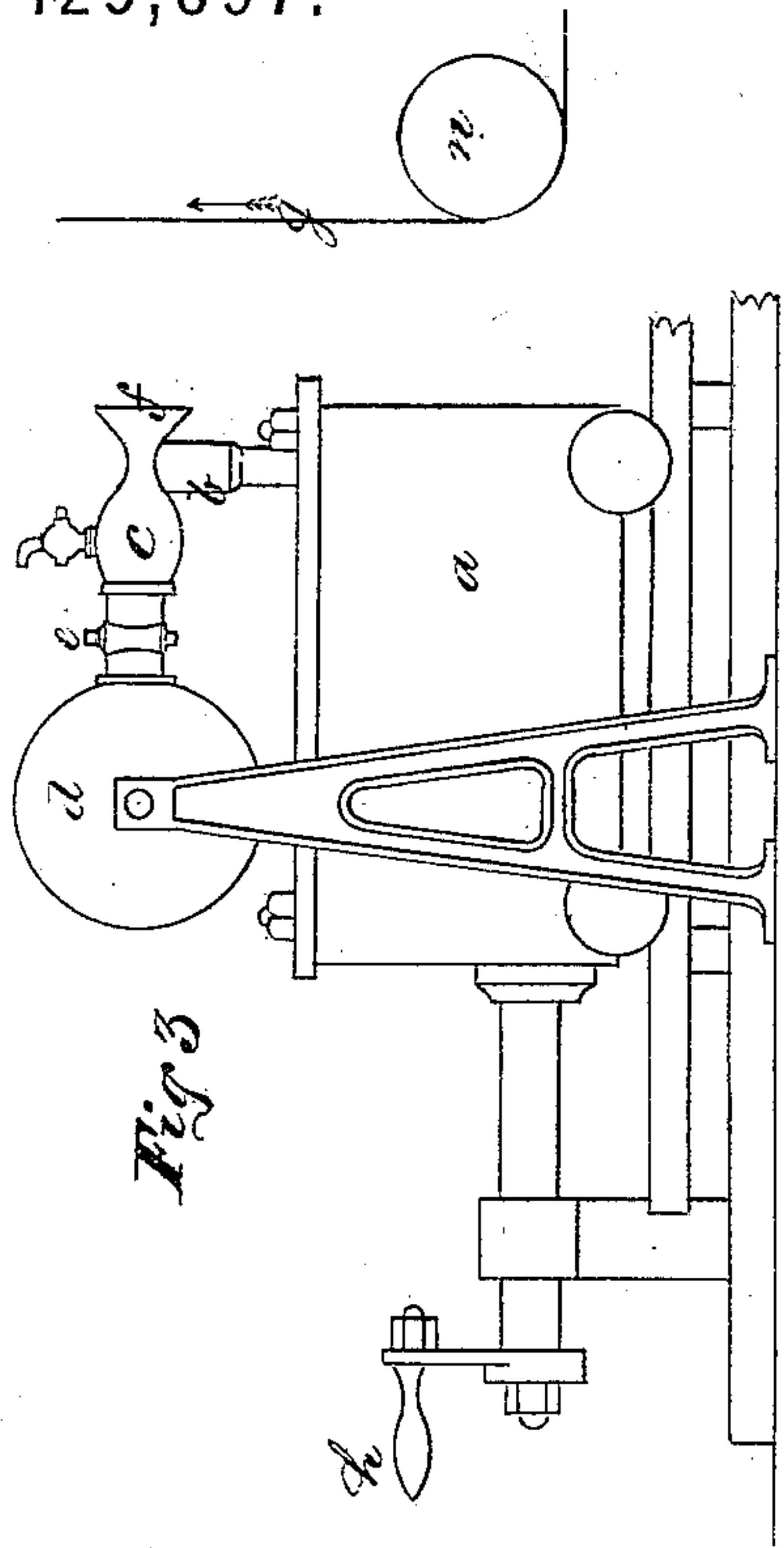


Fig 3

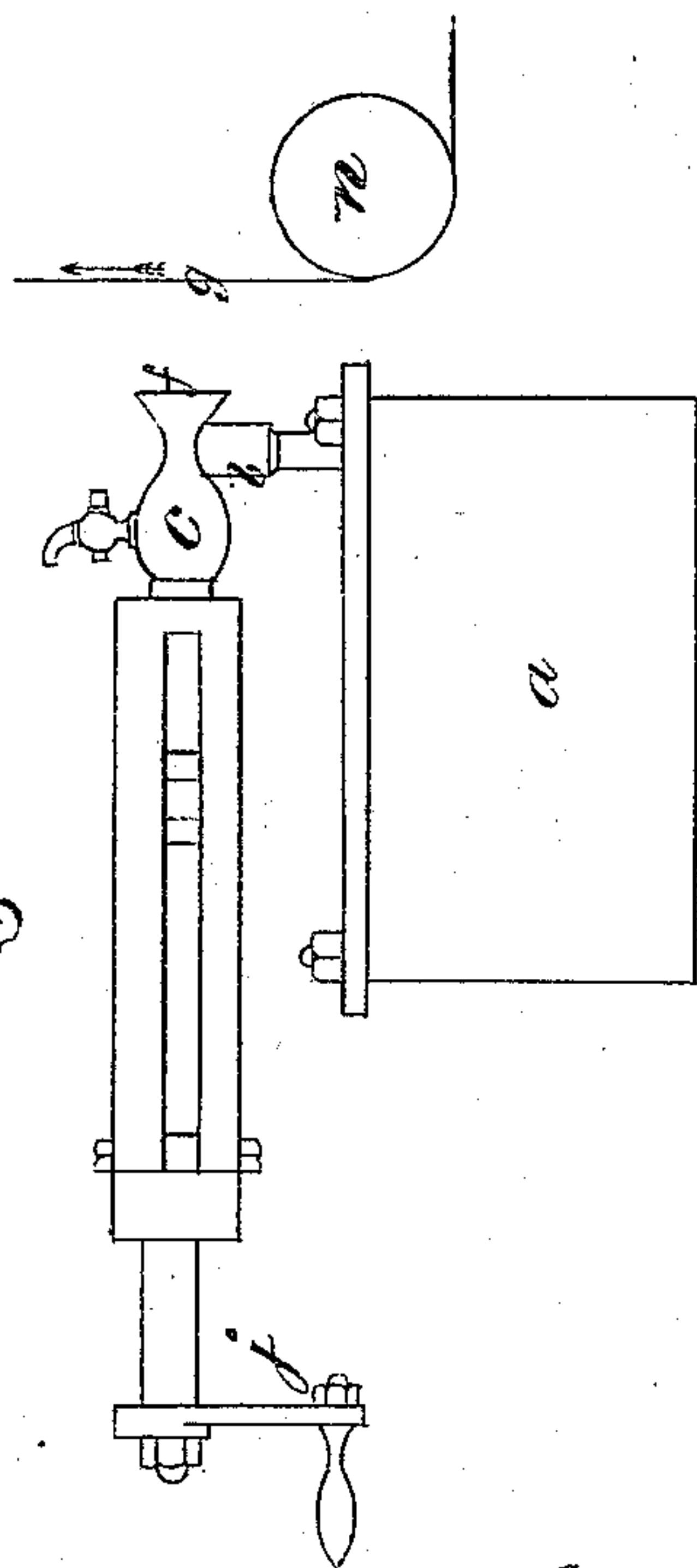


Fig 4

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UNITED STATES PATENT OFFICE.

JOSEPH LEA, OF PHILADELPHIA, AND JONAS EBERHARDT, OF CONSHOHOCKEN, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR BLEACHING, DYEING, AND FINISHING TEXTILE FABRICS.

Specification forming part of Letters Patent No. 125,897, dated April 23, 1872.

Specification describing a Process of Bleaching, Dyeing, Finishing, and Washing all Textile Fabrics, whether of cotton, woolen, linen, silk, or paper stock, invented by JOSEPH LEA, of the city of Philadelphia, in the State of Pennsylvania, and JONAS EBERHARDT, of Conshohocken, Montgomery county, in said State.

The nature of our invention consists in applying to cloth or other fabrics intended to be bleached, dyed, mordanted, finished, or washed, the bleaching, dyeing, mordanting, finishing, or washing agents in a vaporous or finely-divided state.

We will now proceed to describe the process and also the apparatus by which we have obtained satisfactory results in the application of the process.

In the annexed drawing, Figure 1 represents a plan of the apparatus; Fig. 2, a longitudinal vertical section of one pair of the series of vaporizing-tubes *e*, and of part of the color-box *a*, and of the drum *d*; Fig. 3, a side elevation of the apparatus, showing a crank, *h*, for moving the color-box *a* toward or from the fabric *g*; Fig. 4, a side elevation, intended to show the crank *j* attached to the drum *d* to move the series of vaporizing-tubes *e* toward or from the apertures of the vertical tubes *b*.

A, Figs. 3 and 4, is a rectangular box of wood, stone, glass, or metal, as may be best adapted to the acid, colors, or other agents generally employed in the process of dyeing, bleaching, chemicing, starching, finishing, or washing textile fabrics, or fabrics of paper-stock. The length of the box *a* should be equal to the width of the fabric to be treated. Into the cover of box *a* are inserted, at equal or unequal distances, as required, vertical tubes *b*, Figs. 2, 3, and 4, each of about one-half inch in diameter, the lower ends of which tubes extend down into the box *a* so as to be immersed in the liquids or solutions contained therein. The upper portions of the tubes *b* are tapered, as shown, so as to terminate with small apertures, respectively, varying from $\frac{1}{32}$ to $\frac{3}{16}$ of an inch in diameter, according to the density or thickness and quantity of the fluid to be applied to the fabric. Opposed horizontally to the apertures of tubes *b*, respectively, are other tubes *c*, which are attached to

the drum *d*, each tube being provided with a regulating-cock, *e*, the tubes *c* being so adjusted that a current of steam or compressed air or gas from the drum *d* is forcibly ejected across the apertures of the tubes *b*, thereby creating a vacuum in tubes *b* and causing the fluids in box *a* to rise up through these tubes and to be thrown in a vaporized or finely-divided state on the cloth or other fabric *g*. The drum *d* is provided with a crank, *j*, Fig. 1, which passes through a screw-socket, *m*, and the box *a* is provided with a similar crank, *h*, Fig. 3, by which cranks the apertures of the two sets of tubes *b* and *c* are caused to recede from or approach each other so as to vary the force and volume of the application. To promote uniformity of results the ends of tubes *b* and *c* are covered by directors *f*, Fig. 2. The cloth or other fabric *g* intended to be vaporized is drawn up around a roller, *n*, evenly and smoothly in front of the directors *f* in any convenient manner. As the cloth or other fabric passes from its position in front of the directors *f* its surface may be brought in contact with rotary brushes, or passed between cylinders, to promote the spreading and blending of the colors. The cloth or other fabric is next passed through a hot room or aging-box, either to dry the fabric or to fix the mordant or coloring solution upon it. If found necessary to intensify or modify the colors, or produce variations of color, or complete the bleaching, finishing, or washing, the cloth or other fabric may be passed repeatedly through the described operations.

There are many solutions, especially those of indigo, aniline, extracts of madder, cochineal, and Persian berries, which are very costly. These can be used with great economy by our process, as the quantity used can be reduced to the minimum necessary; and in cases where oxidation is necessary, as in indigo dyeing, great savings and other advantages are obtained by the use of our process as compared with any of the processes hitherto practiced.

Although compressed air or gas is sufficient in some cases, we prefer to use steam as the vaporizing agent, since, by warming the color or the liquid employed and expanding the pores of the cloth or fabric under treatment, it pro-

motes the operation and assists to fix the color when the coloring matter comes in contact with mordanted fabrics. It is to be understood that, when it is desired, the cloth or other fabrics are mordanted by a separate application of our process before they are subjected to the described application of coloring matters. By our process we are enabled to apply colors or the other liquors referred to, to one side only of the fabric, if desired. By an arrangement of partitions in the color-box *a* different shades of the same color, or different colors, can be simultaneously applied, either in stripes or rainbows; or we can apply to the fabric at the same time with the coloring matter, as indeed is necessary for the production of aniline solid blacks, metallic salts or oxides. The cloth or fabric to be treated may be printed either with colors or reserves before being subjected to our vaporizing process. By charging the box *a* with water, hot or cold, and enlarging the vertical tubes *b*, our process is effectively applied to the washing of fabrics.

We claim—

1. The process of dyeing and mordanting by applying the coloring matters or mordants in a vaporous state to the cloth or fabrics treated, substantially as set forth.

2. The process of bleaching by applying the solutions for scouring and chemicing in a vaporous state to the cloth or fabric treated, substantially as set forth.

3. The process of finishing by applying the starching, glazing, or other sizing matters in a vaporous state to the cloth or fabric treated, substantially as set forth.

4. The process of washing cloth or other fabrics by the application thereto of hot or cold water in a vaporous or divided state, substantially as set forth.

5. The production of aniline solid blacks by applying simultaneously to the cloth or other fabrics the aniline solution and oxidizing agent in a vaporous state, substantially as set forth.

6. The process of vaporizing, coloring, bleaching, finishing, or washing materials by the aid of steam or compressed air or gas, substantially as set forth for the purposes specified.

7. The apparatus comprising the box *a*, drum *d*, tubes *b* and *c*, and directors *f*, constructed and operating in the manner and for the purpose substantially as set forth.

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Witnesses to the signature of JONAS EBERHARDT:
A. CHARLES STUART,
THOS. A. BURTT.