

(No Model.)

2 Sheets—Sheet 1.

L. LE BLOIS.  
METHOD OF AND APPARATUS FOR BLEACHING AND DYEING TEXTILE  
MATERIALS.

No. 489,819.

Patented Jan. 10, 1893.

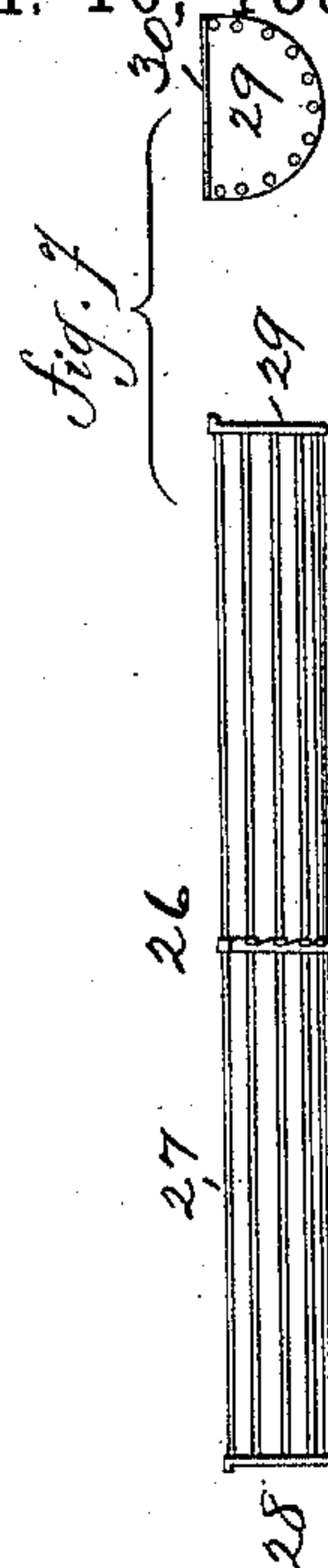
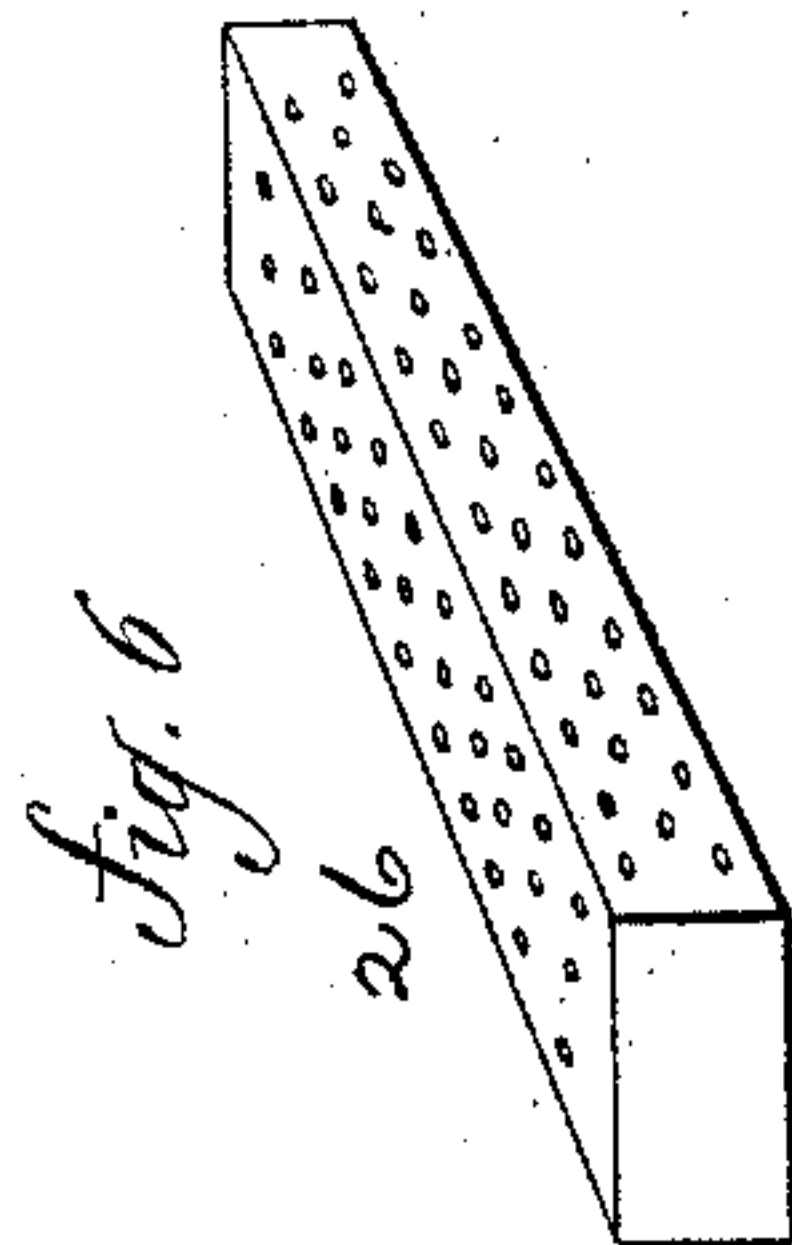
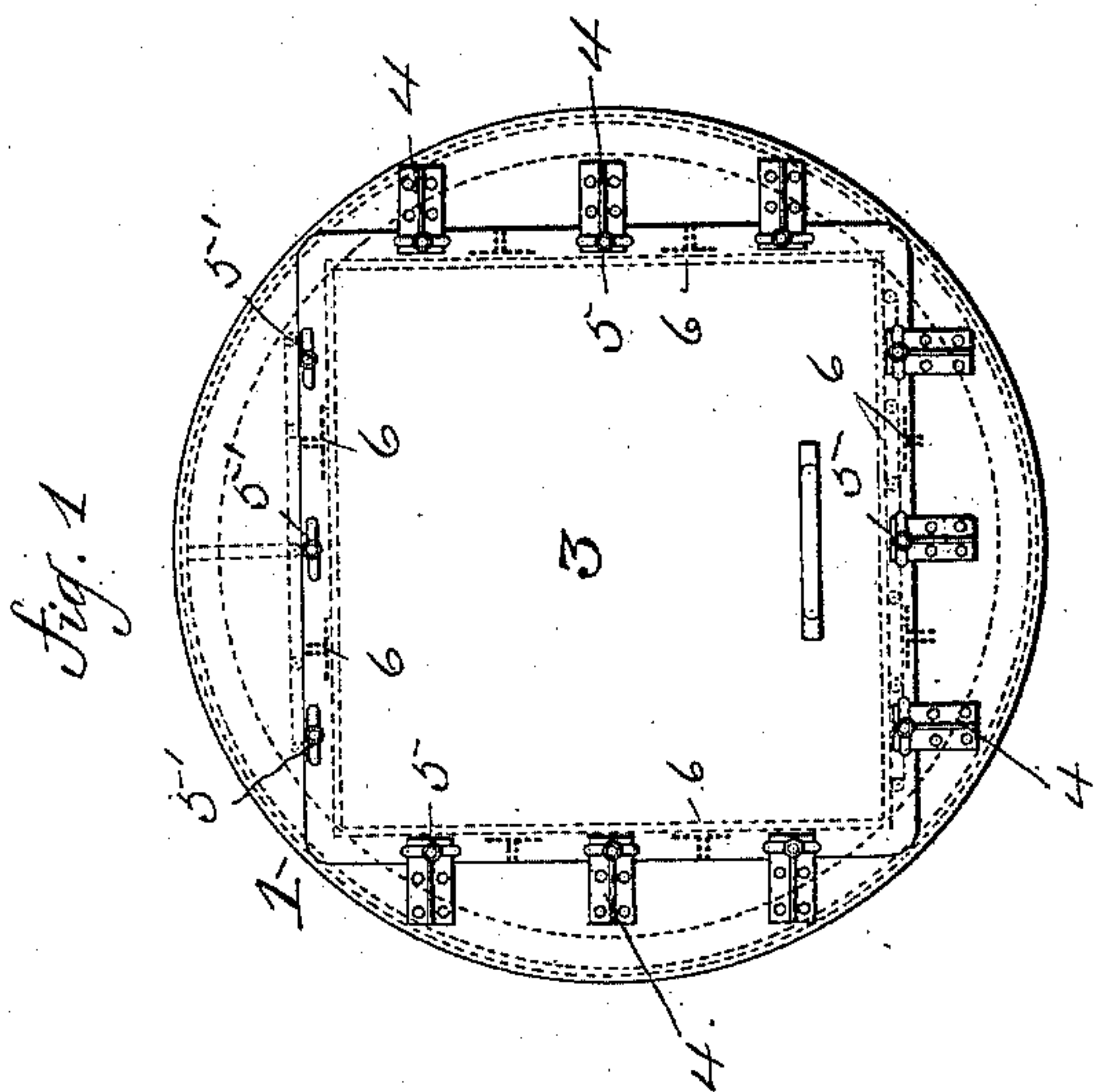
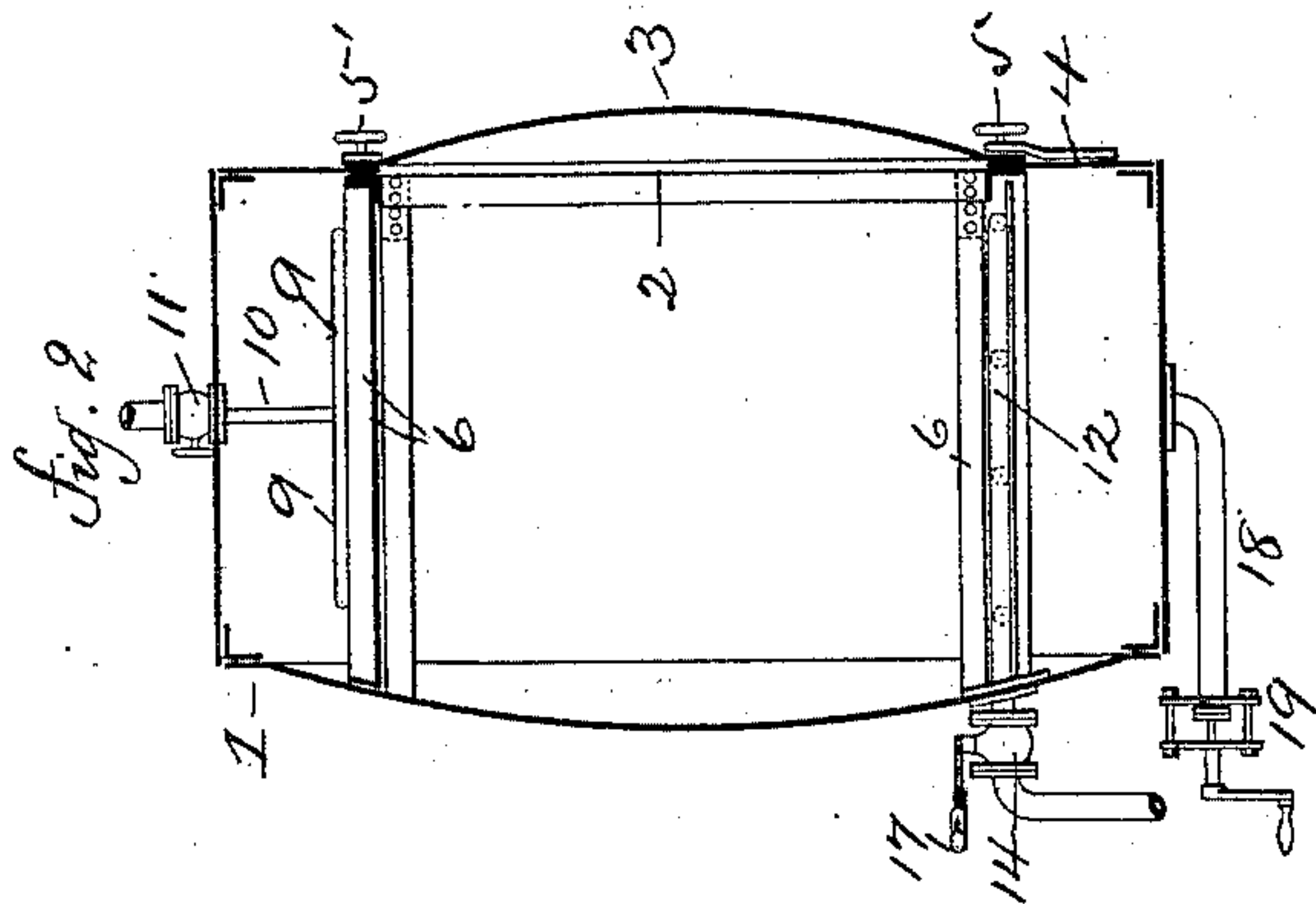
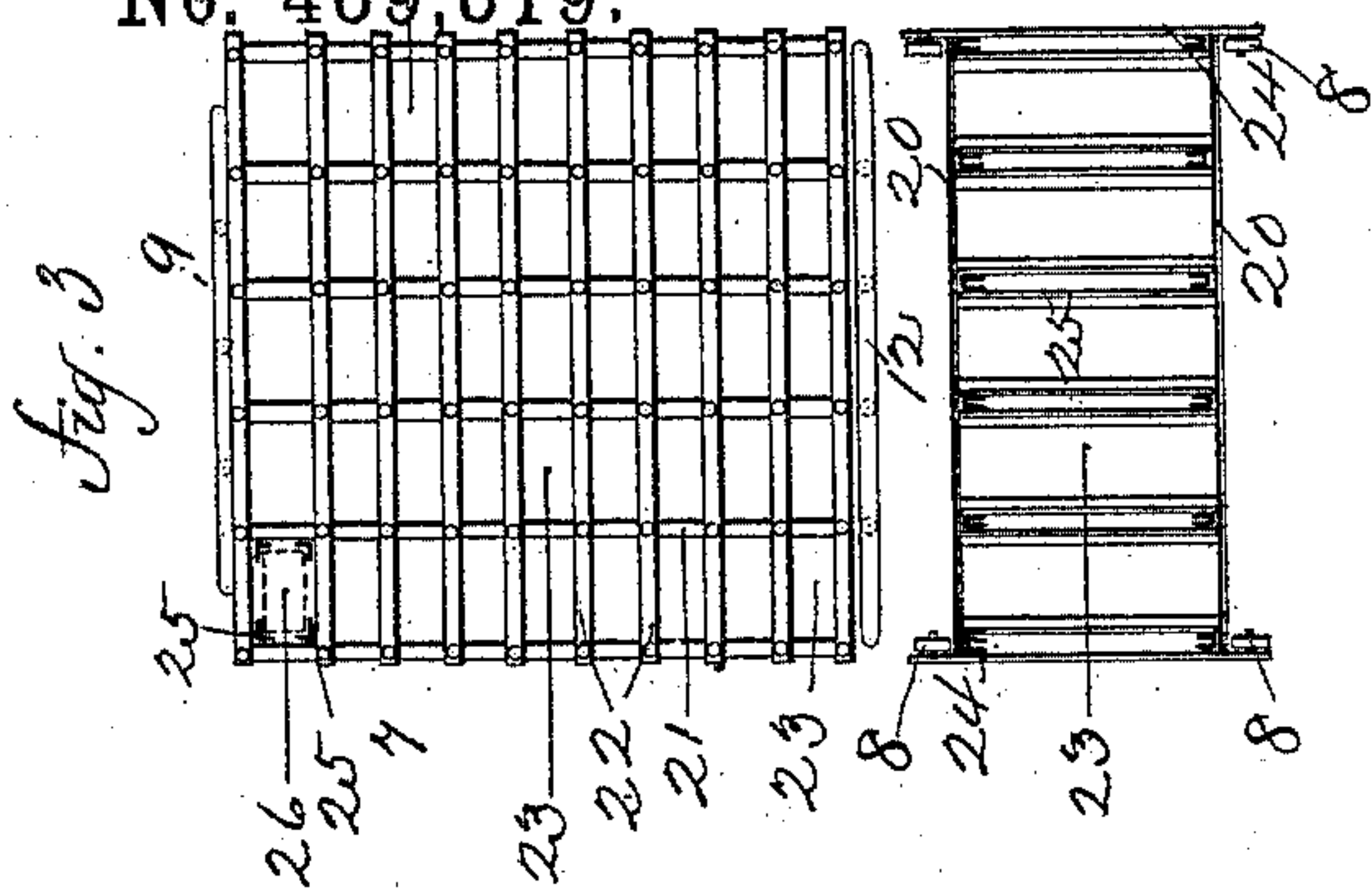


Fig. 5

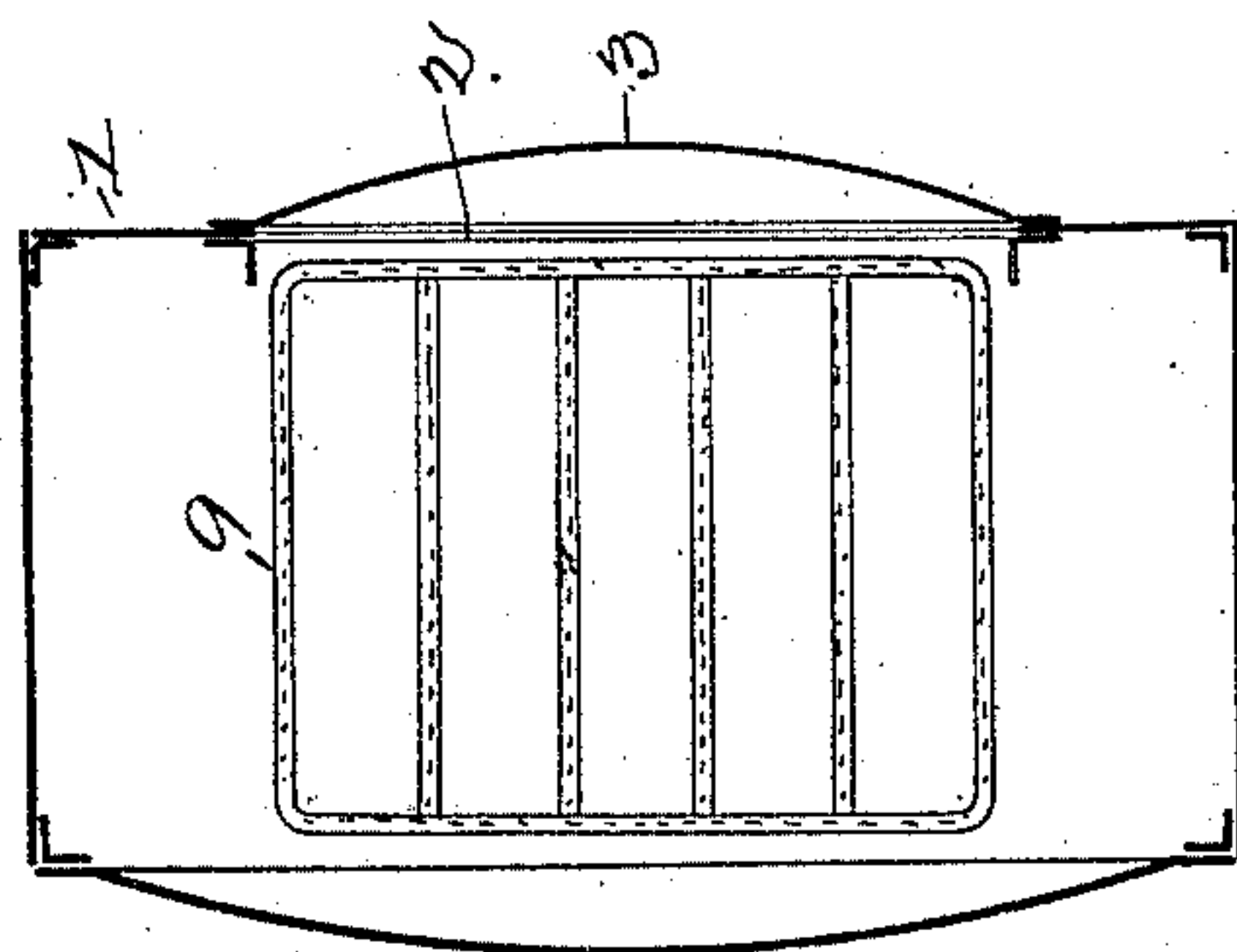
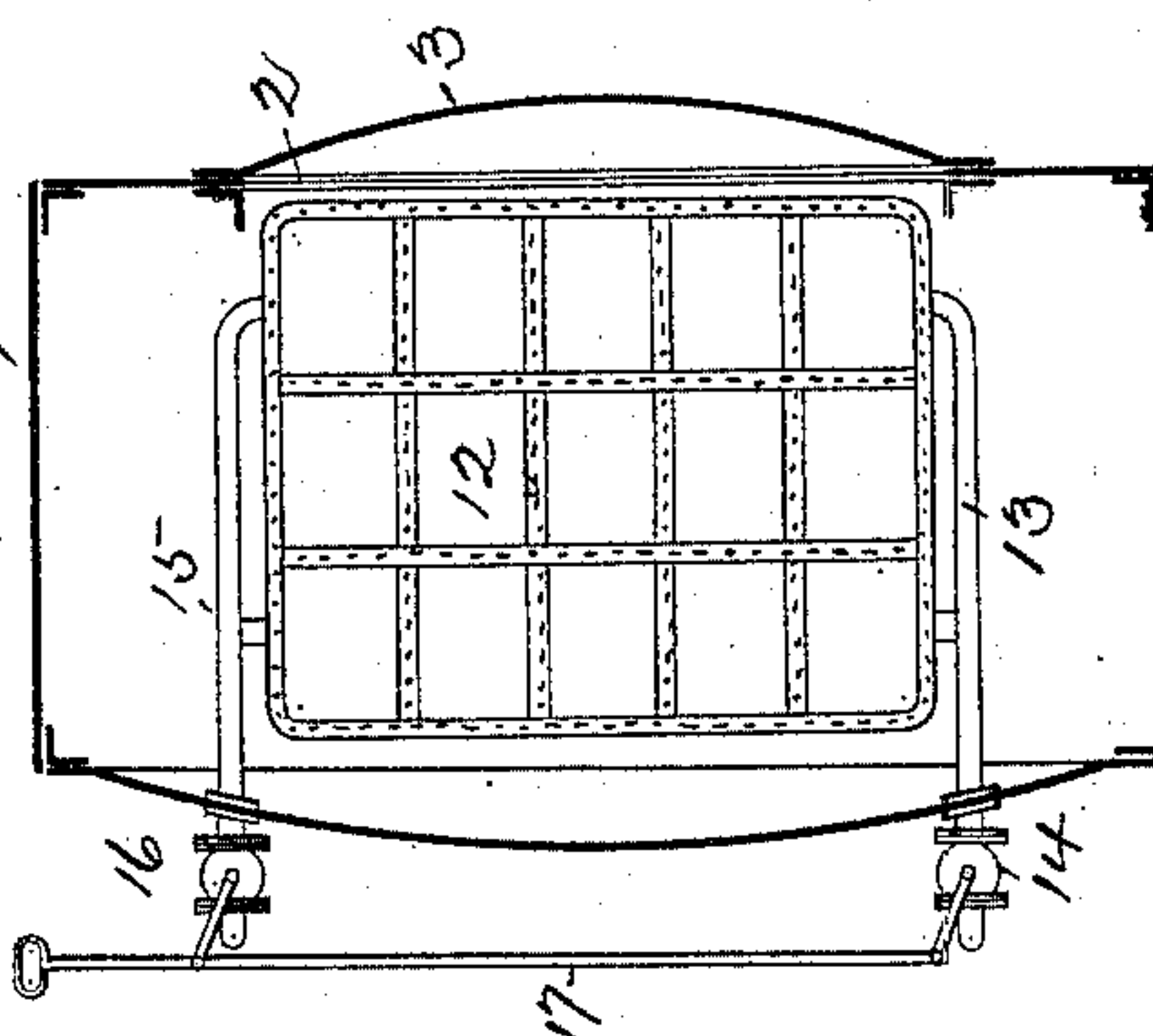


Fig. 4



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# UNITED STATES PATENT OFFICE.

LEOPOLD LE BLOIS, OF ELBEUF, FRANCE.

METHOD OF AND APPARATUS FOR BLEACHING OR DYEING TEXTILE MATERIALS.

SPECIFICATION forming part of Letters Patent No. 489,819, dated January 10, 1893.

Application filed April 4, 1891. Serial No. 387,610. (No model.)

*To all whom it may concern:*

Be it known that I, LEOPOLD LE BLOIS, a citizen of the Republic of France, residing at Elbeuf, Department of the Seine-Inférieure, in the Republic of France, have invented certain new and useful Improvements in Bleaching and Dyeing Cotton and other Textile Materials and in Apparatus Therefor, of which the following is a specification.

My invention has reference to an improved method of and apparatus for bleaching and dyeing vegetable materials, and while the invention is applicable to many kinds of such materials, it is more especially adapted to the bleaching and dyeing of cotton, either raw, or in the form of slivers or threads.

Prior to my invention, it was considered necessary as a preparatory step in the operation of bleaching or dyeing to ungum the material and thereby reduce it to, as nearly as possible, pure cellulose. To do this the material was subjected to the action of a bath or wash for several hours at a temperature equal to or above the boiling point of the bath. The fiber thus treated, being deprived of its natural gums and oils, was harsh, brittle and weakened and consequently there was more or less waste in the further treatment. This is obviated by my invention, for I have discovered that vegetable material, especially cotton, may be bleached or dyed after impregnation in cold or moderately warm liquids thus avoiding the usual ungumming operations and the subjection of the material to high temperatures; consequently vegetable material treated in accordance with my invention retains its natural softness, pliability and strength.

In practicing my invention I first thoroughly impregnate the material with water, or weak bleaching or dyeing fluids at a temperature always below the ordinary boiling point of water, and then bleach or dye the soaked material by successive dippings in a proper bath.

In order to effect the thorough impregnation in the preparatory bath, I separate the material into small parcels, which are placed in specially constructed receptacles accommodating from one to two kilograms of the fiber. These receptacles are then inserted in a vacuum chamber or vat, and the bath is caused to flow into the vat until the material

in the receptacles is covered thereby. I then alternately produce a vacuum in the vat, and admit air thereto, in such manner that the latter will bubble up through the bath and the material contained therein. By these means the liquid of the bath is brought into intimate contact with all the fibers throughout all the separate parcels into which the material is divided, and therefore, a thorough impregnation of the mass is effected.

By using a vacuum chamber the fibers are prepared for bleaching or dyeing at temperatures much below the ordinary boiling point of water. In practice the temperature may vary from 10° centigrade, to 80° centigrade, according to circumstances, and the nature of the material treated, and consequently the fiber is not damaged or injured as it always is when high temperatures are employed. After the material has been thoroughly impregnated throughout, the bleaching and dyeing baths readily penetrate the fiber and act on every portion thereof, so that the ungumming hitherto thought to be necessary, is, by my invention, avoided. After this preparatory treatment, the bleaching and dyeing are accomplished by alternately dipping the material in the proper bath and exposing it to the air. These dippings agitate the bath, and in the case of dyeing, prevent deposits of undissolved dye on the material.

The improved apparatus by means of which the impregnating, bleaching and dyeing operations are performed, is illustrated in the accompanying drawings forming part of this specification.

An important feature of the apparatus is that by its use the direct handling of the material is avoided and the consequent felting of the same is prevented. This is accomplished by the use in the apparatus of perforated or open work chests or boxes, each of which holds but a small part of the entire charge; the apparatus being so constructed that the chests or boxes with their contents undisturbed may be transported from the impregnating bath to the bleaching and dyeing baths and there treated without handling. All this will more fully appear from the following detail description in connection with the accompanying drawings, in which:—

Figure 1, is a front elevation of the vacuum



vat; Fig. 2, is a vertical section of the same; Fig. 3 is a front elevation and top plan of a frame or rack for the interior of the vat; Fig. 4, is a central cross section of the vat; Fig. 5, is an inverted sectional view of the same; Fig. 6, is a perspective view of one form of portable chest or box for the material; Fig. 7, is a side and end view of another form of chest or box; Fig. 8, is a perspective view of still another form of chest or box; Fig. 9, is an elevation of a bleaching and dyeing vat and dipping wheel therefor; and Fig. 10, is an edge view of a portion of the dipping wheel.

Like numerals of reference indicate like parts all throughout the drawings.

Referring to the drawings and more particularly to Figs. 1 to 5, there is shown a vat 1, consisting of a cylindrical or other shaped, cast or sheet-iron body with one end provided with a large rectangular opening 2, through which access is had to the interior of the vat. The opening 2, is normally closed by a door or cover 3, held in place by clips 4, arranged around three sides of the opening, and by clamp screws 5, extending through the clips 4, and into contact with the cover, and by other clamp screws 5', which pass through the cover and into the side wall of the vat on the side of the opening 2, free from the clips 4. Within the vat 1, there is a rectangular frame or support 6, formed of angle iron and shaped to receive a movable frame or rack 7, (Fig. 3,) mounted upon rollers 8, which travel on the lowermost portions of the frame 6, when the rack is inserted in the vat through the opening 2. Within the vat above the frame 6, there is a system of pipes 9, provided with perforations as indicated, and this system is connected by a pipe 10, provided with a valve 11, with a suitable air pump, (not shown) by means of which the air may be exhausted from the vat. Within the vat, below the frame 6, is another system of pipes 12, also perforated. At one end, this second system of pipes communicates with a reservoir (not shown), of water, or other suitable fluid, by means of a pipe 13, provided with a valve 14; and at the other end by means of a pipe 15, provided with a valve 16, the system of pipes may be opened to the free air. The valves 14, and 16 are connected by a link 17, so that they may be operated simultaneously, and these valves are so constructed that in one position the valve 14 is open and the valve 16, closed; in another position the valve 14, is closed and the valve 16, open, and in another, preferably intermediate, position both valves are closed. At the bottom of the vat 1, there is an outlet or discharge pipe 18, closed at its lower end by a valve 19.

The rack shown in Fig. 3, consists of two frames 20, 20, each formed of upright strips 21, joined at intervals by cross-slats 22, so as to form numerous rectangular openings or spaces 23, arranged in horizontal and vertical series. The two frames 20, 20, are joined at the ends by spacing bars 24, and also by an-

gle pieces 25, extending between the two frames 20, at the corners of the openings or spaces 23. The angle pieces 25, in each opening 23, constitute a skeleton frame or way for the reception of a rectangular chest or box 26, shown in perspective in Fig. 6, and formed of perforated metal. The chests, however, may be otherwise constructed, for instance, as shown in Fig. 7, in which case they are semi-cylindrical, being formed of longitudinal slats or rods 27, held and spaced by end pieces 28, 29, and also in the middle as shown, the chest being provided with a cover 30; or the chests may be constructed as shown in Fig. 8, in which case they are rectangular and likewise formed of slats 27, and pieces 28, 29, and a number of intermediate binding pieces. It will be understood that whatever be the shape of the chests the rack will be suitably shaped to receive them.

The chests may be constructed in any suitable manner so long as they will retain the material to be treated and permit the free circulation of liquid through them and to the said material.

Referring now more particularly to Figs. 9 and 10, there is shown a semi-cylindrical vat or trough 31, on the upper straight edges of which are mounted the journal boxes, 32 of the axle or shaft 33, of a wheel 34, which I will hereinafter refer to as the dipping wheel. The dipping wheel 34, is constructed as follows: Upon the axle 33, are two hubs 35, keyed thereto, and on each of these hubs there are a number of radial spokes or arms 36. Each set of spokes carries a number of concentric rings 37, and the spokes of one hub are firmly connected to the spokes of the other hub by braces 38. Secured to the rings 37 and extending from one side of the wheel to the other are angle irons 39, disposed as shown in Fig. 9, to form a series of skeleton pockets for receiving the chests 26 before described, the pockets being shaped to correspond to the form of the chests. When the pockets are rectangular the spokes are cut away as shown at 40, to permit the pockets being placed radially in the wheel.

The vat 31, may be entirely cylindrical instead of semi-cylindrical and in practice it will be connected with reservoirs containing suitable bleaching, dyeing and washing fluids. These reservoirs and connections, and the outlet by means of which the baths are withdrawn from the vat 31, are not shown, since the arrangement thereof will be readily apparent to those skilled in the art to which this invention appertains.

With an apparatus constructed as described my process of impregnating, bleaching and dyeing may be practiced as follows: The material to be treated is placed in the chests 26, which are inserted in the rack 1, and the door of the vat is then clamped tightly in place, thus hermetically sealing the opening through which the chests were introduced. The valves 14, 16 and 19, are closed and the valve



11, opened, after which the air is exhausted from the vat until the desired degree of vacuum is produced. The valve 14, is then opened and water or other suitable fluid is forced  
 5 into the vat by atmospheric pressure, until all the chests are covered, after which the valve 14, is closed. The vacuum is again produced, and then the valve 11, is closed and the valve 16 is opened, thus admitting air  
 10 which enters the vat through the perforated pipes 12, and bubbles up through the liquid in the vat and through the material in the chests. The vacuum thus destroyed is again obtained by closing the valve 16, and again  
 15 opening the valve 11. The alternate creation of the vacuum and admission of air are continued for a time until the entire mass of material is thoroughly impregnated. The manipulations of the valves, in the process so far  
 20 described, may be varied in so far as it is practicable to leave the valve 14, open during the initial exhaustion of air from the vat, in which case the fluid will gradually enter the vat as the air becomes gradually exhausted.  
 25 By the exhaustion of the air, the fibers of the materials treated are freed from the adhering and condensed layers of air which ordinarily envelop the same, and the fluid in the vat has thus direct access to the said fibers; and the  
 30 agitation of the fluid by the subsequent admissions of air, forces the fluid into still more intimate contact with the fibers.

The impregnating baths may be ordinary water, but I obtain the best results by using,  
 35 when preparing the material for bleaching, a weak bleaching bath for the initial impregnation, such for instance as an aqueous solution a three-tenths per cent. solution of neutral hypochlorite of soda.

40 When preparing the material for dyeing I may employ as the initial or impregnating bath, a weak dyeing fluid which will produce on the material, a "ground" adapted to the color or shade to be ultimately produced. The  
 45 ordinary practice in accordance with my method and the one which gives the best results, is to first impregnate the material with either a weak bath of hypochlorite or with a weak dye bath, as the case may be, in the vacuum  
 50 vat, as described, and then to bleach or dye, or bleach and dye the same, as the case may be, in the wheel vat. For this purpose, when the material in the vacuum vat has been impregnated, the fluids therein are withdrawn  
 55 through the valve 19, and the chests with their contents are removed and placed in the pockets in the dipping wheel. The wheel vat is then filled to a suitable height with the bleaching or dyeing fluid, as the case may be,  
 60 and the wheel is rotated alternately to the right and left and thereby effects the successive immersion and exposure to the air of the material in the chests, whereby uniformity of bleaching or dyeing is obtained, while the  
 65 passage of the chests through the fluid thoroughly agitates the same thus aiding in impregnating the material, while in the case of

dyeing, the agitation of the bath prevents deposits of undissolved dye powder on the said material. Mordant, purifying and washing  
 70 baths can also be readily used in the wheel vat in the same manner as the bleaching and dyeing baths are used without deterioration or felting of the material used.

It will be observed that after the material  
 75 is once placed in the chests the operations of impregnating, bleaching, dyeing, washing, and the transportation of the chests from the vacuum vat to the wheel vat, are performed without direct handling of the material treated,  
 80 thus avoiding felting or injury to the materials; this being particularly advantageous with such delicate materials as combed and drawn cotton slivers, which can, after having been dyed, and without any supplementary  
 85 operation, be subjected to the final process of drawing-in and spinning, that is to say, the spinning process may be taken up again at the stage where it was interrupted for the bleaching or dyeing operations. Thus, by the  
 90 combined use of the vacuum and wheel vats, and the portable chests the bleaching and dyeing operations may be comfortably and expeditiously performed without subjecting the material to direct handling, and I am enabled  
 95 to practice my process herein set forth, with certainty of obtaining uniformly good results, and with economy.

Having now fully described my invention, I claim and desire to secure by Letters Patent:  
 100 ent:—

1. In the process of dyeing or bleaching vegetable material, the method of first impregnating the fiber in its natural state with a  
 105 suitable fluid, such as water or water tintured with dyeing or bleaching liquid, at a temperature below the normal boiling point, and then subjecting the treated material to the dyeing or bleaching operation, substantially  
 110 as described.

2. In the process of bleaching or dyeing vegetable fiber, the method of impregnating the material in its natural state, with a suitable fluid, by immersing the material in the  
 115 fluid, at a temperature below the normal boiling point of water, and then alternately creating a partial vacuum over the fluid and passing air through the same, substantially  
 120 as described.

3. In a bleaching or dyeing apparatus, a vacuum vat provided with inlet and outlet  
 125 ducts for a suitable bath, an air exhaust duct at the upper end of the vat, and an air inlet duct at the lower end of the vat, substantially as described.

4. In a bleaching or dyeing apparatus, perforated or openwork chests for the material  
 130 to be treated, in combination with a vat provided with supports for the chests, and having an air exhaust duct above the supports and an air inlet duct below the same, substantially as described.

5. In a bleaching or dyeing apparatus, perforated or openwork chests for the material



to be treated, in combination with a vat provided with supports for the chests, inlet and outlet ducts for a suitable bath, an air exhaust duct above the supports, a system of  
5 perforated pipes below the supports, and an air inlet duct connected to the said system of pipes, substantially as described.

6. In a bleaching or dyeing apparatus, the combination with portable perforated or open-  
10 work chests or boxes for the material to be treated, with a vacuum vat provided with supports for the chests or boxes, and a bleaching or dyeing vat provided with a dipping wheel also having supports for the chests or  
15 boxes, substantially as described.

7. The process of bleaching or dyeing vegetable fiber, consisting in first impregnating the fiber with a weak bleaching or dyeing

fluid and then subjecting it to the action of a bleaching or dyeing bath of the requisite  
20 strength, substantially as described.

8. The process of bleaching or dyeing vegetable fiber consisting in first impregnating the fiber in its natural state with a weak  
25 bleaching or dyeing fluid at a temperature below the normal boiling point of water, and then subjecting the impregnated fiber to the action of a bleaching or dyeing bath of the requisite strength, substantially as described.

In testimony whereof I have signed my  
30 name to this specification in the presence of two subscribing witnesses.

LEOPOLD LE BLOIS.

Witnesses:

ALPHONSE GRÜNFELDER,  
ROBT. M. HOOPER.