(No Model.) 4 Sheets—Sheet 1.

F. E. DROWN.

APPARATUS FOR BLEACHING.

No. 441,946. Patented Dec. 2, 1890.

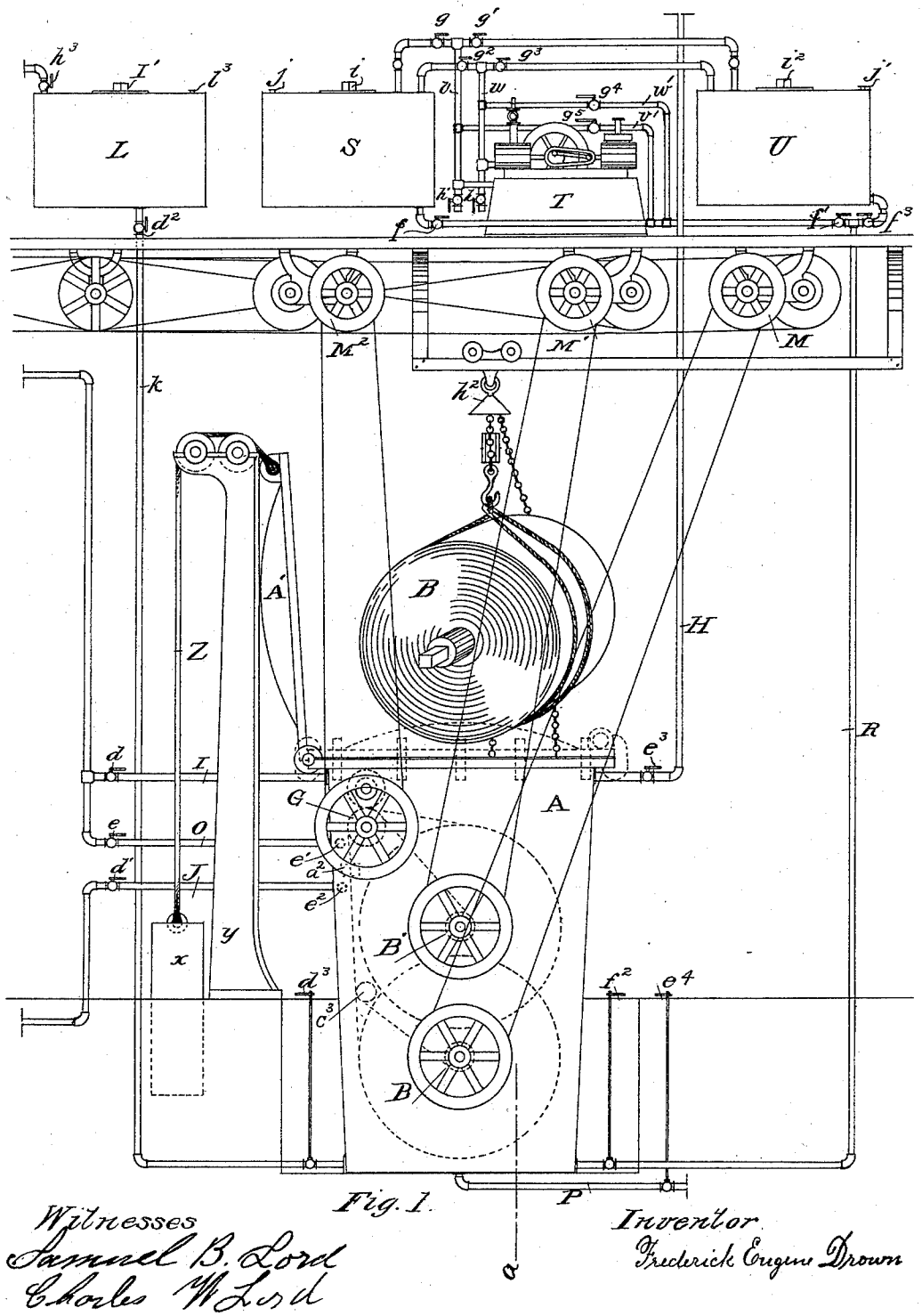

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

F. E. DROWN.

APPARATUS FOR BLEACHING.

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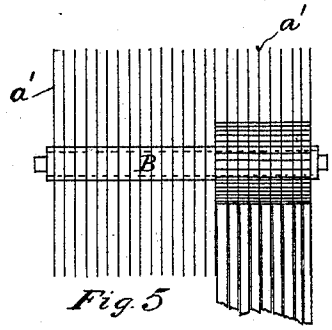

Fig. 5

Fig. 6.

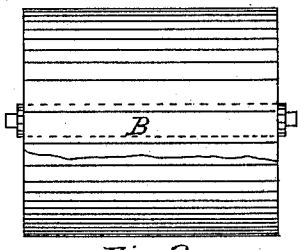

Fig. 3.

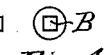

Fig. 4.

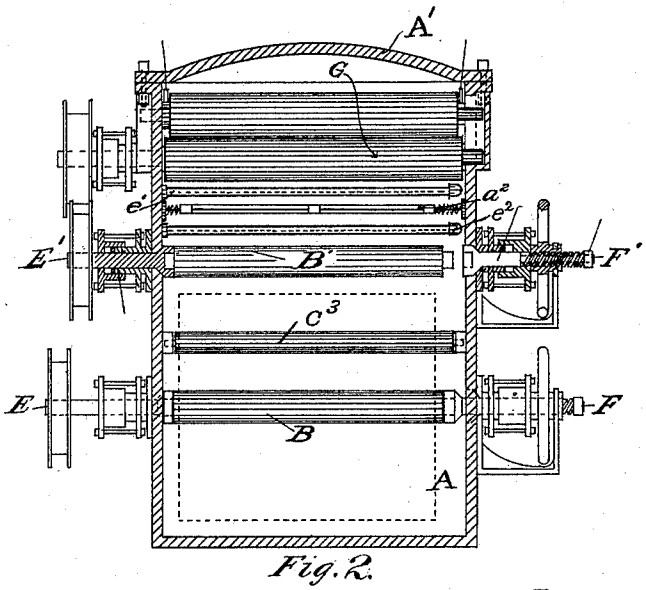

Fig. 2.

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APPARATUS FOR BLEACHING.

No. 441,946. Patented Dec. 2, 1890.

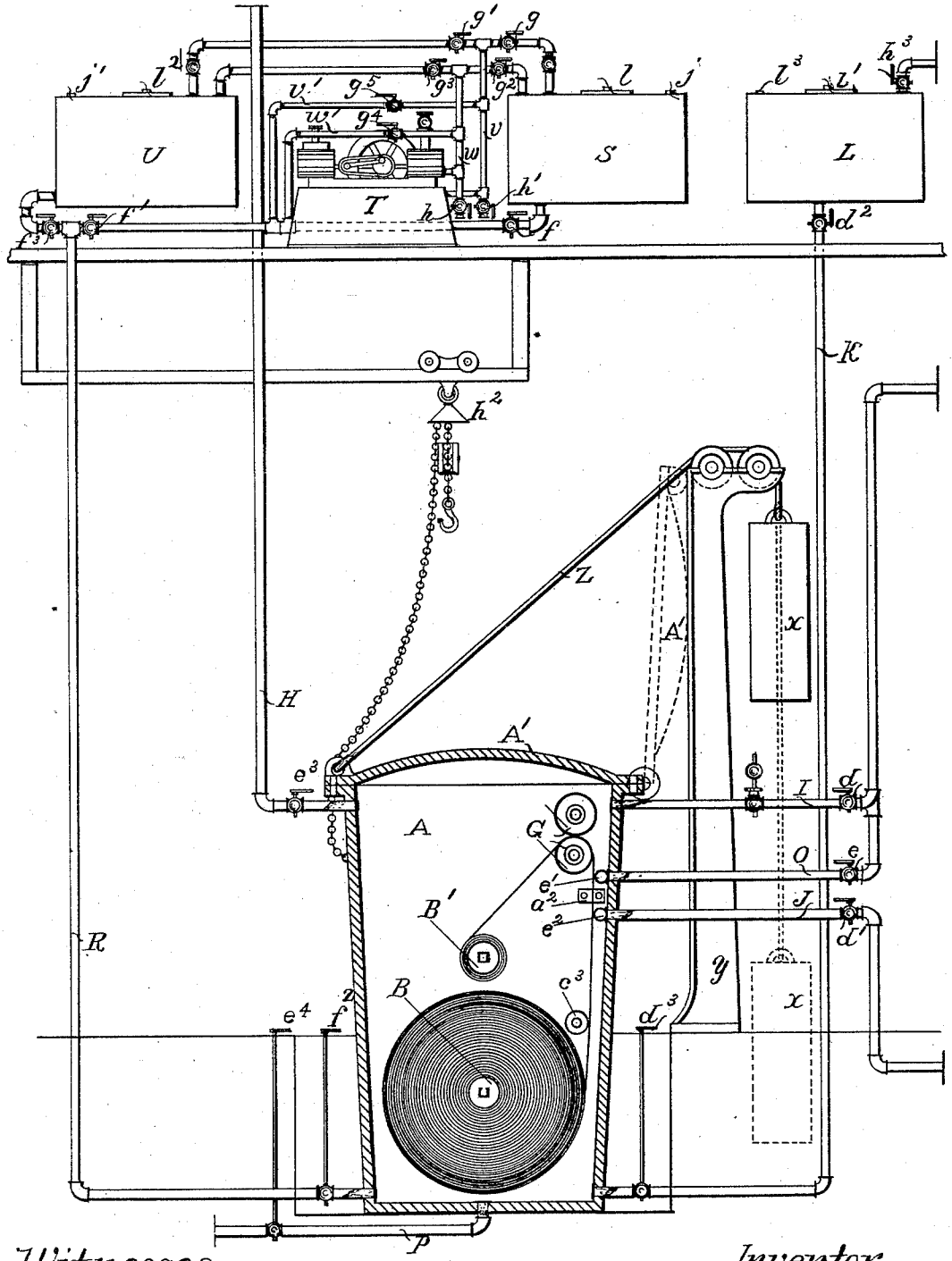

Fig. 7

Witnesses
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(No Model.) 4 Sheets—Sheet 4.

F. E. DROWN.

APPARATUS FOR BLEACHING.

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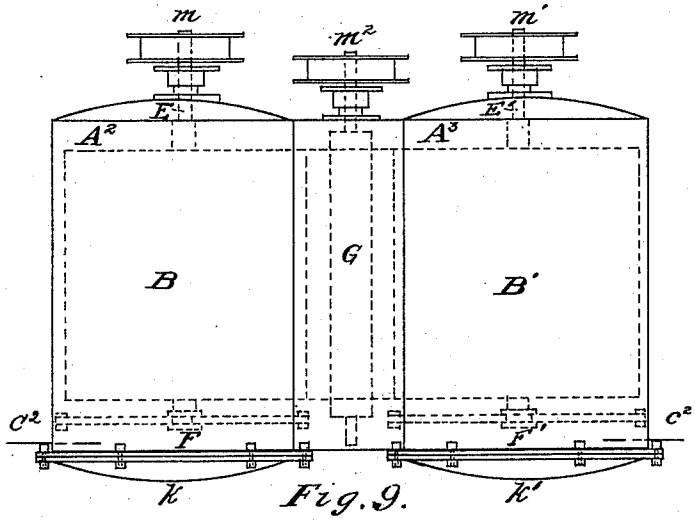

Fig. 9.

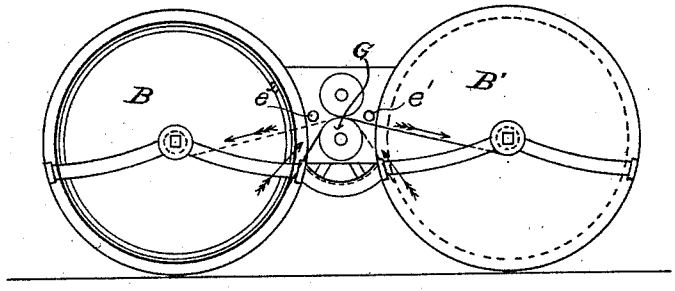

Fig. 8.

Witnesses
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UNITED STATES PATENT OFFICE.

FREDERICK EUGENE DROWN, OF PAWTUCKET, RHODE ISLAND.

APPARATUS FOR BLEACHING.

SPECIFICATION forming part of Letters Patent No. 441,946, dated December 2, 1890.

Application filed March 24, 1890. Serial No. 345,153. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK EUGENE DROWN, a citizen of the United States, residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented a new and useful Apparatus for Bleaching and Dyeing Textile Fabrics, Braids, and Yarns, of which the following is a specification.

My invention relates to an improved apparatus for the purpose; and my invention has for its object the bleaching and dyeing of cotton and other textile fabrics and braids arranged in a specific manner. The pieces of fabric sewed together at the ends are wound in a continuous manner many thousand yards in length upon a "portable" roll, which can be arranged to fit, first, the winding-machine; second, the bleaching and dyeing vessel; third, the finishing machinery. By having its ends arranged for this purpose, or, as is more usually the case in practice, it is arranged to be placed on a shaft adapted to the machine. The fabric in bulk wound on a portable roll is placed in the bleaching and dyeing vessel and therein treated in a thin sheet with the bleaching or dyeing agents, solutions, steam, and gases, or air above or below the normal pressure of the atmosphere, assisting the action of the bleaching and dyeing agents or exhausting them from the fabric by "pressing" the fabric between squeezing-rolls, and after the bleaching or dyeing operations have terminated removing the fabric from the bleaching or dyeing vessel in bulk wound on a portable roll. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an end elevation of the apparatus and vessel A and the fabric in the form of a roll wound on a portable roll B and in position to be lowered into vessel A. Fig. 2 is a longitudinal vertical section of the vessel A on line *a* of Fig. 1. Fig. 3 is an elevation of the fabric in the form of a roll wound on a roll B. Fig. 4 is an end view of the roll B. Fig. 5 is an elevation of the braid wound in the form of a roll onto a roll B, having sheets or plates *a'* fixed to roll B, between which the braid is wound. Fig. 6 is a plan of slotted guide a^2 in vessel A. Fig. 7 is a transverse section of the vessel A and an opposite end elevation of the apparatus from that shown in Fig. 1. Fig. 8 is a transverse vertical section of another form of the vessel A on line c^2 of Fig. 9. Fig. 9 is a plan of another form of the vessel A in which two chambers A^2 and A^3 are connected together, having a space between same for the squeezing-rolls G and having tight-closing lids *k* and *k'*.

Similar letters refer to similar parts throughout the several views.

In bleaching cotton fabric by my method I proceed as follows: The fabric is wound in the form of a roll onto a portable roll B in a continuous manner many thousand yards in length. The fabric is then placed in the vessel A with the portable roll B supported by and fixed to rotate with the rotating shafts E and F. Another portable roll B', the same as roll B, is fixed to rotate with the rotating shafts E' and F'. The end of fabric on roll B is then carried up over the roll c^3 and through the slotted guide a^2 and between the squeezing-rolls G and fastened around the roll B'. The fabric may be carried directly onto roll B' without going through the guide a^2 or over the roll c^3 and treated in this manner. The lid A' is then closed and firmly fastened and the fabric is ready to be treated in the vessel A. The fabric is passed in a thin sheet through the bleaching and dyeing agents and pressed between the squeezing-rolls G by rotating the rolls B and B', and the squeezing-rolls G winding the fabric off of roll B and onto roll B', or, vice versa, off of roll B' and onto roll B by reversing the rotating mechanism.

By winding and unwinding the fabric and passing it in a thin sheet in contact with the bleaching and dyeing agents in vessel A, and assisting the action of said agents or exhausting them from the fabric by pressing the fabric between squeezing-rolls G, the fabric can be very uniformly and expeditiously treated by the different agents and can be washed and squeezed, and, furthermore, the steps required for different qualities of bleaching or dyeing or for different kinds of fabrics can be successfully carried out without removing the fabric from the vessel A.

As the different steps in bleaching and dyeing and the agents used can be varied to a

great extent in my apparatus, I will proceed to describe but one series of steps in bleaching, as follows:

The fabric on a roll B having been placed in the vessel A, with the end of roll B fixed to shafts E and F for the purpose of being rotated and the end of the fabric made fast to roll B′ and the lid A′ closed and made steam-tight and all pipes connecting with the vessel A closed, the valve e^3 in vent-pipe H is opened and the valve d in steam-pipe I opened and steam blown through vessel A to expel the air. Then valve e^3 is closed and valve d also closed and sufficient water admitted to condense the steam and form a vacuum in the vessel A through water-pipe J and perforated water-pipe e^2. The valves d^2 and d^3 in pipe K, connecting vessel A with the alkali-tank L, are then opened and the alkali solutions in tank L drawn into vessel A. Valve d^3 is then closed and a steam-pressure admitted through steam-pipe I. The rolls B and B′ and the squeezing-rolls G are then rotated, winding the fabric onto roll B′. After the fabric has been rewound onto roll B′ the motion is reversed, thus reversing the motion of roll B and B′ and the squeezing-rolls G and rewinding the fabric again upon the roll B. When the fabric has been sufficiently treated with the hot alkali solutions, the valve d^3 is opened and the solution forced back into tank L by steam-pressure admitted through pipe I. Valves d and d^3 are now closed and valve e^3 in vent-pipe H opened and the valve e in steam-pipe O, which is connected with the perforated steam-pipe e' in vessel A, is opened, and the treatment of the fabric on roll B resumed by passing said fabric between the squeezing-rolls G, thence over the perforated steam-pipe e', and winding it up on roll B′. In admitting hot solutions into vessel A, I prefer to form a vacuum in vessel A, as aforesaid, by admitting steam and then condensing it by spray of water. In ejecting hot solutions from vessel A, I prefer to do so by steam-pressure admitted through steam-pipe I. In forming a vacuum and also an air-pressure in vessel A when cold solutions are used I prefer to use a vacuum and air-compression pump T. After alkali treatments have terminated and the vessel A blown out free from alkali solutions the fabric is washed with water in the following manner: The valve d' in water-pipe J, connecting with the perforated pipe e^2 in vessel A, is opened, and the valve e^3 in vent-pipe H and valve e^4 in waste-pipe P are opened to some extent. Then, as the fabric is unwound from roll B and rewound onto roll B′, it passes by the perforated water-pipe e^2, from which a spray of water is forced against the fabric. The fabric is then pressed by squeezing-rolls G and wound onto the roll B′.

In treating the fabric with chlorine solutions I proceed as follows: If desired, a vacuum is formed in vessel A as follows: The lid A′ is closed and made steam-tight and all pipes connecting with the vessel A closed. Then valves f' and f^2 in pipe R are opened, and valve g^4 in suction-pipe w', connecting pipe R with vacuum-pump T, is also opened, and the vacuum is at once formed in vessel A. Valve g^4 is then closed and valve f opened and the chlorine solution in tank S drawn into vessel A, followed by pneumatic pressure, formed by air-compressor T as follows: Valve f is closed, and valve g^5 in discharge-pipe v', connecting pipe R with air-compressor T, is opened and an air-pressure maintained in vessel A. Valve g^5 is then closed.

After the fabric has been treated in the manner heretofore described by passing it in a thin sheet through the solutions by unwinding it from roll B and rewinding it onto roll B′ and the fabric pressed between the squeezing-rolls G the chlorine solution is drawn back into vessel S by vacuum-pump T as follows: The valve g^2 in suction-pipe w, connecting tank S with vacuum-pump T, is opened and a vacuum formed in tank S. Valve f in pipe R is then opened, and valve e^3 in vent-pipe H also opened and the solution withdrawn into tank S. The fabric is now washed and squeezed as before.

In souring, the treatment is the same as with chlorine. A vacuum is formed in vessel A and the diluted acid is drawn in from vessel U through valves f^2 and f^3 and pipe R, followed by pneumatic pressure, if desired. After treatment the solutions are withdrawn into the tank U and the fabric washed and squeezed as before. This concludes one series of steps for bleaching cotton fabric.

For jute fabric, permanganates and sulphurous acid solutions can be used alternately, or weak hypochlorites and alkali solutions and other agents for the bleaching and dyeing of different kinds of fabrics. After bleaching, the lid A′ is taken off and the fabric taken out of the vessel A in the form of a roll on a portable roll B. Lid A′ is arranged hinged to one side of vessel A and counterbalanced over a frame Y by weight X and the roll B taken out by a hoist h^2.

The air-compressor and exhaust-pump T, mounted upon an air chamber or receiver arranged to contain an air-pressure above or below the normal pressure of the atmosphere, is connected to tanks S and U by discharge-pipe v and suction-pipe w and to vessel A by discharge-pipe v' and suction-pipe w' and the pipe R. By this arrangement of connecting pipes the air can be compressed in or exhausted from the vessel A, the acid-tank U, or the chlorine-tank S.

The vessel A can be made in many different forms and shapes. I have shown in Fig. 8—a transverse vertical section of the vessel A on line c^2 of Fig. 9, which is a plan—two chambers A^2 and A^3 connected together, having a space between same for the squeeze-rolls G, the perforated steam-pipe e', and the perforated water-pipe e^2, and having tight-closing lids k and k'. The fabric wound on

roll B is placed in vessel A^2 and the roll B connected to shaft E, which has a steam-tight joint with vessel A^2. The shaft E is arranged to rotate the roll B. The other end of roll B is supported by a short shaft F^2, fixed to removable arms, which are fastened to the side of the vessel A^2. The fabric on roll B is passed by the water-pipe e^2 and between the squeeze-roll G by the steam-pipe e' and wound upon roll B', which is arranged in vessel A^3, and is connected to the shafts E' and F^3, similar to the roll B with shafts E and F^2. When the fabric has been wound upon roll B', the motion of shafts E E' and the rolls G is reversed and the fabric again wound upon roll B.

The foregoing described modified form of the vessel A is adapted more particularly for the bleaching and dyeing of textile fabrics and yarns in a rope form. In this case the portable rolls B and B' have circular plates a' fixed to each end, between which the fabric or yarns are wound in a rope form, the same as thread upon a spool, and the fabric or yarn as it travels in vessel A from roll B to B', or vice versa, is wound in a traverse manner by a traverse guide arranged in the vessel A.

Having herein described my method and apparatus for the purpose, I claim and desire to secure by Letters Patent—

1. In the bleaching and dyeing of textile fabrics and yarns, a bleaching and dyeing vessel having two chambers connected together and having tight-closing lids, and portable rolls having plates fixed to their ends, upon which the fabric and yarns are wound in a rope form in a traverse manner to facilitate its travel in the bleaching and dyeing vessel and its removal therefrom, substantially as described.

2. In the bleaching and dyeing of textile fabrics, an apparatus having a bleaching and dyeing vessel fitted with a tight-closing lid, portable rolls on which the fabric is wound, and a squeezing device between which the fabric is pressed, as set forth.

3. An apparatus for bleaching and dyeing textile fabrics, composed of a steam and air tight bleaching and dyeing vessel having a tight-closing lid, portable rolls on which the fabric is wound, and rotating shafts having steam-tight joints, with the vessel arranged to rotate the portable rolls, as set forth.

4. An apparatus for bleaching and dyeing textile fabrics, composed of a steam and air tight bleaching and dyeing vessel having a tight-closing lid, the portable rolls on which the fabric is wound, the rotating shafts having steam-tight joints, with the vessel arranged to rotate the portable rolls, and the rotating squeeze-rolls having steam-tight joints with the vessel, as described.

5. An apparatus for bleaching and dyeing textile fabrics, composed of a steam and air tight bleaching and dyeing vessel A, having a tight-closing lid A', the portable rolls B and B', on which the fabric is wound, the rotating shafts E and F and E' and F', having steam-tight joints, with vessel A arranged to rotate the portable rolls B and B', the rotating squeeze-rolls G, having steam-tight joints with vessel A, and the perforated steam-pipe e' and the perforated water-pipe e^2, as set forth.

6. An apparatus for bleaching and dyeing textile fabrics, composed of a steam and air tight bleaching and dyeing vessel A, having a tight-closing lid A', the portable rolls B and B', on which the fabric is wound, the rotating shafts E and F and E' and F', having steam-tight joints, with vessel A arranged to rotate the portable rolls B and B', the rotating squeezing-roll G, having steam-tight joints with vessel A, and the guide a^2 and the roll c^3, as set forth.

7. An apparatus for bleaching and dyeing braids, composed of a steam and air tight bleaching and dyeing vessel A, having a tight-closing lid A', and the portable rolls B and B', on which the braid is wound, having sheets or plates a' fixed to rolls B and B', between which the braid is wound, as described.

8. An apparatus for bleaching and dyeing textile fabrics, composed of a steam and air tight bleaching and dyeing vessel A, having a tight-closing lid A', portable rolls B and B', on which the fabric is wound, the squeezing-rolls G, between which the fabric is pressed, and the roll c^3, over which it passes, pipe K and R for solutions and gases, steam-pipe I, perforated steam-pipe e', water-pipe J, perforated water-pipe e^2, vent-pipe H, and outlet-pipe P, as set forth.

9. An apparatus for bleaching and dyeing textile fabrics, composed of a steam and air tight bleaching and dyeing vessel A, having a tight-closing lid A', portable rolls B and B', on which the fabric is wound, the squeezing-rolls G, between which the fabric is squeezed, and roll c^3, over which it passes, pipe K and R for solutions and gases, steam-pipe I, perforated steam-pipe e', water-pipe J, perforated water-pipe e^2, the vent-pipe H, outlet-pipe P, and the air-compressor and vacuum-pump T, as set forth.

March 18, 1890.

FREDERICK EUGENE DROWN.

Witnesses:

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CHARLES W. LORD.