No. 785,283. PATENTED MAR. 21, 1905.

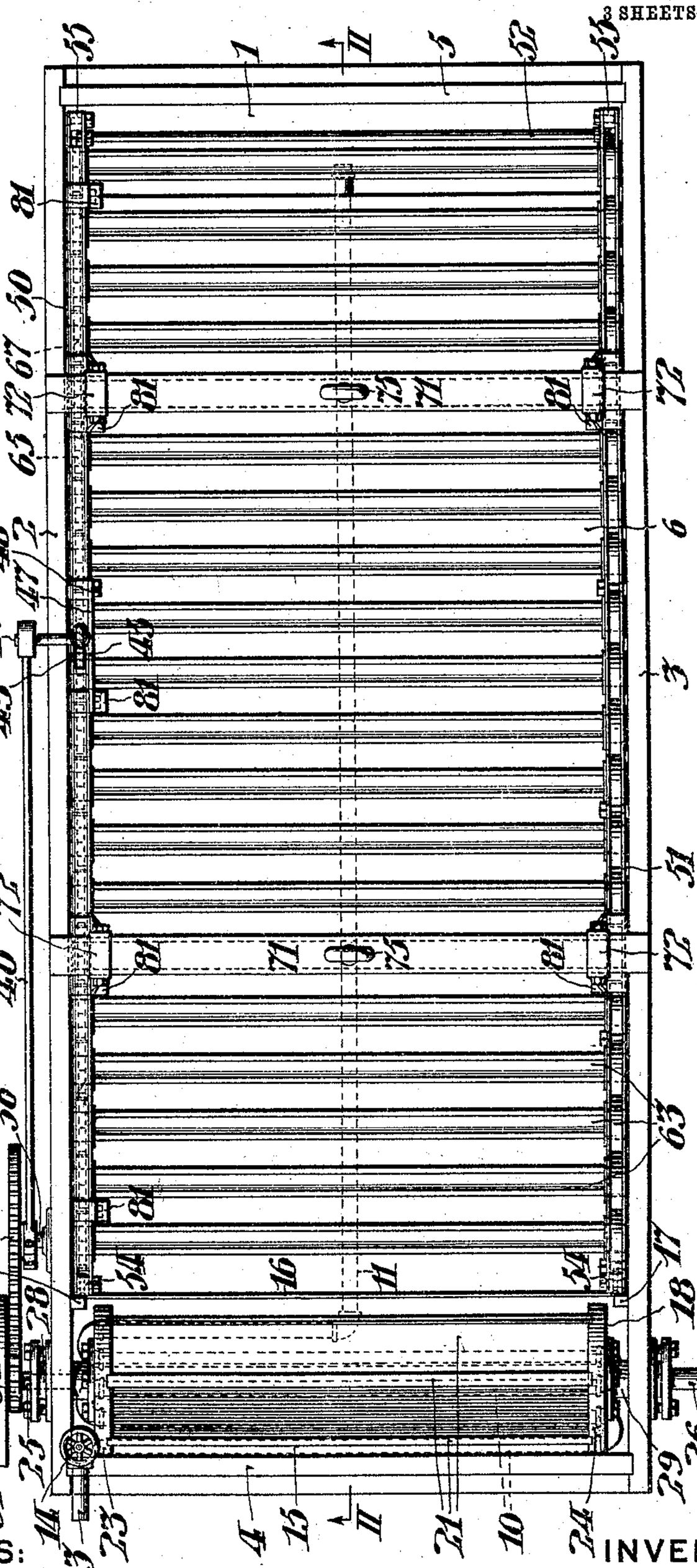
D. F. WATERS.

DYEING APPARATUS.

APPLICATION FILED JUNE 11, 1904.

3 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

Clifton C. Hallowell

John C. Bergner.

INVENTOR:

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3 SHEETS—SHEET 2.

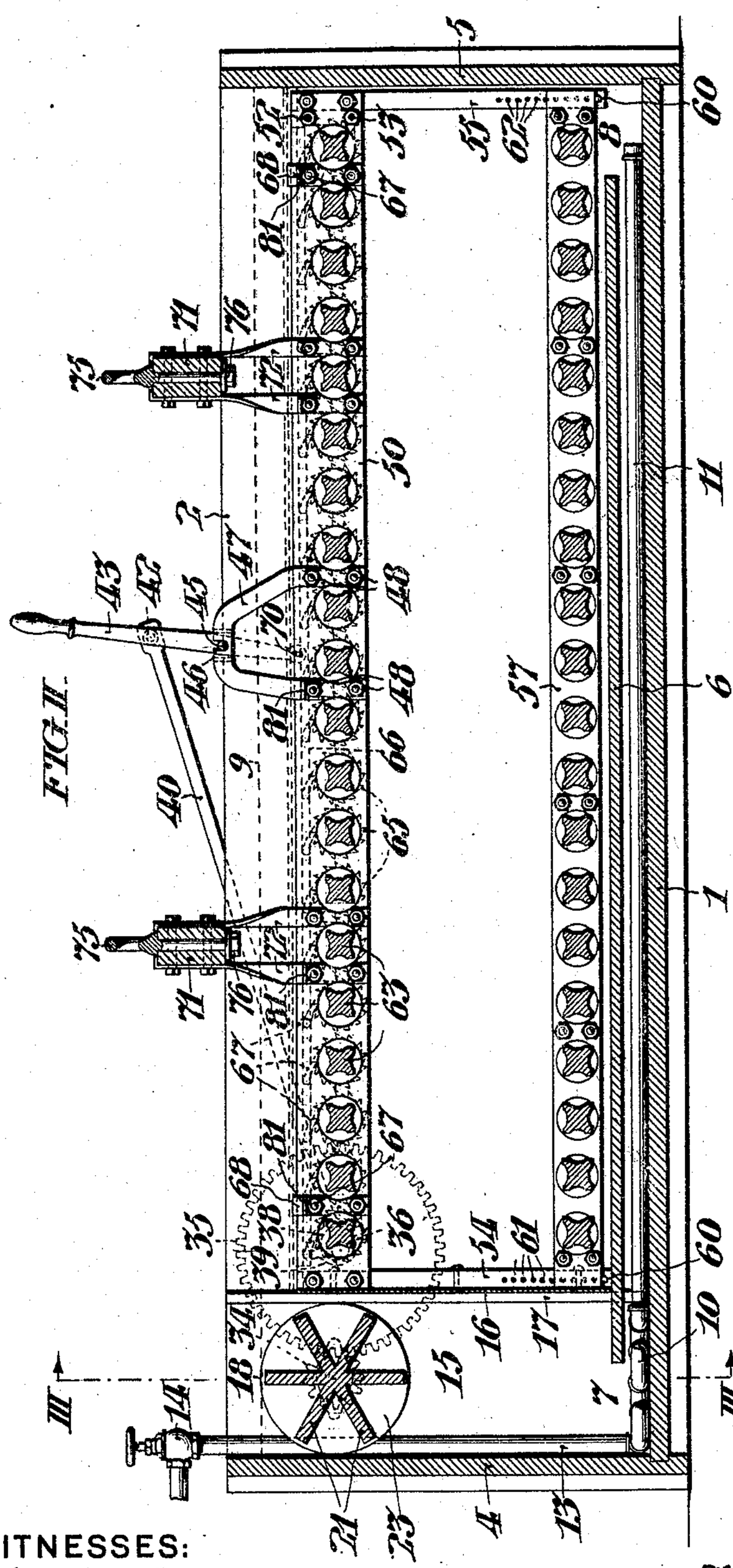

FIG. II.

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3 SHEETS—SHEET 3.

FIG. III.

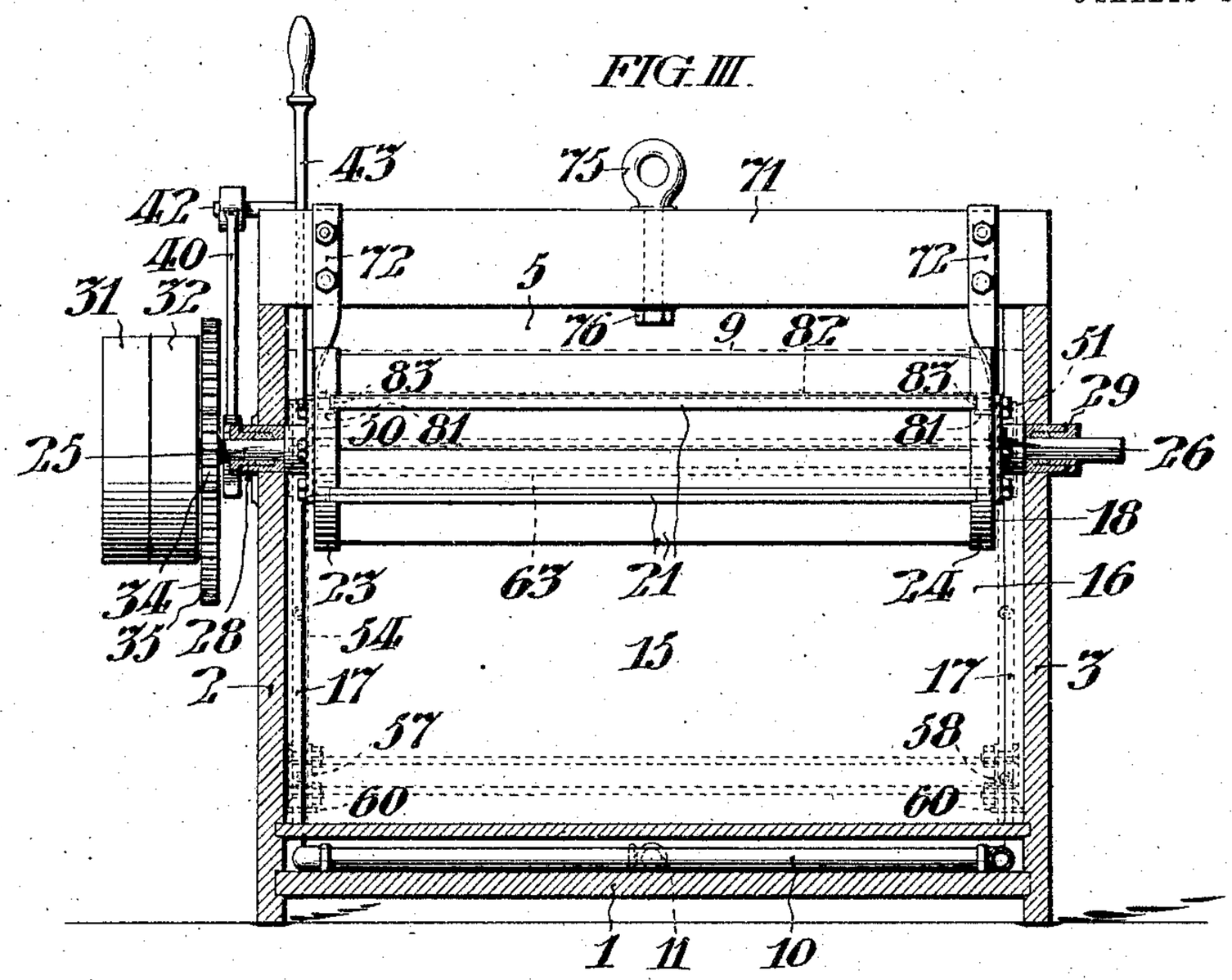


FIG. IV.

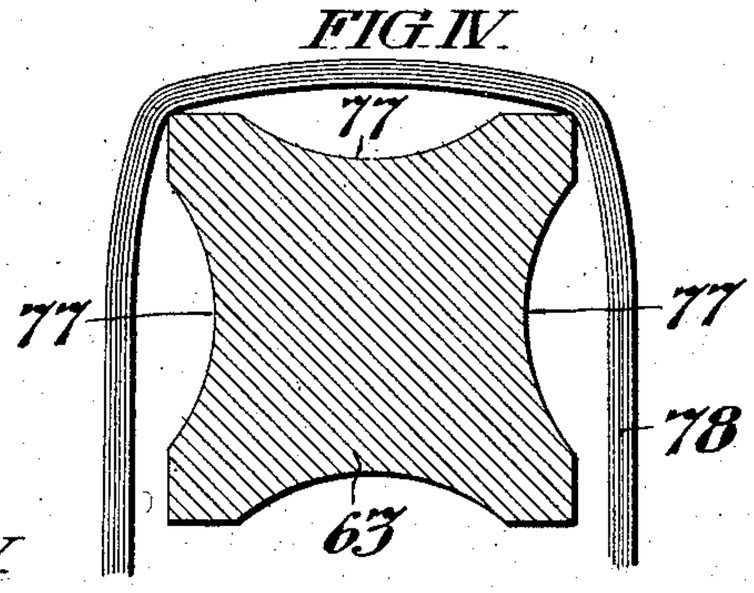


FIG. V.

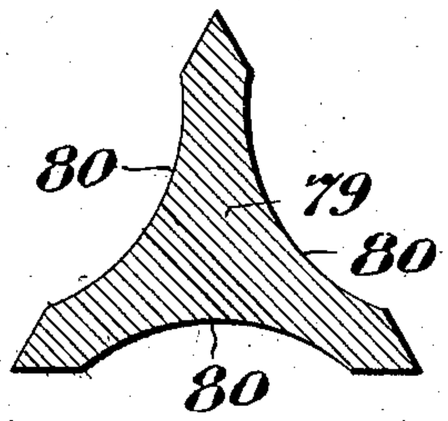
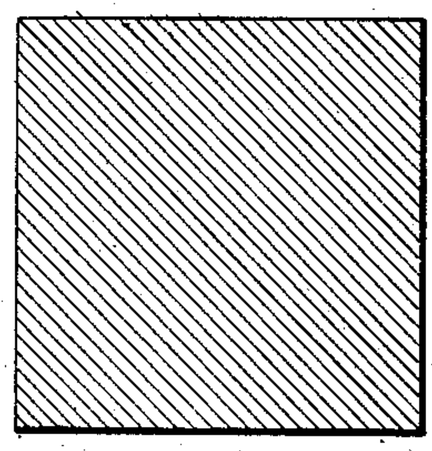


FIG. VI.



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UNITED STATES PATENT OFFICE.

DANIEL F. WATERS, OF PHILADELPHIA, PENNSYLVANIA.

DYEING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 785,283, dated March 21, 1905.

Application filed June 11, 1904. Serial No. 212,179.

To all whom it may concern:

Be it known that I, DANIEL F. WATERS, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Dyeing-Machines, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates particularly to certain improvements in the frame upon which the yarn is suspended and means to move the yarn-sticks to progress the yarn hung thereon.

As hereinafter described, my improvements comprise means to intermittently rotate the yarn-sticks, including ratchet-wheels on the respective sticks, pawls engaged with said wheels, a bar common to said pawls, and means arranged to reciprocate said bar in definite relation to the movement of a liquor-circulating wheel.

My invention includes yarn-sticks of polygonal cross-section having recesses between their angles, permitting access of the liquor between the sticks and the yarn thereon, and an improved liquor-circulating wheel mounted upon a horizontal axis and having a plurality of blades extending parallel with said axis.

My invention comprehends the various novel features of construction and arrangement hereinafter specified.

In the accompanying drawings, Figure I is a plan view of a machine conveniently embodying my improvements. Fig. II is a vertical longitudinal sectional view of said machine, taken on the line II II, in Fig. I. Fig. III is a vertical transverse sectional view of said machine, taken on the line III III in Figs. I and II. Fig. IV shows the cross-sectional configuration of the yarn-stick indicated in Fig. II. Figs. V and VI are transverse sectional views of modified forms of yarn-sticks.

In said figures the vat comprises the floor 1, side walls 2 and 3, and end walls 4 and 5 and is conveniently formed of wood. Said vat is provided with the false floor 6, which terminates short of the opposite end walls 4 and 5, so as to afford passage-ways 7 8 through which the liquor 9 may have free access to the heating-coil 10 and pipe 11, which latter extends between the floor 1 and the false floor 6, as best shown in Fig. II, and is conveniently perforated, so as to distribute within the body of liquor in the vat the steam or other heating medium supplied to the coil 10 through the pipe 13, controlled by the valve 14. The chamber 15 is formed at the left-hand side of said vat, as shown in Figs. I and II, by the partition 16, carried by the yarn-frame and held against the cleats 17, respectively attached to the side walls 2 and 3. The liquor-circulating wheel 18 is mounted to rotate in said chamber 15 on a horizontal axis and in the direction indicated by the arrow in Fig. II to deliver the liquor 9 from said chamber 15 over the top of said partition 16. The upward flow of the liquor in said chamber 15 is also facilitated by the convection-currents produced by said heating-coil 10. Said liquor-circulating wheel comprises a series of blades 21, extending parallel with its horizontal axis and in radial relation thereto, and said blades are secured at their opposite ends in the flanged heads 23 and 24, which are respectively provided with the alined shafts 25 and 26, mounted to rotate in the stuffing-boxes 28 and 29 in the side walls 2 and 3. Said shaft 25 is provided with tight and loose pulleys 31 and 32, by which said liquor-circulating wheel may be conveniently rotated. Between the loose pulley 32 and the stuffing-box 28 the shaft 25 is provided with the pinion 34, which engages the gear-wheel 35 on the stationary stud-shaft 36, which latter is secured on the wall 2. Said gear-wheel 35 is provided with the eccentric 38, having the strap 39, whose rod 40 is connected by the pivot 42 with the lever 43. Said lever 43 has its fulcrum 45 in the recesses 46 in the bracket 47, which latter is conveniently secured by the bolts 48 to the upper side bar 50 of the yarn-frame. Said frame comprises the opposite side bars 50 and 51, which are connected by the cross-bars 52 and 53 and provided with hangers 54 and 55, on which the lower side bars 57 and 58 may be adjustably secured by any convenient fastening means, such as the pins 60, which may be removably inserted in the series of apertures 61 and 62 in said hangers. Said side bars 50 and 51 respectively comprise parallel metal plates, in which the yarn-sticks 63 are

mounted to rotate, and each of said sticks is provided with a ratchet-wheel 65 between the parallel plates of the side bar 50. The pawl-bar 66 extends between said plates above said wheels 65 and is provided with pawls 67 for the respective ratchet-wheels 65 and is arranged to be reciprocated (on the bolts 68 and under the straps 69) by its pivotal connection 70 with said lever 43, which latter is oscillated by its connection with the eccentric 38 above described.

The yarn-frame is conveniently supported in the vat by the cross-beams 71, whose ends rest upon the opposite side walls 2 and 3 of the vat. Said cross-beams are connected with the side bars 50 and 51 of said frame by the metal straps 72 and bolts 73 and are conveniently provided with eyebolts 75, secured therein by nuts 76, by which the frame may be conveniently uplifted from the vat. As shown in detail in Fig. IV, said sticks 63 are preferably of equilateral quadrangular cross-sectional configuration and have cylindriform concave recesses 77 between their angles, preferably coextensive with the sticks. Such construction is advantageous in that the yarn 78 is supported by said sticks with the minimum area of contact with the latter, so that the dye liquor 9 is free to percolate between the yarn and said sticks 63. However, it is to be understood that the last-named advantage may be attained by the use of sticks of other polygonal forms. For instance, Fig. V shows a stick 79 of triangular cross-sectional configuration having recesses 80.

As indicated in Figs. II and III, the bracket 47 and the straps 69 and 72 are provided with flanges 81 to support a cover 82, having battens 83, which rest on said flanges.

It is to be understood that the peculiar recessed form of stick aforesaid is not essential to the operation of the stick-rotating mechanism above described. For instance, I may employ sticks of plane quadrangular cross-section, as shown in Fig. VI, and it is to be understood that the angular edges of each of the forms of sticks aforesaid engage the yarn so as to progress it when the sticks are rotated, and thus present fresh surfaces for contact with the sticks and subject the successive portions of the yarn-hanks to the action of the dye liquor at different depths in the tank, so as to insure uniform coloring of the yarn.

It is to be understood that the depending hangers 54 and 55 and lower side bars 57 and 58 are not essential to the operation of the frame above described and they may be omitted in machines adapted for the treatment of yarn which does not require to be stretched during the dyeing operation.

It is characteristic of the mechanism above described that the sticks 63 are automatically rotated step by step upon their individual axes in definite relation with the continuous rotation of the liquor-circulating wheel 18. However, it is to be understood that if the eccentric-rod 40 is disconnected from the hand-lever 43 rotation of said sticks 63 may be controlled and effected by the manipulation of said lever 43 independently of the rotation of the wheel 18 and, in fact, automatic means for effecting such rotation may be entirely dispensed with.

It may be noted that a liquor-circulating wheel 18, comprising horizontal blades extending the full width of the vat, is advantageous in that it insures uniform circulation of the liquor in a stream the full width of the vat, it being characteristic of circulating-wheels having their axes otherwise disposed that the liquor is caused to circulate in streams less than the full width of the vat and tending to produce an uneven effect of the dye upon the yarn. Moreover, it has been found in practice with wheels of the last-named construction or arrangement that some adjunctive means must be employed to distribute the narrow streams of the liquor—for instance, screens or false floors which are perforated—and I find that in view of the better distribution of liquor secured by my improved form of circulating-wheel such adjunctive devices may be dispensed with.

I do not desire to limit myself to the precise details of construction and arrangement above described, as it is obvious that various modifications may be made therein without departing from the essential features of my invention.

I claim—

1. In a dyeing apparatus, the combination with a vat; of a frame; a series of yarn-sticks mounted to rotate in said frame; means arranged to intermittently rotate said sticks, comprising ratchet-wheels upon the individual sticks; pawls in operative relation with said ratchet-wheels; a bar common to said pawls; a lever connected with said bar; an eccentric arranged to oscillate said lever; and, a liquor-circulating wheel in said vat, connected to rotate in definite relation with the movement of said eccentric, substantially as set forth.

2. In a dyeing-machine, the combination with a vat; of a frame; a series of yarn-sticks mounted to rotate in said frame; a liquor-circulating wheel in said vat; and, means connecting said wheel with said sticks, arranged to rotate said wheel and sticks in definite relation, substantially as set forth.

3. In a dyeing-machine, the combination with a vat; of a frame; a series of yarn-sticks mounted in said frame; a liquor-circulating wheel in said vat; and, means operatively connecting said wheel with said sticks, arranged to shift the latter in definite relation to the movement of said wheel, substantially as set forth.

4. In a dyeing-machine, the combination with a vat; of a frame for the yarn; a heating-pipe in the bottom of said vat; an imper-

forate false floor between said pipe and said frame, terminating short of the opposite ends of said vat; and, a paddle-wheel mounted on a horizontal axis in said vat, arranged to circulate liquor therein above and below said floor, substantially as set forth.

5. In a dyeing-machine, the combination with a vat; of a frame for the yarn; a heating-pipe in the bottom of said vat; an imperforate false floor between said pipe and said frame, terminating short of the opposite ends of said vat; and, a liquor-circulating paddle-wheel mounted on a horizontal axis in said vat, and comprising a series of blades extending parallel with its axis, substantially as set forth.

6. In a dyeing-machine, the combination with a vat; of a frame for the yarn; a heating-pipe in the bottom of said vat; an imperforate false floor between said pipe and said frame, terminating short of the opposite ends of said vat; and, a liquor-circulating paddle-wheel mounted on a horizontal axis in said vat, and comprising a series of radial blades extending parallel with its axis, substantially as set forth.

In testimony whereof I have hereunto signed my name, at Philadelphia, Pennsylvania, this 3d day of June, 1904.

DANIEL F. WATERS.

Witnesses:

JAMES H. BELL,

CLIFTON C. HALLOWELL.