

(No Model.)

6 Sheets—Sheet 1.

T. C. DILL.
APPARATUS FOR DYEING.

No. 586,117.

Patented July 13, 1897.

FIG. 14.

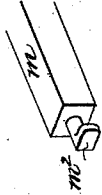


FIG. 10.

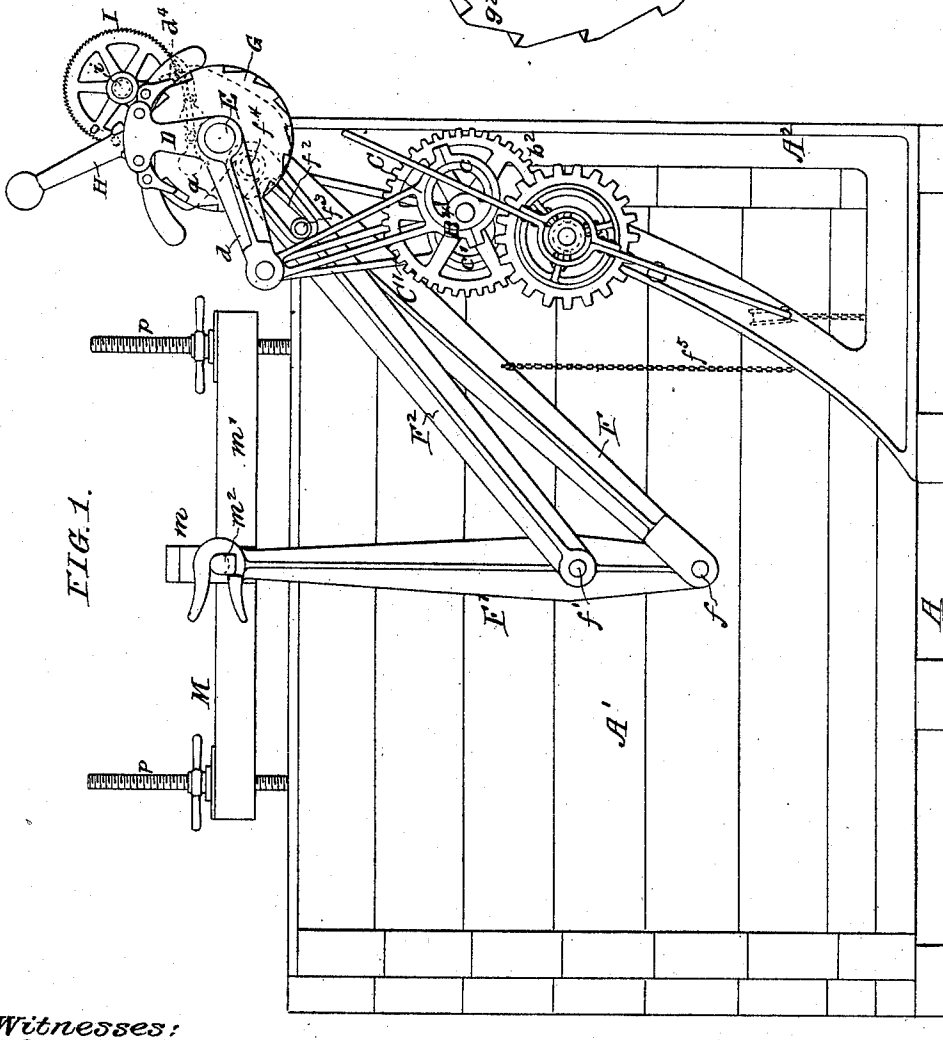
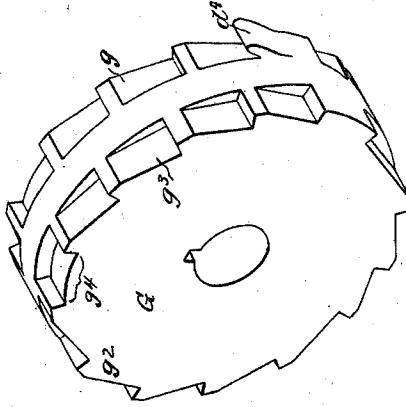


FIG. 1.

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Inventor:

Thomas C. Dill
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Howson & Howson

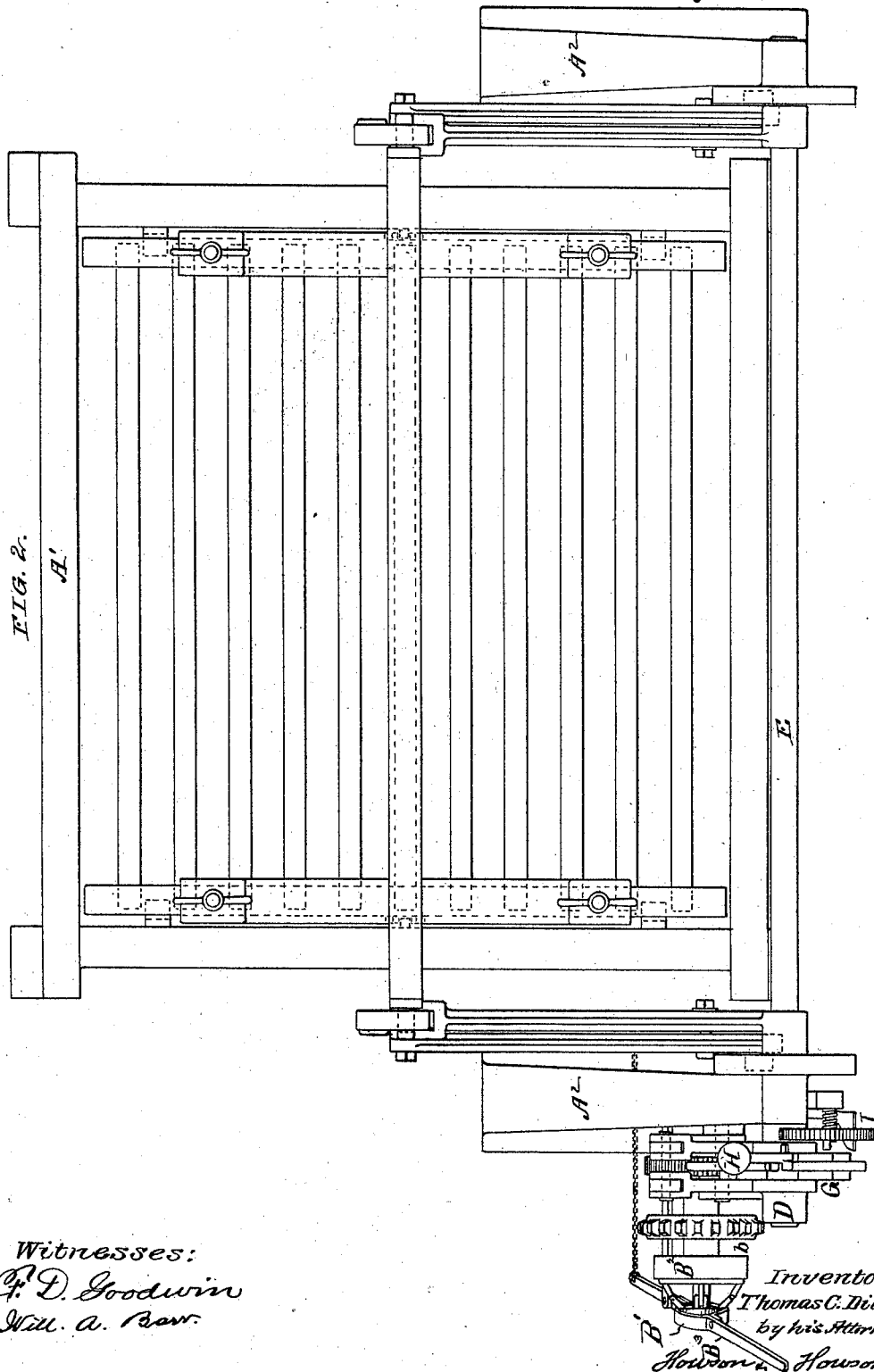
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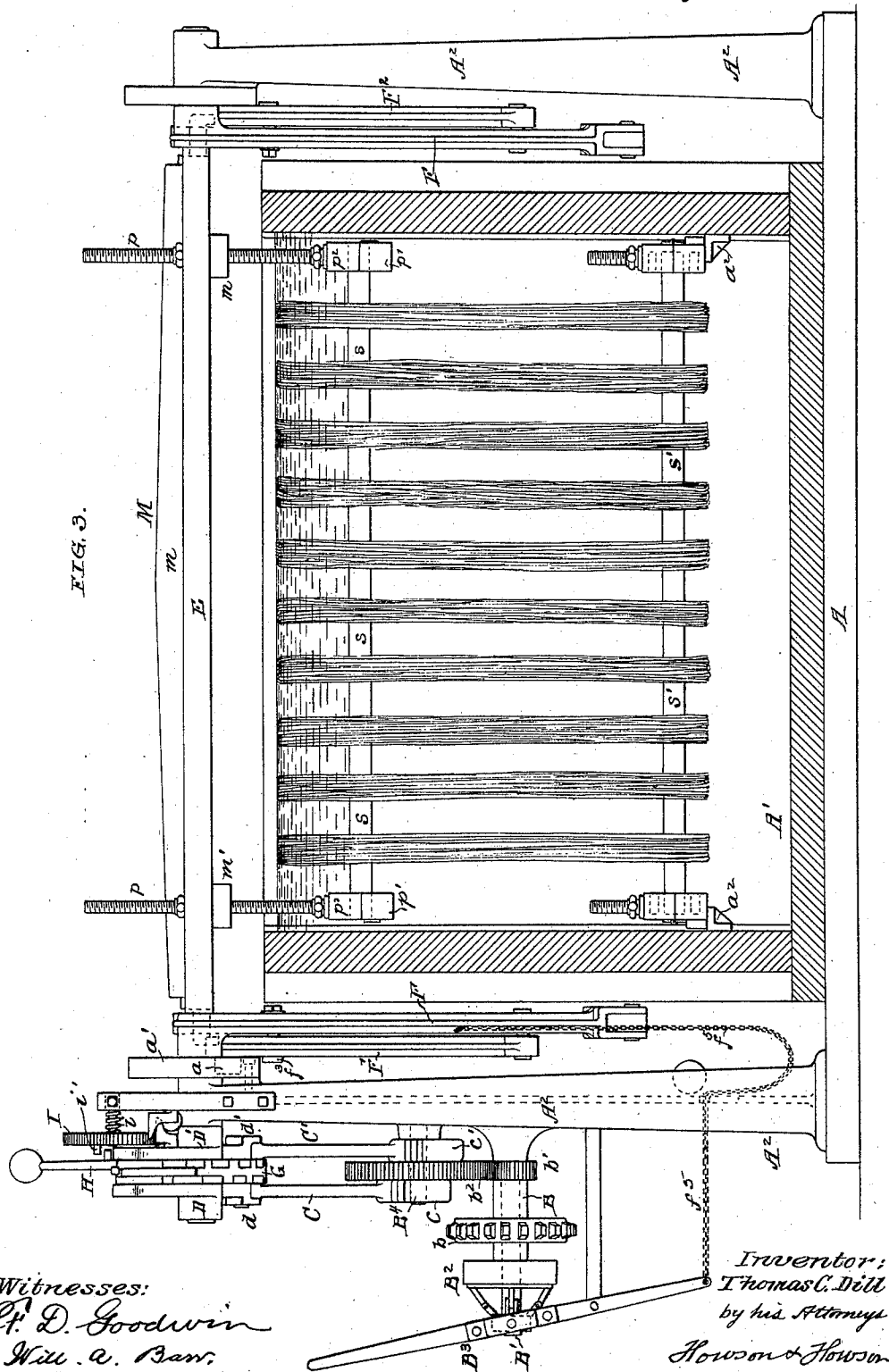
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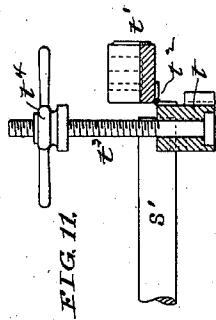
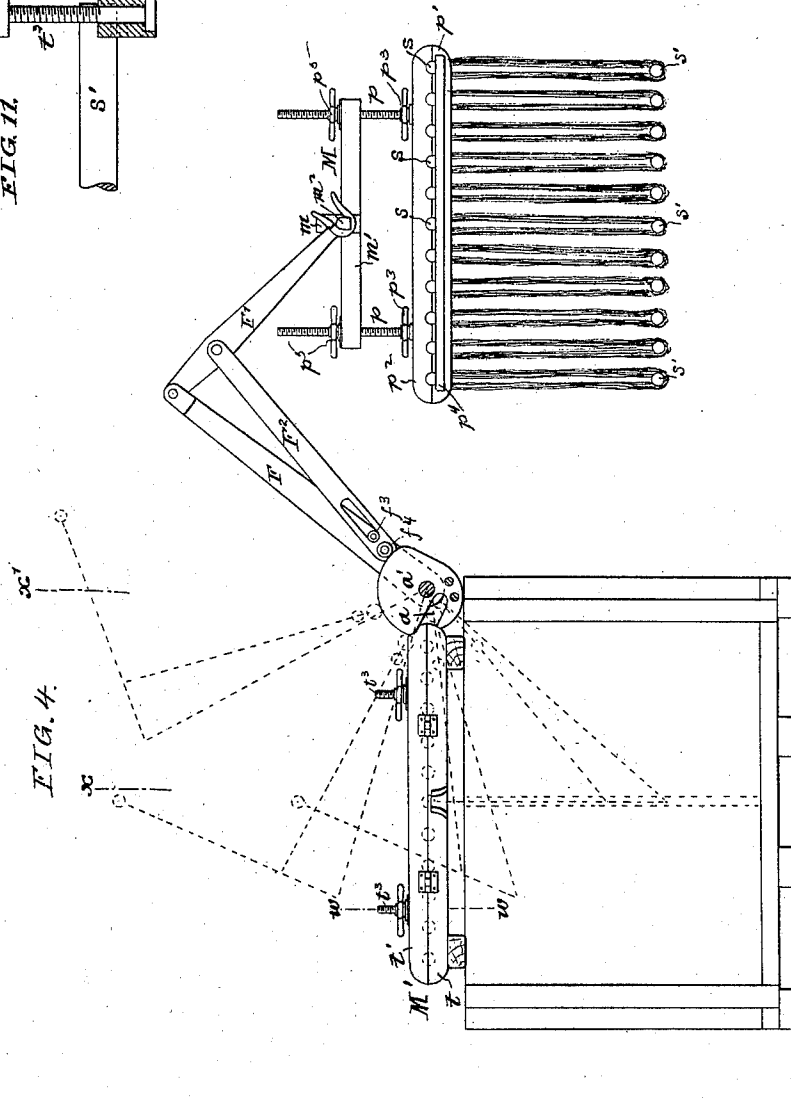


FIG. 11.



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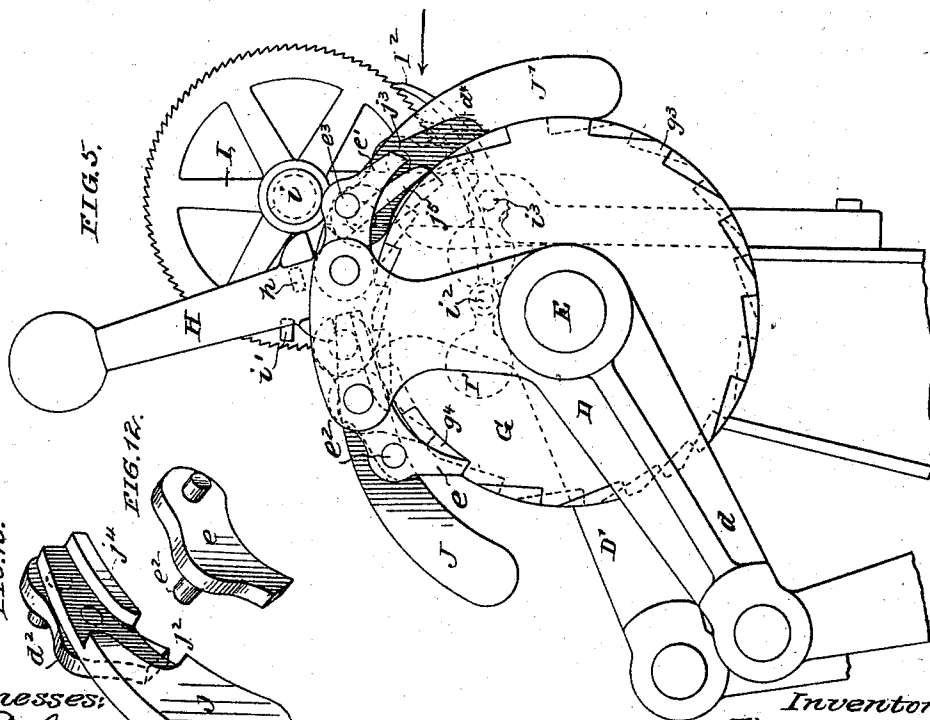
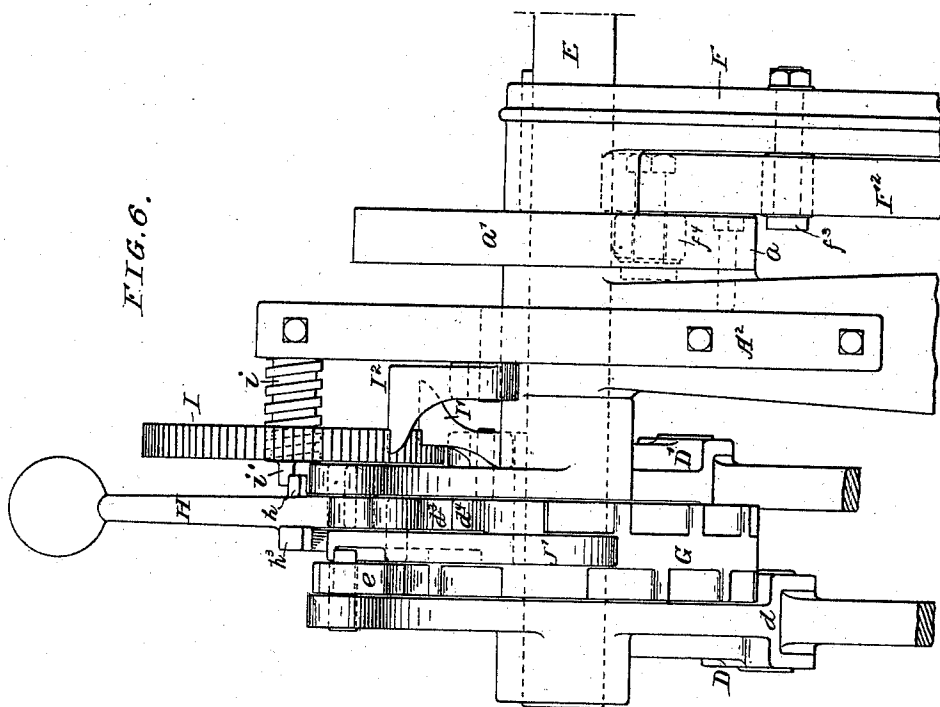
(No Model.)

6 Sheets—Sheet 5.

T. C. DILL.
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Patented July 13, 1897.



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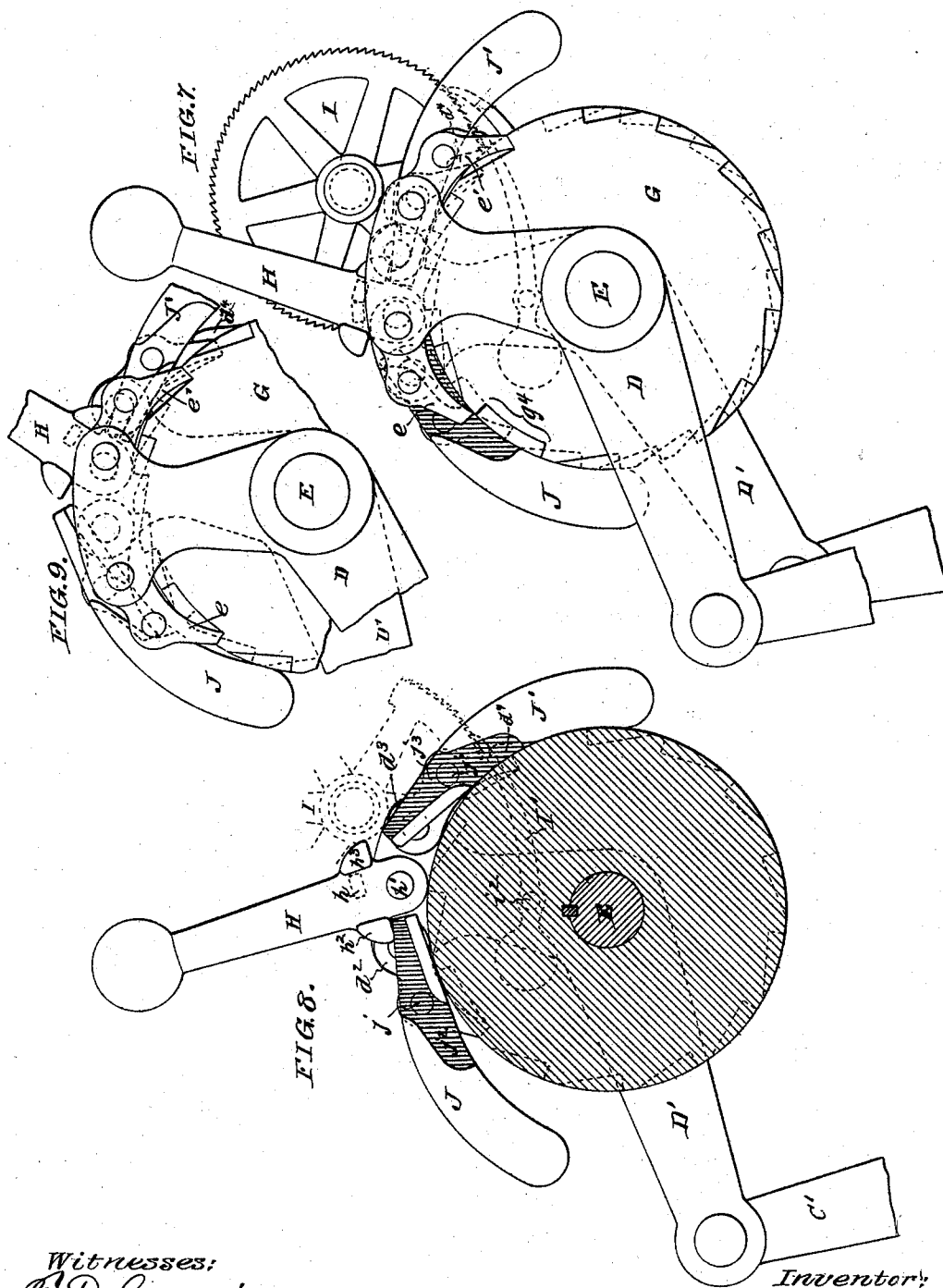
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6 Sheets—Sheet 6.

T. C. DILL.
APPARATUS FOR DYEING.

No. 586,117.

Patented July 13, 1897.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR DYEING.

SPECIFICATION forming part of Letters Patent No. 586,117, dated July 13, 1897.

Application filed March 28, 1896. Serial No. 585,226. (No model.)

To all whom it may concern:

Be it known that I, THOMAS C. DILL, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Dyeing-Machines, of which the following is a specification.

The object of my invention is to construct a dyeing-machine to which can be applied the ordinary vat now in common use and in which the vat is entirely independent of the agitating and lifting mechanism.

A further object of my invention is to so construct the mechanism that the yarn can be raised vertically out of the vat and then carried over to one side thereof and suspended, so that the operator may remove the dyed skeins and load the sticks with yarn to be dyed; and a still further object is to so construct the mechanism that the machine will be automatic—that is, after the sticks are loaded the machine will automatically carry the yarn into the vat, agitate it therein for a certain length of time, then lift it out of the vat and suspend it at one side until thrown into gear again by the operator—whereby the machines can be set by the man in charge to the length of time required for a certain dye or a certain yarn, so that the mistakes due to the carelessness and inattention of the hands in the dye-house are entirely avoided.

In the accompanying drawings, Figure 1 is a side view of my improved dyeing-machine. Fig. 2 is a plan view. Fig. 3 is a longitudinal sectional view of the vat with the mechanism in elevation. Fig. 4 is a side view, partly in section, showing the dyeing-frame suspended at one side of the vat. Fig. 5 is a side view, drawn to an enlarged scale, of the pawl-and-ratchet mechanism. Fig. 6 is a view looking in the direction of the arrow, Fig. 5. Fig. 7 is a side view of the pawl-and-ratchet mechanism, showing the pawls in different positions. Fig. 8 is a sectional view of the pawl-and-ratchet mechanism. Fig. 9 is a diagram view of the pawl-and-ratchet mechanism. Fig. 10, Sheet 1, is a perspective view of the ratchet-wheel. Fig. 11, Sheet 4, is a detail view showing the method of clamping the sticks to the yarn-frame. Figs.

12 and 13, Sheet 5, and Fig. 14, Sheet 1, are views of details of the invention.

A is the base, made in the present instance of planks, and mounted on this base is the vat A', containing the dyeing liquid. Secured to the base at each side of the vat are frames A², carrying the mechanism by which the yarn is suspended and agitated.

B is the driving-sleeve, loose on the shaft B' and clutched thereto by the clutch mechanism B², which is operated by the lever B³. (Shown clearly in Fig. 3.) On the sleeve B is a sprocket-wheel *b*, around which passes the drive-chain. On the shaft B' is a pinion *b'*, engaging with a gear-wheel *b*² on the eccentric-shaft B⁴. This eccentric-shaft carries two eccentrics *c c'*, adapted to sockets in the eccentric-rods C and C', respectively.

The eccentric-rod C is connected to an arm *d* of a bell-crank lever D, while the eccentric-rod C' is connected to an arm *d'* of a bell-crank lever D'. Both bell-crank levers are loosely hung on the shaft E, which is adapted to bearings in the frame A². This shaft E extends across to the frame A² on the opposite side of the vat and is adapted to the bearings therein.

On the shaft E at each side of the vat is an arm F. These arms are keyed to the shaft and are pivoted at *f* to arms F', which support the yarn-frame.

Pivoted to the arm F' at *f'*, some distance above the pivot *f*, is a bar F², which is slotted at *f*² to allow for the free movement of a pin *f*³ on the arm F, and on the end of the bar F² is a pin *f*⁴, adapted to a camway *a* in a block *a'*, secured to the frame A², so that when the arm F lifts the yarn-frame it will remove the yarn-frame from the vat in a vertical line until the yarn is clear of the vat, and then it will swing it over to one side, as indicated in Fig. 4.

The arms F' and bar F², as well as the mechanism connected therewith, are duplicated on the opposite side of the machine, and one set of arms works in unison with the other.

It will be noticed that while the arms are duplicated the mechanism for operating the arms is only at one side of the machine, so

that all the intricate mechanism is at one place and within easy reach of the man in charge of the machine.

In some instances the shaft E may be lengthened and a second shaft may be placed alongside of the vat shown, and a duplicate set of arms can be mounted on the shaft, so that two or more dye-vats and yarn-frames may be used at the same time.

Keyed to the shaft E is a double ratchet-wheel G, (shown clearly in Fig. 10,) and engaging with the ratchet-teeth of this wheel are pawls carried by the bell-crank levers D D', one set of pawls acting to agitate the yarn in the dye-vat, while the other set of pawls act in conjunction with the first set to remove the yarn-frames from the vat and to carry them into the vat.

Referring to Fig. 10, the ratchet-wheel G has a double row of teeth on its periphery. On one row there are two sets of teeth $g^2 g^3$, beveled in opposite directions, so that the pawl that engages one set of teeth will move the wheel in one direction and the pawl engaging the other set of teeth will turn the wheel in the opposite direction. Between the two sets of teeth is a space g^4 , which allows the pawl e to simply work in a given space without imparting motion to the wheel. The teeth on the opposite side are arranged in substantially the same manner, and at the end of one set of teeth is a stop or lug d^4 , beneath which the pawl d^3 rests, thus preventing it from lifting when the pawl d^3 has reached the limit of movement.

The pawls d^2 and d^3 , as shown in Fig. 8, are carried by the bell-crank lever D' and engage with the ratchet-teeth g on the wheel G, Fig. 10, and when the shifting arm H is in the position shown in Fig. 8, as well as in Fig. 1, both pawls d^2 and d^3 engage the teeth g on the wheel G in such a manner that the wheel will vibrate with the movement of the eccentric c' , rod C', and bell-crank lever D'. This movement will be conveyed to the yarn-frames in the vat through the shaft E and arms F F' and bar F², so that the yarn-frames will be raised and lowered during a given number of revolutions of the main shaft, as dictated by the time-wheel I, described in detail hereinafter.

The time-wheel is mounted on a stud i , which is screw-threaded, so that when the time-wheel I turns it is moved forward on the stud, and on the time-wheel is a lug i' , which when the wheel is full out, as indicated in Fig. 6, will rest in the path of a lug h on the shifting arm H. This shifting arm is pivoted at h' to the bell-crank lever D', as indicated in Fig. 8, and has two toes $h^2 h^3$, which project one on one side of the arm and the other on the opposite side. The toe h^2 , when the arm is in the position shown in Fig. 8, rests upon one end of a weight J, pivoted at j to the pawl d^2 , while when the arm is shifted to the position shown in Fig. 7 the toe

h^3 rests upon one end of the weight J', pivoted at j' to the pawl d^3 .

Carried by the bell-crank lever D, Fig. 5, are two pawls $e e'$, one pivoted on one side of the lever and the other on the opposite side. The pawl e engages with the teeth g^2 on the ratchet-wheel G, and the pawl e' engages with the teeth g^3 on said wheel, and on the back of the pawl e is a pin e^2 , which rests in a cam-groove j^2 in the weight J, and on the back of the pawl e' is a pin e^3 , resting in a cam-groove j^3 in the weight J'.

It will be noticed on referring to the perspective view, Fig. 1, that the weights J J' have cam-grooves formed by projecting portions $j^2 j^4$, so that when the pin of the pawl e enters the cam-groove its bearing upon the surface j^4 will tend to hold the pawl e out of gear with the ratchet G when the shifter-arm H is in the position shown in Fig. 5, so that the pawl e will simply work in the space g^4 in the wheel G without imparting motion to the wheel, while the pawl e' will ride upon the cam-surface j^5 and will be lifted clear of the teeth of the wheel G, so that both pawls $e e'$ are out of gear. The pawls are in this position when the yarn-frame is simply agitated in the liquid, motion being imparted to the wheel G and its shaft E through the pawls d^2 and d^3 , which are engaged with the wheel, as shown clearly in Fig. 8.

Hung to the bell-crank lever D', at i^2 , is a weighted pawl I', which engages with the ratchet-teeth on the time-wheel I and feeds the time-wheel forward at each forward movement of the lever.

A weighted detent-pawl I², (see Fig. 5,) pivoted to the frame of the machine at i^3 , prevents the return of the time-wheel, so that the time-wheel will feed forward during a certain period until its lug i' crosses the path of the lug h on the shifting lever H, when the said lug will come into contact with the lug on the time-wheel, and, as the time-wheel is adapted to fixed bearings, the arm H will be shifted from the position shown in Fig. 8 to the position shown in Fig. 7, releasing the weight J and acting upon the weight J' so that the pawls d^3 and e' will be in engagement with their respective teeth on the wheel G and first one pawl will act and then the other to elevate the yarn-frame out of the liquid in a straight line x above the vat, as shown in Fig. 4. At the point x the chain f^5 , which is attached to the shifting lever and is hooked to one of the elevating-arms, is drawn taut and the shifter will release the clutch and stop the machine, so that the yarn can drain into the tub, and at this point the dyer can sample the yarn, if necessary.

The above movement will continue if the chain is detached until the pivot of the yarn-frame is at the point x' , Fig. 4. Then the pawls e and d^2 , which heretofore have simply acted as followers for the pawls e' and d^3 , come into play and allow the yarn-frame to lower a

tooth at a time until the lug d^4 , Fig. 9, locks the pawl j^3 , which will stop this portion of the machine.

It will be seen by the above description
5 that two of the pawls will lock one of the bell-crank levers to the wheel G and its shaft E, so that the yarn-frame will be simply agitated in the liquid, while two cams on one side, when the shifting arm is thrown, will raise the
10 yarn-frame out of the liquid and carry it to a point directly above the mechanism, and as soon as the frame passes over the center the other pawls will allow the frame to lower to a position at the side of the vat within easy
15 reach of the operator.

The top section M of the yarn-carrying frame consists of a longitudinal bar m and cross-bar m' , and on the end of the longitudinal bar are pins m^2 , with which engage the
20 arms F' at each side of the vat. The ends of the arms F' are slotted, forming mouths for the reception of the pins, and each mouth is flared, so that the pin will readily enter, and they open to one side, as indicated in Fig. 1, so that when the mechanism commences to
25 elevate the yarn-frame the yarn is gradually turned, so as to prevent the yarn-frame becoming disengaged. To prevent any lateral displacement, the ends of the pin are headed at
30 one side, as indicated at Fig. 14, and rest back of projections on the lower jaw of the mouth, Fig. 1.

Suspended from the section M of the yarn-frame by screw-rods p , one set at each side
35 of the machine, are recessed bars p' , adapted to receive the sticks s , carrying the skeins of yarn. Mounted above the bar p' is a clamp-plate p^2 , which locks the stick to the bar by turning the nuts p^3 on a screw-rod p , Fig. 4.
40 A plate p^4 at each side prevents the longitudinal displacement of the sticks.

The bar p' can be moved to and from the section M of the carrying-frame by means of a nut p^5 on the screw-rod p , the nut p^5 resting
45 on the cross-bar m' of the section M.

Hung in the lower portion of each series of skeins is a stick s' , and these sticks are held together by the lower section M' of the yarn-frame, which simply consists of two recessed bars t and t' , hinged together at t^2 , Fig. 11, and adapted to receive the ends of the sticks s' . A screw s^3 and nut s^4 lock the bars to the stick, as clearly indicated in Fig. 3.

Secured to each side of the tank, near the
55 bottom, are brackets a^2 , on which the section M' rests during a portion of the stroke of the yarn-frame as it is agitated, so that, as indicated in Fig. 3, when the yarn-frame is lowered the upper sticks s leave the yarn, allowing the dye liquor to gain access to the space
60 between the yarn and the stick, and the yarn will pass away from the lower stick s' when the lower portion of the yarn-frame is stopped by the brackets on the back, so that the liquor
65 will gain access to the portion of yarn below the sticks. Thus the yarn is thoroughly im-

pregnated with the dye liquor, all portions of the yarn being subjected to the liquor at each movement of the mechanism, and as the yarn is perfectly free during certain portions of
70 the time that it is in the liquor it will not kink; but when removed from the liquor it is completely under control, being held by the two sections of the frame.

When the yarn is raised sufficiently clear
75 of the vat, the clamp-bars $t't'$ can be removed from the sticks s' and can be supported on the vat in any suitable manner until a new batch of yarn is adjusted on the upper frame and the sticks inserted within the skeins,
80 after which the clamps can be secured to the lower sticks. It will thus be seen that the machine is automatic to a certain extent, can be readily applied to any length of vat, and the vat can be readily removed from the machine without disengaging any of the mechanism.
85

While I have illustrated my invention in connection with a machine for dyeing yarn, it will be understood that it may be used in
90 connection with machines in which a vat is used and in which material is to be subjected to treatment of liquid in the bath and agitated under treatment—as, for instance, machines for washing yarn, machines for pick-
95 ling metallic plates prior to plating them with tin or other metal, &c; but my invention is especially applicable for use in machines for dyeing yarn.

I claim as my invention—

1. The combination in a dyeing-machine, of a vat, a yarn-frame, lever mechanism, and pawl-and-ratchet mechanism connected therewith for moving the yarn-frame within
105 the liquor and also for elevating the frame from the liquor and swinging it clear of the vat, substantially as described.

2. The combination in a dyeing-machine, of a frame, a series of arms at each side, pawls, and ratchet-wheels, means for operating the pawls, a vat mounted between the
110 side arms and a yarn-frame suspended from the arms within the vat, the whole being so arranged that the vat is independent of the frame, substantially as described.

3. The combination in a yarn-dyeing machine, of a vat, a frame and a yarn-frame, a driving-shaft, eccentrics and their rods, pawl-carrying levers, a shaft, a ratchet-wheel thereon, arms on said shaft adapted to carry
120 the yarn-frame and shifting mechanism whereby the yarn-frame can be agitated within the liquid or removed therefrom, substantially as described.

4. The combination of a vat, a yarn-frame, longitudinal shaft-carrying arms engaging with the yarn-frame, two bell-crank levers, two pawls on each lever, a ratchet-wheel on each shaft with which the pawls engage, a driving-shaft, eccentrics thereon, and eccentric-rods adapted to each eccentric, one rod
130 being connected to one bell-crank lever and

the other rod being connected to the other bell-crank lever, substantially as described.

5. The combination in a vat, of the frame, the driving-shaft thereon, an eccentric-shaft 5 geared to the driving-shaft, eccentrics on said shaft, two bell-crank levers one connected to one eccentric and the other connected to the other eccentric, a double ratchet-wheel, pinions on the bell-crank levers engaging with 10 the ratchet-wheel, a longitudinal shaft carrying the ratchet-wheel, and an arm at each side of the vat secured to the shaft, one arm being connected to one side of the yarn-carrying frame and the other to the other side, 15 substantially as described.

6. The combination in a dyeing-machine, of a vat, a frame, a longitudinal shaft, ratchet mechanism for operating said shaft, an arm secured to the shaft at each side of the vat, 20 an extension of said arm, a yarn-frame with which said extension engages, a lever, an arm connected to the extension and pivoted to the arm near the shaft and a fixed cam engaging with the short arm of the lever, the 25 whole so constructed that on the elevation of the yarn-frame from the tank it will be raised vertically and then swung over to one side of the vat, substantially as described.

7. The combination of a vat, a frame, longitudinal shafts on the frame, a series of arms at each side of the vat, one of said arms being fixed to the shaft, a yarn-frame carried by the said series of arms, a ratchet-wheel having 30 two sets of teeth formed substantially as described, a bell-crank lever at each side of the wheel, mechanism for operating said bell-crank levers, two pawls on each lever one set of pawls adapted to move the wheel in one 35 direction and the other set of pawls adapted to move the wheel in the opposite direction, pivoted weights and a shifting arm so arranged that when the shifting arm is in one position the yarn-frame will be reciprocated 40 within the vat and when the shifting arm is in another position the yarn-frame will be raised and swung clear of the vat, substantially as described.

8. The combination in a vat, of the yarn-frame, the arms on each side of the vat supporting the yarn, the frame, the shaft carrying the arms, a double ratchet-wheel, levers hung on the shaft, pawls on said levers and weights for throwing one set of pawls out of gear while the others are acting a shifting 50 arm and time-wheel adapted to throw the shifting arm when the yarn has been in the vat a certain length of time, substantially as described.

9. The combination of the vat, the yarn-frame, arms at each side of the vat supporting the yarn-frame, shafts carrying the arms, a double ratchet-wheel having teeth arranged 60 substantially as described, levers at each side of the ratchet-wheel, mechanism for operating said levers, two pawls carried by one of said levers, a weight carried by each of said

pawls, said weights being grooved in one side, two pawls carried by the other lever having pins adapted to grooves in the weights, and a pivoted shifting lever adapted to move one 70 or other of the weights so as to allow the pawls with which the weight engages to be free, substantially as described.

10. The combination of the vat, the yarn-frame, a longitudinal shaft, mechanism for 75 operating said shaft, fixed cams and arms secured at each side of the vat to the shaft, an extension of said arm engaging the yarn-carrying frame, and a lever pivoted to the arm and attached to the extension and adapted to 80 ride upon the fixed cams and move longitudinally on its pivot whereby the yarn-frame is elevated in a vertical line out of the vat and turned on the shaft to one side of the vat, substantially as described. 85

11. The combination in a yarn-dyeing machine, of the vat, a yarn-carrying frame, arms at each side of the vat supporting the frame, a longitudinal shaft, ratchet mechanism thereon, a driving-shaft, a clutch and its lever, said 90 lever being connected to one of the frame-carrying arms so that when the arms reach a certain point the lever will be shifted, substantially as described.

12. The combination in dyeing-machines, 95 of the vat, the yarn-carrying frame made in two sections, sticks carried by the upper section on which the yarn is suspended, sticks carried by the lower section and supported by the yarn, vertical guides on which said lower 100 section moves and stops within the vat with which the lower section engages so that as the yarn-carrying frame is raised and lowered within the vat during a certain portion of the stroke the yarn will be free from the sticks, 105 substantially as described.

13. The combination of a vat, a yarn-carrying frame made in two sections, the upper section having side bars and a head, vertical screw-bolts connecting the head to the side 110 bars, sticks adapted to the side bars carrying the yarn, the lower section consisting of sticks and split side bars and means for locking the two sections of the side bar so as to hold the sticks in place, substantially as described. 115

14. The combination of the vat, yarn-carrying frame made in two sections, the upper section consisting of two split side bars having recesses, sticks adapted to said recesses, screw-rods projecting from each side bar, nuts 120 on the screws adapted to lock the sticks to the side bars, a head consisting of a longitudinal bar and cross-bar, said screws passing through the cross-bars and having nuts, projections on the longitudinal bar engaging with the lifting mechanism, with a lower section of the 125 yarn-carrying frame consisting of side bars and sticks, substantially as described.

15. The combination in a dyeing-machine, of the vat, the yarn-frame, pins on the yarn-frame, an arm at each side of the vat, agitating and lifting mechanism connected to said 130

arm, each arm being slotted and having the slot open at one side to engage with the pins on the yarn-carrying frame, the open slots being so arranged that when the yarn-frame is
5 elevated it will be carried by the arms, substantially as described.

In testimony whereof I have signed my

name to this specification in the presence of two subscribing witnesses.

THOMAS C. DILL.

Witnesses:

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JOS. H. KLEIN.