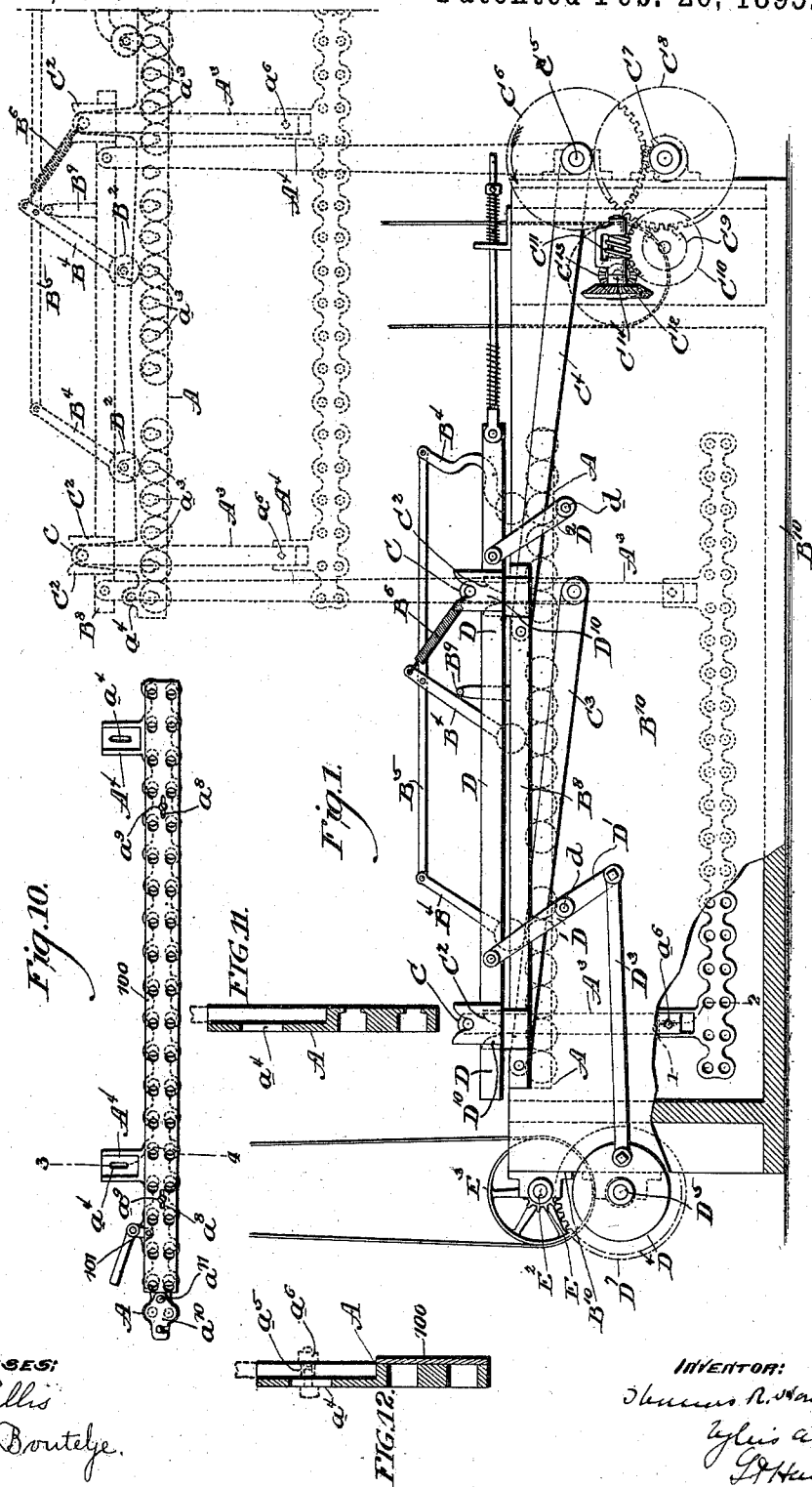


T. R. HOUSEMAN.
DYEING MACHINE.

No. 534,797.

Patented Feb. 26, 1895.



WITNESSES:
M. F. Ellis
Philip Boutele.

INVENTOR:
Thomas R. Houseman
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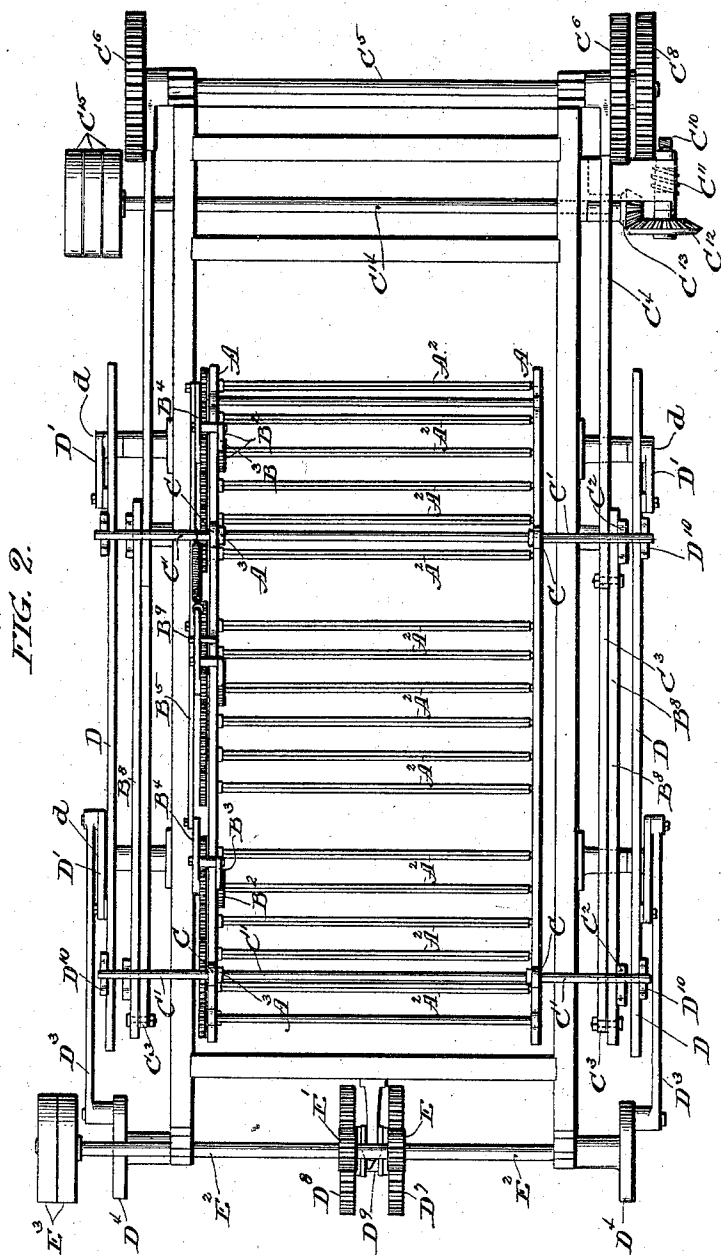
(No Model.)

3 Sheets—Sheet 2.

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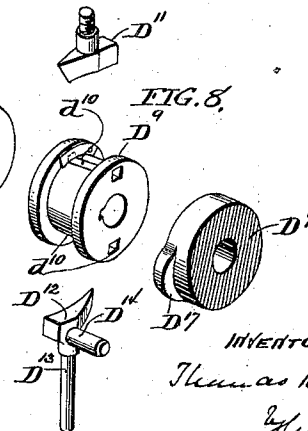
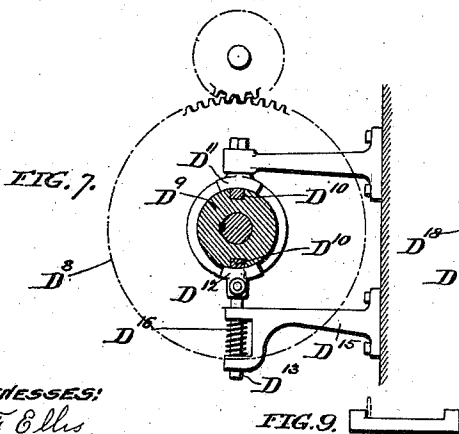
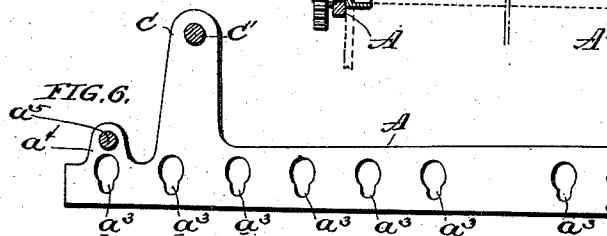
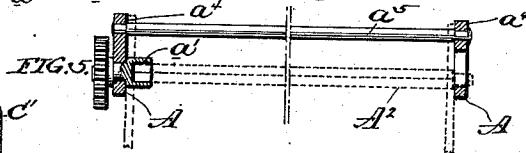
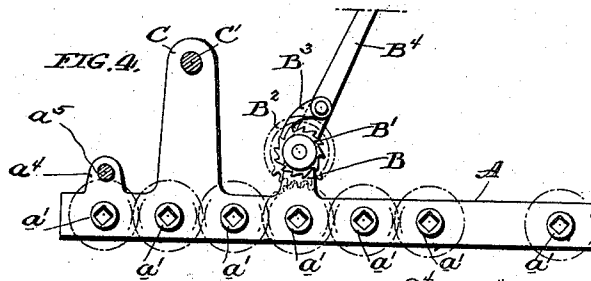
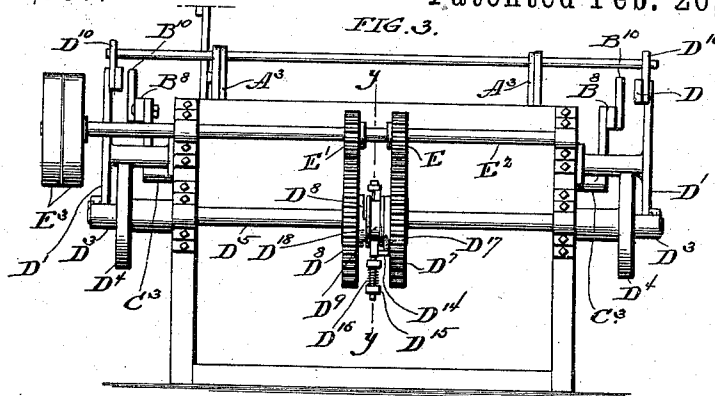
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INVENTOR:
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By
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UNITED STATES PATENT OFFICE.

THOMAS R. HOUSEMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO R. GREENWOOD & BAULT AND SPROWLES & HOUSEMAN, OF SAME PLACE.

DYEING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 534,797, dated February 26, 1895.

Application filed July 10, 1894. Serial No. 517,073. (No model.)

To all whom it may concern:

Be it known that I, THOMAS R. HOUSEMAN, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Dyeing-Machines for Yarn or Skein Dyeing, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

In the drawings—Figure 1 is a view in side elevation of machine partly in section. Fig. 2 is a plan view. Fig. 3 is an end view of same. Fig. 4 is a detached side elevation of frame A. Fig. 5 is a cross-section of yarn frame, line $x-x$. Fig. 6 is a detailed side elevation of frame B. Fig. 7 is an enlarged section at $y-y$ of Fig. 3. Fig. 8 is a detached perspective view. Fig. 9 is a side view of key showing point where spring acts. Fig. 10 is a side elevation of the bottom piece on opposite side of the bottom of the yarn frame. Fig. 11 is a section on the line 1—2 of the lower frame as shown in Fig. 1, and Fig. 12 is a section on the line 3—4 of Fig. 10.

My invention consists in certain organization of mechanism whereby the frame which supports the yarn sticks upon which the yarn or skein is suspended is automatically lifted out of and into a vat containing dye liquor, and when supported in the vat containing the dye liquor, it is automatically intermittently reciprocated by being given a movement, first upward, and forward, and downward, in one direction, and then upward, and backward and downward in the other direction, and between these movements, that is, between the forward and backward movement, a dwell is given, and during one of the movements of the frame, the yarn sticks are automatically turned. The upward, forward and downward movement, and the upward, backward and downward movement given to the frame is for the purpose of approaching the operation of dyeing by hand, by what is called polling, and the dwell at the end of each of the operations is for the purpose of allowing a subsidence of the liquor between the movements, so that the liquor will be in a quiescent condition when the movements begin, and there-

fore in the movement will be caused to pass more thoroughly through the yarn or skein. The mechanism which I have attached for the purpose of automatically turning the yarn sticks during the movement of the frame, is for the purpose of preventing unequal dyeing at the point of support of the yarn upon the sticks, the rotation of the sticks causing the yarn to be passed around it, so that all the yarn is equally exposed to the liquor, and no part remains for a long time upon the stick. I will first describe generally the arrangement and mechanism by which I accomplish these results, and then particularly point out the invention in the claims.

The yarn frame is formed of two longitudinal pieces A, at each side of the top and bottom, the longitudinal pieces at each side at the top and bottom being connected with each other by the cross pieces A'. Uprights A³ connect the top and bottom sections of the frame. The longitudinal pieces A are shown in Figs. 4 and 6, Fig. 4 representing one side of the top of the frame, and Fig. 6 the other side of the top of the frame. Between these longitudinal sections are supported the upper yarn sticks on one side, to wit: that shown in Fig. 4. There is a gear wheel a corresponding to each stick, and the shaft of this gear wheel projects through the piece A, and has the hub a' , which supports one end of the yarn stick A². (See Fig. 5.) The other end of the yarn stick is secured in a socket on the opposite section A, the socket being shown at a^3 (Figs. 5 and 6). This socket is made so as to be larger at one portion than the other, and the end of the stick is reduced in size, so that when one end rests at the bottom of the socket a^3 , the projecting portion or shoulder prevents it from getting out, but when it is lifted up to the large part of the orifice a^3 it can be readily moved laterally.

The bottom pieces A are shown in Figs. 1, 10, 11 and 12, Figs. 1 and 11 showing one side, and Figs. 10 and 12 the other side. Both sides are provided with two of these pieces so as to take in different lengths of yarn. These pieces on each side are connected to the uprights A³ by the arms A⁴, which have the slots a^4 in which the uprights A³ rest. These uprights have orifice a^5 , and they are secured to

the arms A^4 at varying positions by the bolt a^6 . The pieces A on one side have orifices corresponding in number and size to the lower yarn sticks and are provided on the outside with an abutting ring a^7 , which close the orifices beyond or outside of the pieces A. On the other side, see Fig. 11, are corresponding orifices flanged to give sufficient bearing, but, instead of being closed permanently, I provide the metal sheet 100 secured to the piece A through slots a^8 , by countersunk screws a^9 . (See Fig. 10.) This sheet is operated by means of a crank 101, and is provided with orifices corresponding to the orifice in pieces A. When the plate is moved in one direction, the orifices in the plate register with the orifices in the piece; and when moved in the other direction, the solid portions partially cover the orifices in the pieces A. By this construction, the lower sticks are inserted and removed. It is advantageous that one of the sticks should be readily removable independent of the others to test the dyeing, and, to do this, instead of extending the plate over the entire number of stick-orifices, I leave one uncovered by the plate and cover it by an independent solid gate, a^{10} , which is pivoted at a^{11} , and when lifted up it uncovers the orifice, and when closed down, covers it.

Each one of the top yarn sticks is connected to a hub of a corresponding gear wheel, and these gear wheels mesh with each other, as shown in Figs. 1, 2 and 4, in sets of six. Projecting from the piece A is the bracket B, which carries the ratchet wheel B^1 , having upon its shaft the gear wheel B^2 , which meshes with one of the gears carrying the stick, and B^3 is a pawl which when operated, turns the ratchet and moves the gear wheel B^2 , which in turn moves the gear wheel A, which, meshing with the other gear wheels a in the set of six, turns them all, rotating the upper yarn sticks.

As shown in Fig. 2, there are eighteen yarn sticks. Therefore there are three brackets B and three ratchet wheels with their appurtenant gear, each ratchet operating through its corresponding gear B^2 six yarn stick gear wheels. Each one of the three ratchets B^1 has a pawl B^3 , which is connected to an arm B^4 , which arm is pivoted to the shaft of the ratchet, B^1 . These three arms are pivotally connected with each other by means of the longitudinal rod B^5 , the central arm B^4 projecting beyond said rod B^5 , and being connected beyond said rod B^5 to one end of a spiral spring B^6 , the other end of said spring being connected to one of the trunnions C^7 . The lifting frame B^8 also carries the post B^9 , which, when the yarn frame is in the vat B^{10} is adjacent to the central arm B^4 . Projecting from the pieces A are the brackets a^4 , which support cross-pieces a^5 which act as braces for the yarn frame. Projecting from the pieces A are the brackets C, one at each end of said pieces, and through which pass the trunnions C^7 .

Upon the lifting frame B^8 , at each side thereof, are the supports C^2 , adapted to receive and hold the trunnions C^7 . (See Fig. 1, right hand portion dotted line.) At each side of the frame B^8 are connected the arms C^3 , C^4 , the arms C^3 being pivotally connected to the side of the vat B^{10} , while the arms C^4 are connected one to each end of the shaft C^5 . Upon this shaft C^5 is the gear wheel C^6 , which gears with the small wheel C^7 upon the same shaft on which is the gear wheel C^8 , meshing with the gear wheel C^9 on the shaft of which is the worm wheel C^{10} , meshing with the worm C^{11} , on the shaft of the bevel wheel C^{12} meshing with the bevel C^{13} on the shaft C^{14} . At the other end of said shaft C^{14} are the pulley wheels C^{15} , the two outer wheels being loose pulleys, and the center wheel driving pulley, and between these pulleys, from the source of power, is a belt which works upon one of the outer pulleys straight and on the other cross. The arms C^3 and C^4 are of the same length; and the arm C^4 , with its appurtenant shaft, is placed at such position adjacent to the vat, that, taking the yarn frame to be in the position shown in Fig. 1, in dotted lines and the gear C^5 revolving in the direction of the arrow, the lifting frame will move forward and downward so that it will pass into the vat B^{10} .

D is a supporting frame, similar to the frame B^8 , having extensions D^{10} . This frame is supported at one end, on each side, by means of the links D^1 , which links are pivoted to said frame and is also pivoted at d to the vat, and beyond said pivot point is pivotally connected to the links D^2 , which links D^1 are connected to the rods D^3 mounted upon the crank wheels D^4 upon the shaft D^5 . The frame D at the other end is connected by means of the links D^2 , with a vat B^{10} , these two links D^6 and D^7 being parallel one with the other. The shaft D^5 has loose upon it, the gear wheels D^7 and D^8 and intermediate and keyed to said shaft is the clutch D^9 . This clutch is provided (see Figs. 7, 8 and 9) with two pins or keys D^{10} , which are normally held within the hubs of said wheel by means of the cam devices D^{11} and D^{12} , which are set opposite to each other adjacent to said wheel and are supported in a fixed position. The cam device D^{11} is a fixed cam device, while the cam device D^{12} is provided with a rod D^{13} , and the roller D^{14} . The rod D^{13} passes through orifice in the bifurcated end of the bracket D^{15} , and between the bifurcated end of the bracket. Surrounding the bracket or rod D^{12} , is the spring D^{16} . The roller D^{14} is in the path of movement of the projection D^{17} on the wheel D^7 . On the wheel D^8 is the projection D^{18} , and this projection is arranged on the wheel so that it shall lead the projection D^{17} on the wheel D^7 . Meshing with the wheels D^8 and D^7 are the gears E and E' upon the shaft E². At one end of this shaft E² are the pulleys E³, which are driven by means of a belt leading from the source of power. This

arrangement of the shaft E² with gears E and E', the shaft D⁵ with gears D⁷ and D⁸ and intermediate clutch roller D⁹, is such that in the revolution of the shaft E², which rotates the wheels D⁷ and D⁸ are independent of the roller D⁹. When the projection D⁷ strikes the roller D¹⁴ of the cam D¹² it forces it down, releasing the pin D¹⁰, bringing the pin into alignment with the surface of the projection D¹⁸ on wheel D⁸, but, as this projection leads the cam or projection D¹⁷, it is not until the wheel D⁸ makes a complete revolution that it catches the pin and rotates the clutch roller D with it, and with it the shaft, until the pin reaches the cam D¹¹, when it is thrown out of action, and the wheels D⁸ and D⁷ rotate free from the shaft D⁵. When the projection D¹⁷ again strikes the roller D¹⁴, it releases the pin, but the projection D¹⁸ of the gear D⁸, being in advance fails to catch the pin so that it makes a rotation and a half before it strikes the pin. By this means the shaft B⁵, which carries the crank D⁴ is intermittently rotated giving an intermittent movement to the crank, the dwell between rotations being three times the period of the rotation. This mechanical movement I do not intend to claim in this application, as I have filed an application wherein I claim the same broadly, said application being serially numbered 517,072 and filed July 10, 1894, but I explain it fully as it is the means, as will hereinafter more fully appear, whereby I obtain a dwell in the movements given to the yarn frame.

Returning now to the yarn frame and the supporting frame D, as will be seen from inspection of Fig. 1, the arrangement of the parts is such that when the frame B⁸ has made its entire movement it is below the frame D, and, as shown, the position of the frame D is within the frame B⁸ when in that position, so that when the yarn frame supported by its trunnions upon the support C² is moved by the rotation of the shaft C⁵ so as to be carried forward and downward into the vat, when the trunnions reach the supports C² upon the frame D, they will rest in said supports and the frame D⁸ will sink below and the yarn frame be supported upon the supports C². When this occurs the belt which operates the shaft C⁵ is moved on its loose pulley and the belt which guides the shaft E² set into action, and the shaft D⁵, as before described, intermittently operated, thus intermittently operating the crank, which intermittently operates through the rods D² and D' to move the frame with its carried yarn frame first upward, forward and downward, the gearing being arranged, so that this will be done with one half rotation of the wheel D⁸, which will make one half rotation of the wheel D⁴. The shaft D⁵, and with it the wheel D⁴, and the connections to the frame D, then rest or dwell for a revolution and a half of the wheel D⁸, when the shaft D⁵ is again thrown into action and moves the frame upward and backward

and downward to its initial position, when again a similar dwell takes place before the crank again operates. During the upward and forward movement of the frame D, the center arm B⁴ strikes the post B⁹, secured to the frame B⁸, which in this part of the operation is fixed, causing the arm B⁴ to swing independent of the frame D on the post as a center, swinging the other arms B⁴ and the longitudinal rod B⁵, and causing the pawls B³ to operate upon their corresponding ratchet wheels B', and turning the yarn sticks. Thus in this forward movement, caused by the movement of the crank B³ through the links D', D⁶, turns the yarn sticks, bringing a different portion of the yarn skein upon the stick at each movement. On the return movement before described of the supporting frame D, the spring B⁶, which was distended before, pulls the arm B⁴ and the rod B⁵ back to their initial position, bringing the pawl back ready for another operation. By the mechanism hereinbefore described, the yarn skeins are put on the sticks supported by the frame outside, of the vat automatically conveyed into the vat, where they are received upon another support, which is automatically caused to travel upward, forward and downward, giving a motion in the liquor similar to that of ordinary polling, and during said movement the yarn sticks are automatically turned so as to bring fresh yarn upon this support, and at the end of said movement a dwell of sufficient time is obtained to enable the subsidence of the liquor before the return movement backward and downward, already described, takes place. Thus, by this mechanism I approximate by mechanical means the ordinary method of polling and at the same time automatically turn the sticks so as to prevent any portion of the skein remaining throughout upon the supports.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In combination with a dye vat, yarn-supporting sticks, and a frame supporting the sticks, of a means for reciprocating the frame with a dwell for the purpose described.
2. In combination with a dye vat, yarn-supporting sticks and a frame supporting the sticks, of a means for reciprocating the frame with a dwell at the end of the reciprocation in each direction for the purpose specified.
3. In combination with a dye vat, yarn-supporting sticks, and a frame supporting the sticks, of a means for horizontally reciprocating the frame with a dwell for the purpose described.
4. In combination with a dye vat, yarn-supporting sticks, and a frame supporting the sticks, of a means for horizontally reciprocating the frame with a dwell at the end of the reciprocation in each direction for the purpose specified.
5. In combination with a yarn frame, yarn

supporting sticks in said frame, a dye vat, an intermittently rotated shaft, and connection between said shaft and frame, whereby said frame is reciprocated in the rotation of said shaft.

6. In combination with a yarn frame, yarn supporting sticks in said frame, a dye vat, an intermittently rotated shaft, and connection between said shaft and frame whereby said frame is reciprocated in the rotation of said shaft, the rotation of the shaft being interrupted at the end of the reciprocation of the frame in each direction.

7. In combination with a yarn frame, yarn supporting sticks in said frame, a dye vat in which said sticks are adapted to be immersed, a shaft, and connection between said shaft and said frame whereby in the rotation of the shaft the frame is caused to move upward, forward and downward in one direction, and upward, rearward and downward in the opposite direction, and means to intermittently rotate said shaft.

8. In combination with a yarn frame, yarn supporting sticks in said frame, a dye vat in which said sticks are adapted to be immersed, a shaft, and connection between said shaft and said frame whereby in the rotation of the shaft the frame is caused to move upward, forward and downward in one direction, and upward, rearward and downward in the opposite direction, and means to intermittently rotate said shaft, the means being such that the movement of the shaft is interrupted at the end of the movement of the frame in each direction.

9. In a dye vat, in combination, a yarn frame, yarn supporting sticks in said frame, a gear connected to said sticks, a ratchet wheel, a gear on the shaft of said ratchet meshing with the first gear, a pawl to operate said ratchet wheel, an arm to which said pawl is connected, said arm being pivoted to said frame, a fixed post independent of said arm against which said arm rests, and means to vibrate said frame.

10. In a dye vat, in combination, a yarn frame, means to vibrate said frame, yarn supporting sticks in said frame, a gear connected to said sticks, a ratchet wheel, a gear on the shaft of said ratchet meshing with the first gear, a pawl to operate said ratchet wheel, an arm to which said pawl is connected, said arm being pivoted to said frame, a fixed post against which said arm rests, a spring, one end connected to a fixed point, the other end being connected to said arm.

11. In a dye vat, in combination, a yarn frame, means to vibrate said frame, yarn supporting sticks in said frame, a gear connected to each of said sticks, said gears meshing with each other in sets of two or more, a gear wheel for each set, a ratchet wheel on the shaft of each of said last mentioned gear wheels, arms equal in number to the ratchets, said arms being pivoted to the frame, a pawl

pivoted to each arm, and gearing with its corresponding ratchet, said arms being connected together, a fixed post independent of the frame, against which one of the arms rests.

12. In a dye vat, in combination, a yarn frame, means to vibrate said frame, yarn supporting sticks in said frame, a gear connected to each of said sticks, said gears meshing with each other in sets of two or more, a gear wheel for each set, a ratchet wheel on the shaft of each of said last mentioned gear wheels, arms equal in number to the ratchets, said arms being pivoted to the frame, a pawl pivoted to each arm and gearing with its corresponding ratchet, said arms being connected together, a fixed post against which one of the arms rests, a spring, one end connected to the arm resting against the post, the other end to a fixed point.

13. In combination with a dye vat and a yarn frame, and yarn supporting sticks in said frame adapted to support said yarn, two sets of parallel arms pivoted at one end to said frame, one pair of said arms being pivoted at the other end to the vat, the other arms connected to a shaft adapted to be rotated, the relation and position of the shaft and pivotal connection of the arms with the vat, and the length of the arms being such that in the movement of the shaft in one direction, the lifting frame with its yarn frame is moved forward and downward toward and into the vat, while in the other direction, they are moved upward and away from the vat.

14. In combination with a dye vat and yarn frame, and a lifting frame adapted to support and carry the yarn frame in and out of the vat, of a supporting frame secured to the vat provided with supporting members adapted to support the yarn frame, said members projecting above and being out of alignment with the supporting members of the lifting frame when the yarn frame is in the vat.

15. In a dye vat, in combination, with a yarn frame provided with trunnions and a lifting frame provided with rests for said trunnions, said frame being adapted to support and carry the yarn frame in and out of the vat, of a supporting frame secured to the vat provided with rests adapted to receive and support the trunnions of the yarn frame, said rests being in alignment with the trunnions when the yarn frame is in the vat, but above and out of alignment with the rests in the lifting frame when the yarn frame is in the vat.

16. In combination with a yarn frame and dye vat, of a supporting frame provided with links pivotally attached to said frame and the vat, said supporting frame being adapted to support the yarn frame when in the vat, a wheel, connection between said wheel and the links, whereby upon the revolution of said wheel, the links with the yarn frame are moved upward, forward and downward, then moved backward and downward, and means

substantially as described to rotate said wheel intermittently one half revolution.

17. In combination with a yarn frame and dye vat, of a supporting frame provided with 5 links pivotally attached to said frame and the vat, said supporting frame being adapted to support the yarn frame, a shaft, wheels upon said shaft, and connection between said 10 wheels and the links whereby the links with the frame are moved upward, forward, and downward with half revolution, then upward, backward and downward, with other half 15 revolution, and means to rotate said wheels intermittently one half revolution.

18. In combination with a dye vat and a yarn frame and yarn supporting sticks in said 15 frame adapted to support said yarn, a pair of parallel arms, both of said arms being pivoted at one end to said frame and connected at the 20 other end to the shaft adapted to be rotated, the relation and position of the shaft and connection of the arms with the frame and shaft, and the length of the arms being such that 25 in the movement of the frame in one direction, the lifting frame with its yarn frame is

moved forward toward and into the vat, while in the other direction they are moved upward and away from the vat.

19. In combination with a dye vat and a yarn frame, and yarn supporting sticks in said 30 frame, adapted to support said yarn, a pair of parallel arms, both of said arms being pivoted at one end to the frame, and one of said arms being pivoted at the other end to the vat, the 35 other arm being pivoted to a shaft adapted to be rotated, the relation and position of the shaft and pivotal connection of the arm with the vat, and the length of the arms, being such 40 that in the movement of the shaft in one direction, the lifting frame with the arm is moved forward and downward toward and 45 into the vat, while in the other direction they are moved upward and away from the vat.

In testimony of which invention I have hereunto set my hand.

THOMAS R. HOUSEMAN.

Witnesses:

M. F. ELLIS,

PHILIP BOUTELJE.