

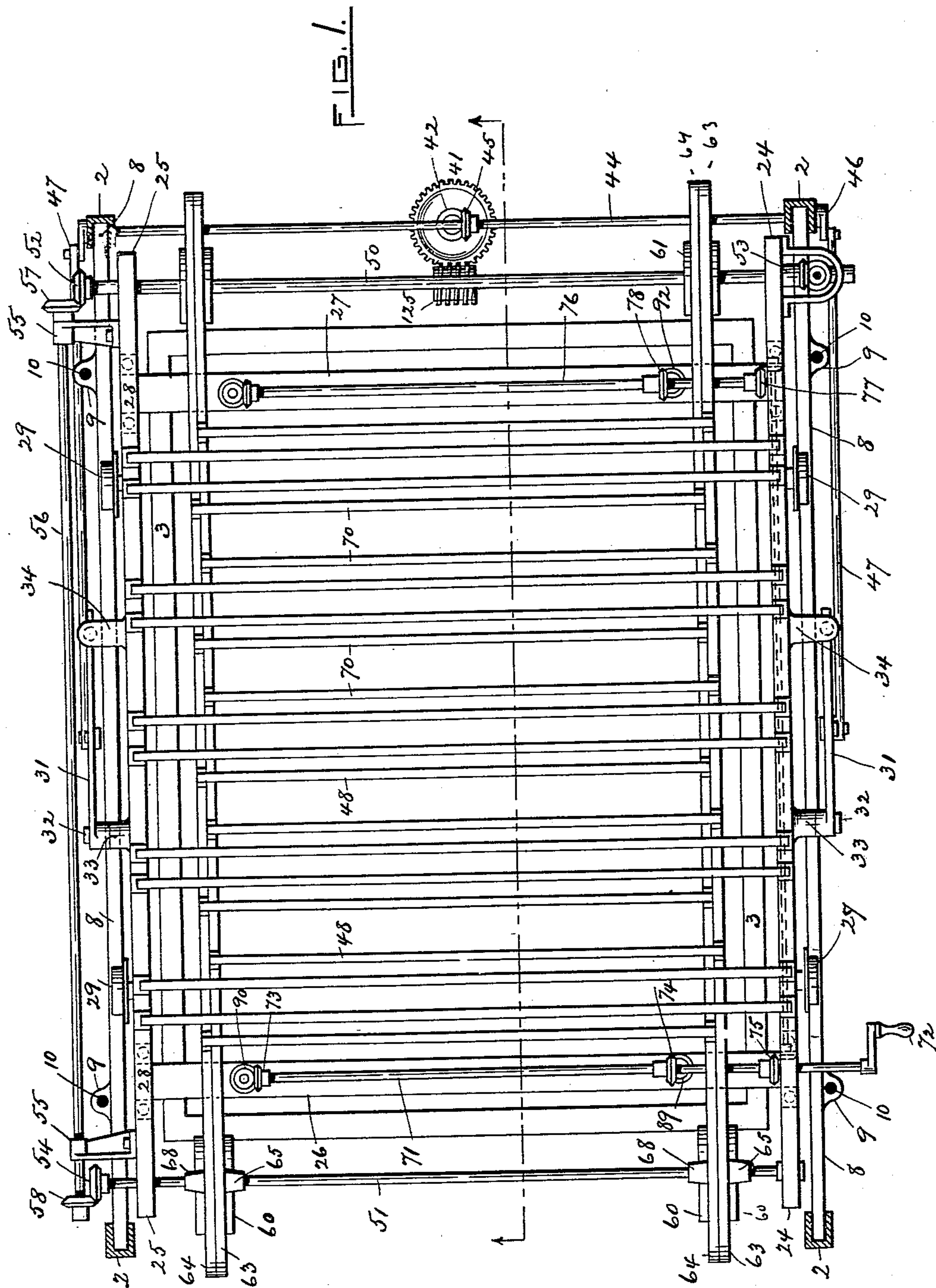
(No Model.)

5 Sheets—Sheet 1.

J. C. BLUNDELL.
YARN DYEING MACHINE.

No. 560,020.

Patented May 12, 1896.



WITNESSES.

Charles T. Hannigan
M. Foster

INVENTOR

John C. Blundell
By *Warren R. Perce*
Atty.

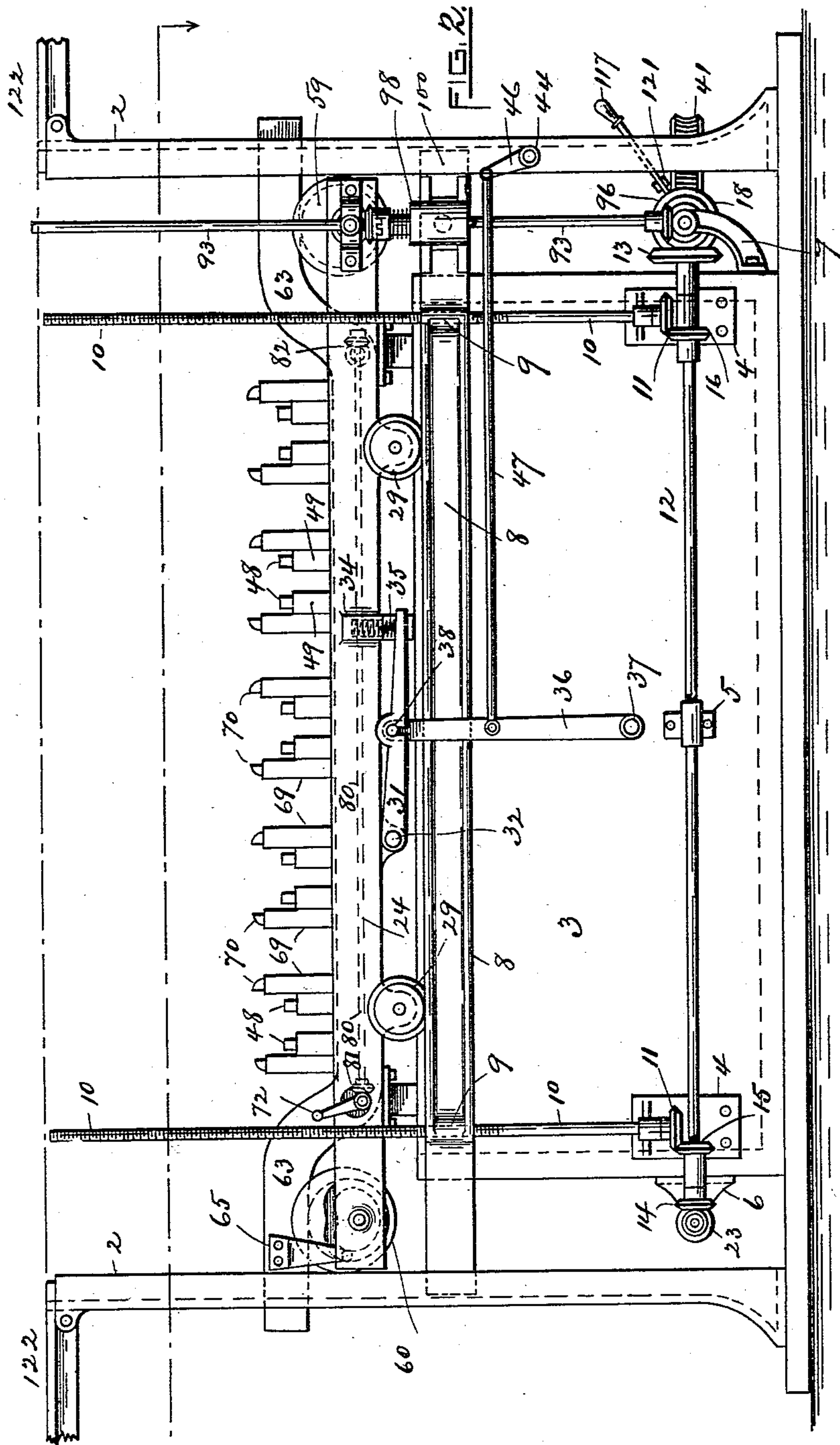
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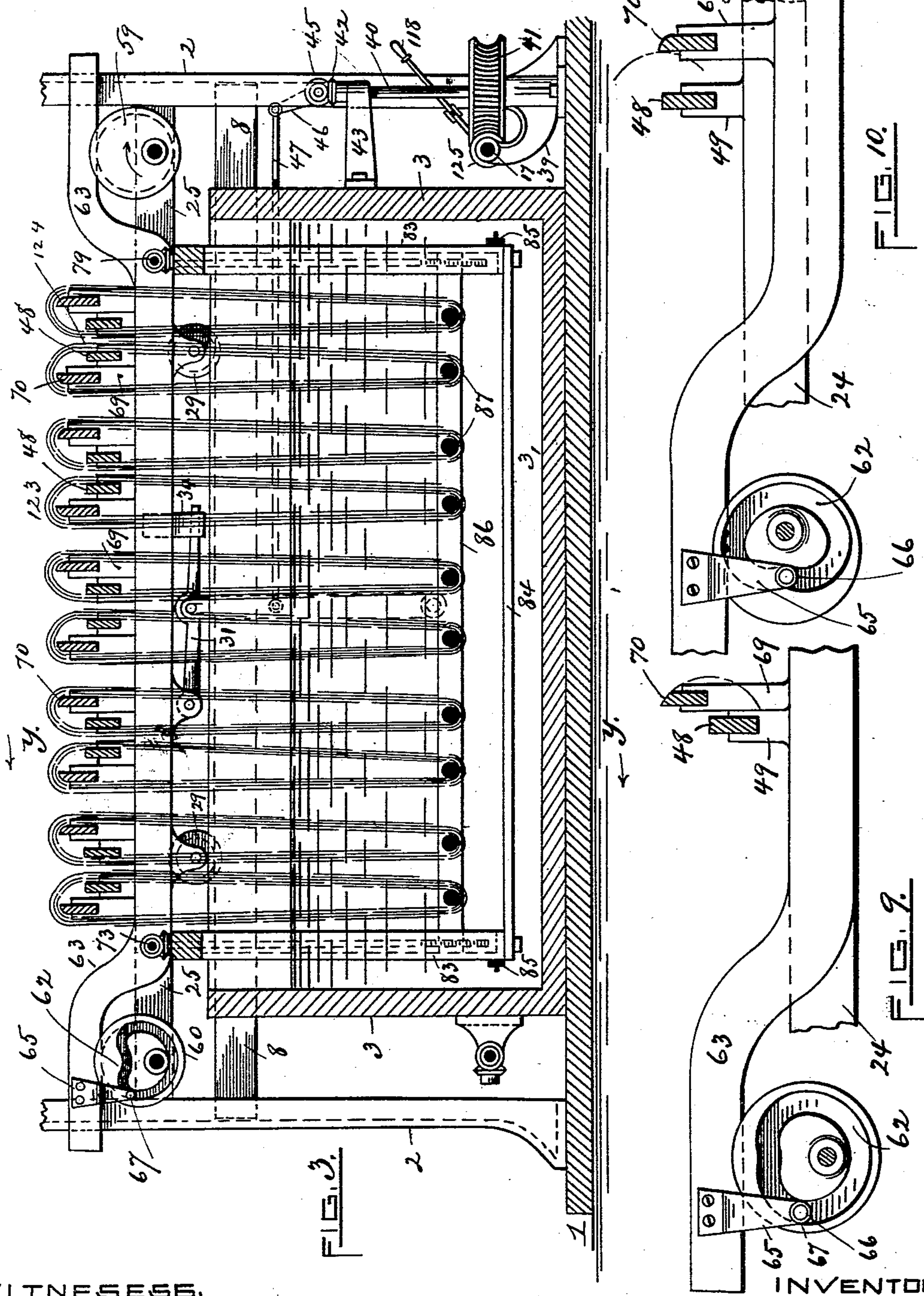
INVENTOR.

John C. Blundell
by Warren R. Perce
Att'y.

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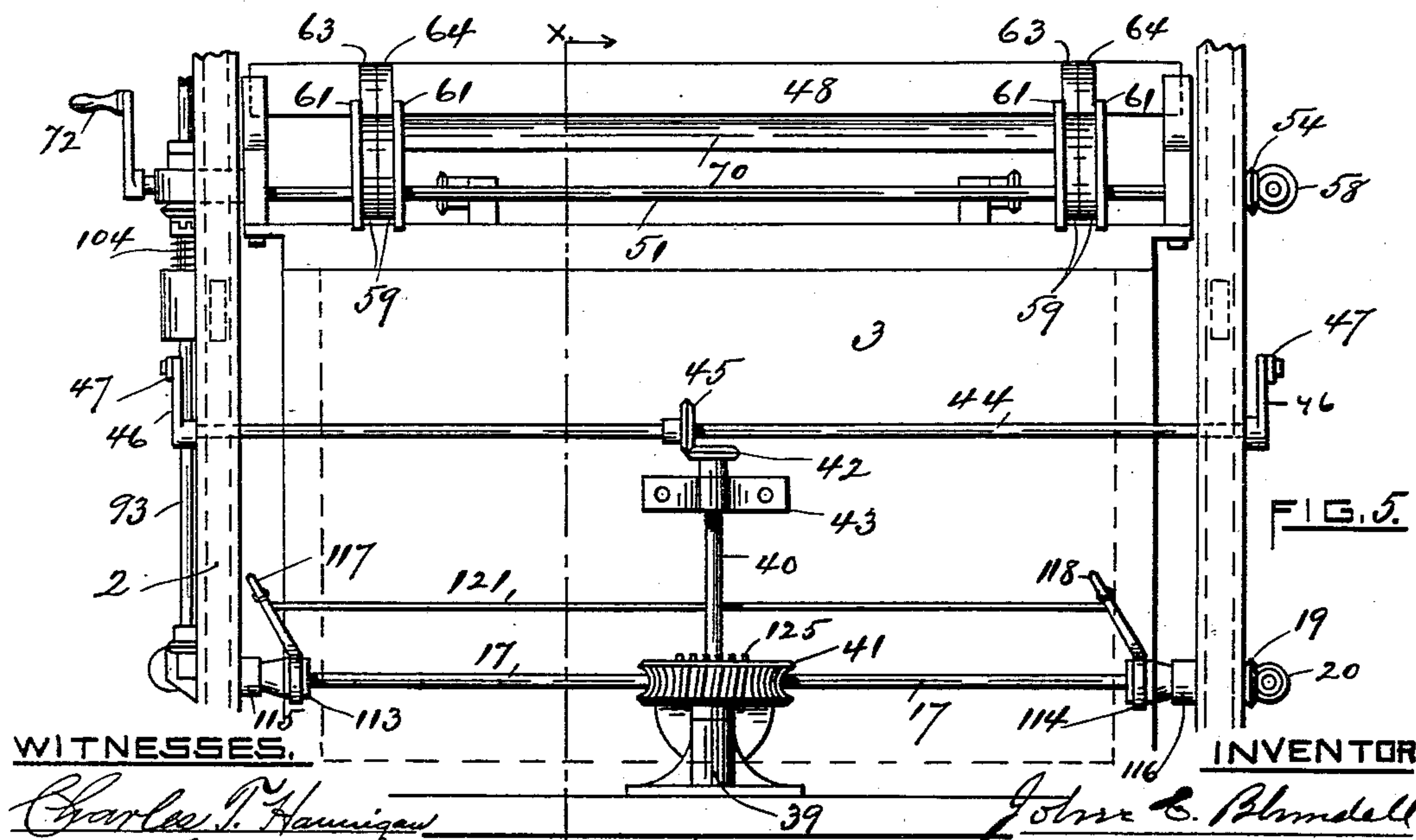
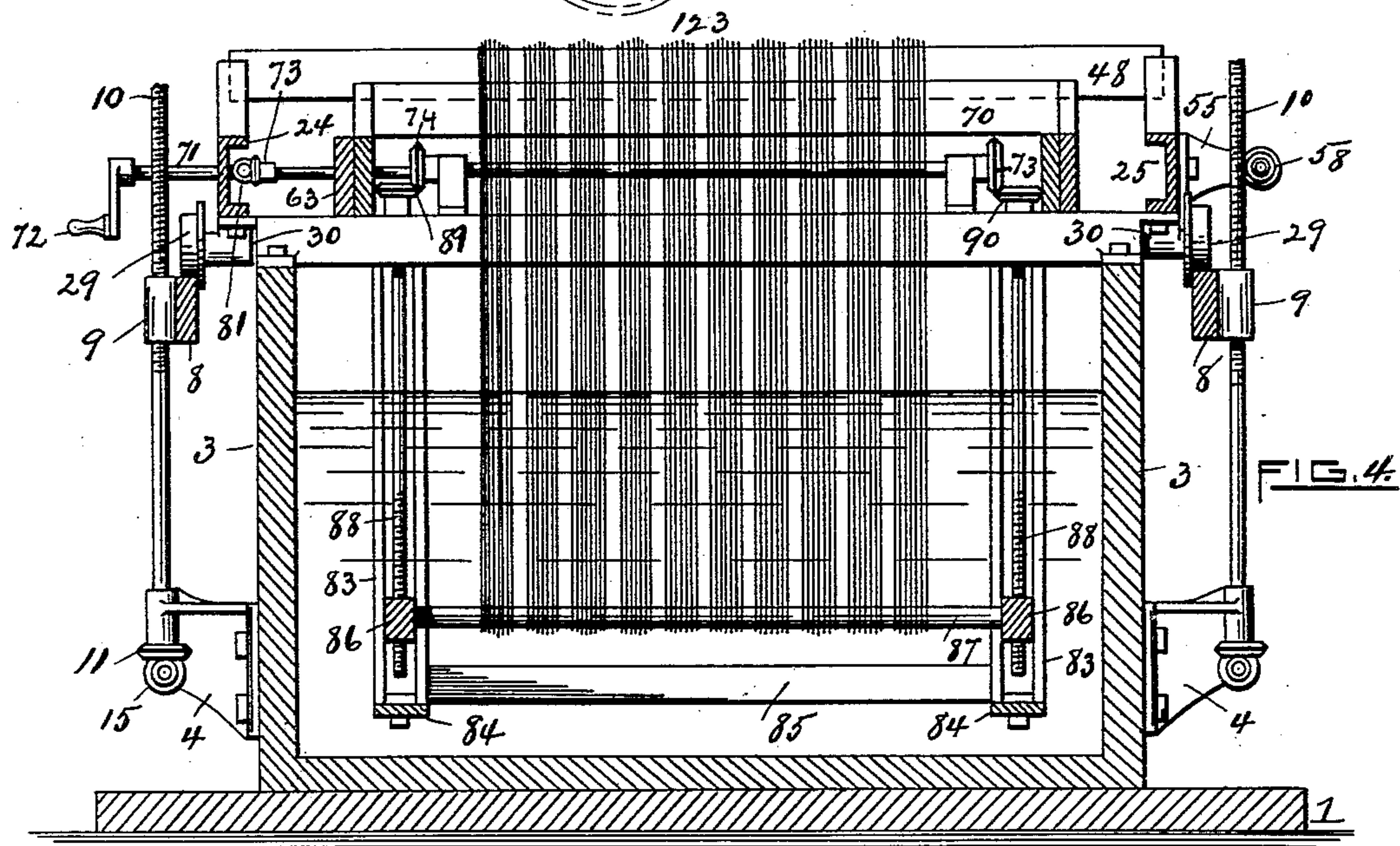
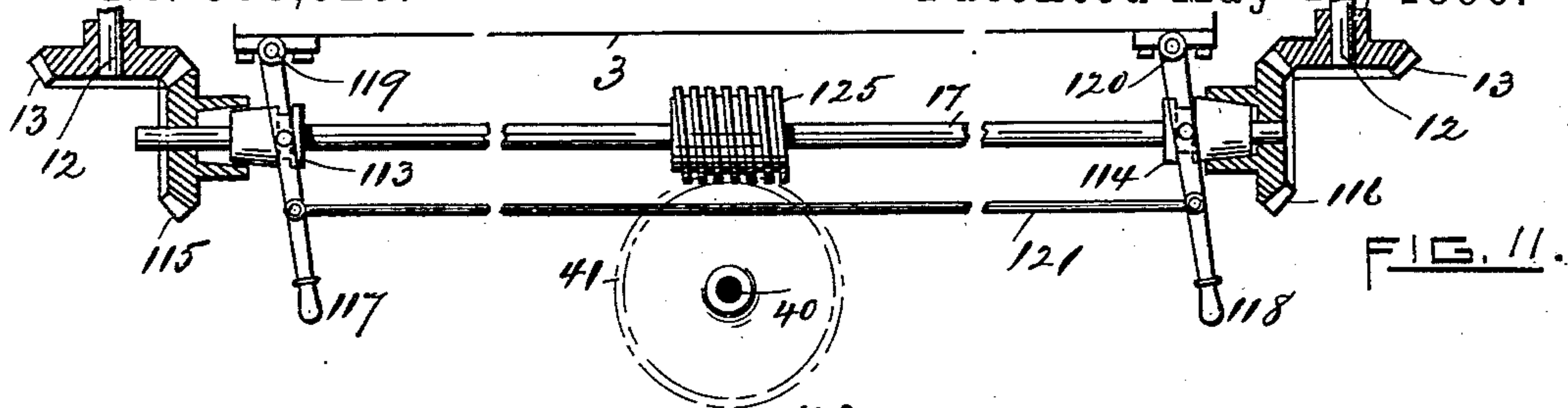
(No Model.)

5 Sheets—Sheet 4.

J. C. BLUNDELL.
YARN DYEING MACHINE.

No. 560,020.

Patented May 12, 1896.



WITNESSES,

Charles T. Hamming
M. Foster

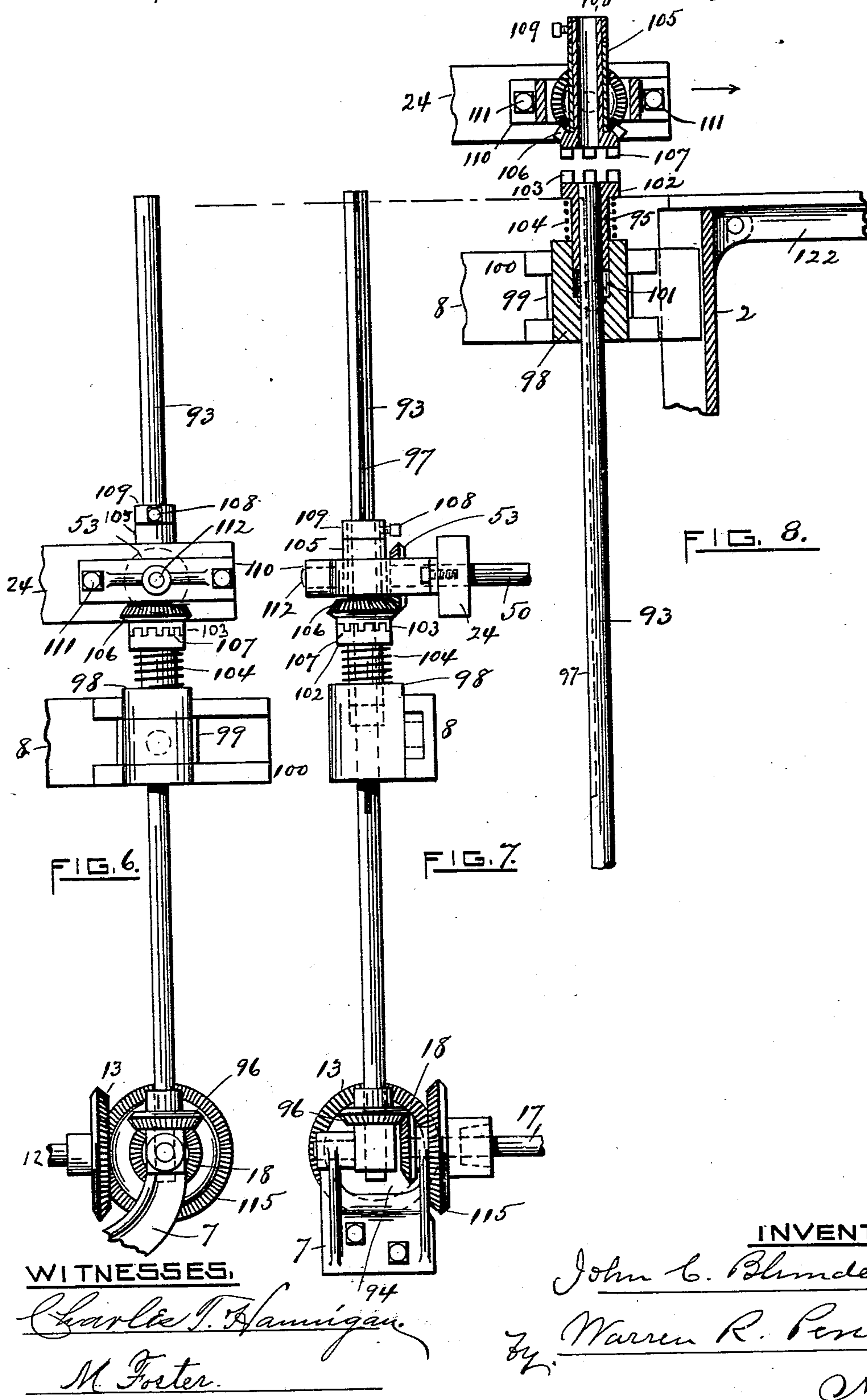
INVENTOR

John C. Blumfield
by Warren R. Pierce
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5 Sheets—Sheet 5.

No. 560,020.

Patented May 12, 1896.



UNITED STATES PATENT OFFICE.

JOHN C. BLUNDELL, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE
GREENWOOD DYEING MACHINE COMPANY, OF SACO, MAINE.

YARN-DYEING MACHINE.

SPECIFICATION forming part of Letters Patent No. 560,020, dated May 12, 1896.

Application filed February 18, 1896. Serial No. 579,732. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. BLUNDELL, of the city of Providence, in the county of Providence, in the State of Rhode Island, have invented a certain new and useful Improvement in Machines for Dyeing Yarn; and I declare the following to be a specification thereof, reference being had to the accompanying drawings.

Figure 1 is a top plan of my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a view of my invention, partly in elevation and partly in section, as seen on line $x x$ of Fig. 5. Fig. 4 is a view of my invention, partly in elevation and partly in section, as seen on line $y y$ of Fig. 3. Fig. 5 is a front elevation of one end of my improved machine. Figs. 6 and 7 are respectively front and side elevations of the rock-shaft and its connected parts. Figs. 8, 9, 10, and 11 are detail views.

Like numerals indicate like parts.

My invention is a device adapted for use in dyeing yarn; and it consists of the novel construction and combination of the several elements and parts hereinafter particularly described, and set forth in the claims.

In the drawings, 1 represents the bed or platform of the machine, rectangular in form, upon which are erected four standards 2, preferably metallic, having longitudinal grooves and shaped in cross-section as shown in Fig. 1.

A tank or vat 3, preferably of wood, is placed upon the platform 1 and holds the dyeing liquor. On each side of the tank 3, near the bottom and ends thereof, are brackets 4 4, having suitable bearings, and at or near the center of the tank, near the bottom thereof, is the bearing 5, while on rear or right-hand end of the tank 3, as seen in Fig. 2, near its bottom, are the brackets or bearings 6, and on the opposite or front end of the tank, near its bottom, are the upwardly-curved brackets 7 7. Rails 8 are arranged on two opposite sides of the tank (but not connected therewith) to form a track. The rails 8 extend from end to end of the machine and enter loosely into the grooves or channels of the standards 2, as seen in Figs. 1 and 2. Said

rails 8 have near their ends, respectively, tubular portion or support 9, whose bore is screw-threaded.

On each of the four bracket-bearings 4 4 is mounted a long screw-threaded rod 10, (see Fig. 4,) which also passes through and is supported by the tubular portion or support 9 of the rails 8 and engages by said screw-threads with said tubular portions of the rails. The rails 8 are thus supported upon said screw-threaded rods and are movable vertically upon said rods when the latter are rotated. The grooves of the standards 2, into which the ends of said rails enter loosely, keep the rails 8 parallel with each other and direct their vertical movement. Each rod 10 has at its lower end a bevel-gear 11.

On each side of the tank 3 is a horizontal shaft 12, mounted in the bearings 4 4 and 5, and provided with the large bevel-gear 13 at its front end, and with the small bevel-gear 14 at its rear end, and with the bevel-gears 15 and 16 near the ends. The bevel-gears 15 and 16 engage, respectively, with the bevel-gears 11 and 11 at the lower end of the rods 10 and 10, respectively. On the front end of the tank 3 is mounted, in the brackets 7 7 thereof, a shaft 17, (see Fig. 11,) on the ends of which are the bevel-gears 18 and 19, the latter engaging with the bevel-gears 20 on the front end of the shaft 21. On the rear end of the tank 3 is mounted in the brackets 6 thereof a shaft 22, on the ends of which are the bevel-gears 23, engaging, respectively, with the bevel-gears on the rear end of the shafts 12 and 21, respectively.

A carriage or frame, composed of the side bars 24 and 25 and the cross-bars 26 and 27, (bolted to the bars 24 and 25, as shown at 28,) travels back and forth by its trucks or flanged wheels 29 upon the rails or tracks 8 8. The wheels 29 are mounted upon journals 30, extending downward from the side bars 24 and 25. On each side bar 24 25 is mounted an arm 31, pivotally connected at 32 upon an extension 33 of said bar. The arm 31 has a central enlargement, in which is a slot. (See Fig. 2.) A bracket 34 extends from the side bar 24 on each side and has a tubular socket or cham-

ber, in which is a spiral spring 35, whose outer end bears against the top of the arm 31 at its free end.

A lever-arm 36 is pivotally mounted at 37 to the tank 3 on each of its two sides and has at its end a pin or stud 38, which enters the slot in the arm 31.

In a standard 39, Fig. 5, is mounted a vertical shaft 40, which is provided with a gear 41, having a concave periphery. At the upper end of the shaft 40 is a bevel-gear 42. The shaft 40 is also mounted in the bearing 43. A cross-shaft 44 is mounted in the standards 2 and has at or near its center a bevel-gear 45, which engages with bevel-gear 42 of the shaft 40. At the ends of the cross-shaft 44 are crank-arms 46 and from each crank-arm 46 extends a link or rod 47, pivotally connected at one end with the crank-arm 46 and at the other end with one of the lever-arms 36 near the center thereof. Top yarn-sticks 48 are detachably mounted on supports 49 on the tops of the side bars 24 25 and extend across the frame or carriage.

At the ends of the side bars 24 25 are cross-shafts 50 and 51, extending from side to side. The cross-shaft 50 has at its ends the bevel-gears 52 and 53 and the cross-shaft 51 has at one end, Fig. 1, the bevel-gear 54. On the farther side of the frame on the side bar brackets 55 55 are fastened, in which is mounted the shaft 56. The shaft 56 has at its ends the bevel-gears 57 and 58, which engage, respectively, with the bevel-gears 52 and 54 of the cross-shafts 50 and 51.

The cross-shafts 50 and 51 are cam-shafts. The cross-shaft 50 has fastened thereon the four eccentric cams 59 59 59 59. The cross-shaft 51 has fastened thereon the four eccentric cams 60 60 60 60. The cams 59 59 have their inner faces in contact, Fig. 5, and have their outer faces extending to form flanges 61. The cams 60 60 also have their inner faces in contact and are provided with flanges 61 on their outer edges, as indicated by dotted lines in Figs. 1, 2, and 3. On the outer face of each cam 60 60 is made a channel 62 of the peculiar shape illustrated in Figs. 9 and 10.

Reciprocating bars 63 63 64 64, having their ends curved and shaped as seen in Figs. 2, 3, 9, and 10, rest by said ends upon the tops of the cams 59 60 59 60, respectively, the thickness of said bars 63 64 together being such as to cause them to fill the space between the flanges 61 61 of the cams 59 60 59 60, respectively, as shown in Fig. 5.

Near the rear end each reciprocating bar 63 has a projection 65, which carries on a stud 66 upon its end a roller 67, which enters and is rotatable in the channel or groove 62 of the cam 60. A similar projection 68 extends from the reciprocating bar 64, near the end thereof and has a similar roller mounted on a stud and engageable with the channel or groove in the cam 60. The reciprocating bars each have a series of supports 69, on which are detachably mounted yarn-sticks 70, ar-

ranged as shown in Figs. 1 and 2. In Fig. 1 it is seen that the yarn-sticks 70 extend alternately between the reciprocating bars 63 63 and the reciprocating bars 64 64.

On the rear cross-bar 26 of the carriage or frame is mounted in suitable bearings a shaft 71, having a crank-handle 72 at one end and a bevel-gear 73 at its opposite end. It also has the bevel-gears 74 75. On the front cross-bar 27 of said carriage or frame is mounted a shaft 76, having at its ends the bevel-gears 77 and 78 and also the bevel-gear 79. In a longitudinal groove of the side-bar 24 is mounted a shaft 80, having at its ends the bevel-gears 81 and 82. The bevel-gear 81 of the shaft 80 engages with the bevel-gear 75 of the cross-shaft 71, and the bevel-gear 82 of the shaft 80 engages with the bevel-gear 77 of the cross-shaft 76.

From the cross-bars 26 and 27 parallel hangers 83 83 83 83 extend downward, which are connected at their bottoms from end to end of the machine by the bars 84 and cross-wise of the machine by the bars 85.

In the parallel hangers 83 83 83 83 are bars 86 86 movable therein, and in said bars 86 86 bottom yarn-sticks 87 are detachably mounted, Figs. 3 and 4. Screw-threaded rods 88 88 extend down into said hangers and pass through screw-threaded bores in the bars 86 86. The rods 88 88 88 88 have at their upper ends, respectively, the bevel-gears 89 90 91 92, which engage, respectively, with the bevel-gears 74 73 79 78 of the cross-shafts 71 76.

On one side of the machine is a vibrating rock-shaft 93, mounted loosely by a collar 94 on the shaft 17. The shaft 17 has the bevel-gear 18, which engages with a bevel-gear 96 on the rock-shaft 93. Said shaft 93 has a longitudinal groove 97. (Shown in full lines in Fig. 7 and in dotted lines in Fig. 8.) This groove 97 extends nearly to the upper end of the rock-shaft 93. The rock-shaft 93 is also supported in the tubular bearing 98, which is provided with a dovetailed plate 99. This plate 99 is movable upon the rail 8 between ways 100. The tubular support 98 has a central tubular socket 101, Fig. 8.

A sleeve or tube 95 is loosely mounted on the rock-shaft 93 and fits loosely within the socket 101 of the tubular support 98. The sleeve 95 has a flange 102 at its top, which is provided with radially-arranged teeth 103. A spiral spring 104 surrounds the sleeve 95, and has its bearings against the under side of the flange 102 and the upper end of the tubular support 98.

A sleeve or tube 105 has at its bottom the bevel-gear 106 and is loosely mounted on a tube (see Fig. 8) which is itself loosely mounted on the rock-shaft 93. Said bevel-gear 106 has the radially-arranged teeth 107. The teeth 107 of the bevel-gear 106 are engageable with the teeth 103 of the sleeve 95, as shown in Figs. 6 and 7. A collar 108 by a set-screw 109 is fastened to said interior tube on the rock-shaft 93. A spline on the interior or

bore of the sleeve 95 enters the longitudinal groove 97 of the rock-shaft 93, as seen in Fig. 8.

On the side bar 24 is a yoke 110, bolted at 111 thereto, and through this yoke a stud-pin 112, Figs. 6 and 7, extends from the sleeve 95. In this yoke 110 is also mounted one end of the cam-shaft 50, having the bevel-gear 53, engageable with the bevel-gear 106 of the sleeve 105.

On the shaft 17, Fig. 11, is the worm-gear 125 and the sliding cone-clutches 113 114, movable on said shaft by a spline connection. The bevel-gear 115 on the shaft 17 has a conical socket adapted to receive the clutch 113, and the bevel-gear 116 on the shaft 17 has a conical socket adapted to receive the clutch 114. Each clutch 113 114 is circumferentially channeled. Levers 117 118 are pivoted at 119 and 120, respectively, to the tank 3 and have stud-pins which enter the circumferential groove of the adjacent clutch. The levers 117 118 are connected by the rod 121, pivotally mounted at its ends thereon. The bevel-gears 115 and 116 are loosely mounted on the shaft 17.

The extension-rails 122 are pivotally mounted at the upper ends of the standards 2 and may be supported by braces or otherwise. The skeins of yarn are shown at 123 passing over the yarn-sticks.

Having described the several parts of my improved machine, I will now explain its operation, beginning with the machine in the position illustrated in Figs. 1, 2, 3, and 4.

The tank or vat 3 is partially filled with the dye liquor, as indicated by broken horizontal lines in Figs. 3 and 4. The yarn skeins pass over the yarn-sticks 48, 70, and 87, their lower portions being submerged in the dye liquor. The yarn skeins 123 are drawn to a proper tension between the yarn-sticks 48 and 70, respectively, by turning by hand the crank-handle 72 of the shaft 71. The bevel-gears 75, 74, and 73 of said shaft 71, respectively, turn the bevel-gears 81, 89, and 90 of the shaft 80 and of two of the rods 88 88. The shaft 80 so turned by the bevel-gear 81 turns, by its other bevel-gear 82, the shaft 76, with its bevel-gears 78 and 79. The bevel-gears 78 and 79 of the shaft 76 turn the other two vertical shafts 88 88 by means of their bevel-gears 91 and 92, respectively. The turning of the vertical rods 88 88 88 and 88 so caused results, by reason of their screw-threaded connection with the bars 86 and 86, in the vertical movement, up or down, as may be desired, of said bars 86 and 86 in the hangers 83 83 83 83, and the yarn skeins are thus drawn to the proper tension by the bottom yarn-sticks, mounted in and movable vertically by said bars 86 86. The shafts, bars, and hangers, which are submerged in the dye liquor, should be made of bronze or of a metal not liable to be corroded or affected by the liquid dye. The yarn skeins 123, so mounted on the yarn-sticks 48, 70, and 87,

require both a horizontal reciprocating movement and also a progressive intermittent vertical movement or feed motion. The horizontal reciprocating movement is given as follows: Power is applied from a steam-engine or prime motor to the shaft 17 by a pulley thereon (not shown) turned by a belt. The shaft 17 by its worm-gear 125 turns the wheel 41 of the shaft 40 and the bevel-gear 42, attached to the shaft 40. The bevel-gear 42 turns the bevel-gear 45 of the shaft 44 and with it the cranks 46 and 46 on said shaft. The cranks 46 46 give a reciprocating movement to the links or rods 47 47, and these communicate an oscillating movement to the levers 36 36, mounted on the tank, Fig. 2. The levers 36 36, by their stud-pins 38 38, at the upper end thereof, engage in the slots of the lever-arms 31 31. The lever-arms 31 31, being pivotally fastened to the side bars 24 25 of the traveling carriage or frame, cause, by their said connection with the oscillating levers 36 36, the carriage or frame to move back and forth, traveling upon the trucks or wheels 29 upon the rails or track 8 8. As all the yarn-sticks are carried by this frame, the yarn skeins upon said sticks are moved regularly back and forth in a horizontal direction in the tank and their submerged portions are thus perfectly subjected to the dye liquor in said tank.

As the top of each lever 36 in oscillating, as above described, necessarily moves in an arc of a circle, the lever-arm 31, which engages by its slot with the stud-pin 38 of the lever 36, rises and falls to maintain said engagement and is kept in proper relative position and contact with the lever 36 by means of the spiral spring 35, which, mounted in the socket of the brackets 34, has its free end always in forcible contact with the end of the lever-arm 36.

The vertical feed motion is given to the yarn skeins 123 by the following means: The shaft 17, rotated by power, as already stated, turns the bevel-gears 18 and 18 thereon. The bevel-gears 18 18 turn, respectively, the bevel-gears 96 96 of the shafts 93 and 93. Said shafts 93 93, so turned, cause the tubes or sleeves 95 105 thereon to turn with them, being engaged therewith by the spline connection of the sleeve 95 with the longitudinal groove 97 of the rock-shaft 93. The teeth 103 of the sleeve 95 engage with the teeth 107 of the sleeve 105 and compel the sleeve 105 to turn with the shaft 93 and with the sleeve 95. This turning of the sleeve causes the bevel-gear 106 on said sleeve to turn also, which gear 106, engaging with the bevel-gear 53, turns the cam-shaft 50. The cams 59 59 are arranged in pairs, as seen in Figs. 1 and 5, and are simply lifting-cams. The cam-shaft 50 has a bevel-gear 52, which turns the shaft 56 by the bevel-gear 57; and the bevel-gear 58 on said shaft 56 turns the bevel-gear 54 of the cam-shaft 51. The cams 60 60 are arranged in pairs on the cam-shafts 51.

The reciprocating bars 63 63, by their curved ends, rest upon the top of the cams 59 and 60, on the peripheries thereof, respectively, and the reciprocating bars 64 64, by their curved ends, rest upon the top of the companion cams 59 and 60, on the peripheries thereof. The roller 67 upon the stud 66 of the projection 65 of each reciprocating bar 63 is rotatable in the channel 62 in the face of the underlying cam 60, as already described.

The rotation of the cam-shafts 50 and 51 causes the rotation of the cams 59 and 60 thereon. The reciprocating bars 63 64, resting on the peripheries of said cams respectively, regularly rise and fall as said cams revolve. At the same time the rotation of the cams 60 60, by means of the channel in each of them and the rollers 67 of the projections 65 68 of said reciprocating bars, give a regular horizontal movement to said bars, alternately, back and forth. These two movements, imparted to the reciprocating bars, give a regularly-intermittent feed motion to the yarn skeins, which I will now describe. When the yarn-sticks 48 and 70 are in the position seen in Fig. 10, the top of the yarn skein lies straight across the tops of said yarn-sticks. The movement of the yarn-sticks 70 is indicated in a dotted curve in Figs. 9 and 10. When the top edge of the yarn-stick 70 has reached the point indicated at the lower end of said curve, it is lifted by said cam-action and comes up alongside of the yarn-stick 48 and lifts the yarn skein bodily off said yarn-stick and carries the top of said skein to the position indicated by the top of said curved dotted line in Figs. 9 and 10. This is the position more fully illustrated in Fig. 3. Then, as the yarn-sticks 70 descend, that part of the skein indicated by 124 in Fig. 3 rests upon the top of the yarn-stick 48, and so the skeins are progressively lifted over and moved upon the yarn-sticks. But inasmuch as the traveling carriage or frame is the mean-while moving back and forth horizontally upon the rails, as hereinbefore specified, it is evident that the rock-shafts 93 93 must be adapted to oscillate or vibrate to allow such movement, and this vibration of the shafts 93 is possible by the following devices: Each vibrating shaft 93 has at its bottom a collar 94, loosely mounted upon the shaft 17, and each is also supported in a tubular bearing 98, which slides in ways 100 upon the rail 8. A stud 112 extends from the sleeve 105 and passes through a hole in the yoke 110, Figs. 6 and 7.

When the yarn has been sufficiently subjected to the dye liquid, it is removed from the tank 3. This is accomplished by the following instrumentalities: By the handle 117 the cone-clutch 113, Fig. 11, is thrown into engagement with the adjacent bevel-gear 115, on the shaft 17. Said bevel-gear engages its companion bevel-gear 13 and turns thereby the horizontal shaft on that side near the bottom of the tank. This shaft has bevel-gears,

which, engaging with the bevel-gears of the vertical screw-threaded rods, turn them also, while the bevel-gear at the rear end of said horizontal shaft, by its engagement with the bevel-gear of the rear cross-shaft, turns that shaft, and said shaft, by its bevel-gear engaging with the bevel-gear on the end of the next horizontal shaft, turns said horizontal shaft, while the bevel-gears on said last-mentioned horizontal shaft, by their engagement with the bevel-gears on the bottom of the other two vertical screw-threaded rods, turns said rods. Thus all four of said vertical screw-threaded rods are turned at the same time, in the same direction, and by reason of their engagement, respectively, in the screw-threaded bores of the tubular supports 9 of the rails 8, the continued rotation of said vertical rods causes the rails to rise and move upward with their ends in and guided by the groove or channels in the standards 2, and the rails 8 thus raised lift with them the traveling carriage or frame, which by its trucks 29 rest on said rails, and as the carriage or frame carries or supports the yarn-sticks and the yarn thereon, the whole frame with its load of yarn is lifted out of the tank 3. This lifting movement continues until the rails 8 are raised to the level of the extension-tracks 122 and the carriage can then be rolled off by its truck-wheels upon the extension-track 122 to a position sufficiently remote from the tank to permit the unloading of the yarn from the yarn-sticks and away from the steam and vapors of the dyestuffs in the tank; but during all the time of this lifting movement it is still necessary to continue the intermittent feed movement of the skeins, otherwise the lower portion of the yarn skeins would be longer submerged in the dye liquor and so absorb more of the dyestuff and the skein would be unevenly colored thereby. For this reason the sleeves 95 and 105 are provided, which, though turning with the rock-shafts 93 93, are movable longitudinally on said shafts, being engaged with each other by the teeth 103 and 107 and also by the spline of the sleeve 95 entering into the groove 97 of the rock-shaft 93. The upward limit of such longitudinal movement of the sleeve 95 is indicated in Fig. 8, where it is seen that the top of the spline of said sleeve serves as a stop when it comes in contact with the end of the groove 93. The upward movement of the rails 8, however, still continuing, lifts the sleeve 105 off the top of the rock-shaft 93 and draws its teeth 107 out of engagement with the teeth 103 of the sleeve 95, as said sleeve 105, by its stud 112, passing through the aperture in the yoke 110, is attached to the side bar 24 of the carriage.

Another lot of yarn skeins is loaded on the yarn-sticks while the carriage is out on the extension-tracks away from the tank. When loaded, the carriage is run off from the extension-tracks onto the rails 8, which have in the meanwhile remained in their elevated position upon the tops of the vertical screw-

threaded rods, and when the sleeve 105 on each side has been brought into position over the sleeve 95 on each side, the carriage is lowered to the position shown in Fig. 2 again.

5 This lowering movement is caused by throwing the other cone-clutch into connection with its adjacent bevel-gear, Fig. 11, and the two horizontal shafts and rear cross-shafts are rotated in the directions opposite to those re-
10 quired for the lifting movement above described, and so the vertical screw-threaded rods by their engagement with the screw-threaded tubular supports 9 of the rails 8 cause the carriage and its load to descend to
15 the position shown in Fig. 2; but it is necessary that during the whole time of this lowering movement that the yarn skeins should have the progressive feed motion described. This is accomplished as follows: As the car-
20 riage descends, the sleeve 105 descends to the sleeve 95, and as the latter is turning, the two sleeves 95 and 105 at once engage by their teeth 103 and 107, coming from the position shown in Fig. 8 to the position shown in Fig.

25 6. As the weight of the sleeve 105 falls upon the sleeve 95 the spiral springs 104 are compressed. The vertical feed motion of the skeins thus begins before the skeins come into contact with the dye liquor. The horizontal
30 reciprocation of the carriage and yarn-sticks does not, however, take place until the rails have reached their first position and the lever-arm 31 of the carriage is again engaged by its slot with the stud-pin of the lever 36,
35 as before.

I claim as a novel and useful invention and desire to secure by Letters Patent—

1. In a yarn-dyeing machine, the combination of a dye-vat, an oscillating arm pivotally
40 mounted on said vat, a railway-track supported above the vat, a traveling frame having yarn-sticks and movable on the railway and provided with a pivotally-mounted arm engageable with the oscillating arm, a shaft
45 rotatable by power and having a crank and a link or rod connecting said crank and oscillating arm, substantially as shown.

2. In a yarn-dyeing machine, the combination of a dye-vat, a railway-track supported
50 above the vat, a traveling frame movable on the railway, a shaft rotatable by power and means intermediate between said shaft and frame adapted to impart a reciprocating movement to said frame upon the railway, a
55 vibrating rock-shaft rotatable by gearing from the main shaft and provided with a bevel-gear and suitable support at its top, two cross-shafts mounted on said frame, each having eccentric cams on which rest reciprocating bars and adapted by their rotation to im-
60 part to said bars a combined vertical and horizontal reciprocating movement, bevel-gears on said cross-shafts engageable with the bevel-gears first named, respectively, means adapted to rotate said cross-shafts to-
65 gether, and upper and lower yarn-sticks mounted in said frame and yarn-sticks mount-

ed on said reciprocating bars, substantially as described.

3. In a yarn-dyeing machine, the combination of a dye-vat, a railway-track supported
70 above the vat, a traveling frame movable on the railway, a shaft rotatable by power and means intermediate between said shaft and frame adapted to impart a reciprocating move-
75 ment to said frame upon the railway, cross-shafts upon said frame adapted to be rotated by power and cams upon said cross-shafts on which cams reciprocating bars rest which are
80 arranged to give a combined vertical and horizontal reciprocating movement to said bars, substantially as specified.

4. In a yarn-dyeing machine, the combination of a dye-vat, a railway-track supported
85 above the vat, a traveling frame movable on the railway, a shaft rotatable by power and means intermediate between said shaft and frame adapted to impart a reciprocating move-
90 ment to said frame upon the railway, a vibrating rock-shaft rotatable by gearing from the main shaft and provided with a bevel-gear and suitable support at its top a tube or sleeve through which said rock-shaft passes and pro-
95 vided with a sliding plate movable in ways upon said railway-tracks, two cross-shafts mounted on said frame, each having eccentric
100 cams on which cams reciprocating bars rest which are adapted by their rotation to impart to said bars a combined vertical and horizontal reciprocating movement, bevel-gears on said
105 cross-shafts, engageable respectively, with the bevel-gears first named, means adapted to rotate said cross-shafts together, and upper and lower yarn-sticks mounted on said frame and yarn-sticks mounted on said reciprocating
110 bars, substantially as described.

5. In a yarn-dyeing machine, the combination of a dye-vat, a frame properly supported
115 on said vat with means adapted to raise or lower said frame, which is provided with yarn-sticks, a cam-shaft mounted on said frame and provided with cams which are adapted to support reciprocating bars thereon and to give to
120 said bars a combined vertical and horizontal reciprocating movement, yarn-sticks upon said reciprocating bars, a longitudinally-grooved vertical shaft rotated by power and having a geared sleeve capable of rotation
125 with said shaft but movable thereon by a spline engaging in the groove thereof, and a gear on said cam-shaft engageable with the gear of said sleeve, substantially as set forth.

6. In a yarn-dyeing machine, the combination of a dye-vat, a frame provided with yarn-
130 sticks, parallel rails on which said frame is supported, tubular screw-threaded bearings upon said rails, vertical screw-threaded rods engageable with said tubular screw-threaded bearings, means adapted to rotate said vertical rods, a shaft rotatable by power and pro-
135 vided with means to move said frame back and forth on said rails, a vibrating rock-shaft properly mounted at its bottom and rotatable by power, a longitudinal groove in said rock-

shaft, a tubular bearing through which the
rock-shaft passes and provided with a slide
movable upon the rail in ways thereon, a sleeve
mounted on the rock-shaft and having a spline
5 which enters said groove therein and also hav-
ing clutch-teeth upon its upper end, a spiral
spring surrounding said sleeve and adapted
to normally keep it in an elevated position, a
sleeve loosely mounted on the rock-shaft and
10 provided with a stud-pin, and with clutch-
teeth upon its lower end engageable with the
clutch-teeth first mentioned and also having a
bevel-gear formed on its outer surface, a yoke

fastened upon said frame and adapted to re-
ceive and support in a hole therein the stud- 15
pin aforesaid, a cam-shaft upon said frame
and having a bevel-gear engageable with the
bevel-gear last aforesaid, a cam on said cam-
shaft adapted to impart to reciprocating bars
resting thereon a combined vertical and hori- 20
zontal movement and yarn-sticks upon said
reciprocating bars, substantially as specified.

JOHN C. BLUNDELL.

Witnesses:

WARREN R. PERCE,
CHARLES D. WOOD.