(No Model.) 11 Sheets—Sheet 1

O. BRYANT.

MACHINE FOR TURNING WHIPS.

No. 389,362. Patented Sept. 11, 1888.

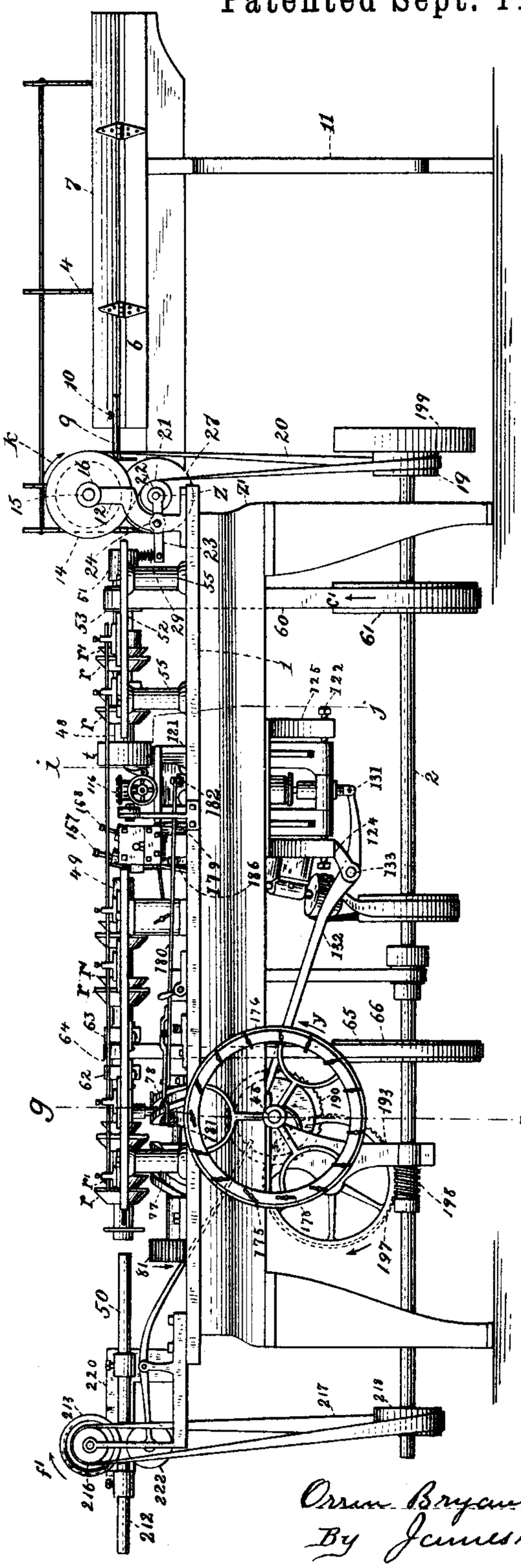

Fig. 1.

Witnesses:
A. W. Langston,
H. Johnson.

Orsun Bryant Inventor.
By James Langston,
Attorney.

(No Model.)

11 Sheets—Sheet 2.

O. BRYANT.

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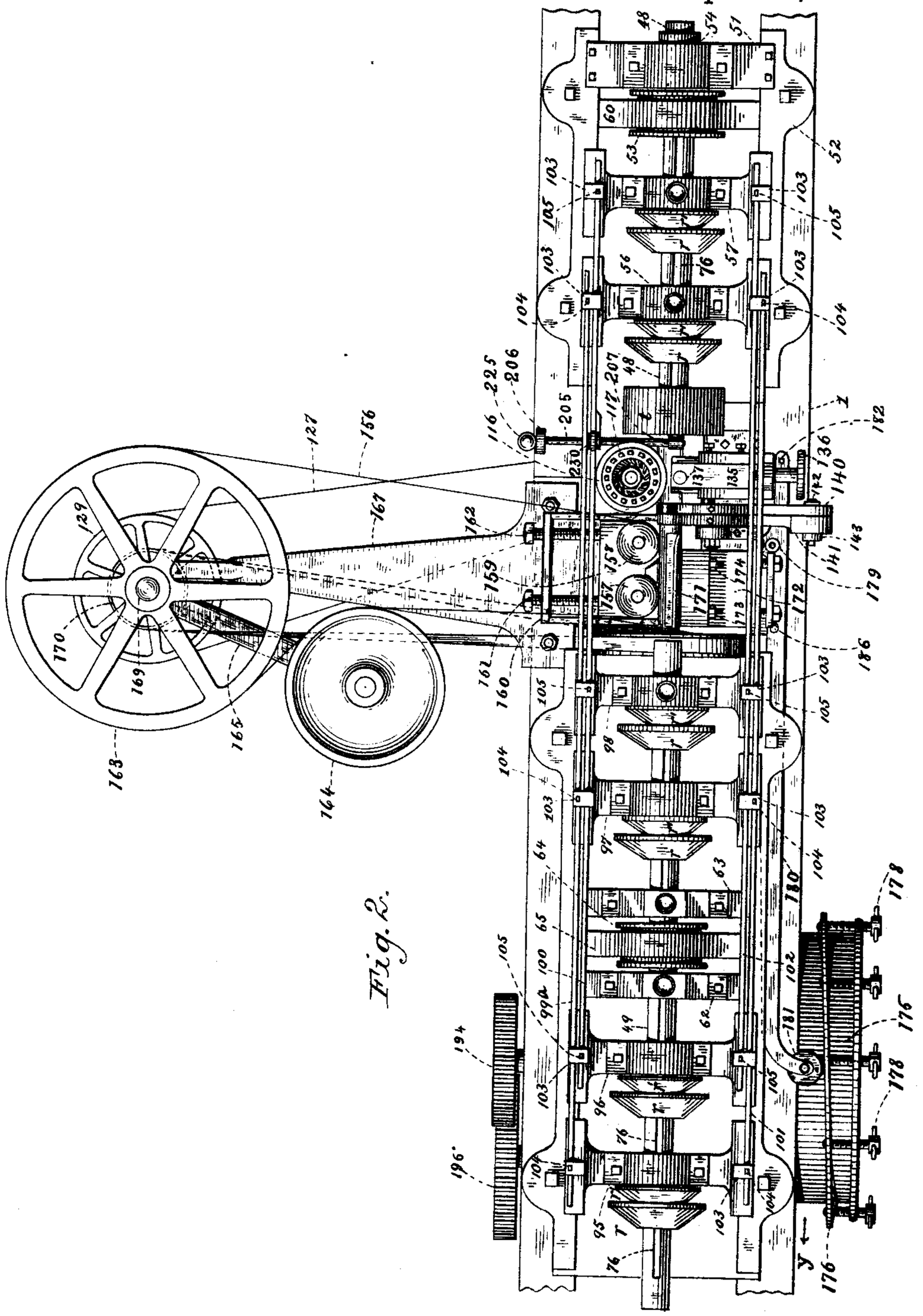

Fig. 2.

Witnesses:
A. W. Langdon,
H. Johnson.

Orrin Bryant, Inventor
By James Dangler
Attorney

(No Model.) 11 Sheets—Sheet 3.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

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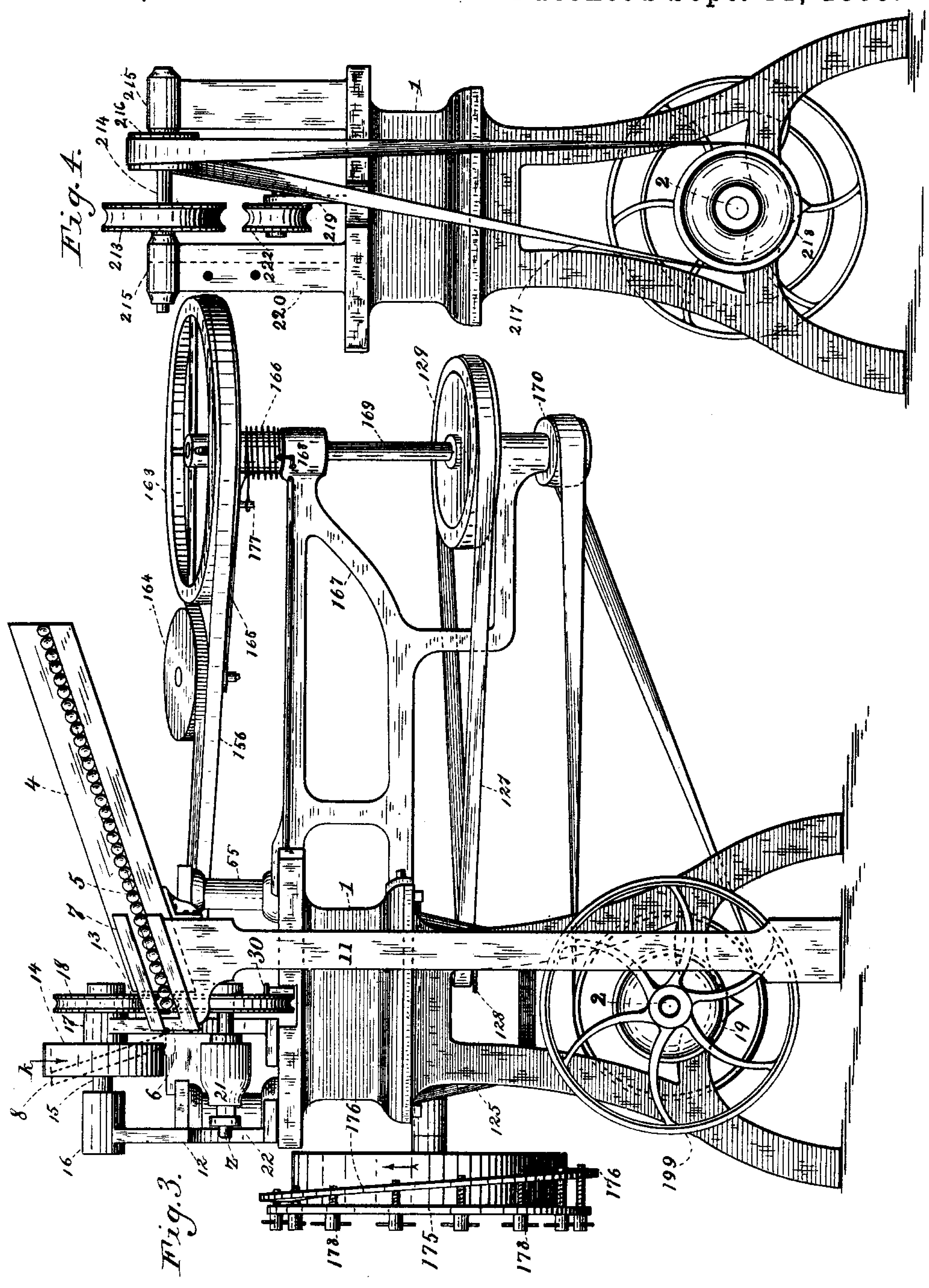


Witnesses:
A. W. Sangster.
H. Johnson

Orrin Bryant Inventor
By James Sangster
Attorney

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 11 Sheets—Sheet 4.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

No. 389,362. Patented Sept. 11, 1888.

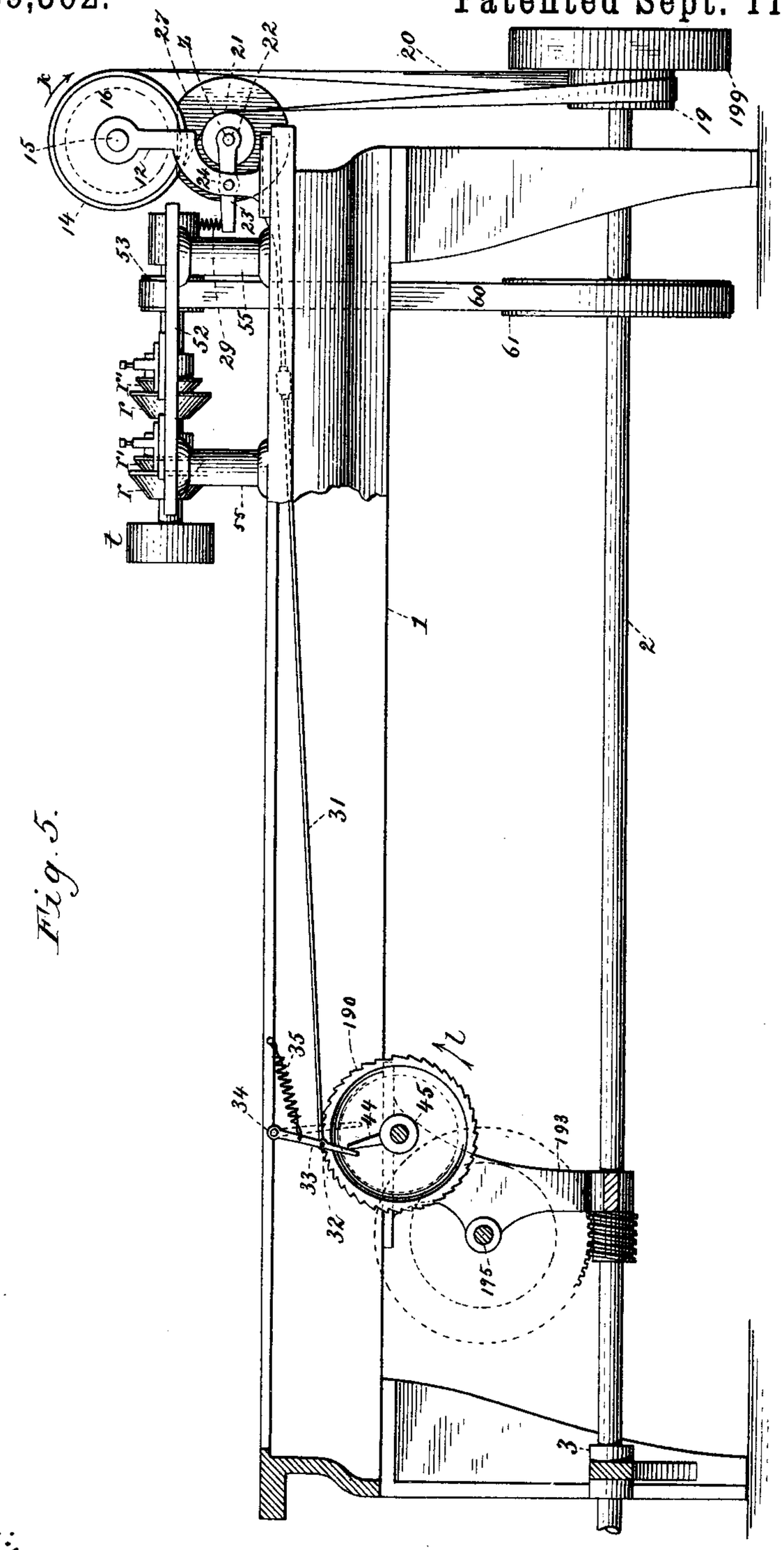


Fig. 5.

Witnesses:
A. W. Langster.
H. C. Johnson.

Orrin Bryant. Inventor.
By James Langster.
Attorney.

(No Model.) 11 Sheets—Sheet 5.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

No. 389,362. Patented Sept. 11, 1888.

Fig. 6.

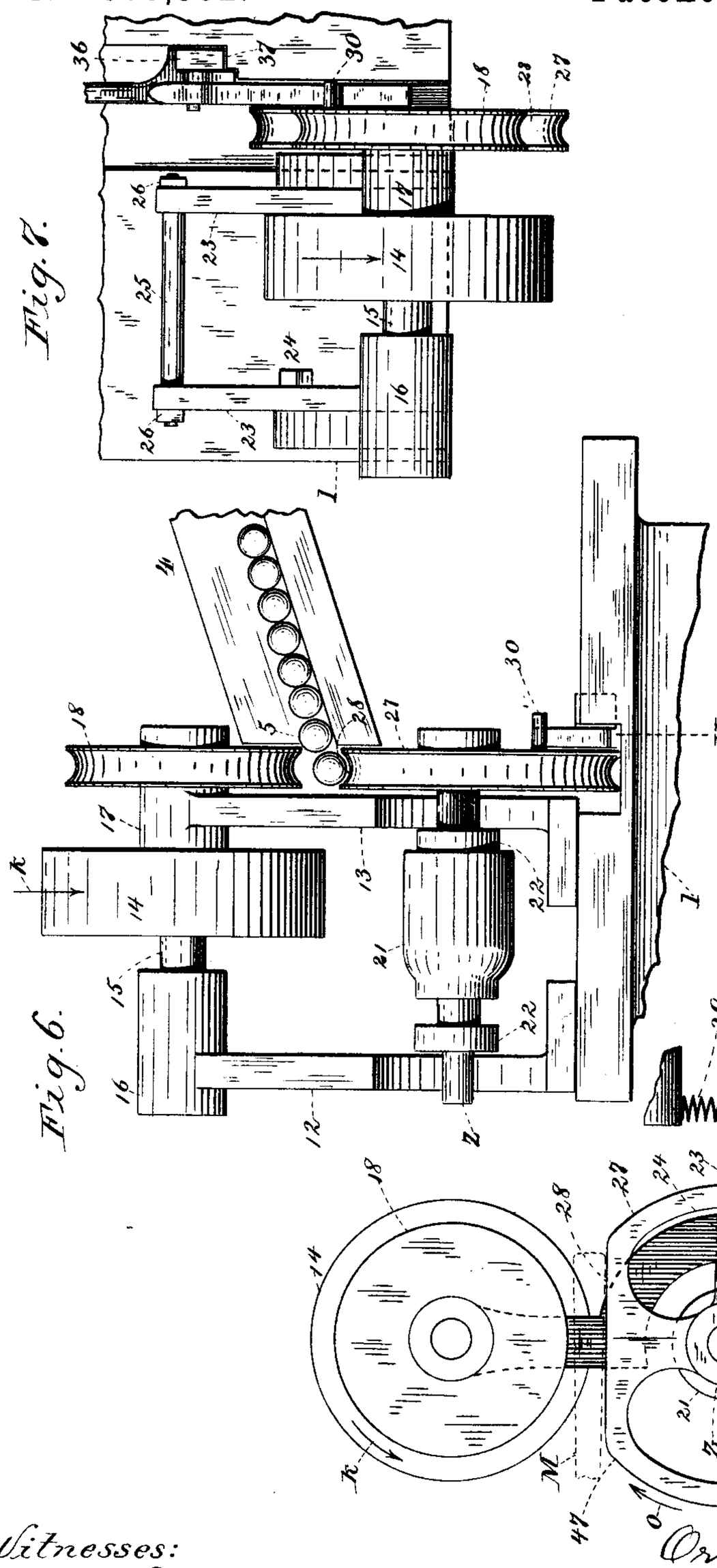
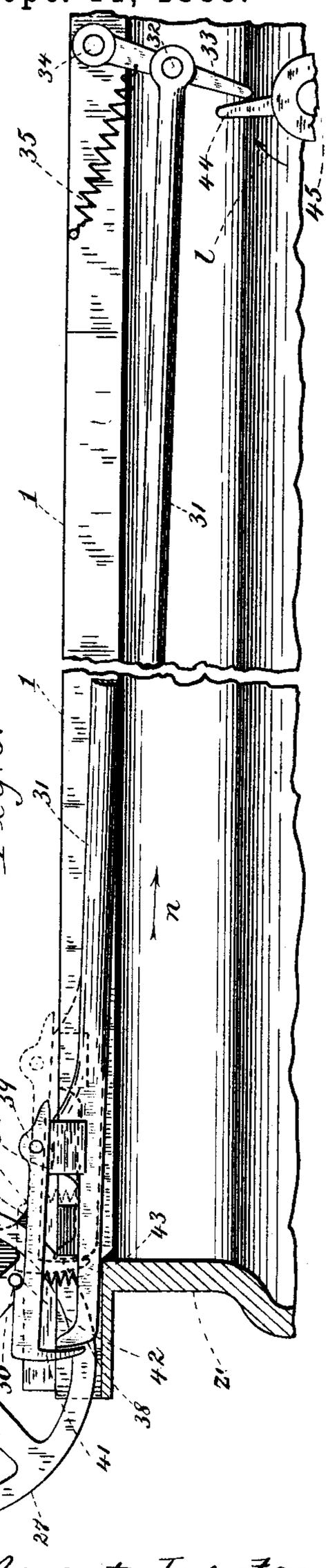


Fig. 8.



Witnesses:
A. W. Langstie,
H. Johnson

Orrin Bryant, Inventor.
By James Langster.
Attorney

(No Model.) 11 Sheets—Sheet 6.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

No. 389,362. Patented Sept. 11, 1888.

Fig. 9.

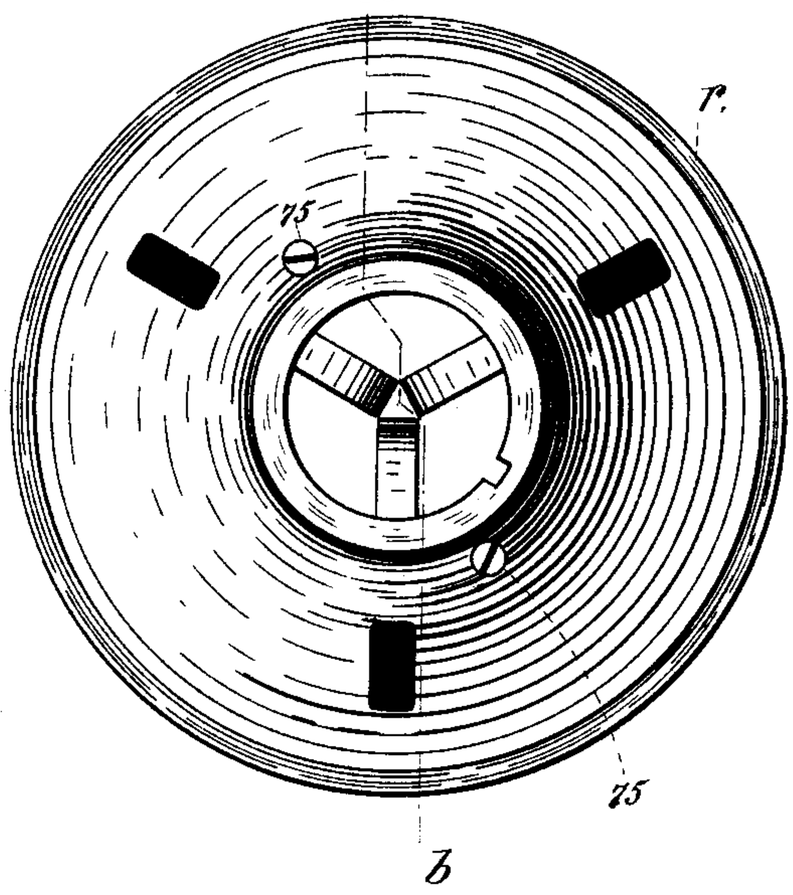


Fig. 10.

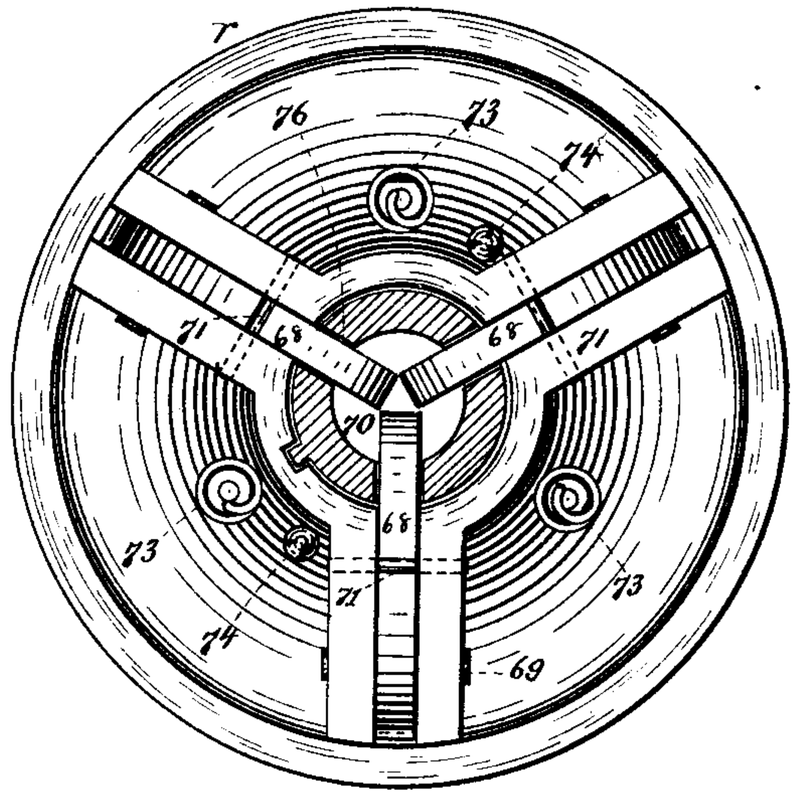


Fig. 11.

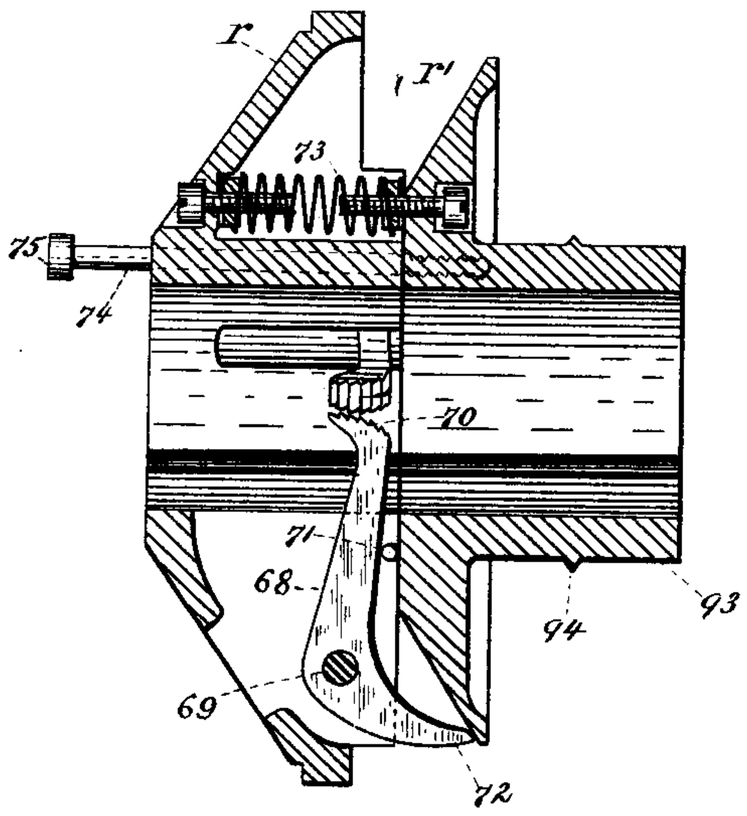
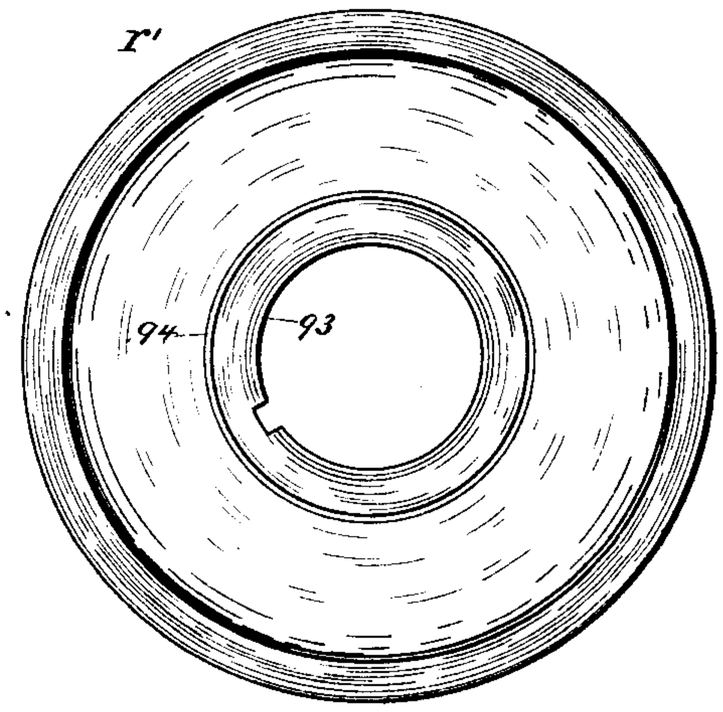


Fig. 12.



Witnesses.

A. W. Langstin.
H. Johnson

By

Inventor.

Orrin Bryant
James Langston.
Attorney.

(No Model.) 11 Sheets—Sheet 7.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

No. 389,362. Patented Sept. 11, 1888.

Fig. 13.

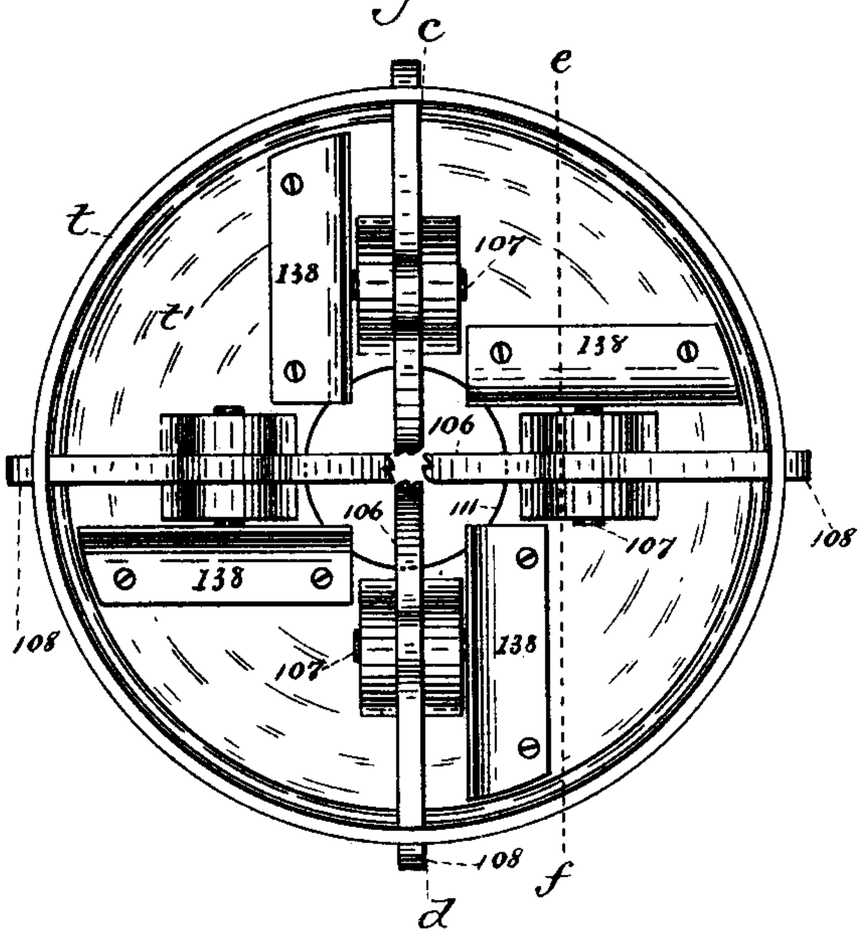


Fig. 14.

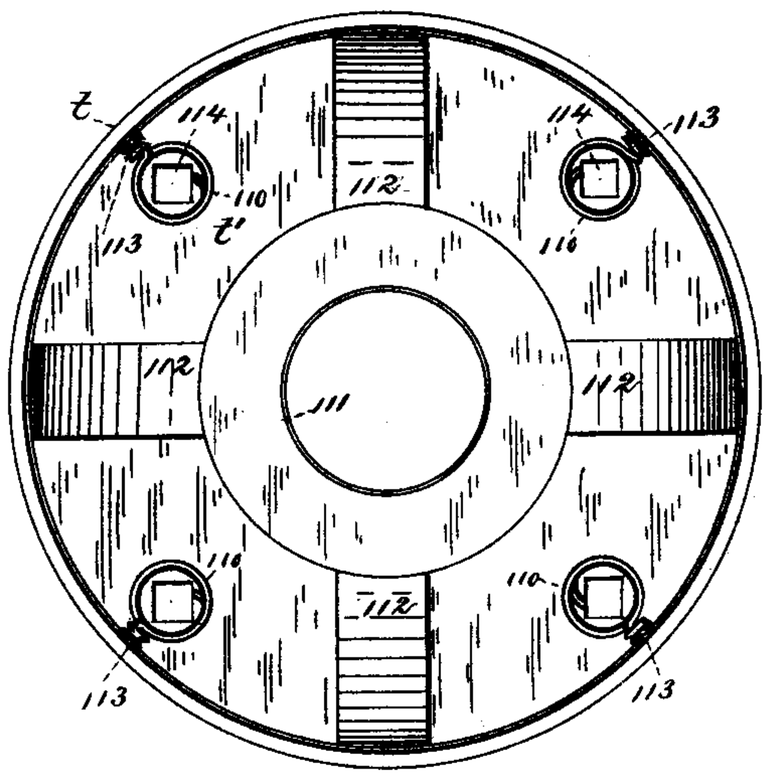


Fig. 15.

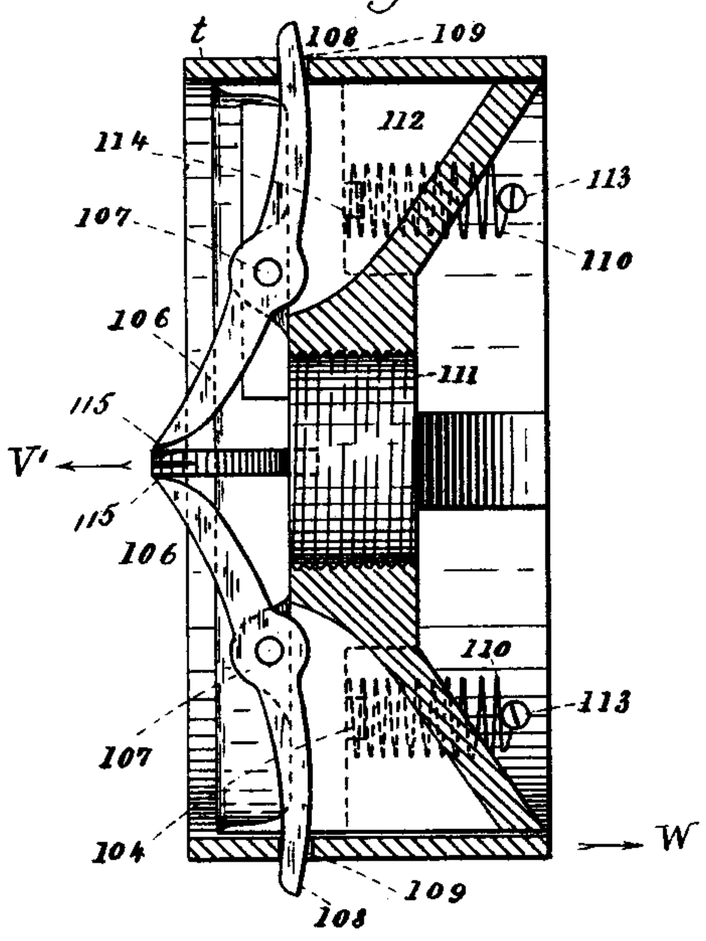
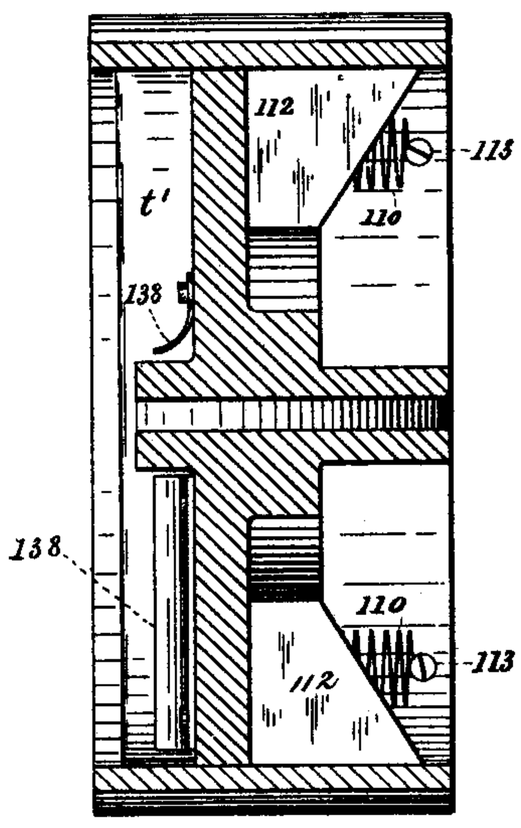


Fig. 16.



Witnesses.

A. W. Langsdale,
H. Johnson.

Inventor.

Orrin Bryant.
By James Langsdale.
Attorney

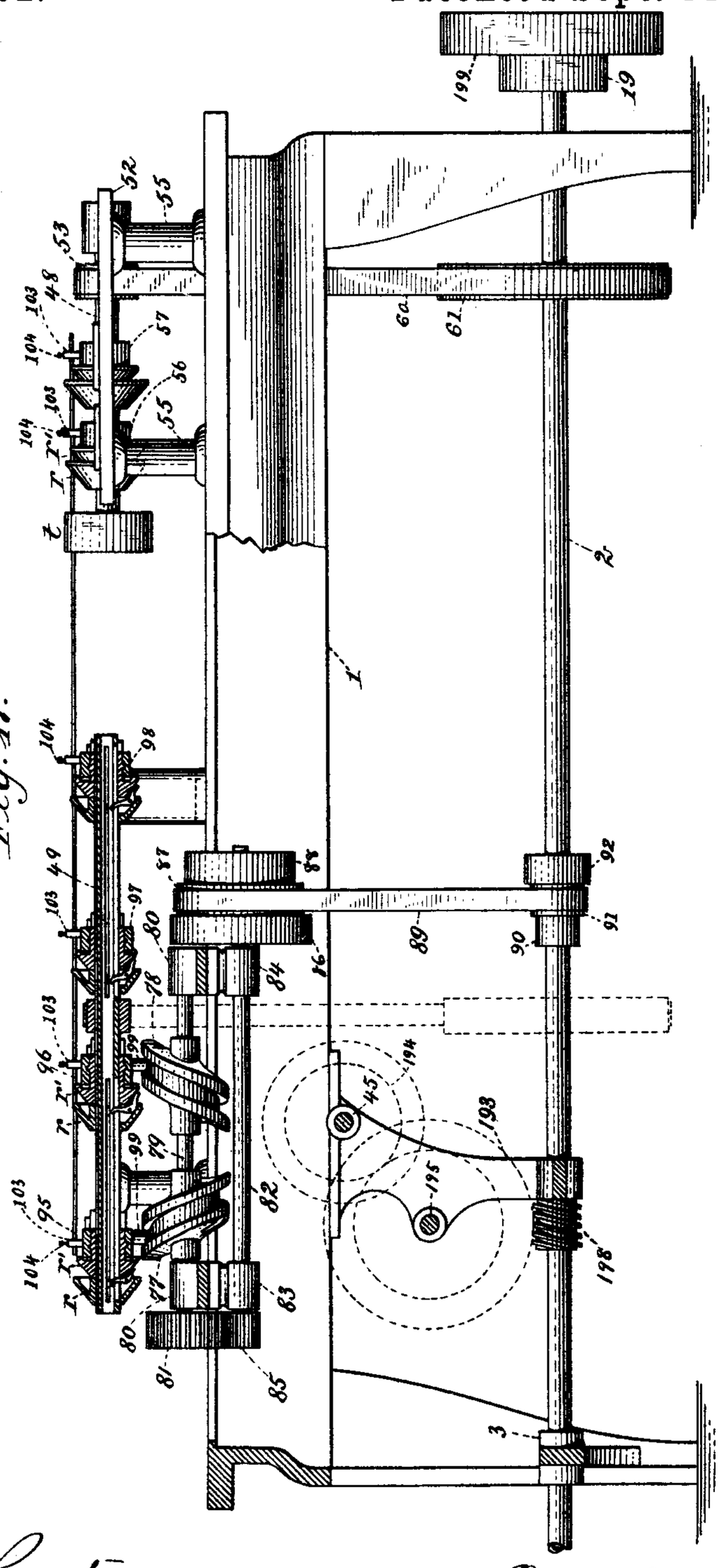
(No Model.) 11 Sheets—Sheet 8.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

No. 389,362. Patented Sept. 11, 1888.

Fig. 17.



Witnesses:
A. W. Langston,
H. Johnson

Orin Bryant, Inventor
By James Langston.
Attorney.

(No Model.) 11 Sheets—Sheet 9.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

No. 389,362. Patented Sept. 11, 1888.

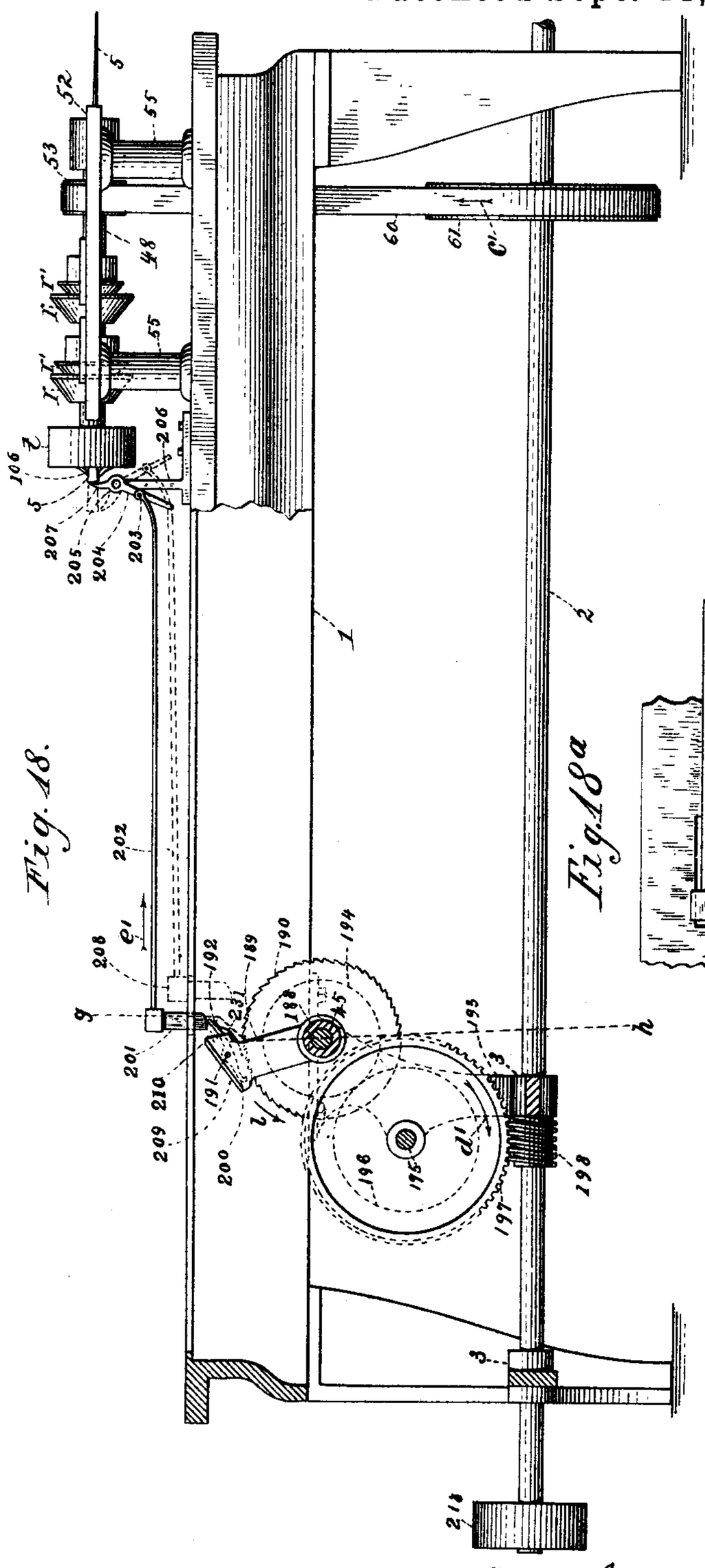


Fig. 18.

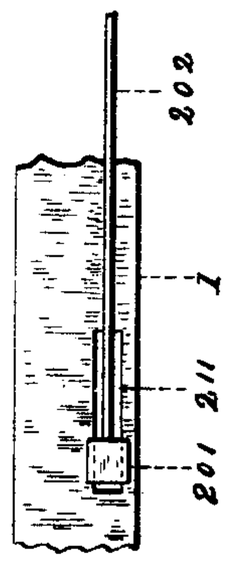


Fig. 18a

Witnesses:
A. W. Langdon,
H. Johnson.

Orrin Bryant, Inventor
By James Langston.
Attorney.

(No Model.) 11 Sheets—Sheet 10.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

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Fig. 21.

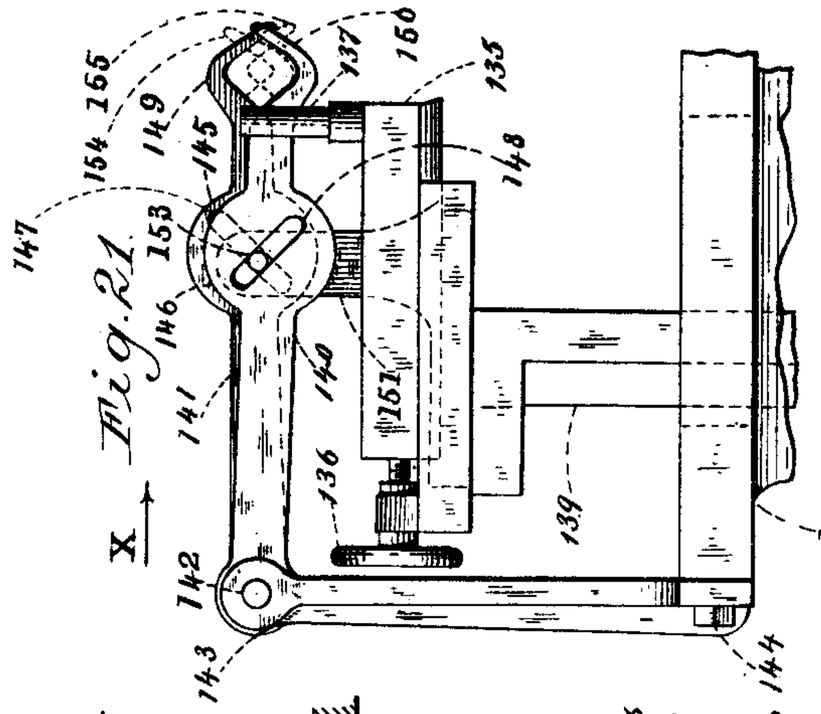


Fig. 22.

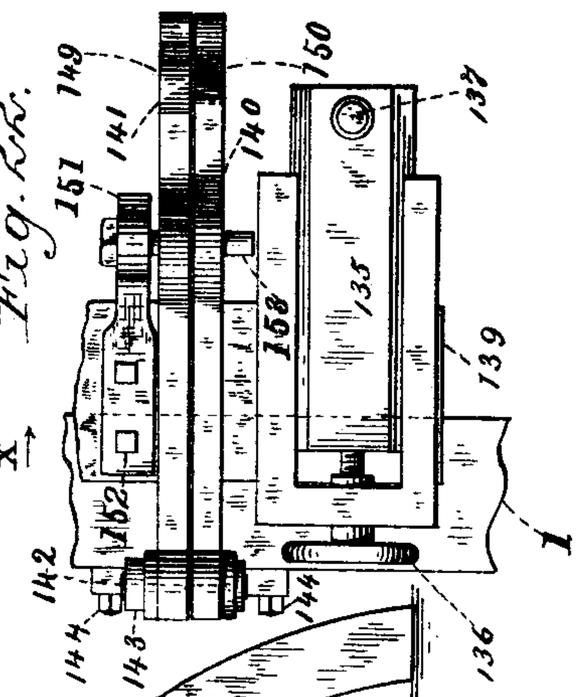


Fig. 20.

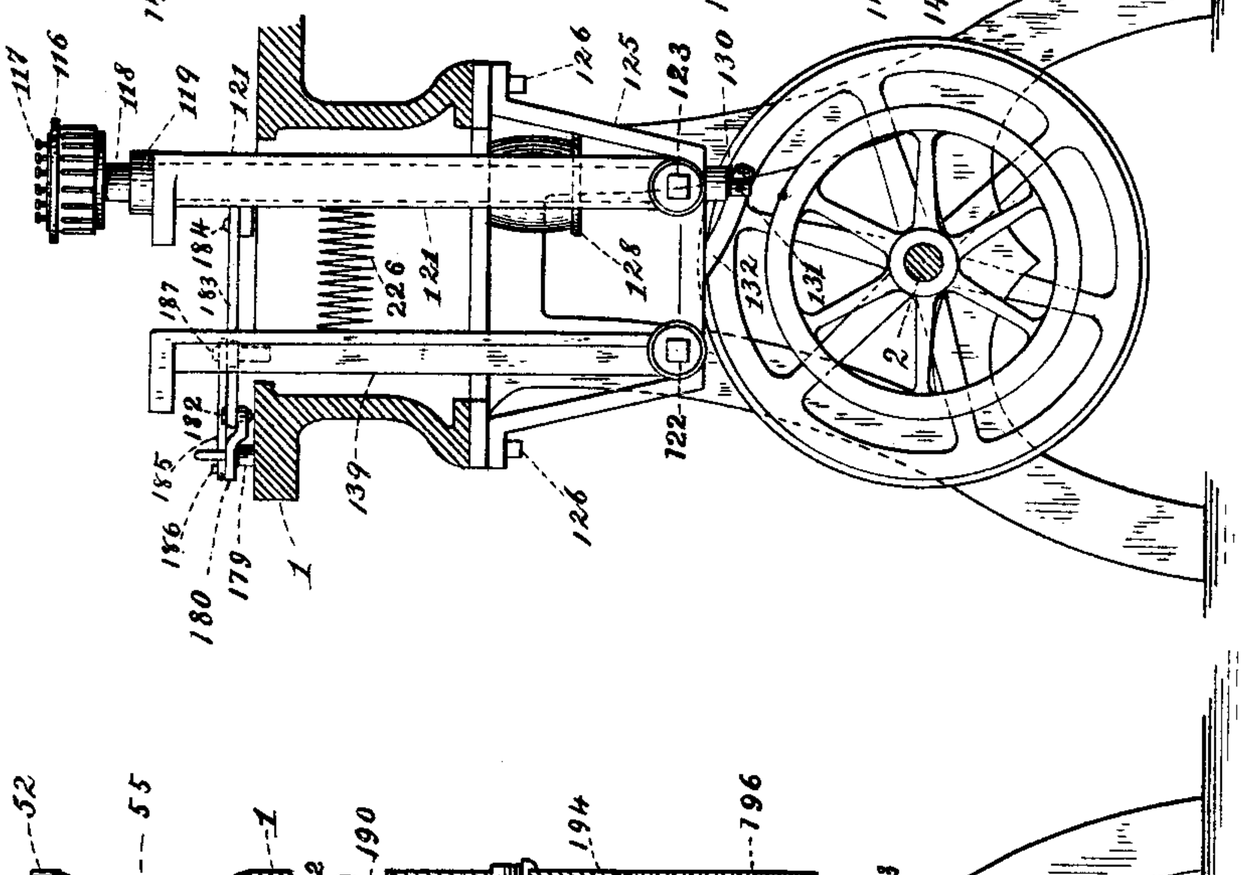
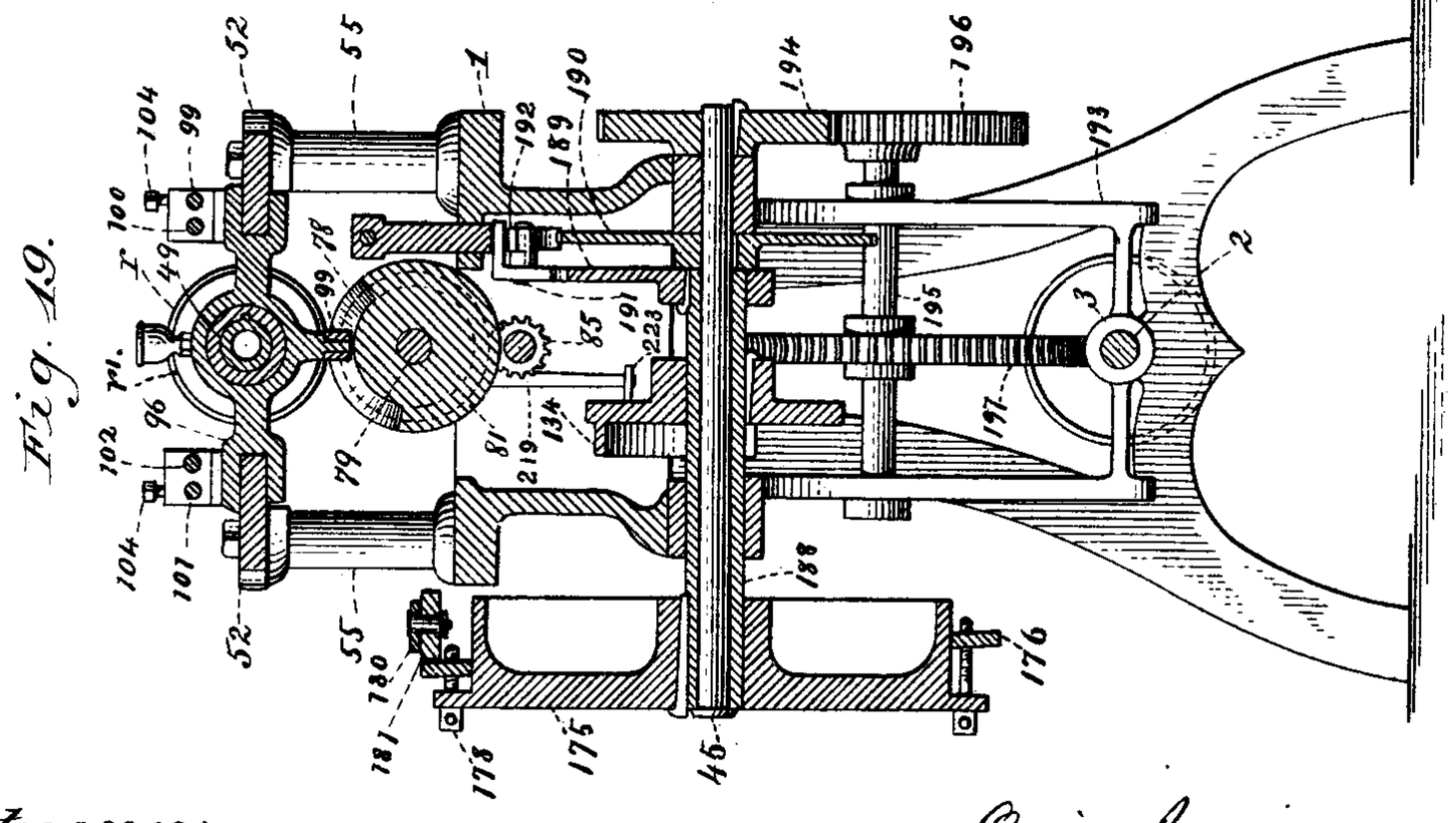


Fig. 19.



Witnesses:
A. W. Langdon,
H. Johnson

Orrin Bryant, Inventor
By James Langdon.
Attorney

(No Model.) 11 Sheets—Sheet 11.

O. BRYANT.

MACHINE FOR TURNING WHIPS.

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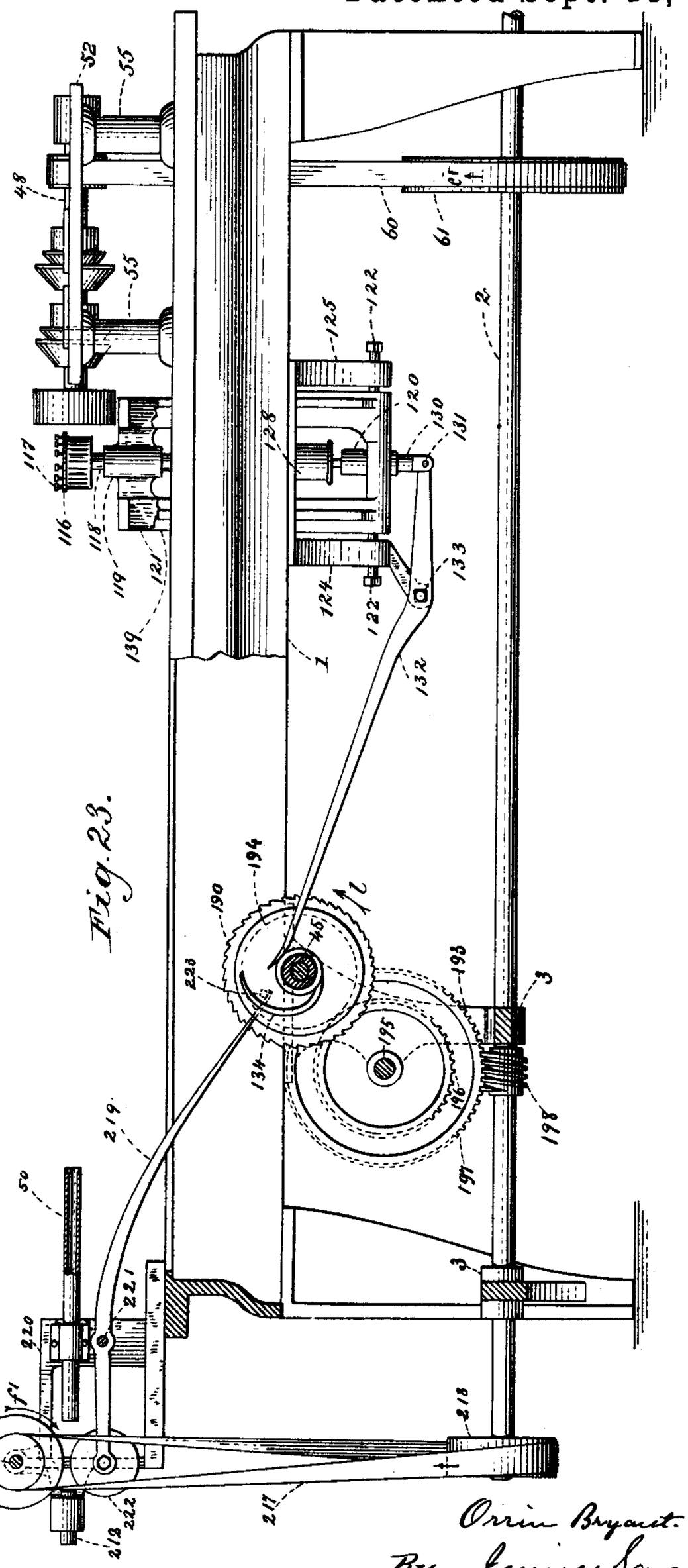

Fig. 23.

Witnesses:
A. W. Langston,
H. Johnson

Orrin Bryant. Inventor.
By James Langston.
Attorney.

UNITED STATES PATENT OFFICE.

ORRIN BRYANT, OF BUFFALO, NEW YORK.

MACHINE FOR TURNING WHIPS.

SPECIFICATION forming part of Letters Patent No. 389,362, dated September 11, 1888.

Application filed November 17, 1887. Serial No. 255,409. (No model.)

To all whom it may concern:

Be it known that I, ORRIN BRYANT, a citizen of the United States, residing in Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Machines for Turning Whips, of which the following is a specification.

My invention consists in certain improvements in machines for turning whips or other similar articles, and relates, first, to the mechanism for giving the whip-blank a downward movement on an inclined supporting-frame, then grasping and throwing it longitudinally into the machine, where it is caught by the feeding mechanism; second, the mechanism for giving a uniform forward motion to the whip through the machine after being thrown longitudinally forward so as to be caught by the feeding-pawls; third, the mechanism for starting the adjustable cam that regulates the tapering form of the whip, and stopping the action of the cam the moment the whip is completed, and the means by which the cam is adjusted to give the desired tapering form to whips of different lengths; fourth, the cutting mechanism and the means for giving the cutters a vertical reciprocating movement while rotating, and thereby causing a continuous cut to be given to the whip as it moves through the machine; fifth, the mechanism for imparting a smooth surface to the whip as it is passing along and being operated upon by the cutters; sixth, to the means for ejecting the whip after it is completed, all of which will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the machine complete. Fig. 2 is a plan or top view of the greater portion of the machine. Fig. 3 represents a front end view of the machine, and Fig. 4 is a rear end view, the mechanism beyond it being omitted, also the rear mandrel and its holding-bracket. Fig. 5 is a sectional elevation of the machine, enough being omitted to show more clearly the mechanism for starting the whip into the machine so as to be caught by the feeding pawls or dogs. Fig. 6 represents (on an enlarged scale) a front elevation of a portion of the whip-starting mechanism. Fig. 7 is a plan or top view, and Fig. 8 is a side elevation, as seen from the back of the machine, showing a section through a portion of the frame in or about line V, Fig. 6. Fig. 9 is a front elevation of one of the feeding-heads. Fig. 10 is a back view of the same. Fig. 11 is a nearly central section through line *a b*, Fig. 9, cutting through both the front and rear portions of the head. Fig. 12 is a back view of the rear portion of the feeding-head. Fig. 13 is a front elevation of the head for receiving and holding the whip from going back and for holding it central and as near the cutters as possible. Fig. 14 is a back view of the same. Fig. 15 is a nearly central section through line *c d*, Fig. 13. Fig. 16 is a section through line *e f*, Fig. 13. Fig. 17 is a sectional side elevation of the machine, enough being omitted to show more clearly the cams for giving a reciprocating movement to the feeding-heads and the mechanism for operating them. A central section is also shown through the rear feeding-heads and the hollow mandrel upon which they move. Fig. 18 is a sectional side elevation of the machine, a large portion of the mechanism being omitted except that portion required for starting and stopping the cam that regulates the tapering form of the whip. Fig. 18ª represents a portion of the frame of the machine and a plan or top view of a portion of the mechanism for starting and stopping said cam. Fig. 19 represents a cross-section through the machine in line *g h*, Figs. 1 and 18, cutting through the cam-wheel for regulating the tapering form of the whip, the sleeve upon which it is mounted, the cam-wheel for raising and lowering the cutters, the ratchet-wheel and a portion of the arm that holds the pawl for operating it, and one of the outside gear-wheels, also through one of the cams for giving a reciprocating motion to the feeding-head and the slideway upon which it moves. Fig. 20 is a vertical cross-section through line *i j*, Fig. 1. Fig. 21 is a detached side elevation of the automatic device for keeping the whip in a central position at a point just beyond the cutters. Fig. 22 is plan or top view of the same; and Fig. 23 is a sectional side elevation showing the mechanism for giving the cutters a vertical reciprocating movement and also the mechanism for ejecting the whip after it is finished, the larger portion of the rest of the mechanism being omitted.

The frame of the machine is preferably made

of cast-iron, and is put together in the usual way.

2 represents the driving-shaft mounted in bearings 3 on a cross-piece between the legs of the frame. At the head or front end of the machine is secured a frame-work, 4, on which the whip blanks 5 are placed. (See Fig. 6, Sheet 5, also Figs. 1 and 3.) The upper portion of this frame-work is preferably made in the form of a light frame of iron, and is placed on an incline, as shown, so that the whip-blanks laid thereon will roll down as fast as a whip is taken away from the lower side of the series of the same. (Shown in Fig. 6.)

In Fig. 3 I have shown an end view of the whip-supporting frame, 4 being the inclined ways. At the front of the incline is a side piece, 6, to prevent the whip-blanks from rolling down too far, and to the side piece, 6, is hinged a cover, 7, the object of which is to keep the whip-blanks at the foot of the series from getting out of position. The dotted lines 8 in said Fig. 3 represents the position of the cover 7 when open.

In Fig. 1 I have shown a gage, 9, secured to the top of the cover 7 by a set-screw, 10. Its object is to provide for whips of different sizes. When set for large whips, two small whips might be caught at the same time; but by loosening the set-screw and turning the gage forward to the required point this may be avoided.

11 represents a supporting-post for the whip-supporting frame-work. (See Figs. 1 and 3.)

The whip grasping and starting mechanism consists of a supporting-frame, 12 13. (See Figs. 1, 3, 5, 6, 7, and 8.)

The driving-pulley 14 is mounted on a shaft, 15, in bearings 16 17, and moves continuously in the direction of the arrow *k*. On the opposite side of the bearing 17 is rigidly secured a grooved pulley, 18, which runs continually in the same direction with the pulley 14. This pulley 14 receives its motion from a pulley, 19, on the main shaft 2, and a belt, 20. (See Figs. 1 and 5.)

21 represents a loose pulley for tightening the belt, and is mounted loosely on a shaft, 2, set in bearings 22 on arms 23, which arms are pivoted to the supporting-frames 12 13 by bolts 24. (Shown in Figs. 1, 5, 7, and 8.) These arms 23 are secured at their rear ends by a bar, 25, and nuts 26. (See Figs. 7 and 8.) Outside the frame-piece 13 is secured to the shaft 21 a grooved pulley, 27, having a straight side, 28, produced by cutting away a segment of the circular pulley, (see Figs. 6 and 8,) so that both the pulley 27 and the loose pulley are on the same shaft, and both are kept up to their place by a spring, 29. (Shown in Figs. 1, 5, and 8.) On one arm of the pulley 27 is a pin, 30. (Shown in Figs. 3, 6, 7, and 8. Outside of the wheel or pulley 27, and within the frame of the machine, is a rod, 31, which is pivoted by a bolt, 32, at its rear end to a downwardly-projecting arm, 33, (see Figs. 5 and 8,) which arm 33 is pivoted to the inner side of the frame by a bolt, 34, so as to be permitted to swing thereon, and is drawn in a direction toward the front end, L′, of the machine when free to act by a spring, 35, when made sufficiently strong for the purpose. At the opposite end of the rod 31 (at the front end of the machine) is a rubber block, 36, (see Fig. 8,) rigidly secured to a raised portion of the same in any well-known way. This rubber block during the sudden movement of the rod 31 forward strikes against a projection, 37, on the frame of the machine, (see Fig. 7,) and thereby materially reduces the force of the concussion by its elasticity. At the end of the rod 31 is a bent portion, 38, and to the enlarged portion opposite the rubber block 36 is pivoted by a pin, 39, a bar, 40, having a hooked end, 41, and notch 42. It is held up with an elastic force by the spiral spring 43. The rod 31 is moved in a direction toward the foot of the machine by means of a spur, 44, secured to a small wheel, which is keyed or otherwise fastened to the shaft 45, (see Figs. 5 and 8,) and turns in the direction of the arrow *l*, shown in Figs. 5 and 8.

It will be noticed that Figs. 5 and 8 are taken from opposite sides of the machine. Consequently the movement of the shaft 45 is apparently in opposite directions in the two figures, while in reality it moves in the same direction—that is, in a direction to move the arm 33 toward the foot of the machine, which movement is given by the spur 44 striking the lower end of the arm 33, (see Fig. 8,) and as it passes by it the spring draws it quickly in the opposite direction. From this construction it will appear that as a whip-blank drops into position, as shown by the dotted lines M in Fig. 8, it will remain stationary, although the pulley 14 is turning in the direction of the arrow *k*; but as the spur 44 is moving in the direction of the arrow *l* it will, when it comes in contact with the lower end of the arm 33, cause it to move the rod 31 in the direction of the arrow *n*, Fig. 8, which operation will cause the notch 42 to move under the pin 30 until the end passes beyond the pin to the other side of it, as shown in Fig. 6, or by the dotted lines 46 in Fig. 8, and as the spur 44 continues its movement it will pass by the lower end of the arm 33 and allow the spring 35 to act, which will cause the rod 31 to move back again with a quick sudden motion, so that its forward end strikes the pin 30 and turns the wheel 27 in the direction of the arrow *o*, thereby causing the part 47 of said wheel to move against the whip-blank and throw it up against the grooved pulley 18, which will instantly cause it to be projected forward into the machine, and said wheel and pulley will hold it and move it until the wheel 27 makes one revolution, and is stopped by the pin 30 coming against the notch 42, which brings it into the position shown in Fig. 8, in which position it remains until the end of the spur 44 passes the

lower end of the arm 33 again, when the same operation will be repeated again as another whip-blank rolls down the inclined frame 4 and takes the place of the one removed.

The starting mechanism above described projects the whip-blank into the opening through the hollow mandrel 48, (shown in Figs. 2, 18, and 23, and others,) thereby bringing it into the feeding mechanism, the construction and operation of which is as follows: The machine is provided with three hollow mandrels, 48, 49, 50, and 212. (See Fig. 1, also Figs. 2, 17, 18, 19, and 23.) The first mandrel, 48, at the head of the machine is mounted in bearing 51, rigidly secured to fixed slideways 52 on the machine by bolts, and is prevented from moving longitudinally by the pulley 53 on one side of the bearing, and a collar, 54, on the opposite side. (See Fig. 2.) The slideways 52 are rigidly secured to the frame 1 on pillars 55. The forward portion of this mandrel is supported in the sliding bearing 56, in which the feed-heads *r r'* are secured, (see Figs. 1 and 2.) A belt, 60, passing over the pulley 53 and around the pulley 61 on the driving-shaft 2, gives this mandrel its rotary motion. The second hollow mandrel, 49, is also supported in stationary bearings 62 63 on each side of the pulley 64, which pulley 64, being keyed or otherwise secured to the mandrel, prevents longitudinal movement of the same. The mandrel 49 receives its rotary movements from a belt, 65, which connects with the larger pulley, 66, on the main shaft. The third hollow mandrel, 50, is rigidly secured to a supporting frame, 220, at the foot of the machine, (see Figs. 1, 23,) and serves as a guide to the whip for keeping it in position as it passes out of the machine.

The construction of the feeding-heads will be better understood by reference to the enlarged views on Sheet 6. The front portion of the head *r* carries three dogs, 68, pivoted thereto by pins 69, and each is provided with a serrated foot, 70. A small pin, 71, at the back of each prevents it from moving back too far. The rear ends, 72, of the dogs are bent back, (see Fig. 11,) for purposes which will be hereinafter shown.

At the rear of the feeding-head is another head, *r'*. It is secured to the front head, *r*, by three spiral springs, 73, (shown in Figs. 10 and 11,) and to limit the distance they shall at any time move apart, two bolts, 74, which pass easily through the front head, are screwed tightly into the rear head. (See Figs. 9, 10, and 11.) These two bolts are placed directly opposite each other and allow the two feed-heads to move back and forth thereon, the heads 75 limiting the distance they shall move apart.

The serrated foot-pieces of the dogs 68 project through three slots, 76. (Shown in Figs. 2 and 10.) The hollow mandrel 48 is provided with two sets of the above described feed-heads *r r'*, *r r'* and *r r'*, *r r'*, and the hollow mandrel 49 has four sets, *r r'*, *r r'* and *r r'*, *r r'*. (See Fig. 2.) It will be seen from this construction that the tendency of the springs 73 is to keep the feet 70 of the dogs 68 close together, and that a whip-blank passing through between them presses all three of them equally farther and farther apart as the blank increases in size, or vice versa, and consequently the ends 72 of the dogs 68 will all press equally against the cone-shaped face of the rear head, *r'*, and force it more or less away from the head *r* against the force of the springs 73, which springs are made sufficiently strong to cause the dogs during the forward movement of the heads to grip the whip-blank with force enough to carry it forward. These feed-heads move the whip-blank forward with an even uniform speed by means of a reciprocating movement back and forth on the hollow mandrels 48 and 49 by mechanism substantially as follows. (See sheets 1, 8, and 10.)

In Fig. 17, Sheet 8, is shown a side elevation of two grooved cams, 77 and 78. They are mounted on a shaft, 79, in boxes 80, rigidly secured to the frame of the machine. At the rear end of the shaft 79 is rigidly fastened a gear-wheel, 81. Below the shaft 79, and parallel with it, is a shaft, 82, set in bearings 83 84, and having at its rear end a pinion, 85, (see Figs. 17 and 19,) adapted to gear in with the wheel 81. At the opposite or forward end of the shaft 82 is a series of pulleys, 86 87 88. (See Fig. 17.) These pulleys (usually termed "speed" or "cone" pulleys) are provided with a belt, 89, (see Fig. 17,) which connects with a series of corresponding pulleys, 90 91 92, on the main shaft 2, whereby the speed of the feeding mechanism may be varied in the usual way of varying speeds.

By referring to the large view of the feed-head, Fig. 11, it will be seen that at the back of the rear portions of the feed-heads there is a long hub, 93, provided with a raised portion, 94, surrounding it so as to prevent any lateral movement within the box in which it is fitted, while it has a free rotary movement therein. These feed-heads work in sliding boxes 56 57 at the head of the machine on slideways 52 and in sliding boxes 95, 96, 97, and 98 on slideways 52 toward the rear portion of the machine. A top view of these sliding boxes is shown in Fig. 2, and a cross-section through them and the slideways on which they move in Fig. 19.

The slideways 95 and 96 are each provided with a downwardly-projecting friction-roller, 99, (shown in Figs. 17 and 19,) which fit into the grooved cams 77 78. These cams are set so that while one feed-head is moving forward the other is moving back, and so that just at the moment, or a little before, one has completed its forward movement, the other has completed its backward movement and started to move forward, so that the feed of the whip-blank is uniformly forward without any lost motion. These two grooved cams 77 78 give

the proper reciprocating movements to all the feed-heads at the front and at the rear of the machine, as follows: By referring to Figs. 1, 2, and 17, but shown more fully in Fig. 2, it will be seen that each sliding box 56, 57, 95, 96, 97, and 98 is connected by means of rods 99ª 100 on one side of the machine and the rods 101 102 on the opposite side. These rods pass through uprights 103, rigidly secured to the sliding boxes by bolts or in any well-known way. The rear end of the rods 99ª and 101 are rigidly secured by set-screws 104 to the uprights, and consequently to the sliding box 95. These rods then pass through holes in the upright pieces in the sliding box 96, and slide easily back and forth without moving said box 96, and then pass through the uprights on the sliding box 97, to which they are fastened by set screws 104. They then pass forward, and are secured by set-screws 104 in the same way to the sliding box 56. The rods 100 and 102 are connected in the same way to the sliding boxes 96, 98, and 57 by set-screws 105, and pass loosely through the uprights in the other sliding boxes. From this it will be seen that the two cams 77 and 78 give the required reciprocating movements to all the feed-heads, as hereinbefore mentioned.

In order to prevent the whip-blank from moving back during the backward movements of any of the feed-heads, I employ a retaining-head, which permits the whip-blank to move easily forward, but holds it from going back. This retaining head *t* is shown in Figs. 1 and 2 and in several other figures of the drawings; but its construction will be better understood by reference to Sheet 7, Figs. 13, 14, 15, and 16. It is composed of two portions, the outer case or rim, *t*, and the inner portion, *t'*, to which four dogs, 106, are secured by pins 107. The outer ends, 108, of the dogs 106 project through holes 109 in the outer rim, *t*. (See Figs. 13 and 15.) This outer rim, *t*, is adapted to slide back and forth over the inner portion, *t'*, and is kept into its place by the spiral springs 110. The inner portion, *t'*, is provided with a screw-threaded opening, 111, adapted to screw onto the hollow mandrel 48, and the dogs 106 are fitted in four hollow portions, 112, (shown in Figs. 14, 15, and 16,) and between these hollow portions 112 the spiral springs 110 are located. (See Fig. 14.) The springs 110 are secured by screws 113 to the outer rim, *t*, and to the inner portion, *t'*, by bolts 114. (See Fig. 14, also Fig. 15, in which the heads of the bolts are shown in dotted lines.) By this construction a whip-blank may be easily passed in through the hollow mandrel and through this head in the direction of the arrows *v'*, Fig. 15, and in doing so it will cause the points 115 of the dogs 106 to open out in accordance with the diameter of the whip-blank, while the outer ends, 108, of the dogs will move in the opposite direction, or in the direction of the arrow W. This will cause the outer portion to move back over the portion *t'* in the direction of the arrow W against the force of the springs 110, and the springs 110 will cause all the parts to resume their normal position, as shown in Fig. 15, the moment the whip-blank passes out. It will be seen that although a whip-blank may be easily pushed forward in the direction of the arrow *v'* it cannot be drawn back in an opposite direction, because the dogs will grip it and hold it; but this head has another office besides this, and that is, it holds the whip-blank exactly in the center of its rotation and keeps it there in a central position all the time it is passing through and its diameter is changing. It also holds it steady in that position as near the cutters as possible. The holding of the whip in a central position and as near the cutters as possible are really its two most important objects, as the construction and operation of the feeding-heads leave very little chance of the whip-blank ever slipping back, because while one set of the feeding-heads is advancing forward and carrying the whip forward with them the others are going back.

138 represents deflecting-plates for throwing off chips and dust while turning.

As to the construction of the cutting mechanism reference is had to Figs. 1, 2, 19, 20, and 23. The cutter-head 116 is made in the usual way, the cutters being put into the head through the side and secured by set-screws 117. (See Figs. 2, 20, and 23.) It is mounted on a vertical shaft, 118, in bearings 119 and 120. These bearings 119 120 form a part of or are attached to the cutter-supporting frame 121, which is pivoted by bolts 123 to supporting frame-pieces 124 125, secured to the bottom of the frame 1 of the machine by bolts 126. (See Fig. 20.) This construction allows the cutters to be moved forward or back. The cutter-head receives its rotary motion by a belt, 127, connected with the cutter-pulley 128 and with the driving-pulley 129. (See Figs. 2 and 3, where the belt-connection is shown.) The cutter-head is also connected with mechanism for giving it a vertical movement up and down while rapidly rotating, whereby a sliding cut is given to the whip-blank as it advances through the machine.

The vertical cutter-shaft 118 is adapted to move vertically in the bearing 119, and at its lower end is a step, 130, fitted to slide up or down in the bearing 120. On the top of this step is a recess, in which the lower end of the shaft 118 is fitted so as to rotate therein. At the lower end of the step 130 is pivoted by a pin, 131, the end of an arm or lever, 132. This lever 132 is pivoted by a pin, 133, (shown in Fig. 23,) to a small piece projecting from the side frame, 124. The opposite end of this arm or lever rests at all times on some portion of the cam 134. (See Fig. 23, in which this construction is shown, also Fig. 19, where a section through this cam 134 and cam-wheel is shown.) As this cam 134 turns in the direction of the arrow *l* it will cause the arm 132

to reciprocate, because as it is raised to the highest point of the cam it falls again, and thereby gives the cutter-head a vertical reciprocating movement. At the front of the cutters is a dovetail sliding piece, 135. It is operated as the slide to an ordinary engine-lathe by a screw and hand-wheel, 136, and is provided with a vertical pin, 137, Figs. 2, 21, 22. The object of this pin is to provide the means for holding the whip-blank up to the cutter. The piece 135 moves in a slideway secured rigidly to a frame-piece, 139. (See Figs. 21, 22.) The frame-piece 139 is pivoted to the supporting frame-pieces 124 125 by bolts 122 in the same way that the cutter-frame is pivoted to the same frame-pieces 124 125, so that the parts 135 137 are capable of a swinging motion back and forth. On the other side of the cutter-head, opposite the head *t*, is another device for keeping the whip in a central position, so that it is held central on both sides of the cutter-head. It consists of two bars, 140 and 141, pivoted by a bolt, 142, (see Figs. 2, 21, and 22,) together and to a standard, 143, which standard is secured rigidly to the frame 1 of the machine by bolts 144. The bars 140 141 are each provided with an enlargement, 145 146, (see Fig. 21,) each having a long narrow opening, 147 and 148, located diagonally and arranged to cross each other at a right angle, or substantially so. Both bars 140 141 are also provided with angular ends 149 150. (See Fig. 21.) To one side of the bars 140 141 is an upright, 151, bolted by bolts 152 to the top of the pivoted frame 139, and having a pin, 153, rigidly secured to it, which pin projects through the diagonally-set openings 147 and 148. It will now be seen that if the top of the frame 139 be moved in the direction of the arrow X (see Figs. 21 and 22) it will carry the pin 153 with it in the same directions, and that as the arms 140 141 are bolted to a stationary point by the bolt 142 this movement of the pin 153 will tend to close the two arms or bring the angular portions 149 150 into the position shown by the dotted lines 154 155, (see Fig. 21,) and thereby contract the opening between these two angular portions, and that a reverse movement will enlarge them. The slots or openings 148 147 should be so located that the swinging movement back or forth of the frame 139 will keep the opening between the angular ends or jaws at all times of the same size of the whip passing through it, so as to hold it steady and true.

To one side of the cutter-head (see Figs. 2 and 3) is an emery-belt, 156, supported on the two loose pulleys 157 158 (see Figs. 1, 2) attached to the top of the cutter-head frame 121, so as to swing back and forth with it. They are secured to a sliding plate, 159. (Shown in Fig. 2.) This plate 159 is made to slide in a dovetail slide, 160, and the plate 159 is adjustable back and forth by means of the bolts 161 162. The emery-belt 156 passes from the pulleys 157 158 around the large pulley 163, then behind a tightening-pulley, 164. (Shown in Figs. 2 and 3.) This tightening-pulley is mounted on a swinging arm, 165, which arm is made to swing on the shaft 169 (with the tightening-pulleys) with sufficient force against the belt 156 by means of a spiral spring, 166, (see Fig. 3,) to give the necessary strain upon the emery-belt. The ends of the spring 166 are secured one to a pin, 168, on the supporting-frame 167, in which the vertical or nearly vertical shaft 169 is mounted, and to which the pulleys 163, 129, and 170 are secured, and the other end of the spring 166 is secured to the pin 177 on the arm 165. By this construction the emery-belt pulleys 157 158 may be adjusted either forward or back by means of the set-screws 161 162 and not interfere with the required strain upon the belt. The object in making them thus adjustable is to provide the means for adjusting the emery-belt up to the whip when required.

For some purposes—a cheaper whip blank, for instance—the emery-belt may be dispensed with, which may be done by throwing off the belt from the pulleys and using the machine without it.

To hold the whip with the required force against the emery-belt, (see Fig. 2,) an adjusting-piece, 171, is used. It is secured to a block, 172, which is also rigidly fastened to the pivoted frame 139. (Shown in Figs. 20, 21, 22, and 23. To this block 172 the adjusting-piece 171 is secured by screws 173 174. (See Fig. 2.) The whip as it is passing through the machine passes between this adjusting-piece 171 and the emery-belt 156. As the whip is passing through the machine, from the time it enters its diameter is becoming smaller until it is finished and passes out. Consequently the cutter-head and the emery-belt must advance from one side as fast as the diameter decreases, and the pin 137 and the adjusting-piece 171. The jaws 149 150 must also close in proportion as the diameter of the whip decreases. This operation is performed by means of the cam-wheel 175, as follows, (see Figs. 1 and 2): 176 is the cam connected to the said wheel in the usual way, and is made of steel sufficiently elastic for the purpose. It is capable of adjustment by means of the set-screws 178 in the ordinary way.

To the frame 1 of the machine is pivoted by a bolt, 179, an arm, 180, having a friction-roller, 181, which rests against the cam 176. (See Figs. 1, 2, and 19.) The opposite end of the arm 180 is pivoted by a bolt, 182, (see Figs. 1, 2, and 20,) to an arm, 183, (shown in Fig. 20,) having its opposite end pivoted to the frame 121 by a bolt, 181. Directly opposite, at an equal distance from the bolt 179, is another short connecting-rod, 185, pivoted by a bolt, 186, to the arm 180, and by a bolt, 187, to the opposite side of the frame 139, (shown in Fig. 20,) in which nearly an end view of the arm 180 is also shown in perspective. It will be seen that a movement of the cam-wheel

175 in the direction of the arrow *y*, Fig. 2, will cause the friction-roller 181 to move in toward the machine, and consequently the opposite end of the arm 180 will move outward, which will cause the frame 121 and the cutters and emery-belt to move forward and the pivoted connecting-rod on the opposite side of the center (or bolt 179) to move in a contrary direction, thereby causing the cutter-head and emery-belt on the one side and the mechanism for keeping the whip up toward the cutters and emery-belt on the opposite side to approach each other. In this way the diameter of the whip is reduced as it passes through the machine. A spring, 226, assists the arm 180 in forcing the frames 121 and 139 apart.

During the operation of the cam 176 it is necessary that the cam-wheel and cam should begin to turn the moment the whip-blank reaches the cutters and continue turning until the end of the whip passes the cutters. This is done as follows, reference being had to Figs. 2, 18, and 19: In Fig. 19 it will be seen that the cam-wheel 175 is keyed to a sleeve, 188. The cam 134 is also keyed to the same sleeve, and also the arm 189, so that when these parts turn the sleeve turns with them and it turns on the shaft 45. Near the end of the sleeve is a ratchet-wheel, 190, rigidly keyed to the shaft 45, and just above the ratchet-wheel is pivoted by a pin, 191, a pawl, 192, adjusted to engage with the said ratchet-wheel 190. Outside of the frame of the machine is a gear-wheel, 194, rigidly secured to the end of the shaft 45.

To the under side of the frame 1 is secured a hanging frame, 193, in which is a box, 3, through which the shaft 2 passes. In this hanger 193 is mounted a shaft, 195, having a gear-wheel, 196, at the end outside the frame 1, adapted to gear in with gear-wheel 194. On the shaft 195 is mounted a worm gear-wheel, 197, adapted to gear in with the worm-gear 198 on the shaft 2. 199 is the main driving-pulley of the machine. It is secured to the shaft 2, and it receives its motion from a belt connected with any suitable source of power. It will be noticed that the pawl 192 (shown in dotted lines in Fig. 18) is provided with a hook-shaped end, 200. (See Fig. 18.) The opposite end is provided with a spring, 231, so that the pawl when left to itself will always be in gear or engaged with the teeth in the ratchet-wheel 190.

When the main shaft 2 is moving, it turns in the direction of the arrow *c'*. (See Fig. 18.) The worm-gear turns the wheel 197 in the direction of the arrow *d'*, and consequently the outside gear-wheel, 196, in the same direction, and the gear-wheel 194, with which it engages, in the direction of the arrow *l*. While all the machinery is thus in motion the cam-wheel 175 remains at rest, while the weight or hammer 201 remains in the position shown in Fig. 18. To the hammer-weight 201 is rigidly secured a connecting-rod, 202, having its opposite end pivoted by a pin, 203, to an arm, 204. This arm 204 is secured to a shaft, 205, mounted in two bearings, 206 230, secured to the top of the frame 1. (See Fig. 2.) The upper portion of the arm is provided with a curved flat portion, 207. This portion 207 when in the position shown in Fig. 18 has its upper portion just opposite the points of the dogs 106 in the head *t*. Now, if a whip-blank, 5, be introduced, as shown in said Fig. 18, the feeding mechanism will carry it forward until the large end strikes the portion 207 and turns it on its center 205 into the position shown by the dotted lines. This operation will bring the hammer-weight 201 into the position shown by the dotted lines 208, thereby drawing the hammer-weight 201 off from the end of the pawl 192, which operation allows its hooked end to instantly drop into gear with the ratchet-wheel 190, and as this ratchet-wheel is turning it causes the arm 189 and the pawl connected with it, also the sleeve 188, the cam-wheel 175, and cam 134 to turn, so that they all rotate in the same direction (the direction of the arrow *l*) with the shaft 45, to which the ratchet-wheel is rigidly fastened. It will be seen that as this ratchet-wheel continues its movement until it makes a full revolution the inclined face 209 of the arm 189 will pass under the hammer-weight 201 and lift it up until the edge 210 passes from under it, when it will drop on the pawl 192 and lift its end 200 out of gear from the ratchet-wheel 190, thereby stopping the rotary motion of the sleeve 188 and the cams carried by it, which will again bring the several parts all into the position shown in Fig. 18, in which position they will remain until another whip-blank is put in, when the same operation will be repeated. The hammer-weight 201 passes down into a long narrow opening, 211, in the top of the frame 1. (See Fig. 18ª.) The motion of the cam-wheel 175 should be timed so that it will make one revolution while a whip is passing through.

The mechanism for ejecting the whip after it is completed is as follows, reference being had to Fig. 23, also Figs. 1, 4, and 19: After the whip is completed it passes from the hollow mandrel 49 into and through the hollow mandrel 50, and into and out of the hollow mandrel 212. (See Fig. 1.)

213 represents a grooved pulley (see Figs. 4 and 23) mounted upon a shaft, 214, in bearings 215. (Shown in Fig. 4.) This pulley 213 is driven in the direction of the arrow *f''*, Fig. 23, by a pulley, 216, and a belt, 217, connected with a pulley, 218, on the main shaft 2. The pulley 213 is thus driven continually all the time the machine is in operation. A curved arm, 219, is pivoted to the supporting-frame 220 by a pin, 221, and is provided with a loose grooved wheel, 222, (see Figs. 4 and 23,) located below and in a line with the grooved wheel 213. The opposite end of this arm 219 projects forward just far enough to be caught by the pin 223. (Shown in Figs. 19 and 23. In

Fig. 23 it is shown in dotted lines because it is on the opposite side of the cam-wheel.) This pin 223 is so located on the cam-wheel that it strikes against the end of the lever 219 the moment the whip is completed, and its end projects in between the grooved wheels 213 and 222. The pin 223 strikes the end of the arm 219, and by moving it down throws the pulley 222 up so as to compress the whip between it and the moving pulley 213, which holds it with sufficient force to throw it out of the machine.

I claim as my invention—

1. In a whip-machine, an inclined framework for holding a series of whip-blanks having a gage at the bottom of the incline for preventing the whip-blank at the lower end of the incline from moving forward too far, in combination with a grooved pulley, 18, a means for driving it continuously in one direction, a grooved pulley mounted in yielding bearings directly below the continuously-moving pulley and having a straight side, 28, on which the large end of the whip-blank to be fed forward rests, a pin, 30, secured to said pulley, a connecting-rod provided with a yielding pivoted bar having a notch, 42, at its forward end for stopping the pin 30 and holding the lower grooved pulley in position to receive a whip-blank, and having its rear end pivoted to a swinging arm pivoted to the frame, a spur secured to the cam-shaft 45 for moving the swinging arm in one direction and drawing its yielding end from under the pin 30, and a spring for giving it a quick return movement for causing it to move the pin 30 and pulley so as to grasp the whip-blank between the upper and lower grooved pulleys and throw it longitudinally forward into the feeding mechanism, and then hold the lower pulley in position to receive another whip-blank until the preceding whip-blank has gone forward sufficiently far to permit another to take its place, substantially as described.

2. The combination, in a whip-machine, of the hollow mandrels upon which the sliding feed-heads operate set in suitable bearings mounted upon the frame of the machine, a series of pairs of feed-heads provided with feeding-dogs and mounted upon said hollow mandrels, slideways for retaining them in position, cams for giving the feed-heads a reciprocating motion to and from each other, rods for connecting the feed-heads, and a means for giving them a rotary motion, the whole combined for joint operation, substantially as described.

3. A feed-head for whip-machines, consisting of the front and cone-shaped rear portions having screws for limiting the distance they shall move apart, in combination with retaining-springs 73 and feeding-dogs 68, having serrated feet for gripping the whip-blank in their forward movements, and backwardly-extending portions 72, for operating in connection with the rear portions, r', and the springs, for the purposes described.

4. In a whip-turning machine, a cutter-head mounted on a vertical shaft set in bearings in a pivoted swinging frame, a vertically-movable step for receiving the lower end of the shaft, an arm pivoted to the said step and to the machine, and a cam for giving a vertical reciprocating movement to said arm and cutter-shaft, in combination with an arm, 180, pivoted to the frame of the machine, an arm for connecting the cutter-head frame with the arm 180, a pivoted frame, 139, carrying the mechanism for keeping the whip-blank up to the cutters, a friction-roller at the opposite end of the arm 180, a cam for operating it, and a spring, 226, for keeping the pivoted frames 121 and 139 apart when not acted upon by the arm 180, whereby the cutters receive a vertical reciprocating movement, and the cutters and mechanism for keeping the whip-blank up to the cutters receive a movement toward and from each other, substantially as and for the purposes described.

5. In a whip-turning machine, a cutter-head mounted on a vertical shaft set in bearings in a pivoted swinging frame, a vertically-movable step for supporting the lower end of the shaft, an arm pivoted to said step and to the machine, a cam for giving a vertical reciprocating movement to said arm and cutter-shaft, and an emery-belt mounted on a substantially horizontal driving-wheel and on loose pulleys mounted on vertical bearings on the top of the cutter-head swinging frame, and kept taut by a loose pulley mounted on a swinging arm for polishing the whip-blank as it passes the cutters, in combination with an arm, 180, pivoted to the frame of the machine, an arm for connecting the cutter-head frame with the arm 180, a pivoted frame, 139, carrying the mechanism for keeping the whip-blank up to the cutters and emery-belt, a friction-roller at the opposite end of the arm 180, a cam for operating it, and a spring for keeping the pivoted frames 121 and 139 apart when not operated by the arm 180, whereby the cutters receive a vertical reciprocating movement, and the cutters, emery-belt, and mechanism for keeping the whip-blank up to the cutters and emery-belt receive a movement toward and from each other, substantially as and for the purposes described.

6. In a whip-turning machine, mechanism for feeding the whip-blank forward, and an arm pivoted to the machine so that its upper end may swing into the path of the whip-blank, and having a connecting-rod pivoted to the lower end of said arm, and provided at its opposite end with a hammer-weight, 201, in combination with an arm, 189, secured to a sleeve carrying the cam and cam-wheel 175, and having an inclined face, 209, a pivoted pawl and a spring, 231, a ratchet-wheel, 190, connected to a shaft, 45, adapted to turn within the sleeve 188, and gear-wheels connecting it with the shaft 2 for operating it, whereby the end of the whip-blank as it moves forward

operates the arm or rod 202, so as to draw the hammer-weight off from the end of the pawl and allow it to drop into gear with the ratchet-wheel and start the cam 176, substantially as and for the purposes described.

7. The combination of the ratchet-wheel 190, mounted on a shaft, 45, gearing for connecting it with the main shaft and giving it motion, an arm, 189, mounted on a sleeve, 188, carrying the cam 176, and having an inclined face, a pivoted pawl, a spring, 231, for causing its engagement with the ratchet-wheel, and a pivoted hammer-weight, 201, whereby the arm 189 as it rotates passes under and lifts the hammer-weight until it drops off onto the end of the pawl, and, disengaging it from the ratchet-wheel, stops the action of the cam 176, substantially as and for the purposes described.

8. In a whip-machine, an ejecting mechanism consisting in the combination of a grooved pulley mounted in fixed bearings at the rear of the machine, means for driving it continuously in one direction while the machine is in operation, an arm, 219, pivoted to a supporting-frame and carrying on the end below the moving-pulley a loose pulley, 222, and a wheel carrying a pin, 223, and mounted on the sleeve 188, so as to make one revolution every time a whip passes through the machine, the pin being adapted to engage once during each revolution with the opposite or lower end of the arm 219, and thereby move its opposite end upward and the loose pulley 222 with it so as to hold the whip between it and the moving pulley with sufficient force to cause its ejectment from the machine at the proper time, substantially as described.

9. The combination of the grooved cams 77 78, mechanism for giving them a rotary movement, the sliding boxes 95 96 and their feed-heads and feed-dogs mounted upon hollow mandrels and slideways, rods for connecting them with the sliding boxes 97 98 56 57, their feeding-heads, and feed-dogs, the grooved cams being constructed as described so that each one starts its forward movement just before the other reaches the end of its forward movement, whereby a uniform forward movement is given to the whip-blank, substantially as described.

ORRIN BRYANT.

Witnesses:
JAMES SANGSTER,
GEO. J. HILL.