H. M. SCHWARTZ.

BRUSH MACHINE.

APPLICATION FILED MAY 8, 1908.

924,194.

Patented June 8, 1909.

11 SHEETS—SHEET 1.

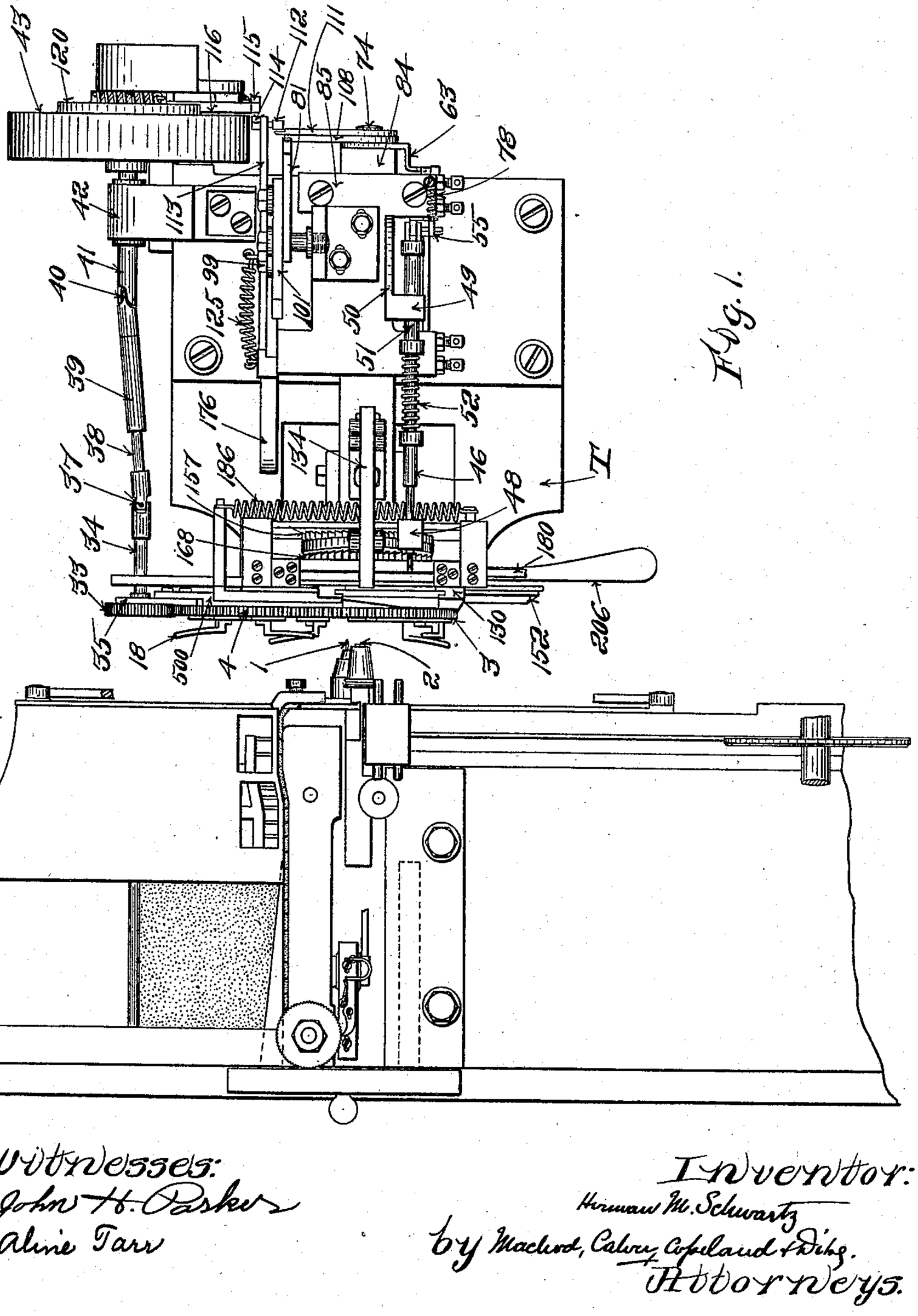

Fig. 1.

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11 SHEETS—SHEET 2.

Fig. 2.

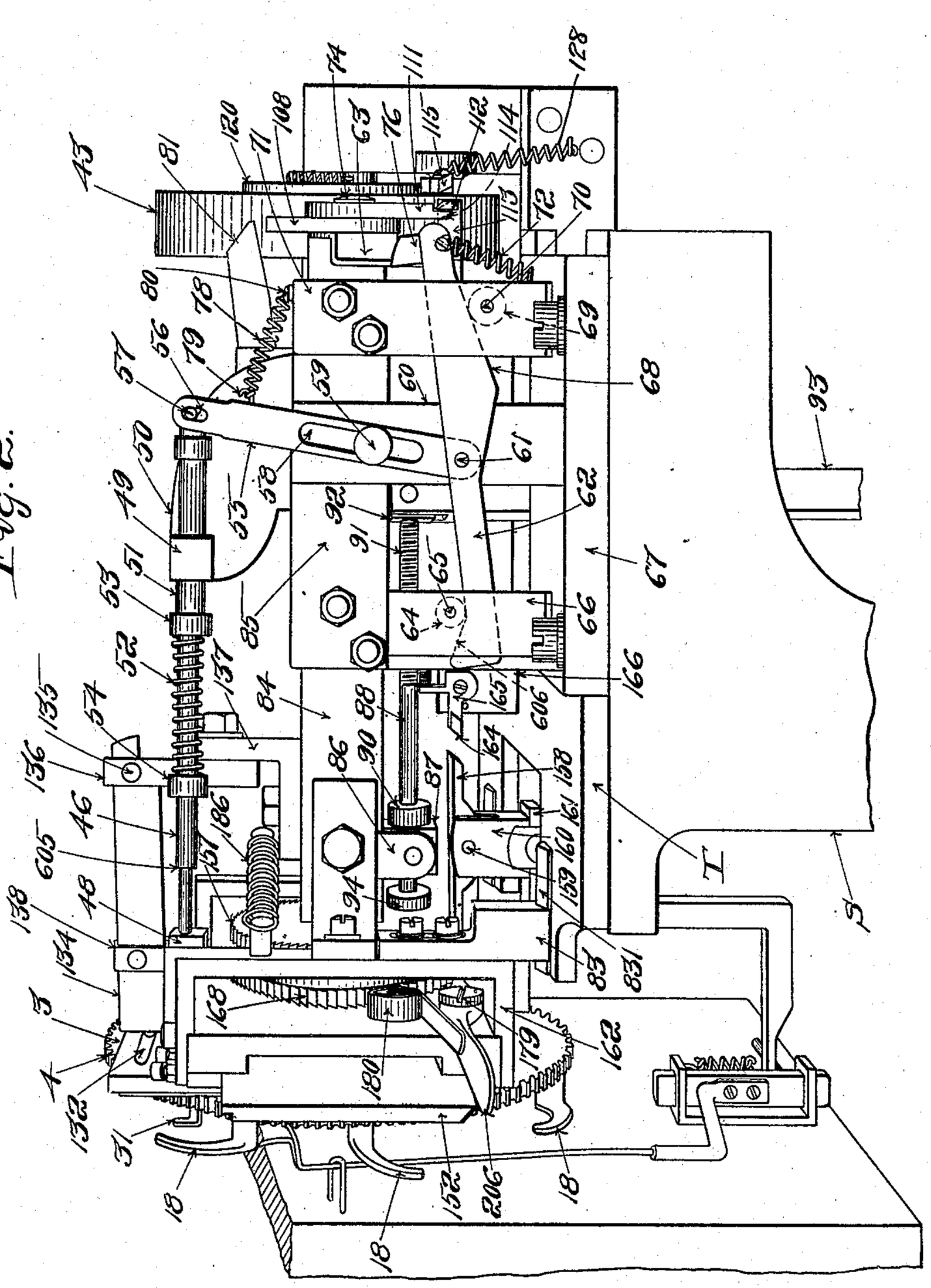

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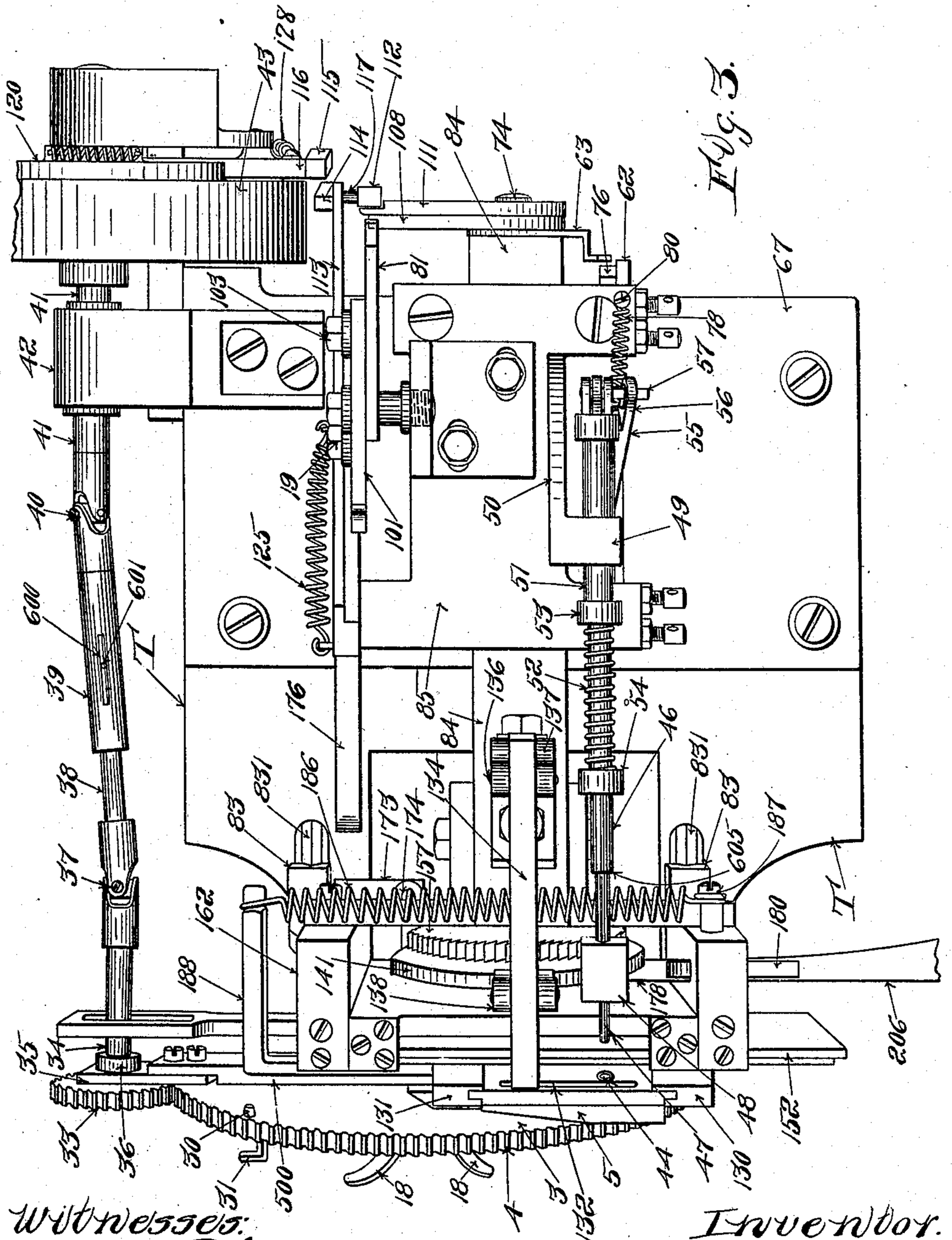
FIG. 3.



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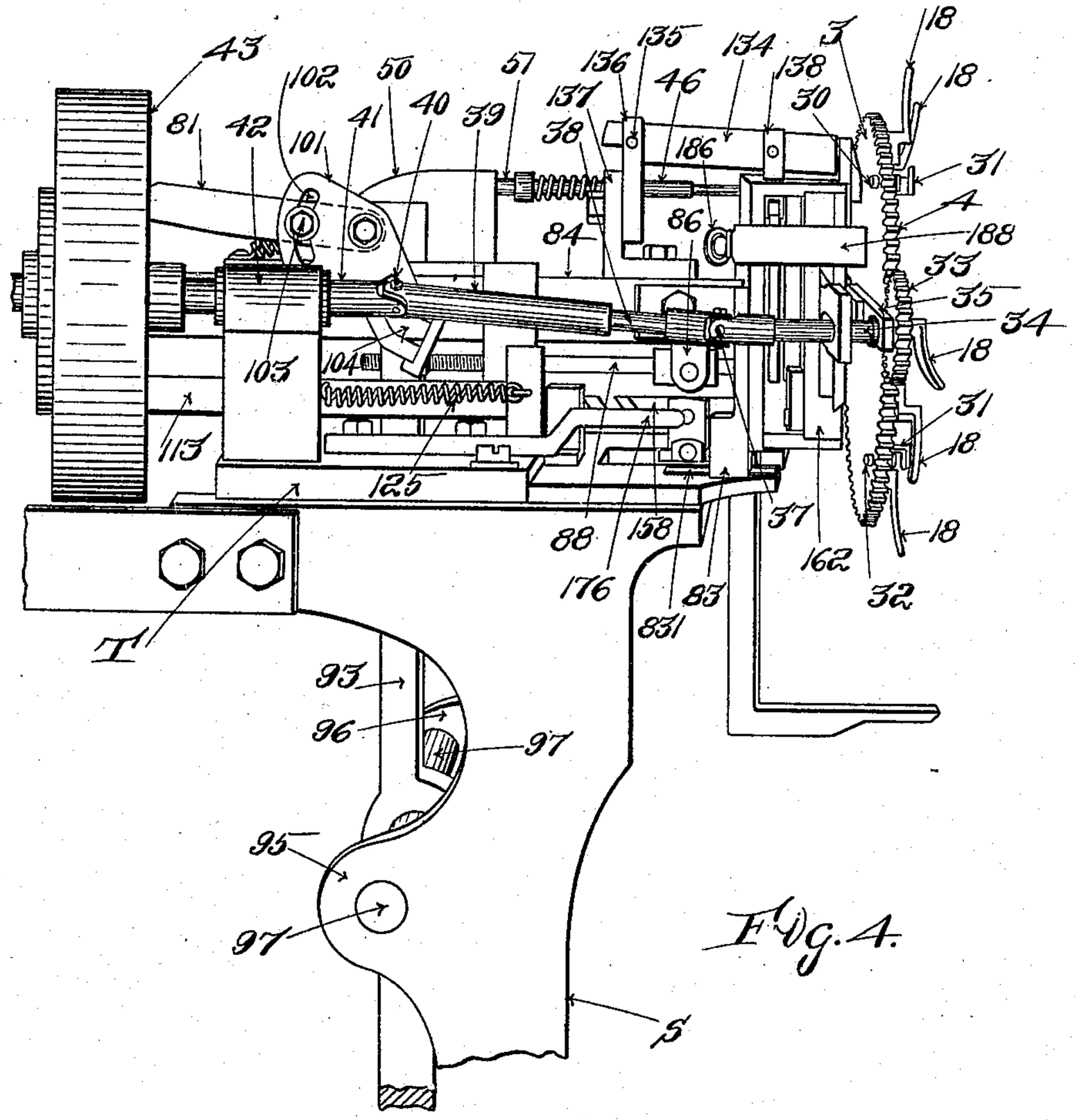

Fig. 4.

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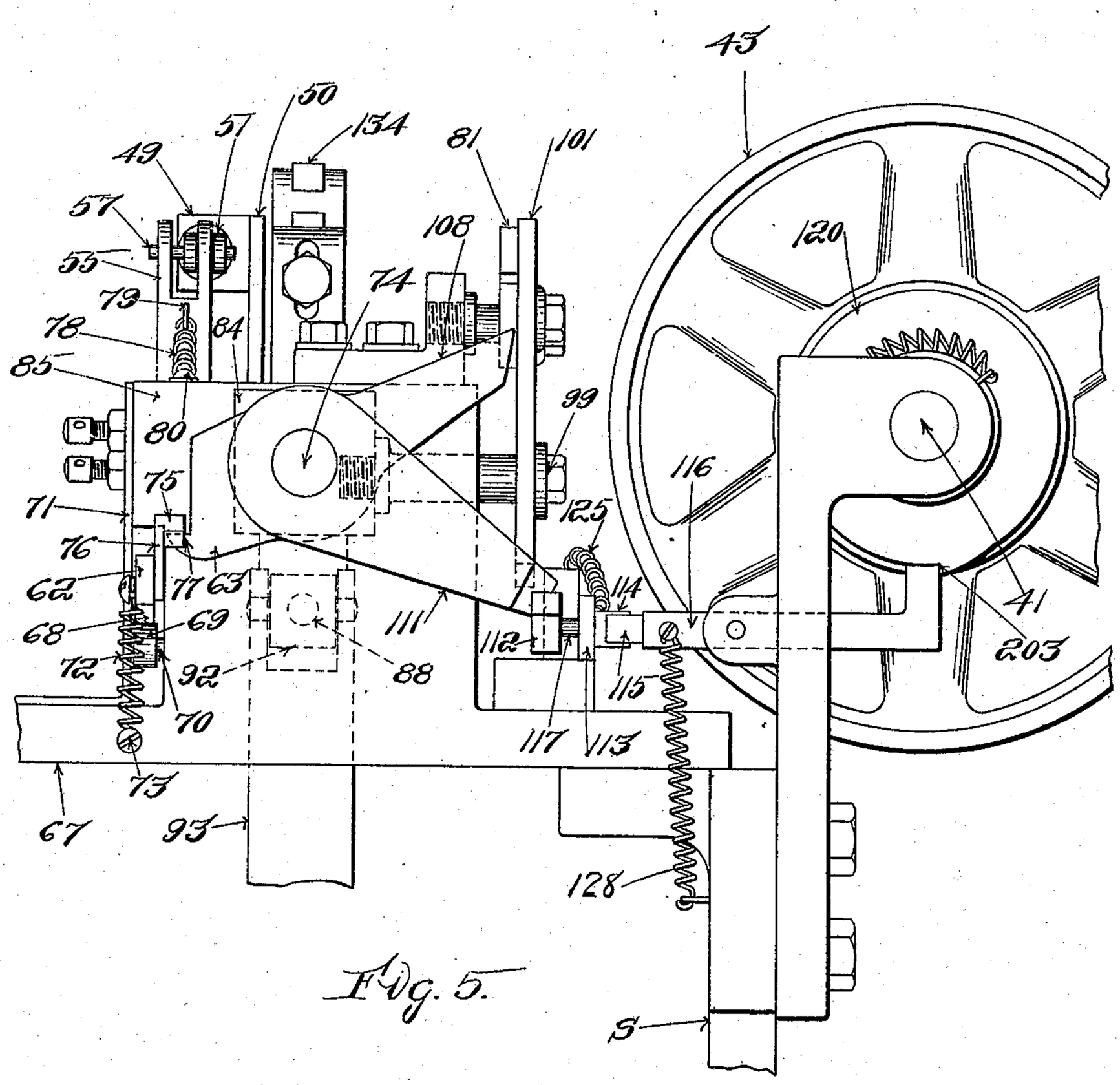

Fig. 5.

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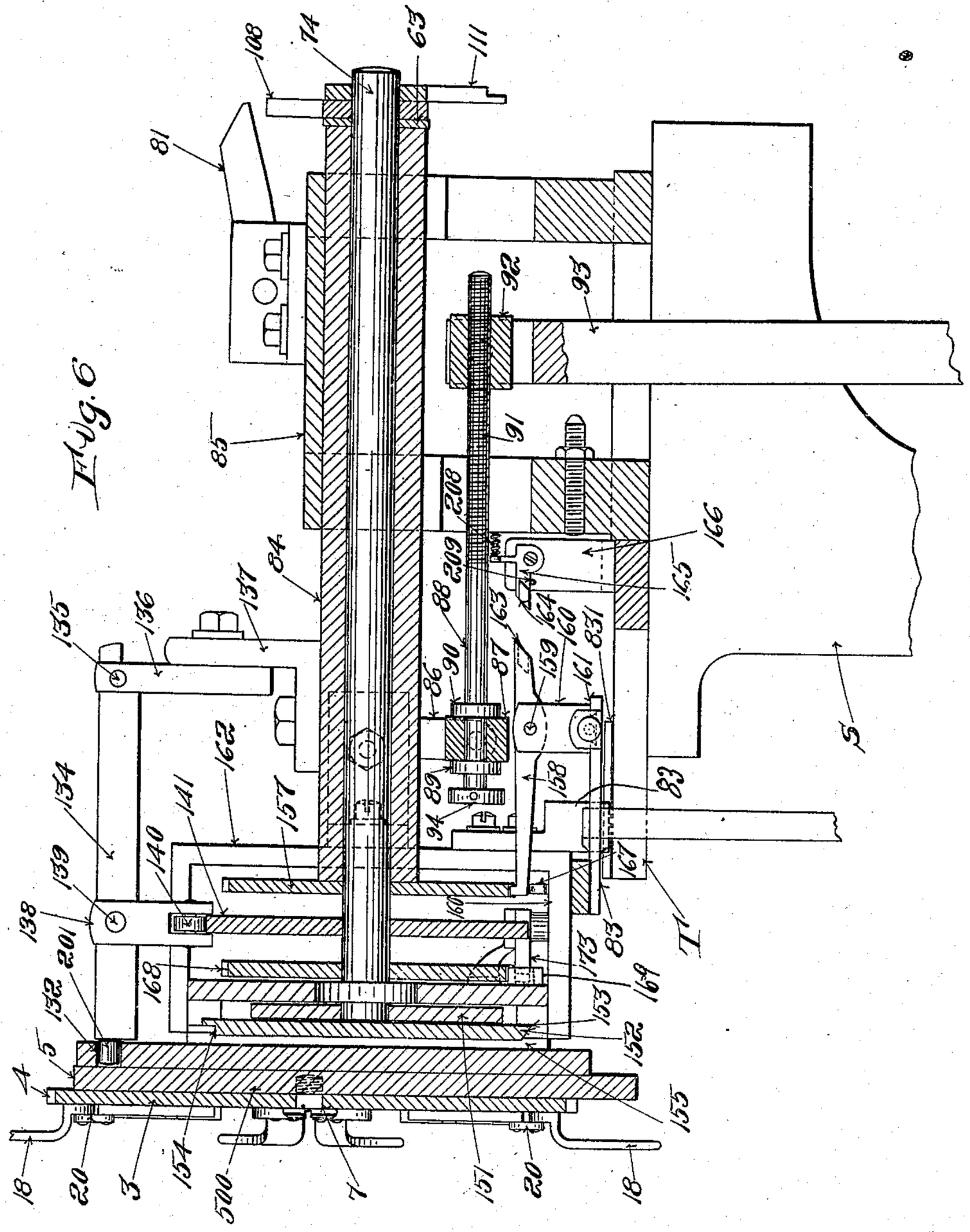
11 SHEETS—SHEET 6.

Fig. 6



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11 SHEETS—SHEET 7.

Fig. 7.

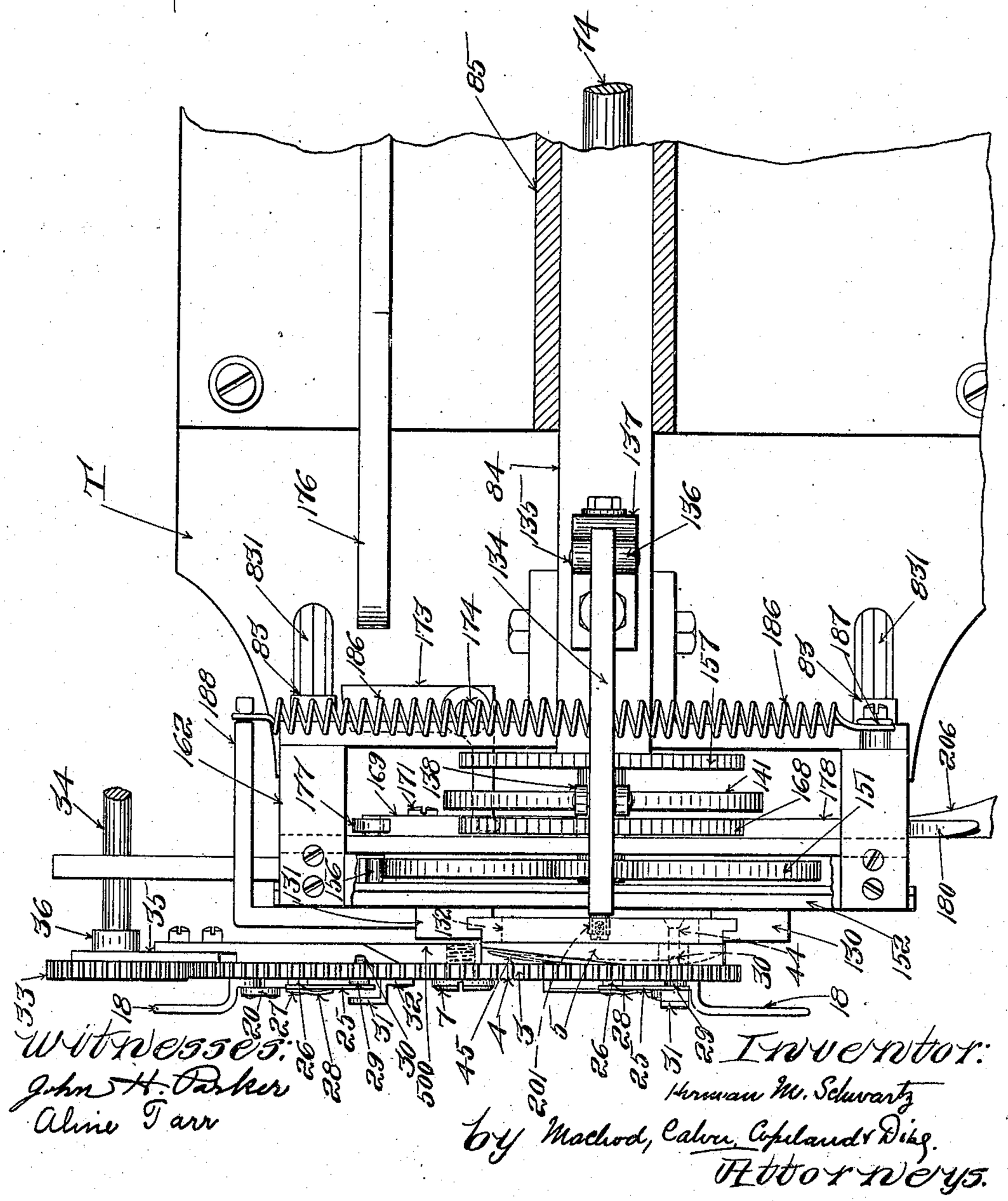

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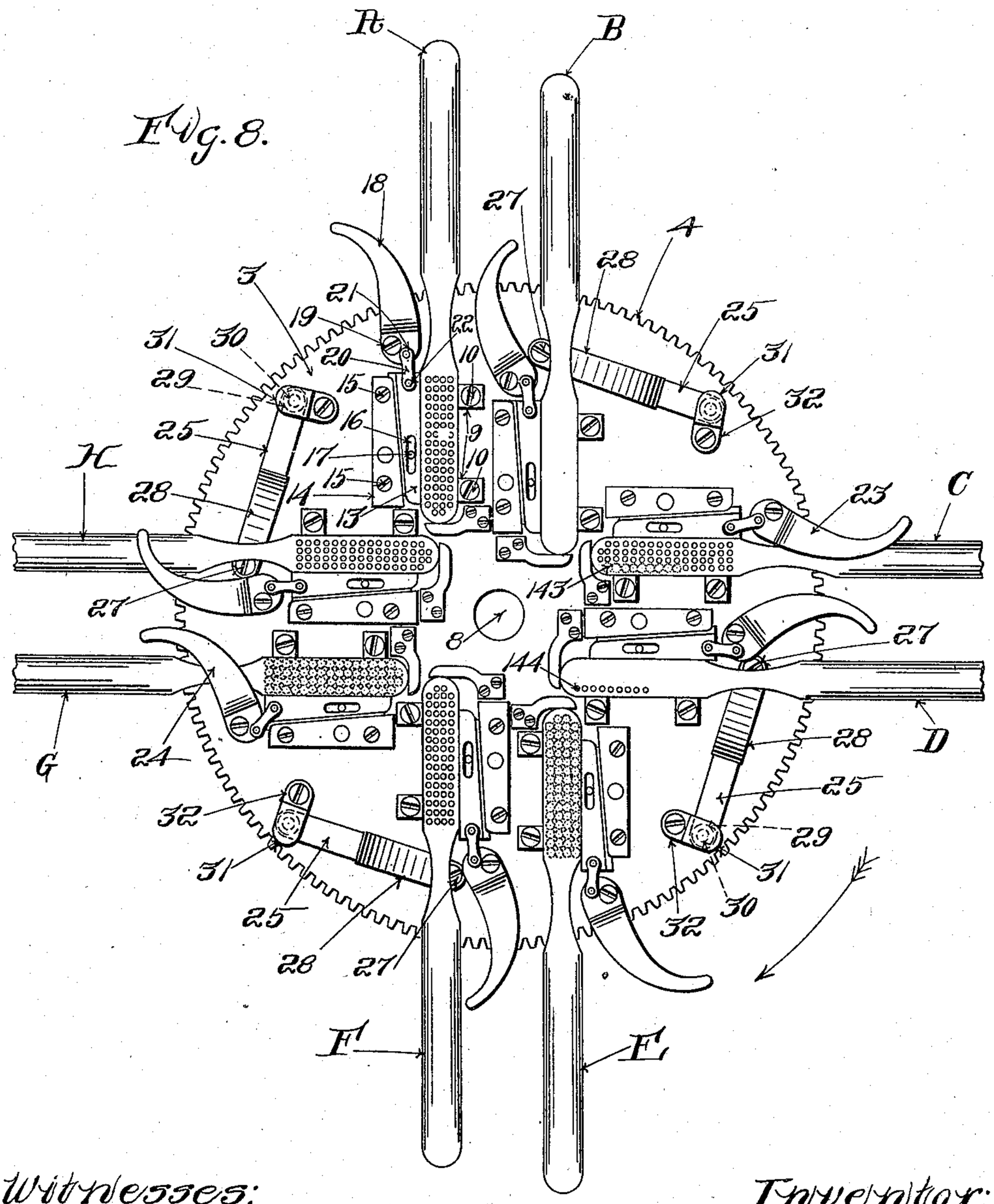
FIG. 8.



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11 SHEETS—SHEET 9.

Fig. 10.

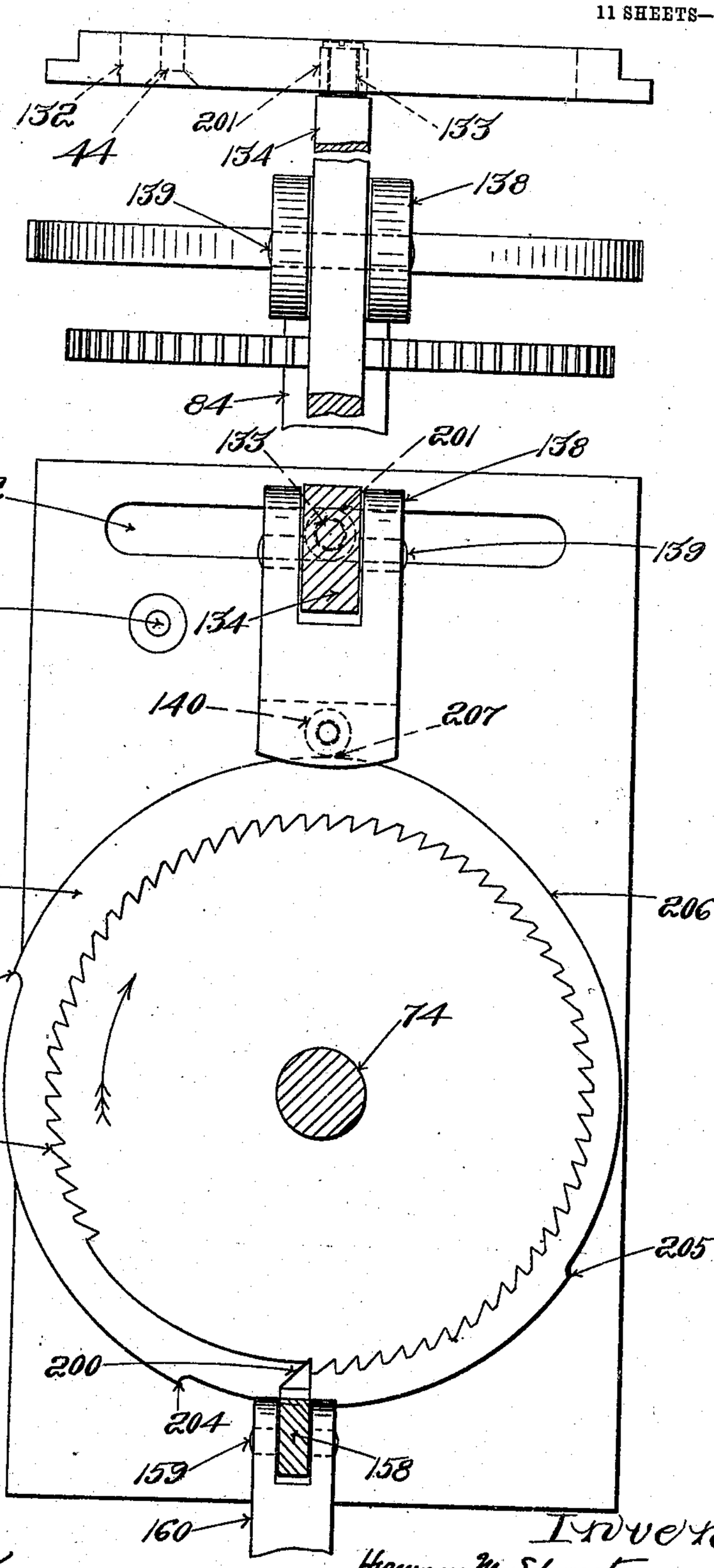

Fig. 9.

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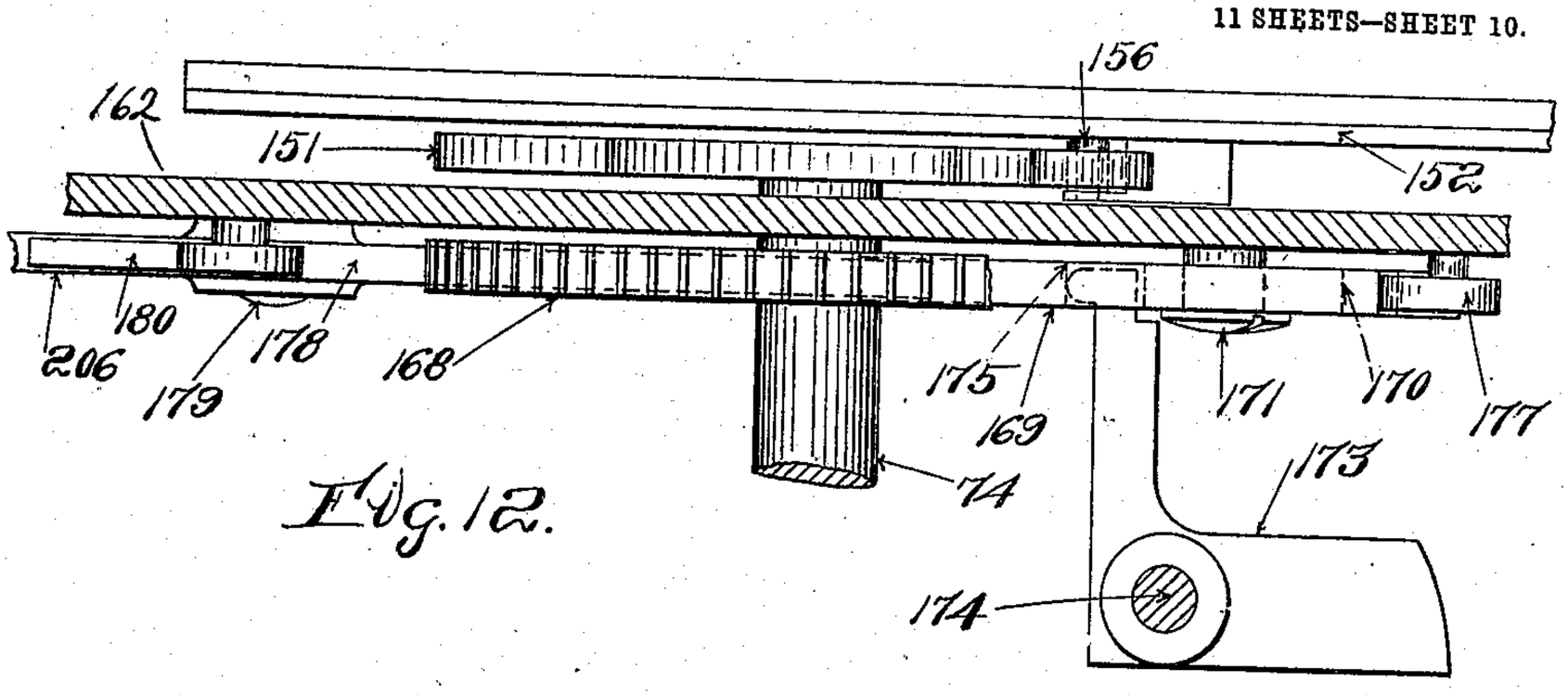
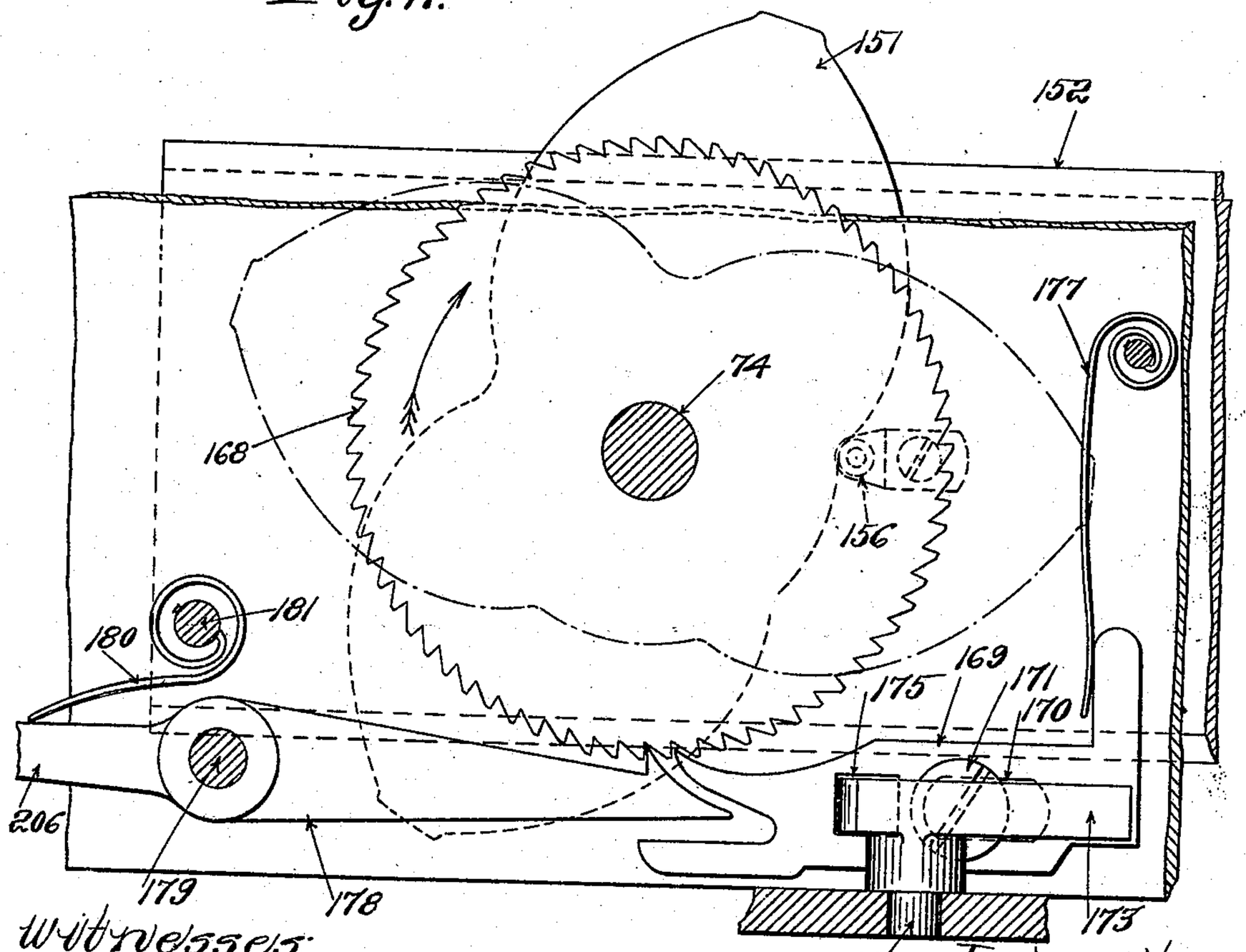


Fig. 12.

Fig. 11.



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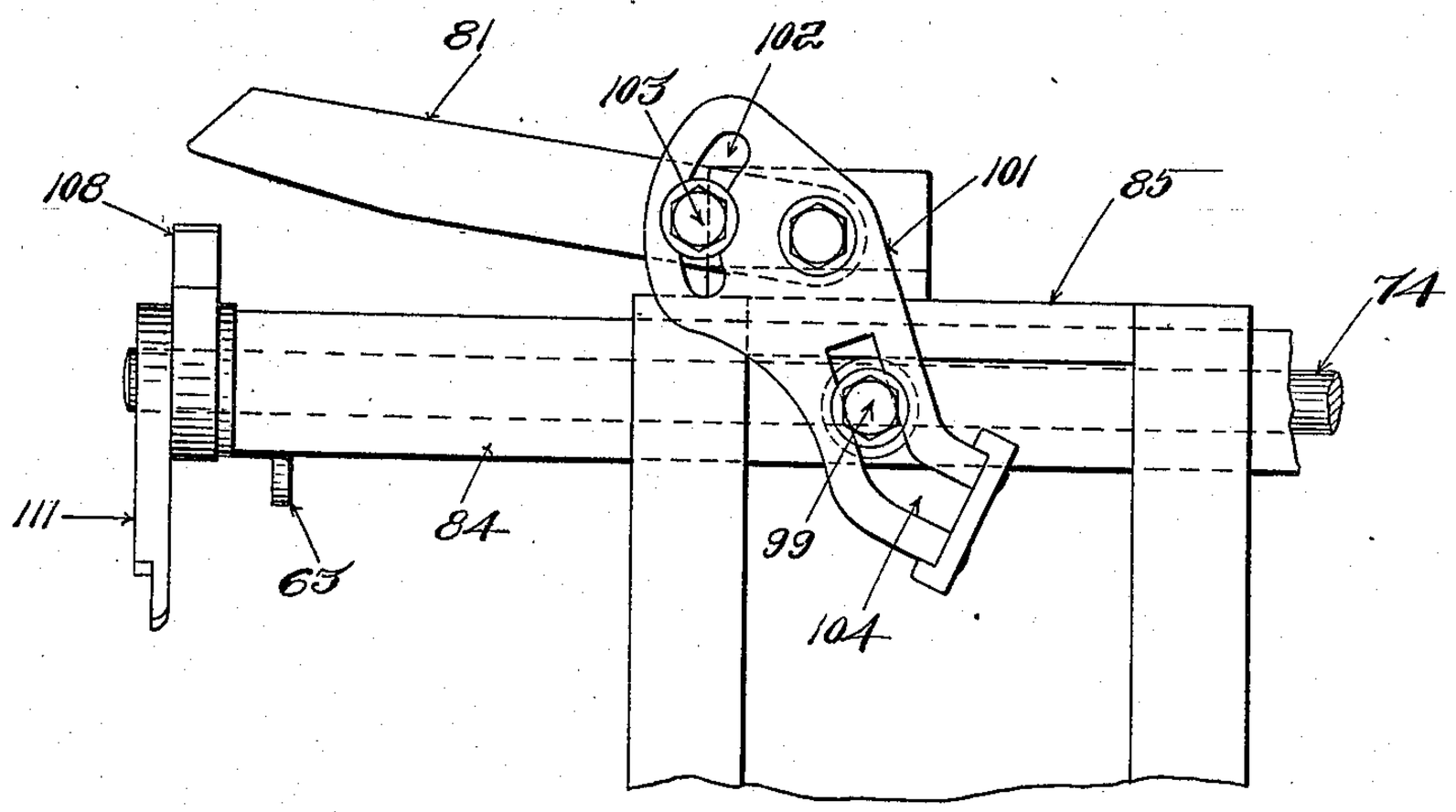

Fig. 13.

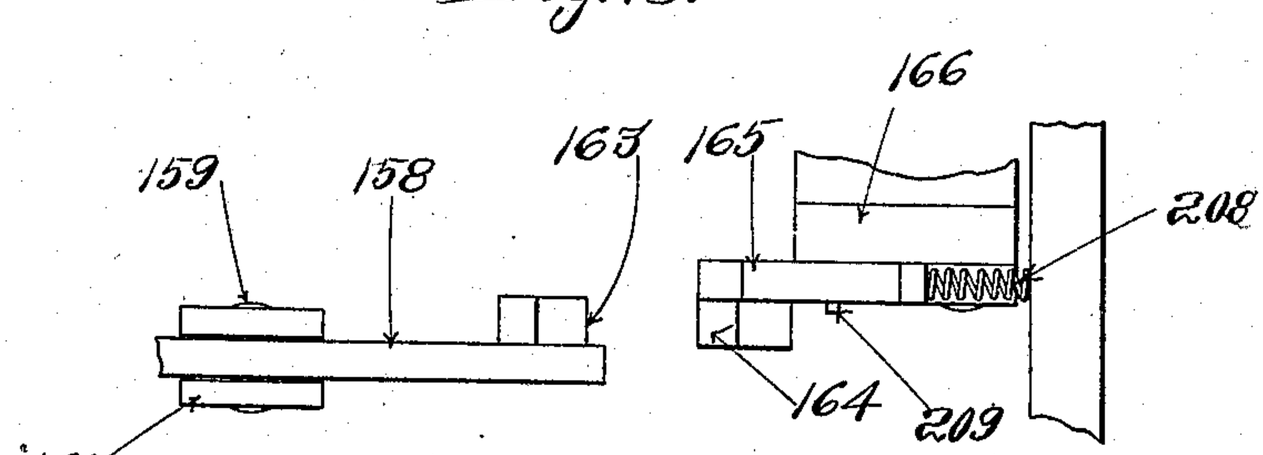

Fig. 14.

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UNITED STATES PATENT OFFICE.

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BRUSH-MACHINE.

No. 924,194. Specification of Letters Patent. Patented June 8, 1909.

Application filed May 8, 1908. Serial No. 431,583.

To all whom it may concern:

Be it known that I, HERMAN M. SCHWARTZ, citizen of the United States, residing at Northampton, in the county of Hampshire and State of Massachusetts, have invented a certain new and useful Improvement in Brush-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has for its object an improvement in machines for boring the bristle receiving holes in brush backs and for filling these holes with bristles and securing the bristles in place by means of a fastening device made from metal or similar material. These operations are sometimes called "drilling" and "plugging" respectively.

The embodiment of my invention shown in the accompanying drawings and hereinafter described is designed for use in the manufacture of tooth brushes, although as will be clear, a machine embodying my invention may be designed for the manufacture of other kinds of brushes.

My improved machine is shown as supplied with eight brush backs which are carried in pairs on a revolving carrier or support. One drill and one plugger is provided and one pair of brush backs is operated on at a time; one of these brush backs is drilled and another which has been previously drilled is plugged, these plugging and drilling operations being simultaneous. When the plugging and drilling operations for one pair of brush backs are completed, the revolving carrier or support moves through a quarter of a circle and presents another pair of brush backs to the drill and plugger. When the carrier has completed three-quarters of a revolution, the drilled back and the filled or plugged brush are removed by the operator, and a drilled back is put in place of the filled brush and an undrilled back or blank is put in the place of the drilled blank. This is the only manual operation required, and is performed without stopping the machine. It will be clear, therefore, that at each quarter turn of the carrier or support after it has completed its first revolution, a filled brush is removed by the operator. The drilling and plugging apparatus is relatively stationary while the carrier or support for the brush backs which is mounted upon a reciprocating carriage moves horizontally toward and from the drill and plugger so that the brush backs which are to be drilled are moved on to the drill, and the depth of the hole drilled may be regulated by regulating the length of movement of the reciprocating carriage. The machine, therefore, embraces two parts or coöperating mechanisms, (1) that which operates the drill and plugger, and supplies bristles and fastening devices to the plugger, which part as above stated is relatively stationary in the form of construction herein shown; and (2) what may be called the reciprocating portion of the machine which moves toward and from the drill and plugger and which embraces the revolving carrier or support for the brush backs, mechanism for revolving the carrier at predetermined times through a quarter revolution; mechanisms for moving the carrier horizontally while a pair of brushes is being drilled and plugged, and for moving the carrier vertically a distance equal to the distance between the rows when the end of a row has been reached, which mechanism also operates when the last tuft of bristles has been set in a brush back to move the holder vertically and position the mechanism properly for the beginning of the drilling and plugging operation in the next pair of brushes which are to be presented to the drill and plugger.

My invention is fully described in the following specification, reference being had to the accompanying drawings, and the novel features thereof are pointed out and clearly defined in the claims at the close of this specification.

While the machine shown in the accompanying drawings and described in this specification is of a specific form especially adapted to operate upon a tooth-brush of a particular description, yet it is obvious that machines embodying my invention may be employed in the manufacture of other kinds of tooth-brushes and of brushes for different purposes without the necessity of changes other than those which can be readily made by a person skilled in the art, and that such machines will be within the scope of the present invention.

In the drawings,—Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a side view of that part of the machine which carries or supports the brush-backs

and by means of which they are presented to the drill and the plugger so that the bristle-receiving holes may be drilled successively in one brush while simultaneously therewith in another brush which has been previously drilled, the bristle receiving holes are successively filled. Fig. 3 is a top view of the mechanism shown in Fig. 2. Fig. 4 is a side view of the mechanism shown in Fig. 2 viewed from the opposite side from that shown in said Fig. 2, and on a smaller scale. Fig. 5 is a rear view of the mechanism shown in Fig. 2. Fig. 6 is a longitudinal section. Fig. 7 is a plan view showing the brush-back carrier and its operating mechanism. Fig. 8 is a front elevation of the head which carries the brush-backs showing eight brush-backs in position. Figs. 9 and 10 are an elevation and a plan view respectively of the cam and connected mechanism which operates to position the brush carrying head vertically. Figs. 11 and 12 are respectively an elevation and plan of the cam and its operating mechanism which operates to position the brush carrying head horizontally. Fig. 13 is a detail of the pushing lever 81 and connected parts. Fig. 14 is a plan view of the rear end of the stop 158 and of the arm 165.

Having reference to Fig. 1, the drill is indicated at 1 and the nose of the plugger at 2. That portion of the machine with which the drill and plugger are connected, and which is shown in said figure to the left of the drill and plugger, I have referred to above as the stationary portion and while I have made improvements in this part of the machine, they form no part of my present invention, but are the subject of separate applications for Letters Patent. So far as the present application is concerned, the drill and plugger may be considered as operating in the well known manner.

My present invention relates to that portion of the machine which is shown in plan view at the right of the drill and plugger in Fig. 1.

I will first describe the mechanism by means of which the reciprocating carriage is moved back and forth to present the work to the drill and plugger for each hole that is drilled and each tuft of bristles which is set. It will be understod that this mechanism is distinct from the mechanism by means of which the carrier or brush support is moved in the plane at right angles to the drill and plugger to present the successive holes to the said drill and plugger, the movement of the reciprocating carriage being in a line with the axis of the drill and plugger.

Referring particularly to Figs. 2 and 6, at S is shown the stationary upright or standard upon which the machine is supported. T indicates a stationary table thereon to which is suitably secured a support for a driving pulley 43 and a casing 85. The foregoing comprise substantially the stationary parts, the other parts shown in Fig. 6 moving back and forth with the movable carriage. Within the casing 85, is a housing 84 preferably square in cross-section which reciprocates lengthwise within the said casing. At the forward end of the hosing 84 is secured the movable carriage 162 provided on its lower side with grooved members 83 which rest upon ways 831 upon the upper surface of the table T and support the carriage. Upon the carriage 162 is supported the disk shaped carrier 3 to which the brush backs are secured during the drilling and plugging operations. It will be seen that the reciprocating carriage is movable horizontally back and forth to present the carrier and the brush backs secured thereto to the drill and plugger at proper intervals. The reciprocation of the carriage 162 and attached parts is effected in the following manner:—Two arms 86 secured to the housing 84 and projecting downwardly therefrom carry between them a pivoted block 87 through which a connecting rod 88 passes. On the other side of the block 87 and on the rod 88 are fixed collars 89 and 90 which secure the rod to the block while at the same time permitting the rod to rotate in the said block 87. The rear end of the connecting rod is screw-threaded as shown at 91 and passes through a block 92 journaled in the upper bifurcated end of the vertical lever 93. Said lever 93 is pivoted on a rod 97 between projections 95 and 96 on the frame of the machine (see Fig. 4), and the said lever 93 is oscillated in any convenient manner as for instance by a cam or eccentric. As it is common in machines of this class to reciprocate the brush support by means of an oscillating lever actuated by a cam or eccentric, it has not been thought necessary to show said actuating means. From the foregoing it will be seen that the depth of hole drilled by the machine may be regulated as desired by rotating the connecting rod 88 by means of a thumb-nut 94 attached to the front end of the said connecting rod. The said reciprocating carriage 162 supports a shaft 74 which for convenience may be called the cam shaft. This cam shaft has a step-by-step rotation for about eight-ninths of its revolution, the remaining portion of the revolution being given to it continuously by means which will be later described. The step-by-step movement of the said cam shaft 74 is imparted to it in the following manner: On a fixed part of the frame of the machine is located a projection 176 against which one arm of a bell crank lever 173 strikes each time that the reciprocating carriage is moved back, the said bell crank lever being pivoted to the reciprocating carriage by means of a vertical stud 174. The other arm of said

bell crank lever 173 enters a slot or recess 175 in a dog 169 which is mounted on a stud 171 on the front wall of the reciprocating carriage. The dog 169 is slotted lengthwise at 170 so that it is free to slide on the said stud 171, whenever the bell crank lever is moved. The end of the dog 169 is formed into a point or prong which engages successively the teeth of the ratchet feed wheel 168. Every time the reciprocating carriage is moved back, the arm of the bell crank lever 173 comes in contact with the fixed projection 176 and the dog 169 is slid to the left as seen in Fig. 11, engaging one of the teeth of the ratchet wheel 168 and moving the wheel through a distance equal to one tooth. The dog 169 is returned to its original position by a spring 177 engaging a projection on the rear end of the dog. To prevent the ratchet wheel 168 moving back with the dog 169 after each forward movement, there is provided the hook shaped locking lever 178 the point of which engages one of the notches in the periphery of the ratchet 168. The said locking lever 178 is provided at its end with a point which projects within a notch in the dog 169. The locking lever 178 is pivoted at 179 on an upright of the reciprocating carriage 162 and is further provided with a handle 206 by means of which the operator may move said locking lever out of engagement with the ratchet wheel 168 and this same movement frees the point of the dog from engagement with the said ratchet wheel so that the operator may turn the shaft 74, the ratchet wheel 168 and attached parts by hand to any desired position should it become necessary. Said locking lever 178 is normally maintained in contact with the ratchet 168 by means of a spring 180, one end of which is fast to a stud 181 on the reciprocating carriage.

Having now outlined the construction of the machine and described the reciprocating carriage, the means by which it is moved and the means by which the cam shaft is given its step-by-step rotation, I will now describe in order the means for supporting or carrying the brush backs; for revolving the carrier to present successively the pairs of brush backs which are mounted thereon to the action of the drill and plugger; for moving the carrier or support horizontally to present the brush backs successively step by step to the drill and plugger, while a row of holes is being drilled in one brush back and a row of bristle tufts is being set in another brush back; and for moving the carrier or support vertically from one row of holes or bristles to the succeeding row, and when the last hole is drilled in one brush back and the last tuft of bristles set in the other brush back reversing the vertical movement of the carrier in order that the next pair of brush backs may be presented to the drill and plugger in the proper position to begin the operation of drilling and plugging over again.

The brush support or carrier is shown in elevation in Fig. 8. It comprises a disk 3, the periphery of which is provided with gear teeth 4. At the center of the disk-shaped carrier 3 is a hole 8 to receive the stud 7 (see Fig. 7) upon which the carrier 3 revolves, said stud being fast in a bar or strip 500 set in a slot or recess in the face of the plate 5. On the face of the carrier 3, I provide eight clamps, each of which is of substantially the same construction. I will describe the upper left hand clamp, Fig. 8, and this description will suffice for each of the other clamps. Two blocks or stops 9, 9, for the side of the brush back and a stop 11 for the end of the brush back are secured by screws 10, or in other suitable manner to the face of the carrier 3, and are so located thereon that when the brush back is brought into contact with them, as shown Fig. 8, it will be properly positioned. The other side of the brush back is in contact with a wedge shaped clamp 13 which is arranged to be forced inwardly between the side of the brush back and a stationary plate 14 which is secured by screws 15 to the face of the carrier 3. The plate 14 has an inclined and recessed side which is in contact with the correspondingly inclined side of the wedge 13 and prevents displacement of the wedge 13. The wedge 13 is provided with a lengthwise slot 16 of sufficient length to permit the wedge to be slid in and out of clamping position when a brush back is to be removed or placed in position. A stud 17 is set in the face of the disk 3 and projects through the slot 16 and by this means the wedge 13 is prevented from lateral displacement. For the purpose of operating the wedge 13, I provide a lever 18 pivoted at 19 to the face of the carrier 3. A link 20 is pivoted at one end, as shown at 21, to the lever 18 and at the other end as shown at 22 to the end of the wedge 13. The lever 18 is curved outwardly away from the carrier (see Fig. 6) just above the pivot 19, and also is curved in the plane of Fig. 8 at the free end as shown so that the lever may be swung over the brush back as shown for example at 23 and 24, and may be grasped by the fingers of the operator when the wedge 13 is to be operated for the purpose of releasing one brush back or of clamping another in position. By swinging the lever 18 to the left, see Fig. 8, the wedge 13 will be raised and the brush back which is there shown as clamped in position released.

In Fig. 8 the brush backs designated A and B are in the positions which they occupy when they are first placed in the machine. It will be noted that A is drilled and is ready to be "filled"; that is, to have the

bristles set therein, while B is an undrilled blank. The filling and drilling of the brush backs are always performed when the latter are in the positions occupied by the backs designated C and D, the movement of the carrier 3 being in the direction indicated by the arrow and each movement of the disk being a quarter revolution. The backs C and D are shown as being in process of being filled and drilled respectively, nine holes of the lower row of the back C having been filled with tufts of bristles and nine corresponding holes in the lower row of the blank D having been drilled. As the filling and drilling continues, the carrier 3 is moved bodily step by step toward the left (Fig. 8), each step being equal to the distance between two adjacent holes. Since both brush backs are supported by the disk 3, the spacing between the holes is always uniform and the plugger which sets the bristles registers accurately with the holes which are to be filled. When the hole at the right end of the lowermost row of holes in the back C has been filled, the carrier 3 is moved downward vertically a space equal to the space between the said hole and the hole directly above it at the right end of the second row of holes. The carrier 3 then moves step by step to the right (Fig. 8) until the hole on the other end of the row is filled (a corresponding row in the back D being simultaneously drilled) when another downward movement of the carrier occurs to position the plugger for the hole at the left end of the third row. Again the carrier 3 moves step by step to the left until this row has been filled, when another downward movement positions the plugger for the top row. The carrier again moves to the right step by step until the last hole in this row has been filled when the carrier 3 moves upward vertically a distance equal to the space between the hole at the left end of the uppermost row and the hole at the left end of the lowest row. Simultaneously with the last mentioned vertical movement the carrier 3 is revolved through a quarter revolution and the backs A and B are moved into position to be plugged and drilled. By the quarter revolution referred to, the backs E and F are moved into the position occupied in the said figure by the backs G and H and the backs G and H are, as will be clear, moved into the position occupied by the backs A and B. The operator now takes the backs G and H out of their clamps, the back G being filled and completed so far as the operation of this machine is concerned, and in condition to have the bristles trimmed and to be otherwise finished. After removing the filled back G and the drilled back H, the operator places an undrilled blank, such as is shown at B, in the clamp from which the drilled back H was removed and a drilled back, as shown at A, in the clamp from which the filled brush G was removed. At the next quarter revolution these two backs are swung into position to be acted upon by the driller and plugger, and the operation is repeated. This operation of replacing the filled brush and the drilled back by a drilled back and an undrilled back respectively is performed while the drill and plugger are doing their work, the backs which have come into position at the top of the carrier being removed, while those shown at C and D are being drilled and filled respectively. From the foregoing it will be seen that the drill and plugger are operating continuously, it not being necessary to stop the machine to remove and replace the brush backs. At each quarter revolution of the carrier 3, therefore, a brush which has been plugged or tufted is removed from the machine.

In connection with the description of the carrier 3 and the clamping devices mounted thereon, attention is called to the spring actuated strips or arms 25, four of which are located at substantially equi-distant points on the said carrier 3. These are each mounted on a short stud 26, (see Fig. 7), by means of a screw 27, said screw also passing through the end of the leaf-spring 28 which bears upon the arm 25, and which tends to press the said arm toward the face of the carrier. The free end of the said arm 25 rests upon the head 29 of a pin 30 which projects through the disk as shown more clearly in Fig. 7. The pins 30 are stop-pins and act successively, one at a time, to lock the carrier 3, after it has completed a quarter revolution, to the plate 5, and to hold the carrier in its place while the drilling and plugging operation is proceeding. The means employed for releasing these pins when the carrier 3 is to be revolved will be hereinafter described. Projecting over the head of each pin is a short arm 31 which is of the angular shape shown in Fig. 7, and provided with a base 32 which is secured to the face of the carrier 3. The said arm 31 serves as a stop to prevent the pin 30 from being pushed out of its socket or hole in the carrier 3 while at the same time permitting the pin to be pushed forward until its inner end is flush with the inner or rear face of the said carrier 3.

As above stated, when a brush back has been filled and its companion drilled, the disk-shaped carrier 3 is moved through a quarter revolution. This is accomplished by means of a gear 33, see Figs. 1, 3 and 4, which is mounted on the end of a shaft 34 journaled in an arm or projection 35 secured to the strip 500 which latter is set in the plate 5. The gear 33 is in front of the arm 35 and at the rear of said arm on said shaft 34 is a collar 36 which receives the end-thrust of the shaft and prevents the gear 33

from being displaced. The arm 35 is bolted to its support 500 in order that it may be detached should it be desired for any reason to remove the gear 33 for repairs or the like. The shaft 34 is provided on its rear end at 37 with a universal joint connection with the shaft 38. The shaft 38 is adapted to slide in a sleeve-shaft 39 so that the gear 33 and the shafts 34 and 38 with their universal connection 37 may move forward and back relatively to the sleeve-shaft 39 while at the same time power may be applied to revolve the gear 33. The sleeve-shaft 39 is slotted lengthwise as shown at 600, Fig. 3, and a pin 601 passes through said slot on to the shaft 38 so that the two shafts will revolve together. The forward and backward movement of the gear is due to its being mounted upon the reciprocating carriage of the machine which moves toward and from the drill and plugger at each time that a hole is drilled and a tuft of bristles set. The rear end of the sleeve 39 is provided with a universal joint connection 40 and is thereby connected with a shaft 41 which is journaled in an upright 42 secured to the stationary frame. The shaft 41 is provided with a pulley 43 through which power may be applied. The pulley 43 is provided with a spring and dog clutch of well known construction by means of which it may, when desired, be rendered fast or loose on the shaft 41. The mechanism by means of which this clutch is operated will be hereinafter described.

It will be clear that, through shaft 41, the gear 33 may be driven and the disk shaped carrier revolved, and that the distance through which the carrier revolves may be governed by the clutch which operates to render the pulley 43 fast or loose on its shaft. The mechanism for operating the said clutch, which is hereinafter to be described, is such as to permit the carrier 3 to be moved through a quarter revolution. When the said carrier has completed a quarter revolution, one of the locking pins 30, heretofore described, snaps into a socket or hole 44, Fig. 7, in the plate 5, and locks the carrier 3 in proper position for a pair of brush backs to be acted upon by the drill and plugger. During the greater part of the revolution of the carrier the pins 30 do not overlie the plate 5, and their ends, therefore, project beyond the rear face of the carrier. For the purpose of pushing them in so that they will be flush with the rear face of the carrier, before they reach the hole 44 in the plate 5 with which they engage, I form a groove 45 (see Fig. 7) in the plate 5 and in the path of the pins 30, said groove having an inclined bottom which, as the pin passes over it, will operate to push the pin in until it is flush with the face of the carrier 3. The continued revolution of the carrier moves the pin over the hole 44 and when this occurs the pin snaps into the hole and locks the carrier. Before the carrier can be again revolved the pin 30 must be freed from the socket 44, as will be clear. To effect this I provide a plunger 46 shown in Figs. 2 and 3. The forward end 47 of this plunger enters the hole 44 from the rear, see Fig. 3, and as the plunger is pushed forward, it pushes the pin 30 forward and frees it from the hole, thus unlocking the carrier 3. The plunger 46 is of less diameter at its forward end and its tip is slightly rounded to permit it to enter the hole 44 as will be clear from Fig. 3. The plunger is mounted to slide in guides formed in the blocks 48 and 49, see Figs. 2 and 3. Block 48 is secured to an upright portion of the reciprocating carriage and block 49 is a part of the upwardly projecting bracket 50 fast on the stationary frame of the machine. The plunger is formed to telescope, the forward part 46 thereof being adapted to slide into the rear part 51. The two parts are held extended by means of a spiral spring 52 which encircles the part 46 and is located between a collar 53 fast on the forward end of the rear portion 51 of the plunger and a collar 54 fast on the forward portion 46. The resistance of this spring 52 is such that it will not be compressed in the operation of the plunger in pushing the pin 30 out of its socket. In the forward movement, however, of the plunger the shoulder 605 thereon comes in contact with the block 48 which acts as a stop and the spring 52 prevents the rear end of the plunger continuing its forward movement due to the movement of the reciprocating carriage.

The plunger is moved forward at the proper time to push the pin 30 from its socket 44 by means of a lever 55, see Fig. 2. The upper end of the lever 55 is slotted, as shown at 56, to receive a pin 57 which projects through said slot and through the bifurcated rear end of the plunger, as will be clear from Figs. 2 and 3. The lever 55 is slotted lengthwise at 58 to receive the stud 59 which passes through the said slot 58 and is secured to an upright portion 60 of the stationary frame. By this arrangement as the lever 55 is swung on the stud 59, it may also move vertically as required. The lower end of the lever 55 is pivoted at 61 to a cam lever 62. This cam lever 62 might be termed a floating lever. It is provided with a cam 606 at its forward end which is in contact with a roll 64 set on a pin or stud 65 projecting from the vertical portion of the frame. As the lever is moved rearwardly, the cam 606 depresses its forward end. A plate 66 secured to the table 67 is placed outside of the forward end of said lever 62 and serves to insure the lever against displacement and

to keep it in contact with the roll 64. The rear end of the lever 62 is also provided with a cam surface 68 which is in contact with a roll 69 similar to the roll 64. The roll 69 is mounted on a stud or pin 70 which projects from an upright of the stationary frame and a plate 71 similar to the plate 66 is secured to the table 67 and to the horizontal top portion of the frame and serves to keep the rear end of the lever 62 in contact with the roll 69 and to prevent the lever from being laterally displaced. The lever 62 is held against the rolls 69 and 64 by means of a spiral spring 72 which is fast at one end to the rear end of the lever 62 and at the other to a stud 73 on the table or frame 67, as will be clear from Fig. 5. The movement of the lever 62 is substantially a horizontal movement and occurs only when it is necessary to actuate the plunger 46 and unlock the disk 3. The said lever 62 is therefore actuated only once for each pair of brush backs that are drilled and filled and its operation occurs when the drilling and filling operation has been completed. To effect this intermittent movement of the lever 62, I provide an arm 63, Fig. 5, which is fast on the shaft 74. This shaft makes one revolution while each pair of brushes is being acted upon and during each revolution of the shaft, the arm 63 is brought into position in front of a block 75 on the upper end of an arm 76 which is rigidly secured to the inner face of the lever 62 at the rear end thereof, as is shown more clearly in Fig. 5. The shaft 74 in addition to its revolving movement slides forward and back with each reciprocation of the head to carry the brush backs toward and from the drill and plugger and when the arm 63 comes into position in front of the block 75 the shaft 74 is in its forward position. As it moves backward the end of the arm 63 engages a notch 77, see Fig. 5, in the block 75 and carries back the block and the lever 62 with which the block is rigidly connected. As the lever 62 is carried back, its cam face 68 rides up on the roll 69 so that the rear end of the lever is raised as the lever is moved rearwardly. This upward movement of the rear end of the lever 62 operates after the lever has been moved a sufficient distance to the rear to raise the block 75 above the projecting end of the lever 63, thus freeing the block 75 from engagement with the arm 63 and thereby stopping the rearward movement of the lever 62. The said rearward movement of the lever 62 causes the upper end of the lever 55 to be swung forward, or to the left, Fig. 2, and forces the plunger 46 forward, freeing the pin 30 from its hole in the plate 5 and permitting the disk-shaped carrier 3 to be revolved. The levers 62 and 55 are returned to their original positions by means of a spiral spring 78, see Fig. 2, which is fast at one end to a stud or hook 79 near the upper end of the said lever 55, and at the other end to a stud 80 on top of the stationary frame. The said reverse movement is further helped by the pull of the spring 72 at the rear end of the lever 62 which has heretofore been described.

The operation of this part of the machine may be stated as follows:—Just before the time when the plunger 46 should unlock the carrier 3, the point of the arm 63 engages the block 75 on the lever 62 so that the backward movement of the reciprocating carriage pulls back the lever 62, thus forcing the plunger 46 into the hole 44 and driving out the pin. The point of the plunger is moved forward by this movement until it is stopped by the shoulder 605 coming in contact with the block 48, this forward movement of the plunger being just sufficient to release the locking pin. The revolution of the carrier 3 begins instantly after the pin has been released from the hole and at the same instant the plunger snaps back into its rear or normal position having been released from engagement with the arm 63 by the cam surface 68 riding up on the roll 69. The rearward movement of the plunger is a very quick movement because the forward end must be out of the hole 44 before the next stop pin on the carrier 3 reaches the hole and the time before the stop pin reaches the hole is very short owing to the comparatively quick movement of the carrier. As will be clear, the plunger must not release the carrier until just the instant of time when it is to be caused to revolve by the actuating mechanism and the plunger must remain in the hole 44 until the revolution of the carriage has begun so that the locking pin will not snap back again into the hole. As soon as the arm 63 is free from engagement with the block 75 as above described, the shaft 74 is caused to revolve quickly through about one-ninth of a revolution, swinging the arm 63 upwardly, so that in the reciprocating movement of the shaft 74 in the forward direction, the said arm 63 will not come into contact with the block 75. This partial revolution of the shaft 74 referred to is effected by means of a pushing lever 81, see Figs. 4 and 13. Said lever 81 is mounted on a rocking lever 101 pivoted at 99 to the casing 85 on the stationary frame of the machine. The lever 101 is of the shape shown in Fig. 13 and is provided with a curved slot 102 and a screw clamping stud 103 by means of which the position of the pushing lever 81 with relation to the lever 101 may be adjusted as desired. The said lever 101 is also provided at its lower end with a cam slot 104, through which projects a cam follower in the form of a stud 99 set in the housing 84 and movable therewith to rock the said lever 101. Both of the levers 81 and 101 move as a solid

piece, although capable of relative adjustment by slot 102 and stud 103 as described. As the reciprocating housing 84 is moved to the right in Fig. 13, the stud 99 will cause the free end of the lever 81 to move down and strike the lever 108 which is fast on shaft 74 if the latter is in the path of movement of the said lever 81 which occurs at one point in the revolution of the said lever 81. When the pushing lever 81 strikes the lever 108, it pushes the lever 108 around and causes a partial revolution of the said shaft 74 and attached parts. The rotation of the shaft 74 moves the arm 63 out of contact with the block 75 on the cam lever 62. About eight-ninths of the revolving movement of the shaft 74 which actuates the cams which position the carrier is an intermittent step-by-step movement corresponding with the step-by-step movement of the brush back holder, but the partial revolution of said shaft just referred to takes place all at once after the operations on a pair of brush backs have been completed, and while the next pair is being shifted into position to be acted upon. At this time also the brush back carrier is raised vertically to proper position to begin the drilling and plugging of the next pair of brushes. The rotation of the disk-shaped carrier 3 through a quarter revolution to present the next pair of brush backs to the drill and plugger (one pair having already been completed) is effected by operating the clutch of the pulley 43, as follows: The pulley 43 is provided with a shipper lever 116 held in engagement with a notch 203 in the clutch disk 120 by a spring 128. Said shipper lever 116 is provided at its other end with a block 115 provided with an inclined or cam face. There is also provided a slide 113 having on its rear end a block 114 having a cam face corresponding to the cam face on the block 115. The slide 113 has also near its rear end a horizontally projecting stud 117 carrying a block 112; said slide 113 is normally maintained in a forward position by means of a spiral spring 125.

The step-by-step rotation of the shaft 74 while a pair of brush backs are being operated upon brings the lever 111 fast on the shaft 74 (see Figs. 3 and 5) into the position there shown with its free end in front of the block 112 on the slide 113 so that the next rearward movement of the shaft 74 carries the slide 113 backward and causes the cam shaped block 114 to engage the corresponding cam shaped block 115 on the shipper lever 116 and trip the said lever 116 thereby releasing the clutch disk 120, which is thereupon turned by the pulley 43 and makes one revolution, being stopped at the end thereof by the engagement of the shipper lever 116 with the notch in the clutch disk 120. The carrier 3 is thereby given one-fourth of a revolution, that being the amount which is caused by a complete revolution of the gear 33. The backward movement of the shaft 74 which causes the arm 63 to engage the block 75 thereby driving out the pin 30 and releasing the carrier 3 is the same movement which causes the lever 111 to pull back the slide 113 and trip the shipper lever 116, thus setting in motion the pulley 43 and the carrier 3. In the next reverse or forward movement of the shaft 74, the pushing lever 81 descends and contacts with the arm 108 on the shaft 74 giving the shaft a small portion of a revolution and moving the lever 111 out of contact with the slide 113.

The mechanism heretofore described comprises the reciprocating carriage, the cam shaft and the actuating means for them, the revoluble disk-shaped carrier which carries four pairs of brush backs, the means for moving said disk through a quarter revolution to present a new pair of brush backs to the drill and plugger when the drilling and plugging operations on the previous pair have been completed, and the mechanism employed to lock the disk in place while the drilling and plugging operation is proceeding. It remains to describe the means by with the brush back carrier 3 is shifted step by step horizontally and vertically to present the two brush backs properly to the drill and plugger to drill and fill the entire series of holes. These horizontal and vertical movements of the carrier are obtained by means of cams on the shaft 74, and to permit the carrier 3 to be thus horizontally and vertically moved, it is supported by a slide or plate which is free to move vertically and which in turn is mounted upon a second slide or plate which is free to move horizontally. The arrangement of the said plates or slides is clearly shown Figs. 3 and 6, the vertical slide being there numbered 5 and the horizontal slide 152. The vertical movable slide 5 supports the carrier 3 and is mounted in guides or ways 130 and 131. The rear face of the said slide 5 near the top thereof is slotted transversely as indicated at 132 to receive a roll 201 on a projection 133 on the forward end of the lever 134. The slot 132 permits the slide 5 and carrier 3 to move horizontally relatively to lever 134 and at the same time to be moved up and down by the action of the said lever. This lever 134 is pivoted at 135 to an upright 136 fast on the bracket 137 which is mounted on the housing 84. The lever 134 is provided with a downwardly projecting arm 138 pivoted at 139 to the lever, and its lower end is bifurcated to receive a roll 140. The roll 140 rests upon a cam 141 which is fast on the shaft 74 and is held in contact therewith by the weight of the carrier 3, the slide 5, the lever 134 and connected parts. As will be clear, the roll 140 being in contact with the periphery of the revolving cam will raise

and lower the lever 134, and consequently the slide 5 and brush back carrier will be raised or lowered in accordance with the shape of the cam.

The cam 141 just described operates to raise or lower the carrier 3 and the brush backs thereon between the successive rows of bristles, this being the so-called vertical movement of the carrier. The cam which effects the horizontal step-by-step movement of the carrier from hole to hole of the same row of holes is shown in elevation at 151 in Fig. 11 and is fast on shaft 74, being located at the extreme left of the shaft as seen in Fig. 6 and directly behind the horizontal slide 152. This slide 152 moves in dove-tailed guides or ways 153 and 154 in the vertical frame 155 of the reciprocating carriage. On the rear face of the said sliding plate 152 is set a stud carrying a cam roll 156. The position of the roll 156 with relation to the cam 151 will be clear from Fig. 11, and this roll is held in contact with the periphery of the cam by a spiral spring 186, see Fig. 7, one end of which is fast to a stud 187 on the reciprocating carriage and the other to a projection 188 from the slide 152. From the foregoing it will be seen that the slide 152 is moved in one direction by the cam 151 and in the reverse direction by the said spring 186.

The shape of the cam 151 is clearly shown in Fig. 11. As has been previously stated, the shaft 74 is given a step by step rotation during about eight-ninths of its rotation. The cam 151 shown in Fig. 11 by means of which the carrier is given its horizontal movement and the cam 141 in Fig. 9 by means of which the carrier is given its vertical movement are shown in the said figures in the positions which they occupy when the machine is about to begin the operation of drilling one brush back and filling another. The drill and plugger preferably begin with the two holes 143 and 144 in Fig. 8. The step-by-step rotation of shaft 74 moves the slide 152 to the left (viewing the machine from the front, *i. e.* the bottom of the sheet of Fig. 3) until the holes in the lowest row have been drilled. When the end of that row is reached, the cam roll 140, having reached the notch 202 in the cam 141, drops onto the next level of the cam, thereby lowering the carrier a distance equal to that between the first and second rows of bristles in the brush. This lowering movement of the carrier takes place while the cam roll 156 is in contact with the portion of the cam 151 at the top in Fig. 11. A continued rotation of the shaft 74 moves the horizontal slide and carrier back again as the holes are drilled in the second row. During this movement the carrier is stationary so far as its vertical movement is concerned, the roll 140 being at this time on the surface of the cam 141 between the notch 202 and the notch 204. At the end of the row, the roll 140 drops into the notch 204 and the horizontal slide and carrier are moved to the left again by the cam 151 to set the third row of bristles. At the end of the third row of bristles, the cam 140 drops down at the notch 205 lowering the carrier the requisite distance, and then the said carrier is moved backward to set the fourth row of bristles. This completes the work of drilling and filling one brush, and it is then necessary for the machine to be returned to its original position. This is accomplished by the rotation of the shaft 74 through the remaining portion of the revolution which is that portion lying between point 206 and point 207, (Fig. 9). During this time the carrier is lifted the distance between the top row and the bottom row of holes.

It will be clear that the shaft 74 must be prevented from movement and locked securely in position during the time that a hole is being drilled and a tuft of bristles being set. To thus lock the said shaft, I provide a ratchet 157, see Figs. 6 and 9, which is fast thereon, and is engaged by a stop 158. The forward end of the said stop 158 is turned at right angles as shown in Fig. 6 and is beveled as shown at 200, Fig. 9, so that it will project between the teeth of the ratchet and will serve while in engagement therewith to prevent the ratchet 157 and consequently the shaft 74 from moving backward. The stop 158 is pivoted at 159 in the upper bifurcated end of an upright 160 which is fast on a rearward projection or bracket 161 secured to the reciprocating carriage 162. The rear end of the stop 158 is offset and beveled as shown at 163, (see also Fig. 14), and when the reciprocating carriage moves rearwardly, the inclined face 163 engages a correspondingly inclined and offset projection 164, (see also Fig. 14), on an arm 165 pivoted to the stationary upright 166, and normally maintained in the position shown in Fig. 6 by a spring 208 and a pin 209. As the reciprocating carriage reaches the end of its rearward movement, the inclined surfaces 163 and 164 are brought into contact and the pawl 158 is freed from engagement with the ratchet 157. By the further movement of the carriage, the inclined surface 163 passes off the inclined surface 164, causing the front end of the stop to engage the ratchet 157, said stop being moved upward by means of the leaf spring 167 secured on top of the support 160. During the forward movement of the carriage, the inclined surface 163 passes under the offset portion of the arm 165 and the said arm rises slightly compressing the spring 208 to allow the stop 158 to move forward. By this means the ratchet 157 and consequently the shaft 74 are free to revolve when the reciprocating

carriage is approaching its rearmost position after a hole has been drilled and a tuft of bristles set. When the pushing lever 81 strikes the lever 108, as previously described, and revolves the shaft 74 through about one-ninth of a revolution, the pawl 158 is held from impeding the movement of the ratchet by means of the smooth portion of the rim of the said ratchet 157.

I claim as my invention:—

1. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a revolving carrier for the brush backs, mechanisms for revolving said carrier, for moving it toward and from the drill and plugger, for positioning it vertically, and for positioning it horizontally to properly present the brush back to the drill and plugger.

2. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a revolving carrier for the brush backs, mechanism for revolving said carrier, mechanisms for positioning it vertically and horizontally to present the brush back properly to the drill and the tuft-setting mechanism, and mechanism to cause the said drill and tuft-setting mechanism and the said carrier to approach each other to drill the holes and to set the tufts of bristles.

3. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a revolving carrier for the brush back, mechanism for revolving said carrier, mechanisms for moving said carrier in two directions in a plane at right angles to the drill and tuft-setting mechanism to present the drill and tufter to the brush back to drill the holes and set the bristles, and mechanism to cause the said drill and tuft-setting mechanism and the said carrier to approach each other to drill the holes and set the bristles

4. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a revolving carrier for the brush back, mechanism for revolving said carrier, mechanisms for moving said carrier in two directions in a plane at right angles to the drill and tuft-setting mechanism to present the drill and tufter to the brush back for the successive holes and tufts of bristles, and mechanism to reciprocate the said carrier in the line of the axis of the said drill and tufter.

5. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a carrier for supporting the brush backs and for causing them to travel in an orbit, mechanism for revolving the brush backs in their orbit, mechanisms for moving the carrier toward and from the drill and plugger, for positioning it vertically, and for positioning it horizontally to properly present the brush backs to the drill and plugger.

6. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a carrier for supporting the brush backs and for causing them to travel in an orbit, mechanism for revolving the brush backs in their orbit, mechanisms for moving the carrier toward and from the drill and plugger, and for moving it in two directions in a plane at right angles to the drill and plugger to properly present the brush backs to the drill and plugger.

7. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a carrier, automatic means for moving said carrier to present successive pairs of brush backs to the drilling and tuft-setting mechanisms, and a series of clamps for the brush backs on the said carrier arranged in pairs in positions such that the movement of the said carrier shall present the pairs of brush backs successively to the drilling and tuft-setting mechanisms.

8. In a brush making machine and in combination with drilling and tuft-setting mechanisms, a carrier, means for revolving said carrier to present successive pairs of brush backs to the drilling and tuft-setting mechanisms, a series of clamps for the brush backs on the said carrier arranged in pairs in positions such that the movement of the said carrier shall present the pairs of brush backs successively to the drilling and tuft-setting mechanisms, and independent means for moving the said carrier in two directions in a plane at right angles to the drilling and tuft-setting mechanisms to properly present a pair of brush backs to be drilled and tufted.

9. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted on said carriage, cams to move the carrier in two directions in a plane at right angles to the drilling and tuft-setting mechanisms, and locking means to hold the carrier from rotation during the drilling and tufting operation.

10. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted on said carriage, means for giving to the carrier a partial revolution after the completion of the operation on a pair of brush backs, a pair of clamps on said carriage to hold the brush backs which are in operative position, and other clamps for holding brush backs in non-operative positions.

11. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted on said carriage,

means for giving to the carrier a partial revolution after the completion of the operation on a pair of brush backs, a pair of clamps on said carriage to hold the brush backs which are in operative position, and other clamps for holding brush backs in non-operative positions, said last mentioned clamps being located on said carrier in positions to be brought into operative position by the revolution of said carrier.

12. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted on said carriage, clamps in pairs on said carrier for holding the brush backs some in operative and some in inoperative position, and locking means for securing the carrier from rotation as each pair of clamps is brought into operative position by the rotation of the carrier.

13. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted on said carriage, clamps in pairs on said carrier for holding the brush backs some in operative and some in inoperative position, cams on said carriage for moving said carrier in two directions in a plane at right angles to the drilling and tuft-setting mechanisms, and locking means to hold the carrier from rotation during the drilling and tufting operation.

14. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted on said carriage, clamps in pairs on said carrier for holding brush backs, one pair in operative and the others in inoperative position, locking means to hold the carrier from rotation during the drilling and tufting operation, cams for moving said carrier in two directions in a plane at right angles to the drilling and tuft-setting mechanisms to present the successive holes to the tufter, and means acting between the successive cycles of operation of the cams to cause said carrier to revolve and present a new pair of brush backs in position to be operated upon.

15. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a revolving carrier for the brush backs, a reciprocating carriage for causing said drilling and tuft-setting mechanisms and said carrier to approach each other, a constantly rotating element and a clutch intermediate said constantly rotating element and said carrier to cause said carrier to be rotated by said element when the clutch is operated.

16. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier for the brush backs supported on said carriage, a constantly rotating element, a clutch intermediate said constantly rotating element and said carrier to cause said carrier to be rotated when the clutch is operated, and locking means to limit the rotation of said carrier and hold the carrier from rotation between the successive actuations of said clutch.

17. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier for the brush backs supported on said carriage, a constantly rotating element, a clutch intermediate said constantly rotating element and said carrier to cause said carrier to be rotated when the clutch is actuated and cams on said carriage for moving said carrier in two directions in a plane at right angles to the drilling and tuft-setting mechanism between the intervals of rotation caused by the actuation of said clutch.

18. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier for the brush backs supported on said carriage, a constantly rotating element, a clutch intermediate said constantly rotating element and said carrier to cause said carrier to be rotated when the clutch is actuated, cams on said carriage for moving said carrier in two directions in a plane at right angles to the drilling and tuft-setting mechanism between the intervals of rotation caused by the actuation of said clutch, and locking means to limit the rotation of said carrier and to hold the carrier from rotation during the movement of the carrier by the said cams.

19. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a rotating carrier mounted on said carriage and a pin adapted to engage said revolving carrier and a non-rotating part of said carriage and to hold said carrier from rotation when said pin is in engagement with the said carrier and the said non rotating part of the said carriage.

20. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a rotating carrier mounted on said carriage, said carrier and said non rotating member being provided with registering holes, a pin in one of said holes, and a spring acting upon said pin and tending to cause it to enter the hole in the other member when two of the said holes are in registration with each other.

21. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier for the brush backs supported on said carriage, a constantly rotating element, a clutch intermediate said rotating element and said carrier to cause said carrier

to be rotated when the clutch is operated, a spring actuated pin in a hole in said revolving carrier and normally in engagement with a registering hole in a non rotating portion of said reciprocating carriage and releasing means operating just prior to the operation of said clutch to withdraw the said pin from the hole in the said non rotating element to permit said carrier to rotate when the said clutch is actuated.

22. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a rotatable shaft in said carriage, a revolving carrier for the brush backs mounted on said carriage, an arm on an end of said shaft, a constantly rotating element, a clutch intermediate said constantly rotating element and said carrier to cause said carrier to be rotated when the said clutch is operated, a clutch arm to actuate said clutch, said clutch arm being in the path of movement of the arm on said rotatable shaft so that said clutch lever is engaged by said arm once for each rotation of the said rotatable shaft.

23. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier thereon, a cam shaft, ratchet and pawl mechanism for causing said cam shaft to rotate step by step during a part of its cycle of rotation, an arm on said cam shaft, and a pusher arm contacting with said first mentioned arm to cause the said cam shaft to move continuously through the remaining part of its cycle of rotation.

24. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a rotatable shaft mounted on said reciprocating carriage, a revolving carrier for the said brush backs mounted on said carriage, locking means to prevent the rotation of the said carrier at predetermined intervals and releasing means for said locking means.

25. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a rotatable shaft mounted on said reciprocating carriage, a revolving carrier for the said brush backs mounted on said carriage, an arm on one end of said rotatable shaft, locking means to prevent the rotation of the said carrier at predetermined intervals and releasing means for said locking means actuated by said arm on said rotatable shaft once for each rotation of said shaft.

26. In a brush-making machine, the combination with drilling and tuft-setting mechanisms, a revolving carrier mounted on a reciprocating carriage and locking means to prevent the revolution of the carrier at predetermined intervals, of releasing means for the said locking means comprising a telescoping rod mounted at one end on a fixed part of the machine and at the other on the reciprocating carriage, and actuating means for the said telescoping rod.

27. In a brush-making machine, the combination with drilling and tuft-setting mechanisms, a revolving carrier mounted on a reciprocating carriage and a locking pin to prevent the revolution of the carrier at predetermined intervals, of releasing means for said locking pin comprising a telescoping rod slidably mounted at one end on a fixed part of the machine and at the other on the reciprocating carriage, a pivoted link to reciprocate the said telescoping rod, a floating lever connected to said pivoted link, and means operated at predetermined times to actuate said floating lever and operate the said telescoping rod.

28. In a brush-making machine, the combination with drilling and tuft-setting mechanisms, a revolving carrier, a reciprocating carriage, a cam shaft, mounted on said carriage and locking means to prevent the revolution of the carrier at predetermined intervals, of releasing means for said locking means comprising a telescoping rod slidably mounted at one end on a fixed part of the machine and at the other on the reciprocating carriage, a pivoted link to reciprocate the said telescoping rod, a floating lever connected to said pivoted link and having a projection thereon, and an arm on said cam shaft which engages said projection once for each rotation of the said cam shaft and thereby actuates the telescoping rod through the intermediate connections.

29. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a shaft mounted therein, an arm on one end of said shaft, a revolving carrier mounted on said reciprocating carriage, locking means to prevent rotation of said carrier at predetermined intervals comprising a spring actuated pin in a hole in said carrier adapted to engage a registering hole in a non rotating part of said reciprocating carriage and releasing means for said locking means comprising a sliding pin adapted to be actuated by said arm on said rotatable shaft once for each rotation of said shaft to push said pin out of the hole in the said rotating part of the said reciprocating carriage.

30. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted thereon, a rotatable shaft in said carriage, cams on said shaft to move the said revolving carrier in two directions in a plane at right angles to the line of movement of said carriage, a ratchet on said shaft and actuating means therefor comprising a slidable dog, a bell crank lever, one arm of which engages said dog, and a projection on a fixed part of the frame of

the machine and contacting with the other arm of said bell crank at each reciprocation of said carriage to cause the said dog to slide and to move the said ratchet and attached parts.

31. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted thereon, a rotatable shaft in said carriage, cams on said shaft to move the said revolving carrier in two directions in a plane at right angles to the line of movement of said carriage, a ratchet on said shaft, a pawl to actuate said ratchet in one direction, and a locking lever to prevent the rotation of said ratchet in the reverse direction.

32. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier mounted thereon, a rotatable shaft in said carriage, cams on said shaft to move the said revolving shaft in two directions in a plane at right angles to the line of movement of said carriage, a ratchet on the said shaft, a pawl to actuate said ratchet in one direction, and a locking lever to prevent the rotation of said ratchet in the reverse direction, said locking lever engaging said pawl so that the said pawl is moved out of contact with the said ratchet whenever the said lever is moved out of contact.

33. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier for the brush backs mounted on the said carriage, a constantly rotating element on a fixed portion of the machine and sliding connections between the said carrier and the said constantly rotating element whereby the said carrier may be revolved by the said constantly rotating element regardless of the position of the reciprocating carriage.

34. In a brush-making machine and in combination with drilling and tuft-setting mechanisms, a reciprocating carriage, a revolving carrier for the brush backs mounted on the said carriage and having gear teeth in its outer edge, a gear in engagement therewith, a constantly rotating shaft on a fixed portion of the machine, the center of said shaft being out of line with the center of said gear, and a sliding connection provided with a universal joint between said constantly rotating shaft and said gear whereby change in position of the carrier caused by the reciprocation of the carriage may not interfere with the rotation of the carrier by the constantly rotating element.

In testimony whereof I affix my signature, in presence of two witnesses.

HERMAN M. SCHWARTZ.

Witnesses:

WILLIAM A. MACLEOD,

ALICE H. MORRISON.