

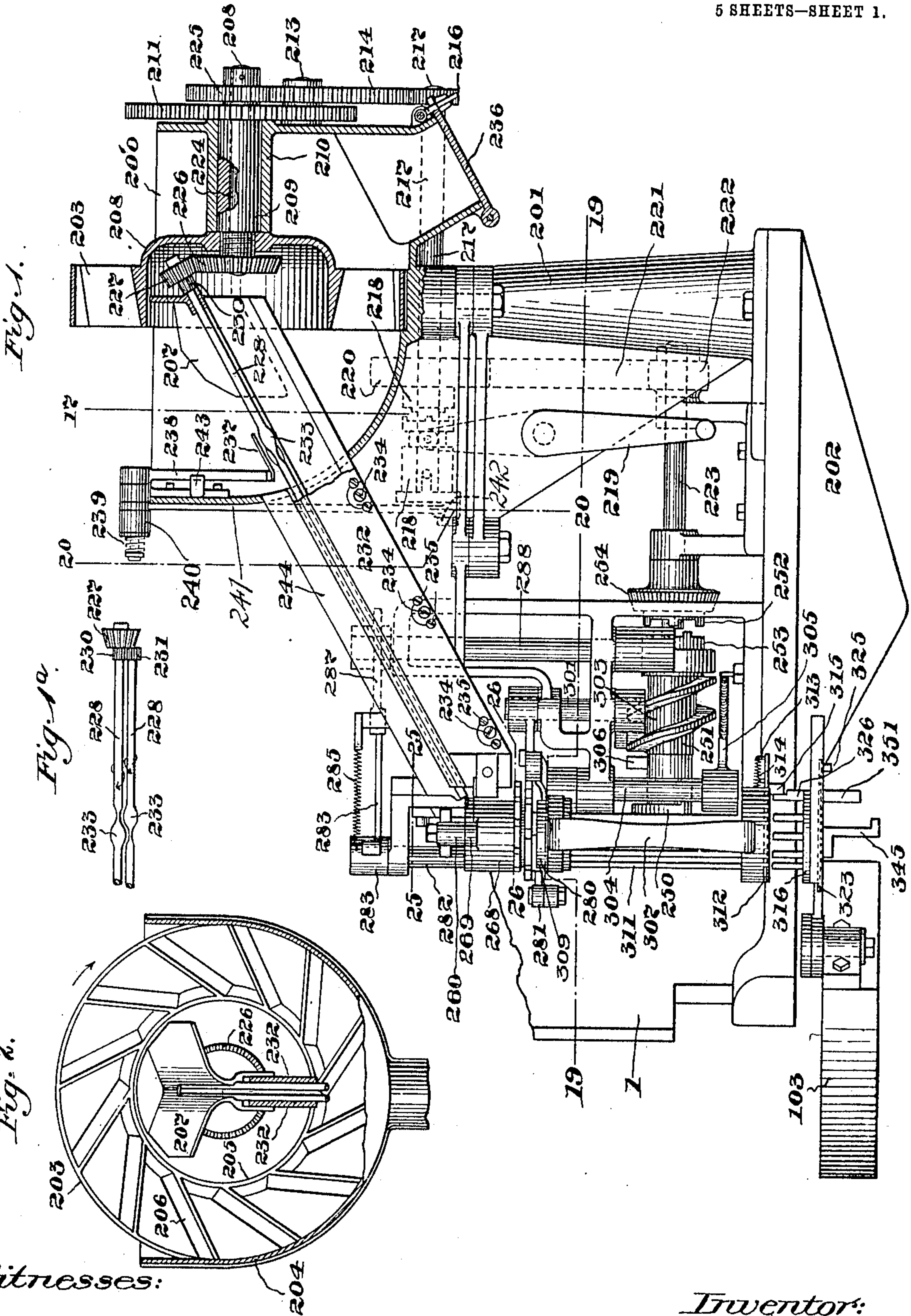
E. WOODWARD.
HEEL NAILING MACHINE.

APPLICATION FILED JULY 14, 1905. RENEWED NOV. 22, 1909.

947,366.

Patented Jan. 25, 1910.

5 SHEETS—SHEET 1.



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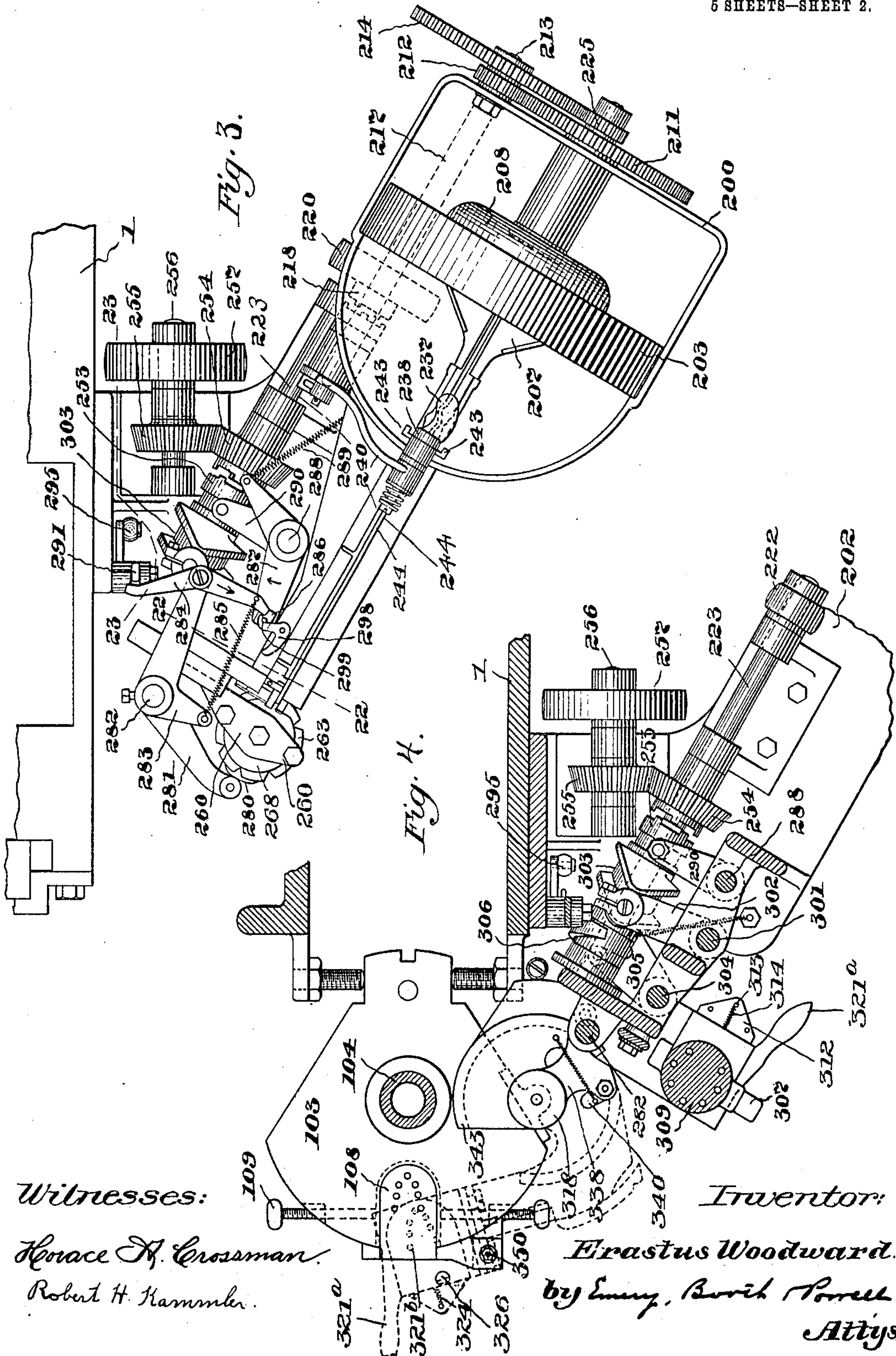
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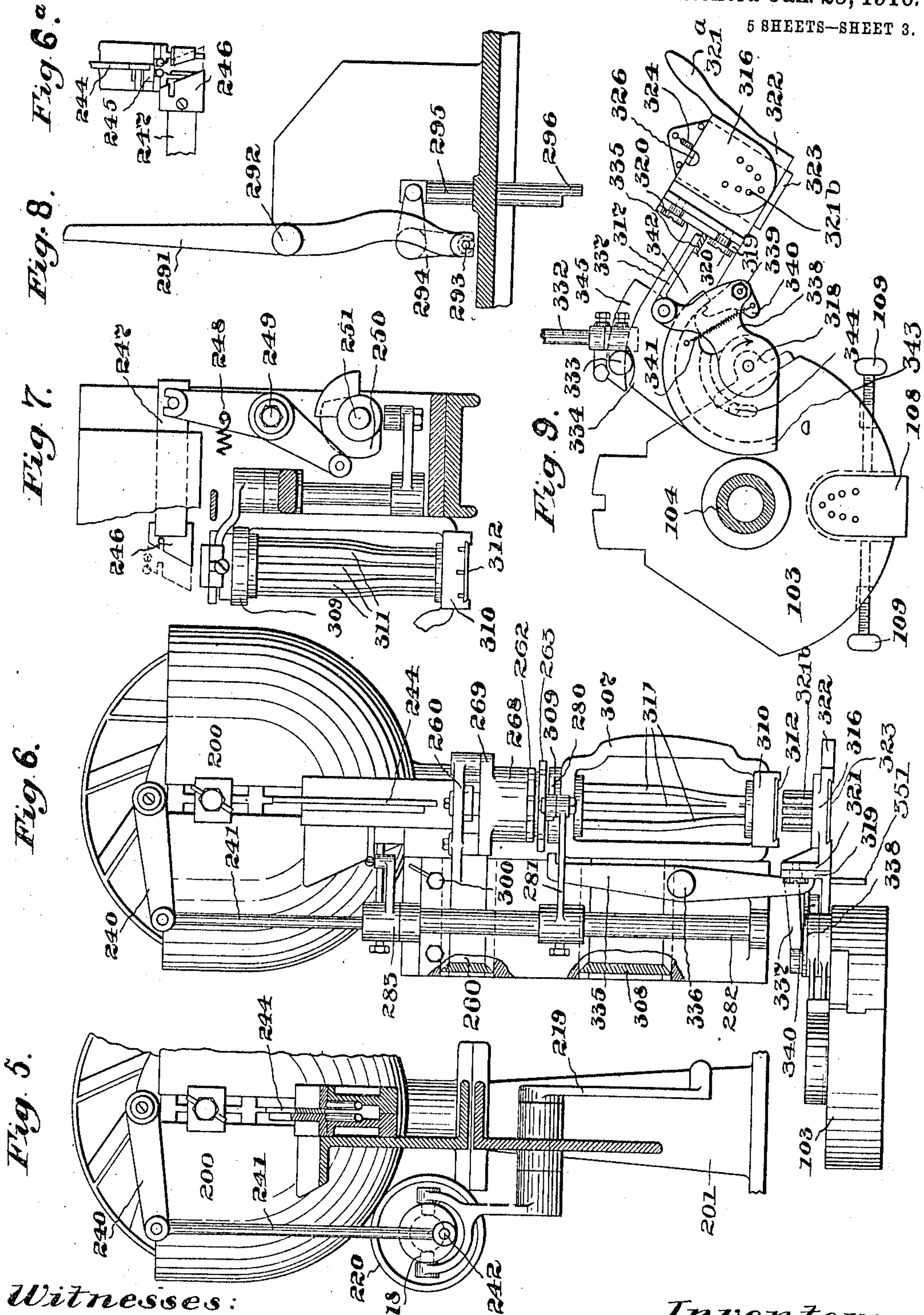
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5 SHEETS—SHEET 3.



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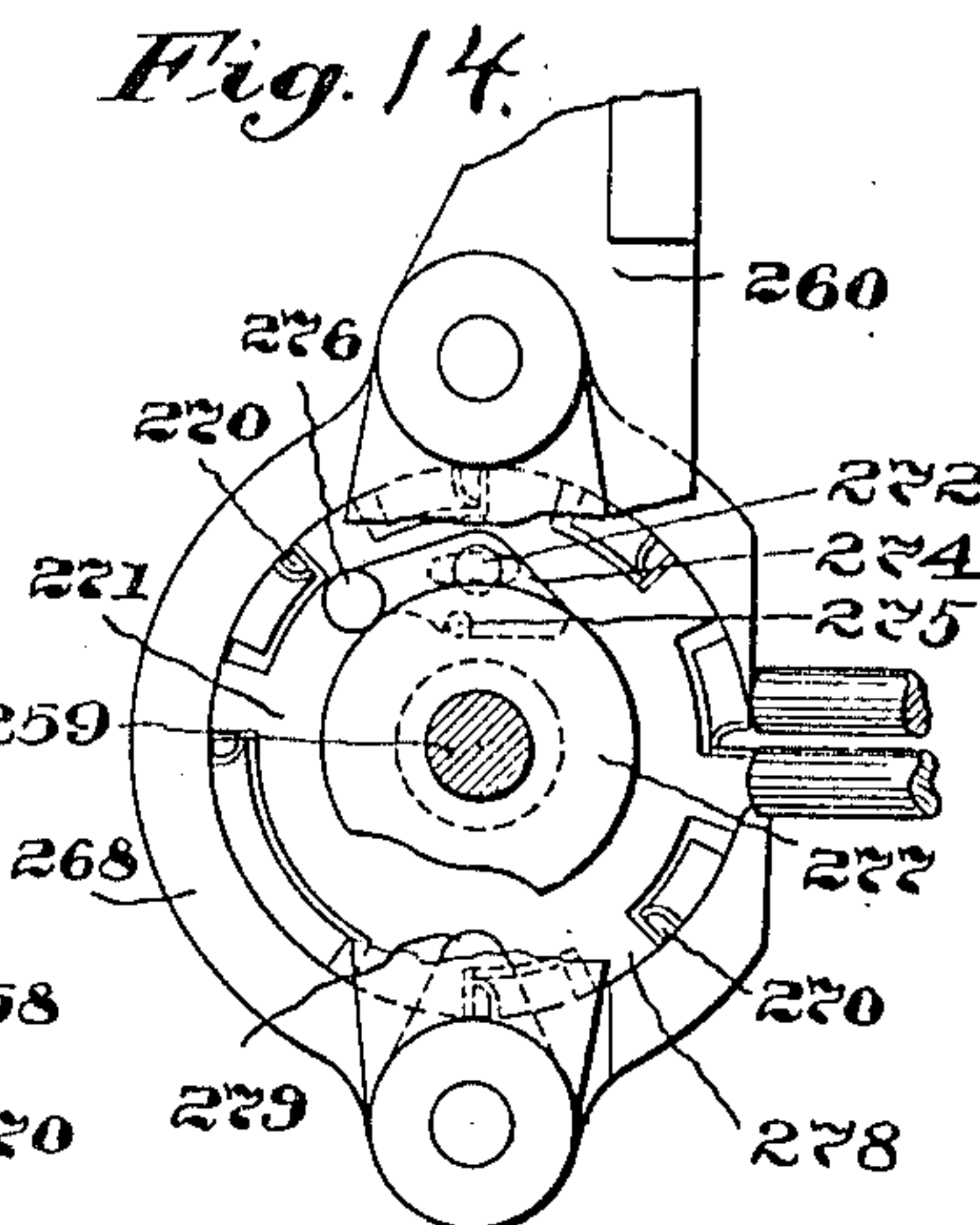
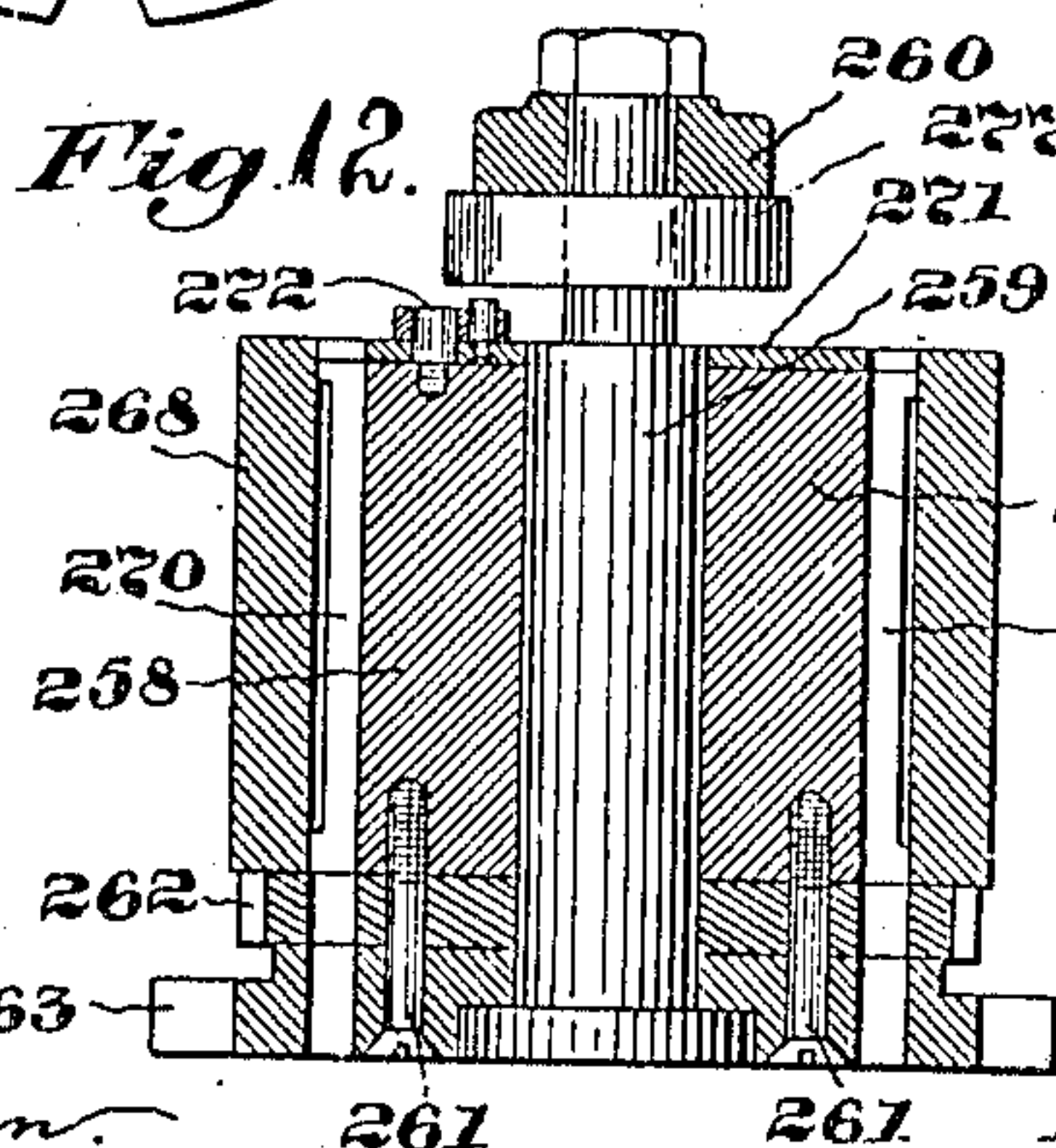
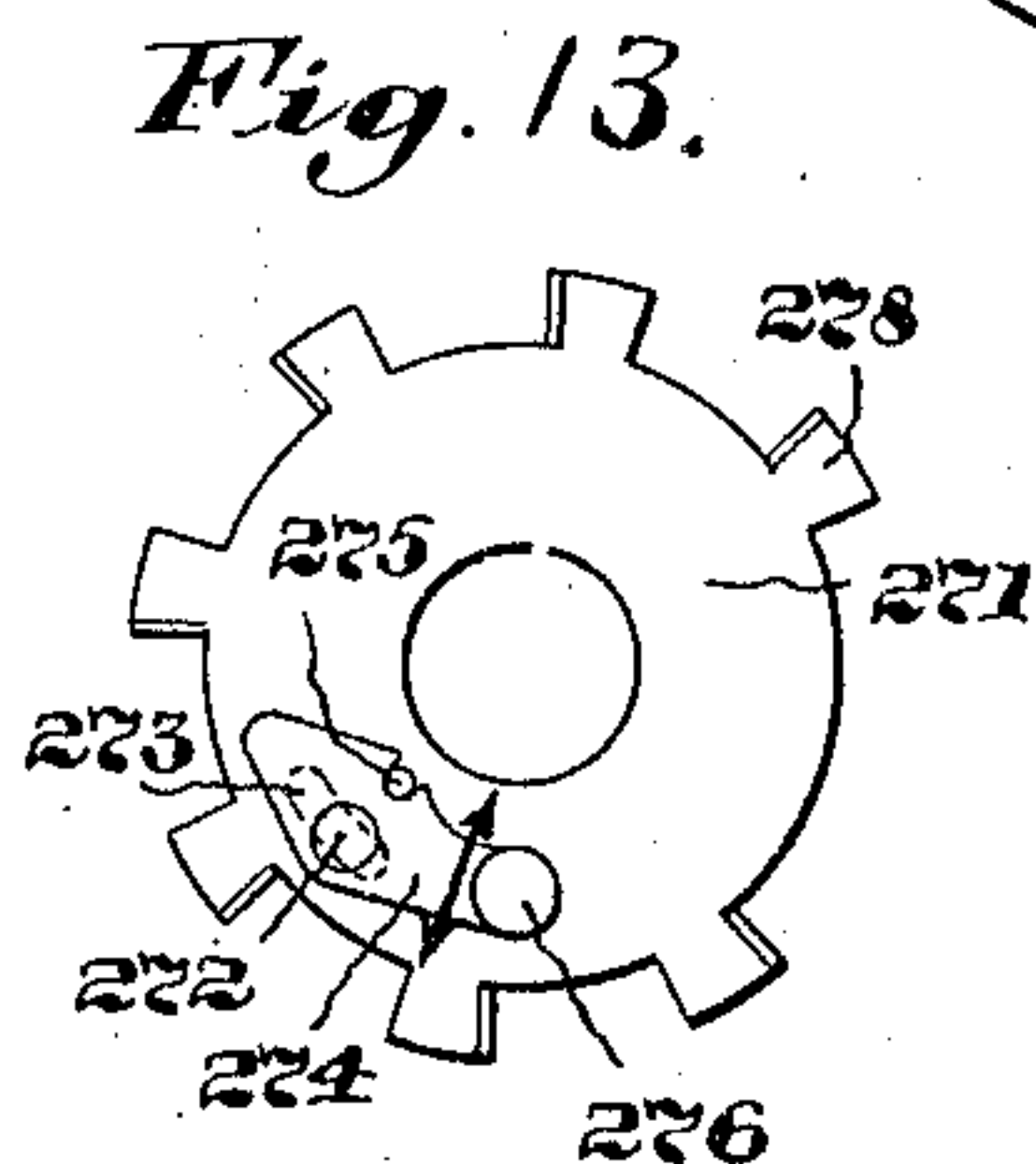
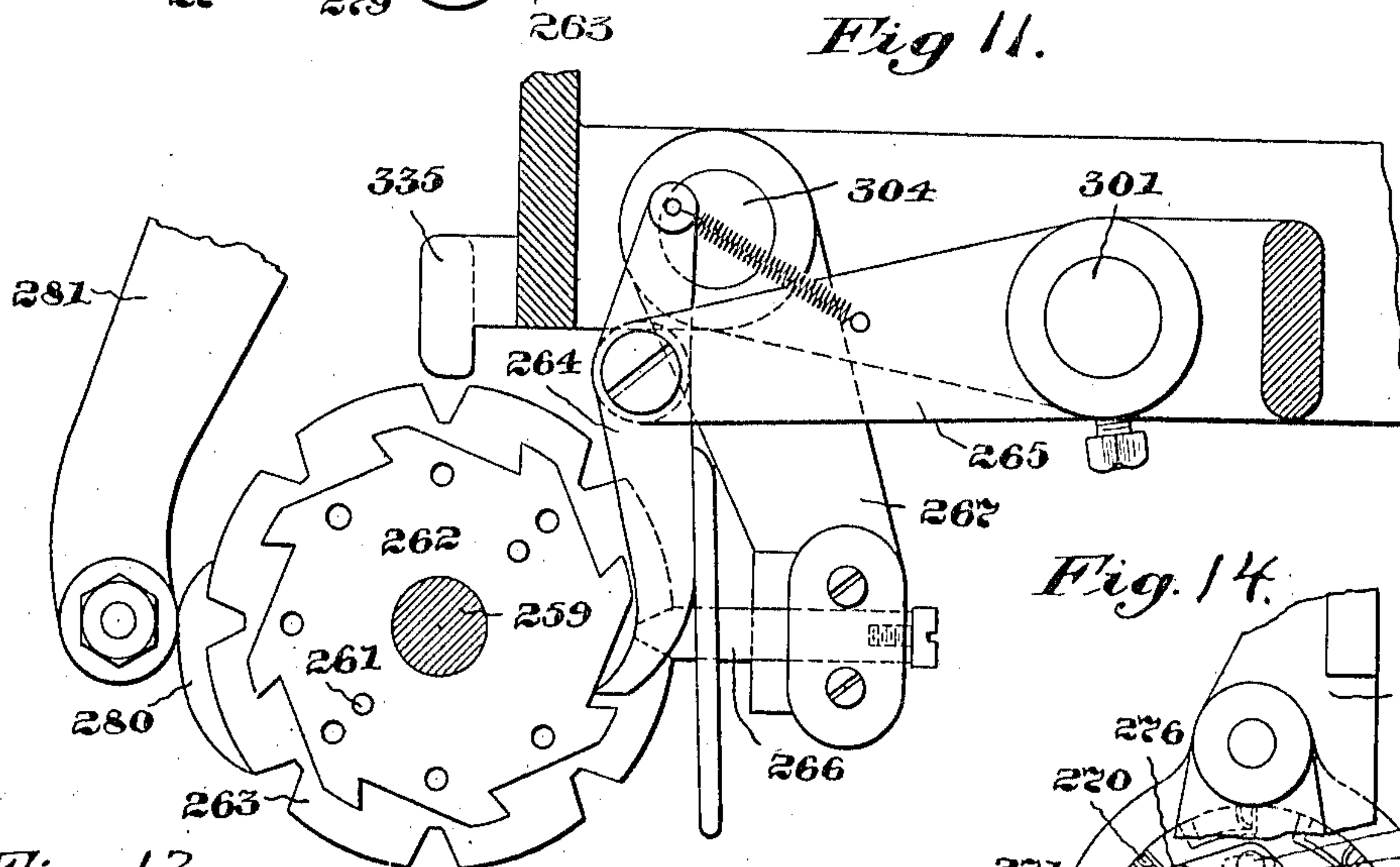
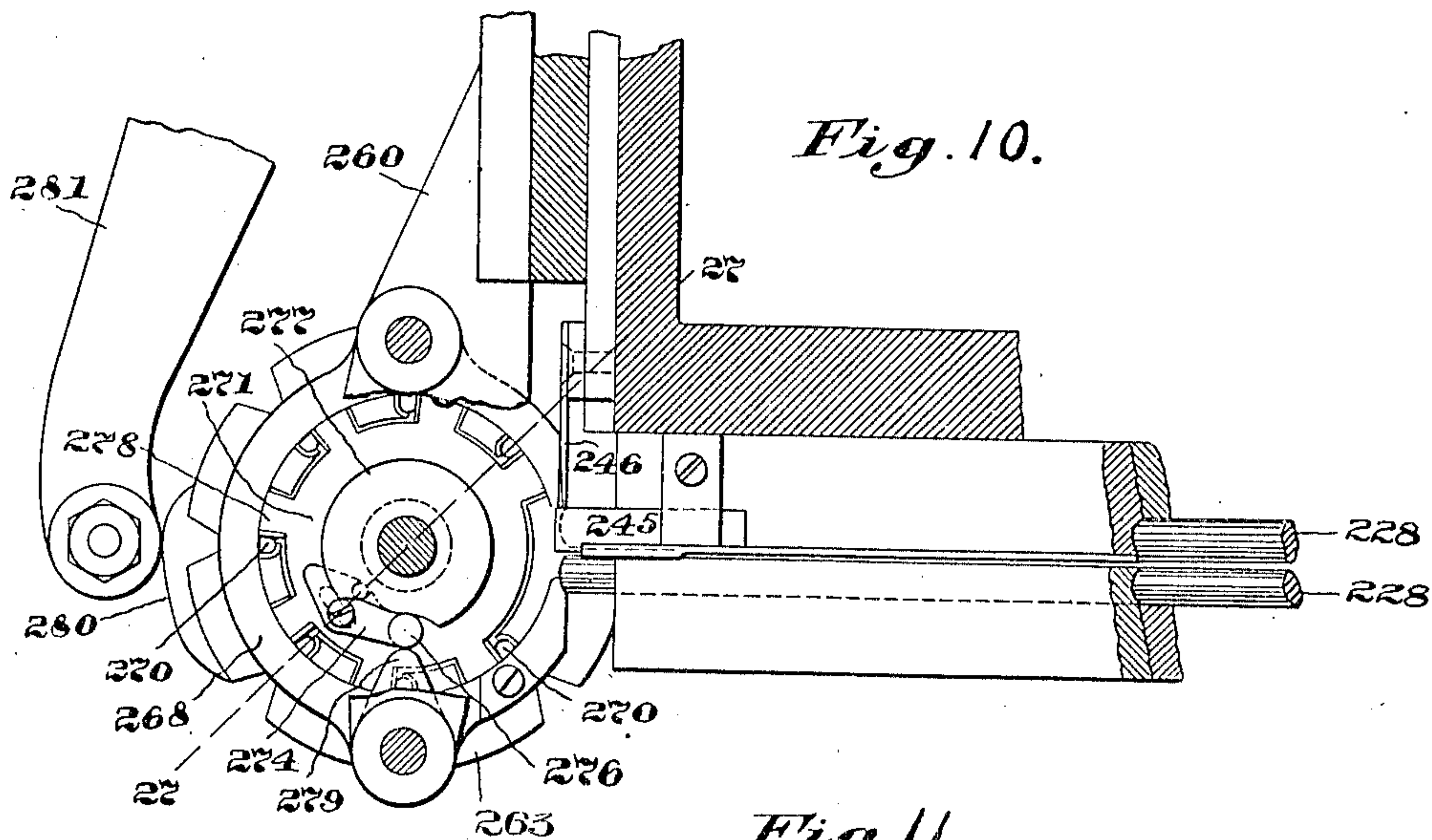
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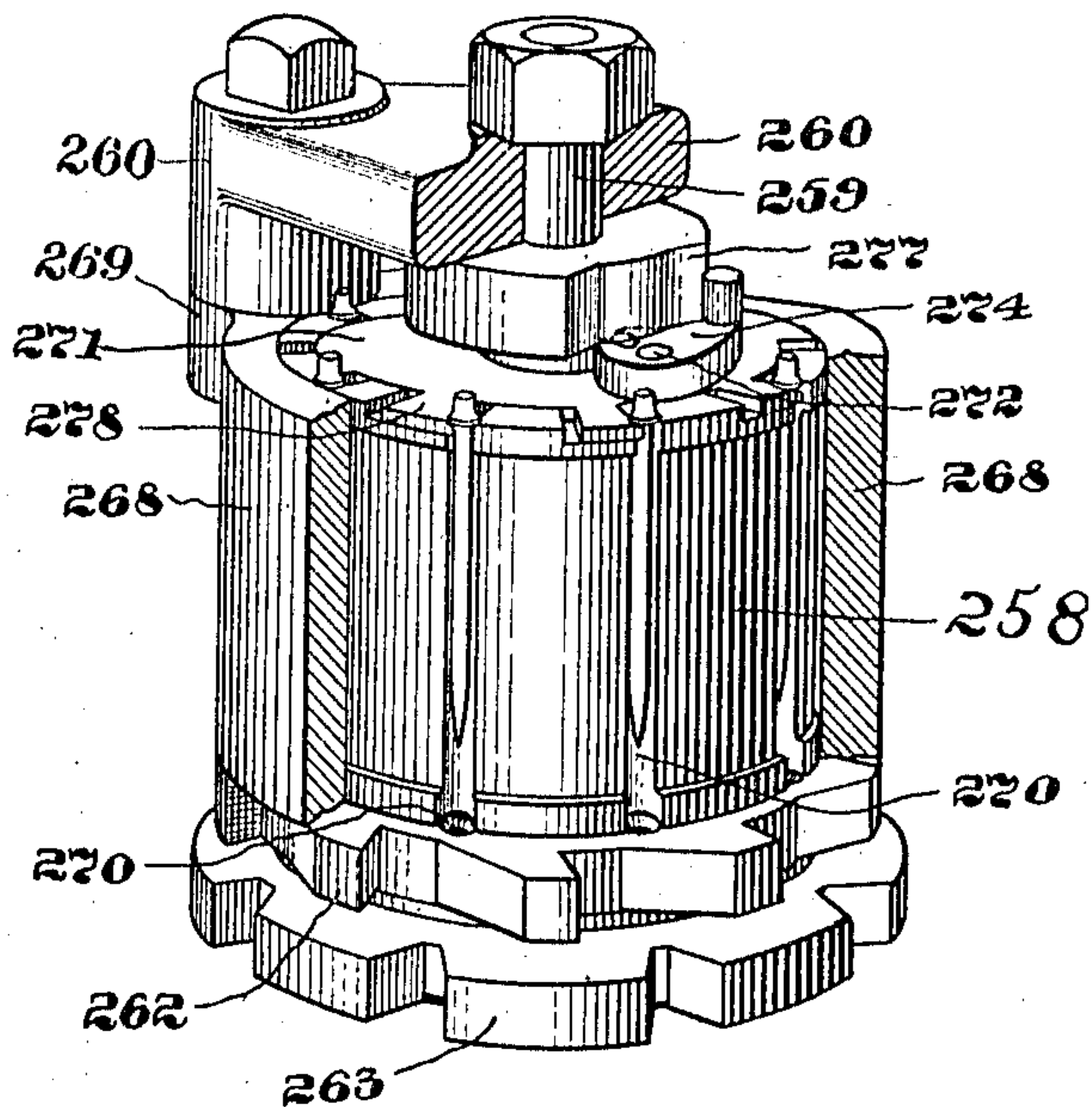
APPLICATION FILED JULY 14, 1905. RENEWED NOV. 22, 1909.

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5 SHEETS—SHEET 5.

Fig. 15.



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UNITED STATES PATENT OFFICE.

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HEEL-NAILING MACHINE.

947,366.

Specification of Letters Patent.

Patented Jan. 25, 1910.

Application filed July 14, 1905, Serial No. 269,668. Renewed November 22, 1909. Serial No. 529,295.

To all whom it may concern:

Be it known that I, ERASTUS WOODWARD, a citizen of the United States, and a resident of Somerville, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Heel-Nailing Machines, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

The invention to be hereinafter described relates to nail assorting and feeding mechanism, and more especially to such mechanism as may be applied to or associated with boot and shoe heeling machines.

As generally stated, the object of the present invention is to provide an organized nail assorting and feeding mechanism which will be efficient in operation, act with certainty and precision in assorting nails and delivering them to other means for further manipulation or driving, and wherein the parts shall be combined and arranged in a simplified manner for conjoined operation, as will best appear from the following description in connection with the drawings, which show one form of the invention for illustrative purposes.

In the drawings, Figure 1 is a side elevation, of the loading and carrying mechanism, embodying the present invention, some of the parts being shown in section; Fig. 1^a is a detail showing one of the ends of the raceway shaft and the means for driving the same; Fig. 2 is a cross sectional detail on the dotted line 17, Fig. 1, looking to the right, showing in face view the nail lifter wheel and the raceway, in cross section; Fig. 3, a top or plan view of the loading mechanism shown in Fig. 1; Fig. 4, a very similar view, with the hopper and raceway removed to expose the operating parts beneath, the view being a horizontal section upon the dotted line 19—19, Fig. 1; Fig. 5 is a vertical, irregular vertical section on the dotted line 20—20, Fig. 1; Fig. 6, a left-hand end view of the parts shown in Fig. 1; Fig. 6^a, same sheet, is a detail showing the nail feeder to be described; Fig. 7 is a sectional detail on the dotted line 22—22, Fig. 3, looking to the left and showing the nail feeder operating mechanism; Fig. 8 is a sectional detail on the irregular dotted line 23—23, Fig. 3; Fig. 9 is a horizontal view looking down upon the nail plate; Fig. 10 is a hori-

zontal sectional detail upon an enlarged scale, on the dotted line 25, Fig. 1, showing the carrier wheel that receives the nails from the raceway; Fig. 11, a view similar to Fig. 10, upon a lower horizontal plane indicated by the dotted line 26, Fig. 1, and showing the means for rotating and registering the carrier wheel; Fig. 12 is a vertical cross section on the dotted line 27—27, Fig. 10; Fig. 13 is a detail showing the nail retaining and dropping plate; Fig. 14, a view similar to a part of Fig. 10, but showing the carrier wheel in a different position, the wheel here being shown in register with the end of the raceway in readiness to receive a nail therefrom; Fig. 15 is a perspective view of the nail loading wheel, its notched actuating and centering wheels, and its nail retaining top plate.

This mechanism, in the form in which I have herein embodied my invention, comprises in general, a nail hopper which receives the nails in bulk, and in which revolves a lifting wheel that deposits them in small quantities upon an inclined table, leading from which is a downwardly inclined chute or raceway that conducts the nails to the mechanism for transferring them to and loading the nail block. I prefer to employ a raceway comprising two parallel and oppositely rotating shafts or rods, between which the nails rest and travel, and which by their rotation enforce a sufficient travel of the nails. Suitable means are provided for clearing this raceway of improperly positioned nails.

Referring first to Figs. 1 to 4 inclusive, the nail hopper is shown at 200, it being supported upon a column 201, bolted or otherwise secured to a table bracket 202, suitably secured to the machine frame. Within this hopper rotates the lifting wheel 203, which, see Fig. 2, comprises two concentric members 204, 205, between which are formed the pockets 206, that lift the nails from the hopper and deposit them upon the receiving table 207, Fig. 2. This lifting wheel, see Fig. 1, is provided at its rear side, at the right, Fig. 1, with a cup 208, screwed upon the inner end of a sleeve 209, mounted to turn loosely in a bearing 210, formed upon or secured to the hopper wall. The wheel sleeve 209, protrudes from the back of the hopper and has formed as a part of it, the toothed wheel 211. This toothed wheel 211,

see Fig. 3, meshes with and is driven by a pinion 212, mounted loosely upon a stud 213, and having secured to or formed as a part of it the larger toothed wheel 214, which in turn, see again Fig. 1, is driven by a pinion 216, upon a horizontal shaft 217, journaled in suitable bearings in the hopper casting. Rotation of this shaft 217, thus operates to rotate slowly the lifter wheel 203, in the direction of the arrow, Fig. 2. The said shaft 217, see dotted lines Fig. 1, is fitted at its front end with a sliding clutch 218, under the control of a hand lever 219, by which said shaft may be clutched as required to a pulley 220, loosely mounted on said shaft and driven by a belt 221, from a pulley 222, on a driver shaft 223, journaled lower down in bearings upon the bracket table 202.

Within the wheel carrying sleeve 209, Fig. 1, is a shaft 224, provided at its outer end with a pinion 225, driven by the same wheel 214, that is used as an intermediate driving wheel for the nail lifter 203, said shaft 224, however, being rotated at a much higher speed than the nail receiving wheel. At its inner end, within the hopper, said shaft 224, carries a bevel wheel 226, that meshes with and drives a bevel pinion 227, see Figs. 1 and 1^a, upon the upper end of one of two like upwardly inclined raceway shafts 228. Close beside the raceway shaft 228 thus driven, is the mating shaft, driven at the same speed but in an opposite direction from it, by intermeshing pinions 230, 231, Fig. 1^a, the direction of rotation being upward and outward, as indicated by the arrows, Fig. 1^a. These raceway shafts have long bearing supports in the upper and inner corners of the raceway supporting plates 232, Figs. 1 and 2, which prevent the said shafts springing apart and widening the nail space between them. The upper ends of these raceway shafts, see Fig. 2, lie directly beneath the opening in the nail receiving table 207, so that the nails deposited thereon by the nail lifter 203, will roll or slide downward to the lowest part of the table which is formed by the rolling surfaces of the raceway shafts between which the points of the nails fall, the nails hanging by their heads which rest upon said raceway shafts, if headed or collar nails are employed, or are supported between the shafts by their diverging sides if taper cut nails are employed.

The adjacent surfaces of the rotating raceway shafts act upon the nails suspended by and between them much like a friction screw, to feed said nails gradually down the raceway at a speed determined by the speed of rotation of the shafts and the angle at which the shafts are pitched, the nails being assisted of course, by gravity. This shaft raceway presents greater freedom from clogging than does an ordinary raceway with fixed walls.

To displace any improperly positioned nails and particularly nails that might tend to lie lengthwise between the raceway shafts instead of hanging between them, I have provided the said shafts, see Fig. 1^a, with adjacent, deflecting portions 233, that cause the line of raceway opening between the shafts to be deflected, first to one side and then to another, so that a nail approaching the first enlargement will by engagement with the wall at the first deflection, be deflected off to one side so as to drop from the raceway into the hopper. Should it fail to be deflected and disposed of by the first deflection in the raceway, it immediately meets a second deflecting or opposed moving wall which tends further to deflect it in the same direction, or if the engagement be right, it may tend to deflect it in an opposite direction, this action being repeated several different times in the arrangement illustrated. I have found this construction in practice to be very efficient for the purpose described. The raceway supporting plates 232, nearly but not quite encircle the raceway shafts, thus furnishing ample bearings for the latter and enabling said shafts to be separated by separation of their carrier plates, as well as closed together by causing said plates to be drawn together. For the purpose of adjusting this separation, said plates are provided at suitable points, see Fig. 1, with draw screws 234, and adjacent set screws 235, by means of which said plates may be adjusted to any given separation to accommodate any size of nail.

The hopper referred to, at its bottom, has a door 236, by which to empty it when it is desired to change the size of nails to be used. To insure all nails in the raceway being down to the required level before leaving the hopper, and to insure also that no surplus nails lie improperly positioned on the raceway shafts, I have provided at the lower end of the hopper, see Fig. 1, and immediately above the raceway where it leaves the hopper, a raceway cover or cap 237, carried upon the lower end of a depending arm 238, on a short shaft 239, see Fig. 1, on the top of the hopper. This shaft at its front end has frictionally mounted upon it the laterally extended operating arm 240, Figs. 3 and 5, to which is pivoted the depending connecting rod 241, operated at its lower end by a crank pin 242 on the end of the clutch shaft 217, Fig. 1, referred to. Within the hopper the depending clearer arm 238, see Fig. 3, reciprocates between two stops 243, which limit its movement in both directions and the frictionally carried operating arm 240 is given an excess of movement over any permitted to the said depending arm 238. This is to provide a rest for the clearer arm at each end of its reciprocation to give opportunity for the nails under the clearer plate

or cover to right themselves, which they would not do so readily if they were always acted upon from above by a constantly moving clearer or cover. This also permits said clearer arm to be arrested should it meet a nail which obstructs its movement and is not easily displaced without stopping the operating arm, to stop which would cause breakage of the operating parts. Upon the return movement, however, of said operating arm, this frictional engagement moves the clearer arm back away from its obstructing nail and thereafter reciprocates it within such limits as are possible until it has freed the raceway and is able to have its full movement.

Outside the hopper, the raceway is covered by a cap or plate 244, Fig. 1, to prevent the nails jumping or riding out because of the upward and outward rotation of the raceway shafts.

Applied to the top side of the raceway, at the lower end thereof, see Figs. 6^a and 10, is a retainer or stop spring 245, the downturned end of which overhangs the head of the lowermost nail and holds the entire series of nails in the raceway by their heads. While all the nails in the raceway but the lowermost one hang in positions approximately perpendicular to the axes of the raceway shafts because of the action of the raceway shafts thereupon, the weight of the series of nails, together with the action of the raceway shafts, tending to feed the nails constantly downward, causes the lowermost nail, which is held slightly by its head behind the stop spring 245, to be thrown forward at its point end and into a substantially truly vertical position, with its point end widely separated from the point end of the next nail above, thus to enable the lowermost nail always to be readily picked off from the raceway.

Standing across the lower end of the raceway and acting as a wall against which the point end of the lowermost nail is thrown in its forward position just described, is a thin plate 246, Figs. 6^a and 7, which constitutes the nail feeder. Fig. 6^a shows the lower end of the raceway with the nail feeder standing across the same, in dotted lines, and Fig. 7 shows the feeder from behind, that is, from the right, Figs. 1 and 10. This feeder is mounted upon the end of a horizontal slide bar 247, arranged in a slide way in the lower end of the loader casting or frame and, at its opposite end, is engaged by the forked upper end of a lever 248, Fig. 7, pivoted at 249 to the said frame and provided at its lower end with a roller stud acted upon by a cam 250. This cam is fast upon the end of a shaft 251 which, see Fig. 1, is aligned with but detached from the shaft 223 heretofore described. The opposing ends of these two shafts 223 and 251, Fig. 1, are provided

respectively with clutch members 252, 253, the clutch member 253 being mounted to slide upon its shaft 251, although connected to rotate therewith. When these clutch members are connected, rotation of the shaft 223 will cause corresponding rotation of the shaft 251 and, by its cam 250 will cause the said nail feeder to be reciprocated across the lower end of the raceway. Referring to Fig. 6^a, when the said feeder is withdrawn from the end of the raceway, the lowermost nail therein, being freed thereby at its point end and held only by its head under the stop spring 245, swings outward or forward at its point end across the path of movement of the feeder so that in the succeeding forward movement of the feeder the lower corner thereof, made pointed for the purpose, passes behind the point end of the nail and, as it advances, acts by its upwardly and rearwardly inclined holding edge to pick off said lowermost nail and forcibly withdraw it from under the stop spring 245 which yields for the purpose, snapping down immediately to catch the next succeeding nail and hold it with its point end against the feeder as before. When the retreating feeder frees the lower end of the lowermost nail in the raceway and permits its point end to be thrown outward as described, said point end strikes against the wall of the opposed loading wheel, to be described, which prevents said point end from further moving outward, and as the advancing point of the feeder passes behind it, the head end of the nail is forcibly drawn out from under the spring, making it certain that the nail is completely and fully withdrawn before the nail feeder can pass completely behind it.

The clutch members 252, 253, Fig. 1, are normally in engagement, but by automatic mechanism to be described, and which will best be understood at a later point in this description, said members are automatically disengaged to stop the nail feeder when the required number of nails have been delivered for a single heeling operation but without stopping said shaft 223. This latter shaft, which is the driving shaft for the entire loading mechanism, is provided with a bevel gear wheel 254, Fig. 3, driven by a correspondingly beveled gear 255, upon a short shaft 256, journaled in suitable bearings secured to the table support and provided at its end with a belt pulley 257, to be belted to and driven by a suitable counter or drive shaft.

Referring now to Figs. 10 to 14 inclusive, I will describe specifically the nail loading wheel heretofore referred to as standing in front of the lower end of the raceway and between which and the raceway the nail feeder reciprocates. This loading wheel shown in perspective in Fig. 15 is marked 258 Fig. 12. It is cylindrical in shape and

of a depth from top to bottom somewhat exceeding the longest nail to be used. This wheel, see Fig. 12, is mounted to rotate loosely upon a headed pin 259, that depends from a bracket 260, secured to the lower front end of the loader frame. At its under side said loading wheel has secured to it by screws 261, two superimposed notched wheels 262, 263. The wheel 262 has its notches or teeth like ratchets and is engaged by a pawl 264, Fig. 11, upon the end of an arm 265, which rotates the loading wheel step by step by mechanism to be described, while the lower notched wheel 263 has its notches made V-shaped to serve as centering or registering means to be engaged by the wedge pointed centering device 266, adjustably mounted in the end of an arm 267, also operated by mechanism to be described.

Surrounding the nail loading wheel is a practically cylindrical wall or casing 268 which, see Fig. 6, is provided with oppositely extended ears 269, by which it is secured to and depends from the same bracket 260 that carries the pivot pin upon which the loading wheel rotates. This inclosing wall or casing is open at its side Fig. 10, at a point directly opposite the lower end of the raceway, to permit the nails to pass from the raceway to the wheel. Within this inclosing wall the said loading wheel is provided at its periphery with a series of vertical nail receiving grooves 270. In the present instance I have provided seven of these nail receiving grooves, to receive seven nails, the number intended to be driven through the heel to attach the latter to its sole. Whatever be the number of nails and nail grooves employed, there is always one more feed tooth upon the ratchet 262 and one more centering notch upon the wheel 263 than the number of such nail grooves and, since the nail grooves are spaced equally with the feed teeth, it follows that there is one blank space upon the carrier wheel opposite the additional feed tooth.

In the operation of the machine, before each feeding movement of the nail feeder across the lower end of the raceway, a nail receiving groove on the loading wheel is brought into position opposite the end of the raceway to receive the nail separated from the raceway by the said feeder until all the grooves in the said wheel have been filled with nails, after which they are all dropped simultaneously through suitable tubes to the transferring device or carrier, which delivers them to the nail block.

To retain the nails in the loading wheel until all the grooves are filled and to permit the nails to be simultaneously discharged at the required time, I have applied to the upper end of said loading wheel a retaining plate 271, Fig. 15, and shown separately in Fig. 13, the same being mounted to oscillate

relative to the loading wheel about the wheel carrying pin 259.

The loading wheel, see Fig. 12, carries a stud 272, that rises through the slot 273 shown in dotted lines, Fig. 13, in the said retaining plate, said stud above said retaining plate serving as a fulcrum for a shifting lever 274. This shifting lever at its inner side is notched to engage a pin 275 on said retaining plate, and is also extended circumferentially to provide a long arm having at its end an upturned finger 276, which, in the rotation of the loading wheel, is caused to travel around and in contact with a stationary cam 277, Fig. 10 and Fig. 15, fast upon a depending boss on the supporting bracket 260 and surrounding the loading wheel pivot pin 259. Since this releasing lever 254 is fulcrumed upon a pin on the loading wheel, it is obvious that oscillation of said lever in the direction of the double headed arrow, Fig. 13, will cause the pin 275 to be reciprocated circumferentially to cause the retaining plate 271 to be oscillated on and relative to the end of the loading wheel. This retaining plate 271, see Figs. 13 and 15, is provided at its periphery with a series of radially extended fingers 278, one for each nail receiving groove of the loading wheel, said fingers being intended to constitute one of the supporting sides for the nail receiving grooves of the wheel. The opposite supporting sides for these grooves are constituted by the side walls of the grooves themselves, raised however immediately adjacent their respective grooves to bring them to the level of the top of the retaining plate, as best shown in Fig. 15.

During the loading of the wheel, the retaining plate 271, is in position with its various fingers 278 over-hanging the edges of the tops of the nail receiving grooves as shown in Figs. 14 and 15, leaving merely sufficient openings between them and the opposite groove walls to receive the shanks of the nails below the heads or collars thereof. As the nails are picked off successively from the lower end of the raceway and pushed laterally into the nail receiving grooves of the loading wheel, their heads or collars pass above the retaining plate 271 and by resting upon the said plate and the opposed grooved wall serve to suspend the nails by their heads in their receiving grooves. The nails remain so suspended until all the grooves are filled when just before the end of the step feed immediately following the filling of the last groove in the rotation of said holding wheel, Fig. 10, the end of the releasing lever 274, traveling against the stationary cam 277, is forced into the depression in said cam by an opposed wall 279, Fig. 14, causing said lever as described, to oscillate the retaining plate slightly relative to the loading wheel, to remove the edges of its retaining fingers

278 from beneath the nail collars or heads resting thereon, and opening to their full size the nail receiving grooves of said wheel to permit all the nails previously suspended upon said plate to be simultaneously released to drop down through the grooves and out at the lower end of the wheel. This last feeding movement of the wheel which causes the release of all the loaded nails, brings the blank space upon the wheel into position opposite the raceway to bar further entrance of nails into the wheel. Simultaneously also with this last feeding movement a cam, secured upon the bottom of the notched centering wheel 263, and marked 280, Figs. 10 and 11, comes into engagement with the end of a lever 281, to stop the nail feeder and the loading wheel, to suspend their operation until the wheel is required again to be loaded. This is accomplished by the following mechanism: Referring to Fig. 1, said lever 281 is fast upon the lower end of an upright shaft 282, mounted in suitable stationary bearings, said shaft at its upper end carrying a bell crank lever 283, Fig. 3. The long arm of this bell crank lever carries a push dog 284, the active end of which is connected by a spring 285, with the other arm of said bell crank lever. This spring has two functions, the first to hold the active end of said push dog in operative position and the second to hold the cam lever 281 in operative engagement with its cam. This push dog at its active end is adapted to engage a notched block 286 on a bell crank lever 287, fast upon the upper end of an upright shaft 288, mounted in stationary bearings, the other arm of said bell crank lever receiving a spring 289, connected with the loader frame and acting to swing said bell crank lever and its shaft 288 in the direction of the arrow, Fig. 3, against the end of the push dog, which latter controls it. At its lower end said upright shaft 288 carries a clutch arm 290, Fig. 4 the forked end of which engages a circumferential slot in the movable clutch member 253, Fig. 1, on the end of the shaft 251.

When the cam lever 281, Fig. 3, is thrown outward upon the last step movement of the loading wheel, it operates through its bell crank lever 283, to push the dog 284 outward, in the direction of the arrow thereon and thereby turn the bell crank lever 287 in a direction opposite the arrow thereon to swing the clutch arm 290 to the left, Fig. 3, to disengage the clutch members and stop the shaft 251, and the nail feeder and the nail loading wheel operated thereby. This feeder and nail loading wheel remain temporarily out of action until the nails loaded into the wheel have been delivered to the nail block ready for nailing a heel whereupon the loading wheel and feeder should be again set in operation to supply a new set of

nails for the next heel. This is accomplished as follows: Referring to Fig. 3, the push dog 284 has a rearwardly extended tail portion that stands in front or to the left of the upper end of an upright lever 291 which, see Fig. 8, is fulcrumed at 292 in a stationary bearing and has its lower end forked to receive a pin 293 on a bell crank lever 294, fulcrumed in the same support. The horizontal arm of said bell crank lever is jointed to the upper end of a short upright starting rod 295, the lower end of which is notched at 296 to be operated by a suitable manually controlled means as will be understood.

When the slide bar 296 is lifted it operates the bell crank lever 294, Fig. 8, to swing the lower end of the upright lever 291 to the right and its upper end to the left and, see Fig. 3, thereby swinging the push dog 284 to disengage its active end from the block 286 on the clutch controlling bell crank 287, and permit the latter under the action of its spring 289 to be swung in the direction of the arrow, Fig. 3, to reengage the clutch members and again set in motion the shaft 251, its feeder and nail loading wheel. It is frequently necessary in the practical operation of a machine of this sort to vary the number and size of nails that are driven into and through the heel. For example, successive lots of shoes may be of different styles or sizes and require more or less nails than the previous lot or case; and of course, every change in the number of nails used in a heel requires a change of nail loading wheel, the number of grooves in which must always correspond with the number of nails to be used in the heel. To enable this change to be made conveniently, the loading wheel supporting bracket 260, Fig. 10, is made as a dovetailed slide shown best in Fig. 6, such that said bracket, together with the nail carrying wheel (but without the feeder) may be withdrawn at the side of the machine and to the right, Fig. 6, and a similar slide carrying a loading wheel inserted in its place, having the required number of nail loading grooves. When this slide is withdrawn of course the cam 280 carried at its under side is also withdrawn, and the cam lever, 281, Fig. 11, if not otherwise held, would be immediately thrown inward and, by the mechanism described, would affect the engagement of the clutch members 253, 252, and start up the feeder to feed out nails from the end of the raceway, with no loading wheel in position to receive them. To prevent this, see Fig. 3, I have provided a latch to catch and hold the bell crank clutch operating lever 287, said latch being marked 298, it being adapted to be swung by the operator behind and to engage a pin 299 upon the block 286, on said bell crank lever to hold said lever 287 in position with the clutch member disengaged. When the

operator finds it necessary to withdraw the nail loading wheel slide for the substitution of a different wheel, he first throws this latch 298 into position to hold the clutch members disengaged and, after having substituted the wheels, he releases said latch to render the mechanism again automatically operative.

To hold the wheel carrying slide 260 in its operative position, one of its bearings, for example, the upper one, Fig. 6, is made as a gib with means as the clamp bolt 300, to clamp it while in use and to release it for removal.

The same ratchet feed and centering mechanism are used to feed and control all the loading wheels, whatever be the number of nails provided for, and whatever the number of step feeds required to effect complete rotation thereof. This I accomplish by employing a ratchet feed, the feed dog of which has the maximum throw required for the longest teeth upon a wheel having the fewest nail receiving grooves. This feed dog, however, always moves to one fixed predetermined point and provides a lost motion of greater or less extent between the beginning of its movement and the point of initial engagement with the shorter ratchet teeth, which varies, of course, according to the number of teeth and the length thereof.

Referring now to Fig. 11, the feed pawl carrying lever 265 is vibrated by a short upright shaft 301, to the upper end of which it is fixed, said shaft being journaled in suitable stationary bearings and, see Fig. 4, is provided at its lower end with an arm 302, carrying a cam roller that travels in a peripheral cam 303, fast on said shaft 251. The throw of this cam is sufficient for a maximum pawl feed and, with the lost motion between a long and a short feed always at the beginning of the pawl throw, obviously it will leave the successively engaged ratchet teeth and the loading wheel affixed thereto, always in one fixed and predetermined position relative to the end of the raceway whether the actual step movement has been long or short. When the shaft 251 is unclutched and stopped the feed pawl of course also is stopped and, when the loading wheel slide is withdrawn for the substitution of a new wheel, this pawl yields before the ratchet wheel as the latter is withdrawn. The pawl, however, may be thrown back with the finger prior to and to permit insertion of the new ratchet wheel upon a new slide.

Because the ratchet feed is always to one predetermined point irrespective of the length of feed, the same centering device 266, Fig. 11, may be employed for all the loading wheels.

The actuating arm 267 Fig. 11 for this centering device is therefore given a uni-

form movement, it being mounted for this purpose on the upper end of a short upright shaft 304, carried in suitable stationary bearings and provided at its lower end, Fig. 4, with a cam lever 305, adapted to be engaged intermittently at each rotation of said shaft 251 by a wiper cam 306, Figs. 1, and 4 fast on said shaft.

I have referred to the loading wheel as having one blank or ungrooved space, see Figs. 10, 13 and 14, and I have stated that this blank surface of the wheel is brought into position opposite the end of the raceway upon the last step feed prior to unloading the nails from the said wheel. The reason for this will now be apparent. It requires an appreciable rotatable movement of the loading wheel to effect the release of the loaded nails and, if by the last step feed of the wheel, to get this movement the first groove still loaded were brought into position opposite the end of the raceway, there would be no opportunity to again rotate the wheel to restore the release plate until that first groove had passed the raceway, consequently the nail fed thereto would have dropped at once through the wheel, making two nails through that one groove instead of one. Consequently it is necessary to provide a blank upon the loading wheel of sufficient length to enable the wheel to be given an additional step feed following the nail releasing movement, to give the releasing plate time to be restored to nail holding position before the first of the now empty grooves is brought into position in front of the raceway. For this reason I provide one ratchet tooth and one feed more than the number of nail grooves in the wheel, and employ this extra or, so to speak, lost feed, for the restoring of the releasing device to nail holding position, so that the feeder, though it reciprocates across the end of the raceway, during the time that the blank space on the wheel is in front of the raceway, is prevented, nevertheless, from picking off the nail from the raceway because the blank wheel-surface prevents the point end of the nail swinging outward sufficiently to permit the point of the feeder to pass behind it. In fact, the curved faces between the several nail receiving grooves and the blank surface referred to in their rotation, fall slightly beyond the downturned end of the nail holding spring 245, so that as the wheel turns from one nail receiving groove to another, the nails are really pushed inward with their points backward instead of forward. For this reason, when the blank surface of the wheel is brought into position in front of the nail raceway, the point of the leading nail is not only prevented from swinging outward or forward, but is in fact pushed inward to make certain that the feeder clears it. When however a nail

groove is brought into position in front of the raceway, the holding spring alone engages the nail at its top end and the point end being no longer restrained, swings forward into the groove sufficiently to enable the feeder to pass behind it and pick it off.

I will now describe the means for carrying the nails from the loading wheel to the nail block.

While the required number of nails have been loaded in the wheel, they are arranged circularly instead of substantially in the shape of a horse-shoe, as is required for the average heel and, it is necessary to rearrange them to approximately heel shape before they are delivered to the nail block wherein of course the nail holes are positioned exactly as required for the heel. Since these shapes vary with the different heels, means must be provided for taking the nails from the invariably circular positioning of the wheel and delivering them in the various horseshoe or heel shapes required. I have provided for this by means best shown in Figs. 1, and 5 to 9 inclusive. Referring to these figures directly beneath the nail loading wheel, see preferably Fig. 6, is arranged a distributor comprising a vertically rectangular frame 307, one of the upright arms in which is shaped as shown, to constitute a handle. This frame is mounted upon a horizontally movable slide 308, fitted in a bracket on the loader shelf, said frame at its upper end being provided with a disk 309, Figs. 4 and 7, provided with circularly arranged holes corresponding to and registering with the nail receiving grooves in the particular loading wheel with which it is intended to be used. At its lower end, said distributor frame is provided with a head 310, containing an equal number of holes, but arranged according to the desired heel shape and the holes in its bottom head are connected with those in the top head or disk by a plurality of nail tubes 311, so that the nails upon reaching the bottoms of these tubes will be in the desired arrangement for the heel.

The bottom head 310 is provided at its under side with a supporting plate 312, shown best in Fig. 1, mounted to slide horizontally in said head and rising from this plate is a pin 313, connected by a spring 314, with said bottom head, said spring drawing its supporting plate normally to the left, Fig. 1, under and to close the lower delivery ends of all the tubes and serving to support in the lower ends of said tubes the entire series of nails simultaneously deposited therein by and from the loading wheel described. This supporting plate is provided with a series of holes corresponding in arrangement with the arrangement of the delivery ends of said tubes but, in the normal spring-holding position of said plate, these

holes are out of register with the ends of their respective tubes, leaving the latter effectually barred. At its under side said supporting plate is provided with a depending lug 315, Fig. 1, by which to slide the plate backward until its holes register with the ends of the tubes, thereby to release the nails from the bottoms of the tubes and permit them to gravitate into the carrier to be described.

Of course there is a separate distributor for every nail holding wheel and new shape of heel or heel requiring a different number of nails, these distributors being shifted always when the nail loading wheels are shifted, and frequently the distributors will be shifted to give a new shape at the bottom without shifting the loading wheel.

At a level below the distributor, Figs. 1, 6 and 9, is arranged the nail carrier 316, it consisting, see Fig. 9, of a swinging carrier arm 317, pivoted at 318, and adapted to swing from a position beneath the distributor to a position immediately above the nail block. This carrier is provided at its free end with an upturned flange 319, see Fig. 6, grooved or notched at its upper edge to receive the headed supporting lugs or screws 320, projecting from the upturned flange 321, of a removable carrier head 322. This removable carrier head is provided with a handle 321^a, to facilitate the swinging of the carrier, and is also provided with a series of short, vertical nail tubes or holders 321^b, corresponding in number and arrangement to the number and arrangement of nail tubes at the lower end of the distributor. At the under side of the carrier head is a nail-supporting slide plate 323, Fig. 9, controlled by a spring 324, and perforated to operate in all respects like the corresponding slide plate 312 at the under side of the distributor. This carrier slide plate is provided with a depending lug 325, Fig. 1, by which it may be slid back to bring its holes into register with its nail holding tubes.

At its upper side, see Fig. 1, the carrier head is provided with a post 326, which, as the said carrier is thrown backward or to the right, Fig. 1, engages the depending lug 315, on the distributor nail supporting plate 312 and throws the latter back just as the carrier head reaches its position beneath the nail tubes thereby to release the nails from the distributor tubes and permit them to drop simultaneously into the corresponding short tubes of the carrier head in which they remain supported upon the carrier supporting plate 323, Fig. 9.

The operator swings the carrier around into position over the nail block 108 and, just as it reaches a position in which its nail holding and loaded tubes register with the holes in the nail block the depending carrier slide lug 325, Fig. 1, strikes the front of

the nail block and causes the slide to be moved on and relative to the carrier head to release the nails in the carrier tubes and permit them to drop simultaneously into the corresponding holes in the nail block.

If the nails are collar nails, they are supported in the holes of the nail block by usual yielding centering jaws or devices which, being common to the art, need not be further referred to. If the nails used are cut nails they will be permitted to drop down through the nail block holes until they rest upon the heel positioned below the nail block.

I have now described the mechanisms for picking off or feeding the nails singly from the raceway, loading them into the loading wheel, discharging them down through the distributor tubes into the heel shaped carrier, and carrying the nails to and delivering them into the holes of the nail block 108 which may be clamped in position, Fig. 9, by screws 109, on the holder 103, carried by the sleeve 104.

To enforce a predetermined order of movement of the various operated parts described, and to prevent the operation of any of the parts, whatever their predetermined order, in such a manner as to damage the machine or the work, I have provided various safety or locking devices which I will now describe. These are provided not only because of mistakes liable to be made by the operator himself, but, because between the operations performed or set in motion by the operator, there are various things to be done by the attending boy.

It is desirable to provide against the loading or attempted loading of two successive series of nails at one time into the carrier tubes, and, also, into the distributor tubes; in other words, to enforce the carrying and driving of one set of nails before another is loaded into the carrier.

Referring now to Fig. 6, upon the stationary frame adjacent and at the left of the distributor frame 307 is an upright lever 335, fulcrumed at 336, with its lower end standing opposite the nail carrier when the latter is in its rearmost nail receiving position. The upper end of this lever 335 stands in position opposite a stop cam 280, Fig. 11, on the under side of the centering wheel 263 that is attached to the loading wheel. Assuming the carrier to have received its complement of nails from the distributor, which, as will be described, is necessary to be accomplished before the machine can be started, the operator starts the machine, the loading wheel is set in operation and, as it commences to rotate, its said cam 280, Fig. 11, meets the upper end of said upright lever 335, Figs. 11 and 6, and throws the same inward to cause its lower end to be thrown outward to engage the nail carrier and push the latter from under the distributor tubes

far enough to permit the distributor nail supporting slide 312, Figs. 1 and 6, to be moved by its spring to close the distributor tubes, thereby preventing a second series of nails from being dropped down through the distributor into the carrier even though the latter be permitted to remain in said position during the time required for a second loading of the wheel and discharge of the nails therefrom into the distributor tubes which, as stated, when once started, takes place automatically and without reference to the other operations of the machine. To prevent the nail carrier being forcibly returned to its rearmost position to uncover the distributor tubes to receive a second set of nails before it has been carried to the nail block to deliver its first set, I have provided the following mechanism. The lower end of said upright lever 335, Figs. 6 and 9, is connected by a link 337, with a segmental plate 338, Fig. 9, fulcrumed upon the carrier pivot 318, and immediately above said carrier. This segmental plate has pivoted to it at 339, Fig. 9, a notched latch plate 340, acted upon by a spring 341, and held normally against the inner edge of a segmental or arc shaped finger 342, on one edge of a segmental cap plate 343, that is arranged over the carrier to give it a firm and sufficient bearing to keep it from wobbling or twisting in its swinging movements.

When the stop cam 280, Fig. 11, throws back the upper end of the upright lever 335, and throws outward the lower end of said lever to displace the carrier as described, it also through said link 337, swings the segmental plate 338 in the direction of the arrow, Fig. 9, far enough to permit the notched end of the latch 340 to catch upon the end of the curved finger 342, which holds said latch, its segmental plate and upright lever in their new positions and positively prevents said upright lever from being returned to its original position by any attempt on the part of the boy to push the carrier back into nail receiving position. Thus, having once filled his carrier and started the machine the boy is prevented from again returning the carrier for a second set of nails until he has moved the carrier to the nail block, discharged his nails thereinto and returned the carrier to receiving position. When the carrier, thus displaced by said upright lever with its complement of nails, has been swung into position over the nail block and has delivered its nails thereinto, the pin thereon, marked 344, see dotted lines Fig. 9, strikes the short arm of said latch and swings inward its notched end to free the segmental plate 338 and permit the latter under the action of the latch spring 341 Fig. 9 to be returned to its normal position. The return of said segmental plate 338 acts at the same time to

return the lower end of the upright lever 335 to its normal position and throws the upper end of said lever into position for a new engagement by the loading wheel 5 cam 280.

I have shown that when the machine is started, the loading wheel loads up with nails and automatically delivers them into the distributor tubes where they remain until the carrier is brought around to receive them, when the loading wheel is stopped. I have also shown that the carrier after having delivered one set of nails to the nail block, and upon its return to nail receiving position, automatically effects the delivery of the next set from the distributor into its own tubes. I have shown that the machine cannot be started until said carrier has been returned completely to nail receiving position. I have shown also that when the loading wheel is again so set in operation, its first movement is to displace the carrier so that when the next set of nails is delivered to the distributor tubes they will not fall directly into the carrier tubes to place two sets therein instead of one. I have also shown that this carrier when once so displaced to protect it from a second set of nails before the first has been delivered, cannot be returned again to nail receiving position until it has been moved to the nail block, delivered its nails and returned again to receiving position. I have shown that the loading wheel and mechanism for operating it, when once set in operation, continues until the wheel is loaded, when it automatically unclutches itself and stops.

The various other features of my invention it is believed will have been fully understood from the foregoing description of the parts and the mode of operation thereof, and need not, therefore, be further emphasized herein, since they are particularly referred to in the claims.

45 Claims.

1. In a machine of the character described, a nail carrier, and means to deliver nails to the said carrier including a nail hopper, a rotary lifter therein, a roller raceway having 50 opposed rolling surfaces, and concentrically arranged means for rotating the said lifter and said raceway surfaces.

2. In a machine of the character described, a nail carrier and means to deliver nails to the said carrier including a nail hopper, a rotary lifter therein, a roller raceway having opposed rolling surfaces, and a nail receiving table within said lifter and comprising in part stationary inclined surfaces and in 60 part the rolling raceway surfaces.

3. In a machine of the character described, a nail carrier and means to deliver nails to the said carrier including a nail hopper, a rotary lifter therein, a roller raceway having 65 opposed rolling surfaces, a movable cover

for the said rotatable raceway surfaces, and friction means for moving said cover with means to limit the cover movement within the range of movement of said friction moving means.

4. In a nail assorting and feeding mechanism, nail supplying means comprising a raceway consisting of parallel rotating shafts with a nail receiving opening between them, and raceway supporting plates 70 extending parallel to said shafts, substantially throughout their length and partially inclosing the same.

5. In a machine of the character described, nail supplying means including a raceway 80 consisting of inclined parallel rotating shafts with a nail receiving opening between them and means on the said shafts to deflect the line of said nail receiving opening.

6. A machine of the character described 85 comprising nail supplying means including a raceway consisting of inclined parallel rotating shafts with a nail receiving opening between them, and offset enlargements and depressions on said shafts to cause deflection of said nail receiving opening. 90

7. A machine of the character described comprising nail supplying means, a raceway consisting of opposed rotating shafts with a nail receiving opening between them 95 and upwardly yielding means disposed above the rotating shafts beyond the reach of nails properly positioned in the raceway and constructed and arranged to engage a nail lying lengthwise on or between said shafts to direct the same therefrom. 100

8. A machine of the character described comprising nail supplying means, a raceway having opposed rotatable raceway shafts with a nail receiving space between 105 them, and means utilizing the rotative movement of said shafts to cause an outward or separating movement of the point end of the endmost nail of the series about its head as a pivot. 110

9. In a machine of the character described, nail supplying means, a raceway having opposed rotatable raceway shafts with a nail receiving space between them, and means 115 utilizing the rotative movement of said shafts to cause separation of the endmost nail of the series, said means including a stop spring for the lowest nail in the raceway.

10. In a machine of the character described, nail supplying means, a raceway having opposed rotatable raceway shafts with a nail receiving space between them, means utilizing the rotative movement of said shafts to cause separation of the endmost nail of the series, and feeding means to engage the endmost nail so separated and remove it from the raceway. 120 125

11. In a machine of the character described, nail supplying means, a raceway 130

having opposed rotatable raceway shafts with a nail receiving space between them, a movable stop for the head end of the lowest nail in the raceway to retain the head end of the nail, the rotation of the raceway shafts causing the pointed end of the lowermost nail to be extended farther forward than the remaining nails, and feeding means engaging the nail whose head is engaged by said stop for removing said nail from the said series, said stop being movable therefor.

12. In a machine of the character described, nail carrying means and nail supplying means for the latter, a downwardly inclined raceway composed of parallel rotating shafts, means at the end of said raceway to engage at one end the endmost nail to cause the rotative action of said raceway shafts thereon to project a part of said nail away from the next adjacent nail, feeding means to engage said endmost nail and remove it from said raceway, and means to receive and deliver said nail to nail carrying means.

13. In a machine of the character described, nail carrying means, and nail supplying means therefor, a raceway for the nails, a rotatable loading wheel having a plurality of nail receiving grooves disposed upon its cylindrical surface, and means to feed the nails from said raceway to said wheel, a separate nail distributor intermediate said loading wheel and said carrier, and means to deliver said nails simultaneously, first to said distributor, and then to said carrier.

14. In a machine of the character described, nail carrying means, and nail supplying means for the latter, a raceway, a loading wheel opposed to the end thereof, means to feed the nails singly from the raceway to said loading wheel, means to retain each nail so loaded and to release said nails after loading, a distributor to receive the nails from said loading wheel, means to retain the loaded nails in said distributor, and means controlled by said carrier to release said nails automatically for discharge into said carrier.

15. In a machine of the character described, nail carrying means, and nail supplying means for the latter, a raceway, a loading wheel at the end thereof, means to deliver the nails from said raceway into said wheel, releasing means on said wheel adapted when operated to release all the nails in the wheel, and means operated by rotation of the wheel itself to effect operation of said releasing means.

16. In a machine of the character described, nail carrying means, and nail supplying means for the latter, a raceway, a loading wheel opposed thereto and to receive the nails singly therefrom, a distrib-

uter below said loading wheel, said distributor at its upper end, receiving the nails from said wheel and delivering them at the lower end arranged in heel formation.

17. In a machine of the character described, nail carrying means, and nail supplying means for the latter, a raceway, a rotatable nail loader adjacent the inner end thereof, pawl and ratchet means for rotating said nail loader, means to center said wheel at the end of each step feed thereof, means to deliver the loaded nails from said loader, a distributor for such nails and means to deliver the nails therefrom to said carrier.

18. In a machine of the character described, nail carrying means, and nail supplying means therefor, a raceway, a nail loading wheel opposed thereto, and provided with a series of nail receiving grooves in its cylindrical surface, means to rotate it to carry said nail receiving grooves past the end of the raceway, and means automatically to stop said wheel at the end of each period of rotation.

19. In a machine of the character described, nail carrying means, and nail supplying means for the latter, a raceway, a nail loading wheel opposed thereto, means to rotate it, a release plate on and rotatable relative to said wheel, and a lever on said wheel and engaging said release plate with means for actuating said lever at the end of each complete rotation of said wheel to release the nails therefrom.

20. In a machine of the character described, nail carrying means, and nail supplying means for the latter, a raceway, a loading wheel opposed thereto and provided with raised nail seats and a releasing plate having nail seats flush with said wheel nail seats and cooperating with the latter to support the nails loaded in said wheel and means to remove said release plate to release the nails held thereby.

21. In a machine of the character described, nail carrying means, and nail supplying means for the latter, a raceway, a loading wheel opposed thereto, a distributor arranged below said raceway, said wheel and said distributor being removable for the substitution of other wheels and distributors for different kinds of work, and a removable carrying head for said nail carrier.

22. In a heeling machine, nail delivering mechanism, a carrier to transfer nails from delivering to heel nailing position, means to load said carrier with a gang of nails, and means to prevent loading the carrier with a second gang of nails until the first gang has been discharged from the carrier, said means being controlled by the movement of the carrier to heel nailing position.

23. In a machine of the character described, heeling mechanism, loading mechanism, means to operate said loading intermit-

tently, a carrier to transfer the nails from said loading mechanism to the nailing mechanism and means requiring a complete effective movement of said carrier from nail receiving to nail delivering position and return to set in operation said nail loading mechanism.

24. In a nail assorting and feeding mechanism, nail supplying means comprising a raceway having an opening for nails, a loading wheel having nail receiving grooves formed in the cylindrical wall thereof with blank faces between said grooves, means for rotating said wheel, said wheel being arranged opposite the delivery end of the raceway to receive nails therefrom as said grooves come opposite the end of the raceway, and prevent nails from passing from the raceway when a blank face comes opposite the end of the raceway, means for stopping the rotation of said wheel after it has received a series of nails, and means for delivering said series of nails therefrom as a gang.

25. In a machine of the character described, heeling mechanism, loading mechanism, a nail carrier to receive nails from said loading mechanism, means to operate said loading mechanism intermittently, each intermittent operation loading a complement of nails for one heel, and means operated by the commencement of the loading by said loading mechanism of one complement of nails, to move said carrier out of nail receiving position.

26. In a machine of the character described, heeling mechanism, loading mechanism, a nail carrier to receive nails from said loading mechanism, means to operate said loading mechanism intermittently, each intermittent operation loading a complement of nails for one heel, and means operated upon completion of the loading by said loading mechanism of one complement of nails, to move said carrier out of nail receiving position and substantially simultaneously locking itself against further loading movement.

27. In a machine of the character described, heeling mechanism, loading mechanism, a nail carrier to receive nails from said loading mechanism, means to operate said loading mechanism intermittently, each intermittent operation loading a complement of nails for one heel, and means operated by said carrier, upon completion of the loading, to move said carrier out of nail receiving position and substantially simultaneously

locking said loading mechanism against further loading movement, said means preventing return of said carrier to nail receiving position until movement of the latter into delivering position.

28. In a machine of the character described, heeling mechanism, loading mechanism, a nail carrier to receive nails from said loading mechanism, means to operate said loading mechanism intermittently, each intermittent operation loading a complement of nails for one heel, and means operated upon completion of the loading to move said carrier out of nail receiving position and substantially simultaneously lock said loading mechanism against further loading movement, said means preventing return of said carrier to nail receiving position, and means set in operation by movement of said carrier into nail delivering position to remove the means which moved it out from nail receiving position to enable it upon its return to be moved into nail receiving position again.

29. A nail assorting and delivering mechanism comprising a roller raceway and means to deliver nails thereto, a roller of said raceway having a series of alternating portions disposed circumferentially of the roller at different radial distances from the axis thereof to engage the nails and agitate them in their passage along the raceway.

30. A nail assorting and delivering mechanism comprising a roller raceway and means to deliver nails thereto, the rollers of said raceway having a series of alternating portions disposed circumferentially of the rolls at different radial distances from the axis thereof to engage the nails and agitate them in their passage along the raceway.

31. A nail assorting and delivering mechanism comprising a roller raceway and means to deliver nails thereto, the rollers of said raceway having a series of alternating portions disposed circumferentially of the rolls at different radial distances from the axis thereof to engage the nails and agitate them in their passage along the raceway, and a plate disposed above said series of alternating portions.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ERASTUS WOODWARD.

Witnesses:

FREDERICK L. EMERY,
ROBERT H. KAMMLER.