Sept. 15, 1931. R. COSSOCK 1,823,644

NAILING MACHINE

Filed March 20, 1931 4 Sheets-Sheet 1

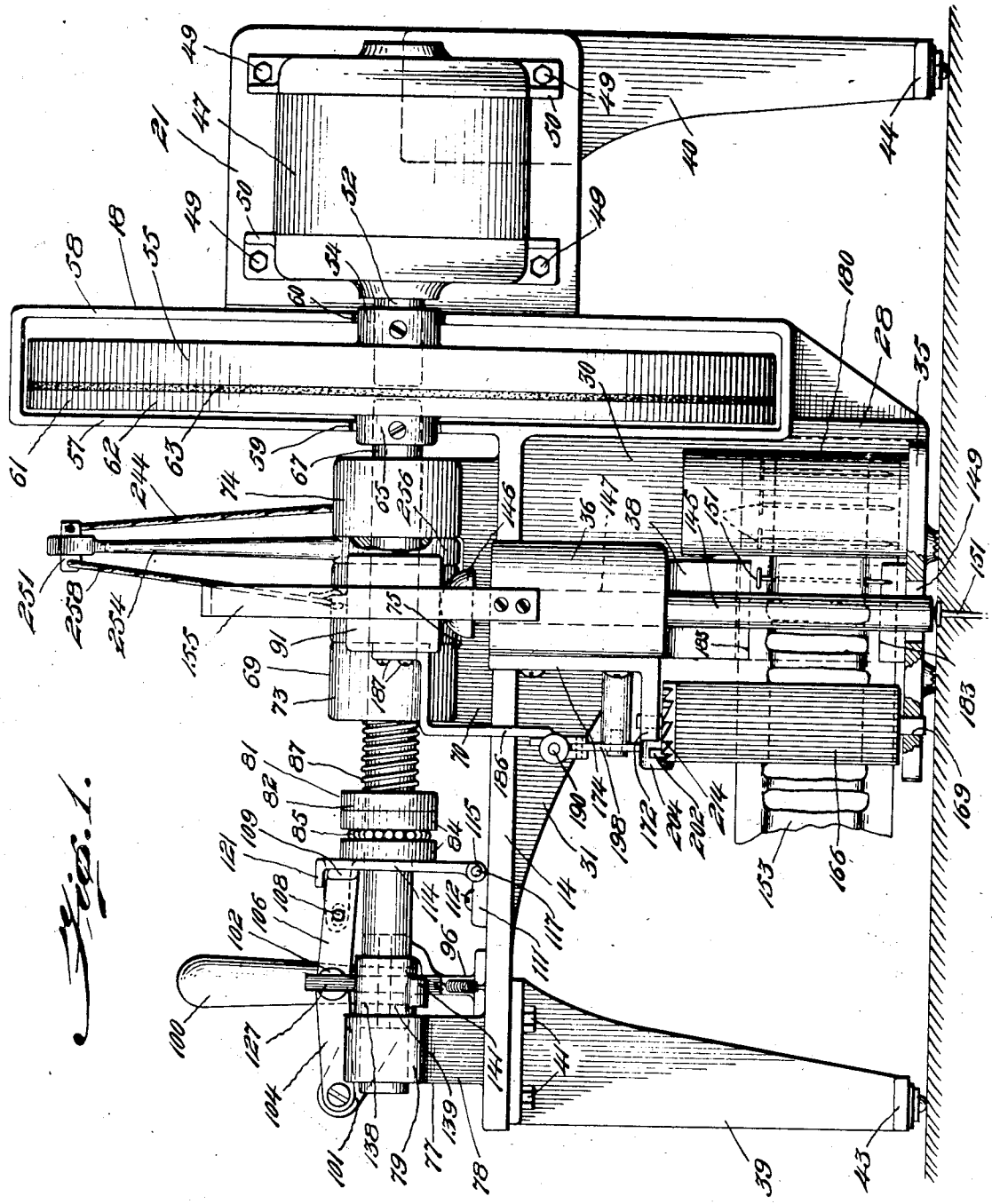


Fig. 1.

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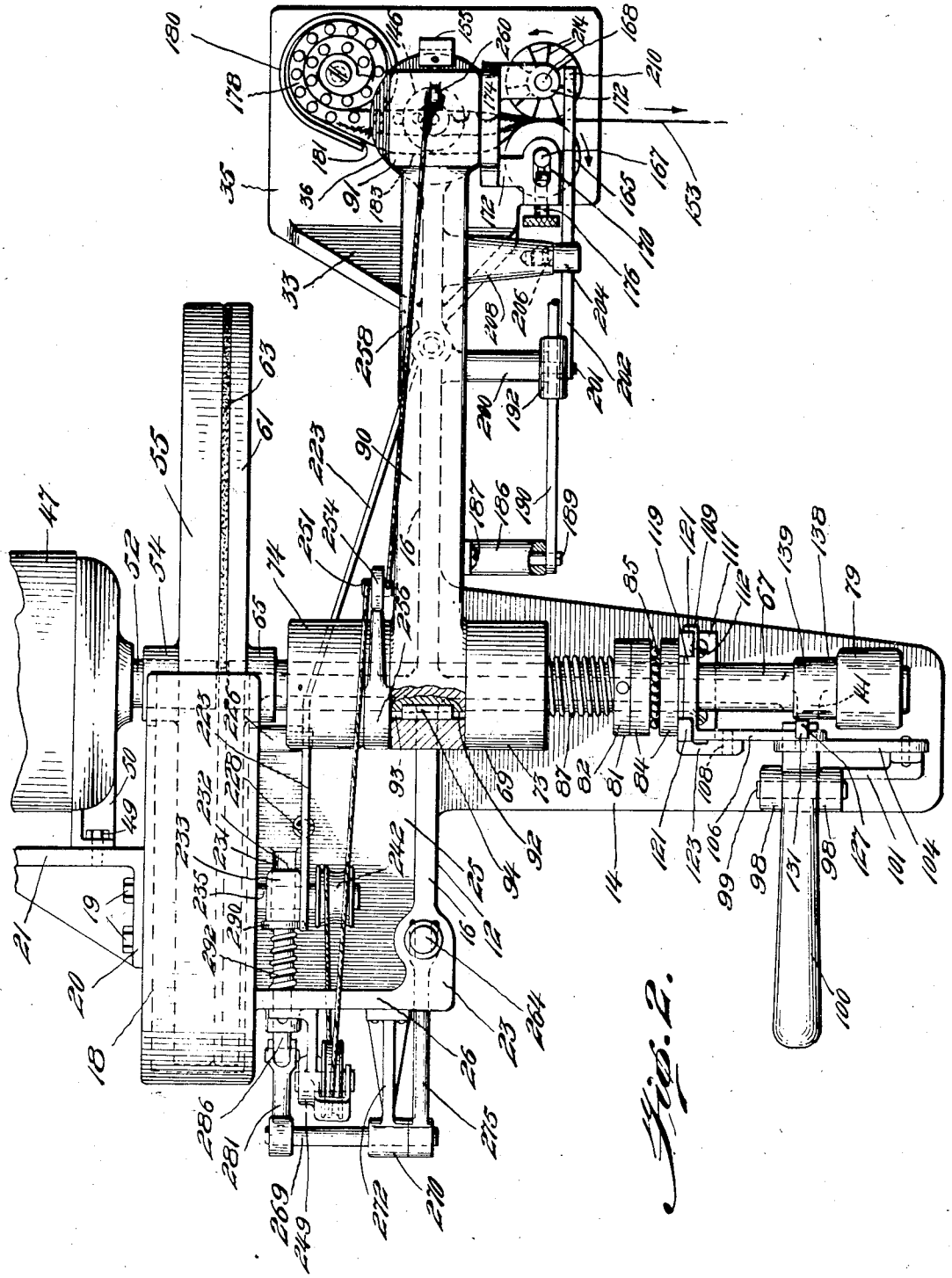


Fig. 2.

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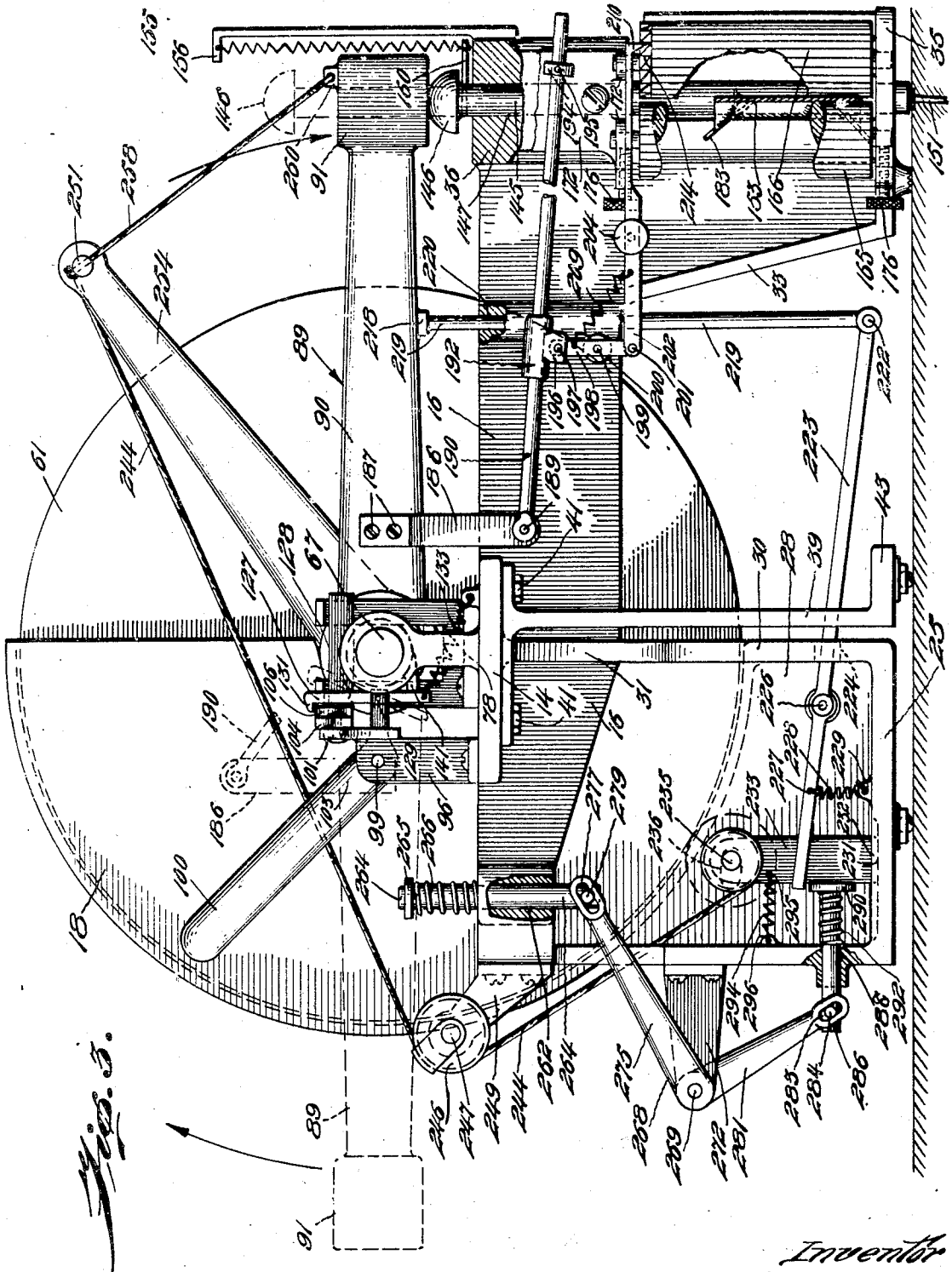


Fig. 3.

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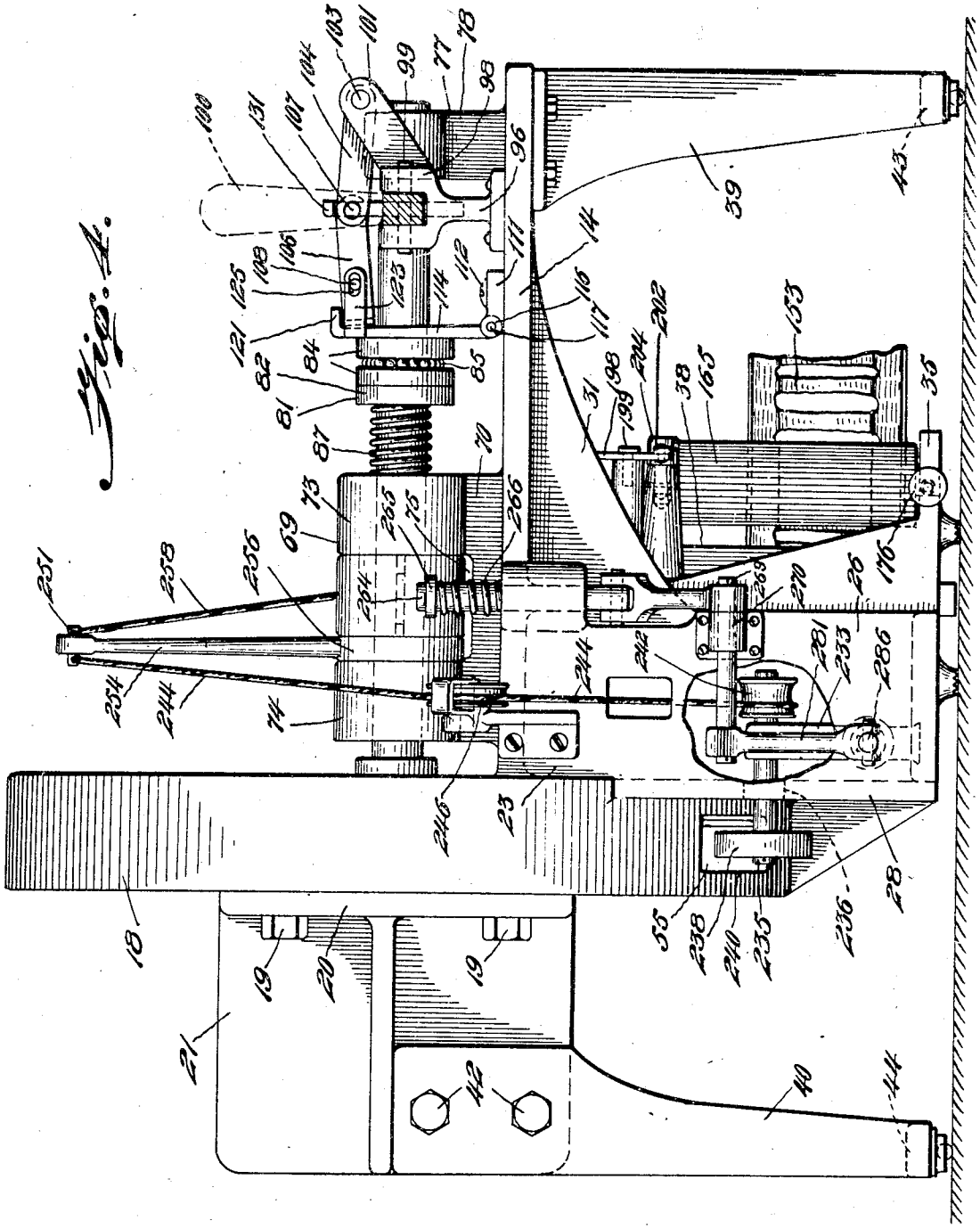


Fig. 4.

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UNITED STATES PATENT OFFICE

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NAILING MACHINE

Application filed March 20, 1931. Serial No. 523,968.

My invention relates to machines for driving nails.

Heretofore the use of hammers in nailing machines has been limited to plungers or the like of a rectilineally reciprocable character.

An essential object of my invention is to utilize in automatic nail driving the advantages inherent in the oscillatory or swinging movement of a hammer heretofore attained only by the natural movement of the human arm.

Another object is to combine with the means for actuating the power stroke of the oscillatory hammer, a novel means for returning the latter to idle position.

Additional objects are to utilize a stroke of a swinging or oscillatory hammer for actuating the nail carrying strip, and for setting in operation the means for returning the hammer to original position, and to utilize the return stroke of the hammer for putting out of operation the hammer returning means.

Further objects are to insure a maximum power of stroke, accuracy of coordination between the hammer blows and the advancing nails, facility of operation, portability, and inexpensiveness of construction.

To the above ends essentially, but not exclusively, my invention consists in such parts and in such combinations of parts as fall within the scope of the appended claims.

In the accompanying drawings which form a part of this specification,

Figures 1, 2, 3 and 4 are a front elevation, a plan view, an end elevation, and a rear elevation respectively of a nailing machaine embodying my invention.

Like characters of reference indicate like parts throughout the views.

The framework of my machine may be of any form most convenient for carrying the operative parts.

As herein shown the frame 12 comprises a longitudinally disposed table 14 cast with an intermediate portion of which is the intermediate portion of a transversely disposed vertically faced bar of web 16. The inner end of the table is integral with one of the sides of a transversely disposed upright semicircular housing 18, to whose other side is fixed by bolts 19 or otherwise the flange 20 of a vertically and longitudinally directed mounting plate or backing 21. A rectangular downwardly directed extension 23 comprises a floor 25, a back wall 26 extending from the rear end of the web 16 to the adjacent side of the housing 18 an outer end wall 28 integral with the housing, and a front wall 30 formed by the enlarged inner end of a longitudinally disposed web 31 depending from the table 14. Cast with the web 16 at a point behind its forward end is a downwardly and forwardly directed flat triangular leg or support 33 integral with a forwardly directed foot 35. Cast with the end of the web is a cylindrical upright enlargement 36, above a nearly semicircular enlargement interval at its lower end with the foot 35, and provided with a plane front face 38. A portion of the enlargement 36 partly overhangs the foot. Cooperating with the leg 33 are legs 39 and 40, fixed by bolts 41 and 42 respectively, to the frame parts 14 and 21, and provided with terminal feet 43 and 44 respectively.

An electric motor 47 is attached to the plate 21 by bolts or screws 49 passing through the attaching lugs 50 of the motor casing, or otherwise. The motor shaft 52 is fast in the hub 54 of a disk or fly wheel 55, constituting one member of a friction clutch, partially enclosed in the housing 18 whose inner and outer walls 57 and 58 are centrally provided with semicircular openings 59 and 60. The housing is completed by a peripheral rim. The hub 54 is loose in and concentric with the opening 60.

In the housing is a friction disk 61 which includes a metal body 62 and a facing or lining 63 of frictional material engageable with the cooperating disk 55. The two disks constitute the cooperating contacting members of a friction clutch. The disk 61 has a hub 65 extending through the opening 59 of the housing, and in which is fast a longitudinally reciprocable rock shaft 67 in alignment with the shaft 52 and drives

thereby when the described clutch members are in contact with each other.

A bearing 69 for the shaft 67 comprises a standard 70 integral with the table 14, and two heads 73 and 74 interspaced as at 75. A second bearing 77 for this shaft includes a standard 78 and a head 79. An annular shoulder member 81 upon the shaft intermediate the two bearings comprises a collar 82 fast to the shaft and, in this instance, an antifriction bearing adjacent thereto comprising raceway disks 84 loose on the shaft embracing balls 85. A helical spring 87 surrounding the shaft 67 has its ends abutting against the member 81 and the bearing head 73.

An oscillatory hammer 89, comprising a helve or shaft 90 and head 91, is provided in it send or hub portion, as shown in Figure 2, with a bore 92 through which the shaft 67 slidably passes, and with a longitudinal groove 93 communicating therewith to receive a spline 94 seated in the shaft and slidable in the groove. Thus the hammer is radially fast to the shaft while the latter is axially slidable relatively to the hammer.

Cooperating with the spring 87 to longitudinally reciprocate the shaft is a mechanism operating upon the toggle principle, about to be described.

Fixed to or integral with the frame and constituting a part thereof is a standard 96 provided with a bifurcated upper portion to form ears 98 to receive a pintle 99 upon which is pivoted intermediate its length an operating handle 100. There is a lateral inclined arm or extension 101 integral with the standard supporting one end of a toggle 102 as follows. To the upper end of the extension is pivoted by a pin 103 the outer end of a toggle plate or arm 104. The inner end of the latter is connected to the corresponding end of a second toggle arm 106 by a povot pin 107. Intermediate the length of the arm 106 is a pin 108; and integral with this arm, as shown in Figure 2, is a finger or extension 109 disposed at right angles thereto.

Adjacent the standard 96 is an attaching plate 111 fixed to the table 14 by screws 112 or otherwise. A vertical bearing plate 114 has upon its lower ends hinge sleeves 115 interengaging hinge sleeves 116 upon the attaching plate through which extends a pintle 117. The plate 114 has its upper end bifurcated by a vertical slot 119, as shown in Figure 2, to loosely admit therethrough the shaft 67. The upper end of the bearing plate has an inturned flange 121 overlapping the toggle arm extension 109. A lug 123 integral with a lateral edge of the bearing plate 114 has a longitudinal guide slot 125 in which loosely registers the pin 108.

An upright latch lever 127, as shown in Figure 3, is pivoted intermediate the length of its shank 128 upon a pin 129 near the inner end of the operating lever 100, and its beak 131 normally overlaps the member 106 at the apex or elbow of the toggle, and is induced to such position by a helical spring 133 attached at one end to the lower end of the latch, and at its other to a pin 136 in the table 14. A cam 138 comprises a sleeve 139 fixed to the rock shaft 67 and a curved cam finger 141 extending radially therefrom engageable with the lower end of the latch lever 127. The sleeve 139 normally abuts against the bearing head 79.

The operation of the toggle and clutch mechanism is as follows. With the parts in normal position as shown in full lines the operator manually elevates the outer or handle end of the lever 100 and through the latch 127 depresses the toggle 102 and thus distends the toggle elements whereby the bearing plate 114 presses against the shoulder member 81, compressing the spring 87 and forcing the clutch disk 61 into contact with constantly rotating driving clutch disk 55, and instantly propels the hammer in its driving stroke.

At the close of the propelling impulse the cam finger 141 strikes the lower portion of the latch lever 127 and tilts it out of engagement with the toggle to the position shown in broken lines in Figure 3, permitting the latter to resume its original undepressed elevated position under the influence of the spring 87 which simultaneously separates the two clutch disks 61 and 55. The instant the cam finger has released the latch lever the latter is returned to its original position under the influence of the spring 133.

A nailing anvil or plunger 145 has a head 146 and is slidably mounted in a central vertical bore or guideway 147 in the enlarged portion 36 of the frame and is movable through an opening 149 in the foot 35. The head of the anvil is in the path of the hammer head in its forward or power stroke which causes one of the nails 151, in alignment with and below the anvil, to be torn from its paper nailcarrying strip 153 and be driven into the work.

When not engaged by the hammer, the anvil is maintained in the elevated position indicated in broken lines in Figure 3. A post 155 fast to the guide portion 36 of the frame has upon its upper end an inturned portion 156 to which is attached the upper end of an expansion spring 158, and to whose lower end is attached a pin 160 fast in the anvil immediately below the head.

The means for advancing the strip 153 step by step to prevent successive nails of the series to the plunger includes two vertically disposed drawing rolls 165 and 166 whose respective axial shafts 167 and 168 have their lower ends journaled in openings

169 in the foot 35, and their upper ends in openings 170 in lateral ears 172 upon a plate 174 fixed by screws or otherwise to the side of the frame portion 3.

The roll 165 is frictionally driven by its companion roll 166 and is adjustable therefrom by adjusting screws 176 engaging its shaft ends 167. The nail loaded end of the strip 153 is formed into a package roll or scroll 178, as shown in Figure 2, resting on end loosely in a substantially cylindrical container 180 provided with a vertical slot 181 to admit the passage of the traveling strip transversely of the face 38 of the frame portion 37. In passing, the top and bottom margins of the strip travel in rearwardly inclined, longitudinally disposed, guide slots 183 in the face 38, as shown in Figures 1 and 3.

The mechanism for actuating the roll 166, as shown in the last mentioned figures, is a depending L shaped bracket 186 fixed by screws 187 to an intermediate portion of the helve 90, and to which is pivoted by a pin 189 the rear end of a rod 190 upon which slides a sleeve 192. Near the free end of the rod is mounted a slidable stop 194 adjustable by a set screw 195. Pivoted at its upper end to a lug 196 upon the bottom of the sleeve by a pin 197 is a lever 198 pivoted intermediate its length by a pin 199 to the end of an arm 200 integral with the web 16. Pivoted to the lower end of the lever 198 by a pin 201 is the rear end of a push rod 202 slidable in a bearing 204 pivoted on a pin 206 in the end of a stud 208 integral with the web 16. A spiral spring 209 connects the upper portion of the lever 198 with the rear portion of the push rod 202.

The forward portion of the rod is flat, and depending from its end is a tooth or pawl 210 having a vertical front face and a beveled rear face. This pawl is adapted to successively engage a plurality of ratchet teeth 214 upon the top of roll 166.

The described roll operating mechanism is actuated by the hammer 89. When the latter returns from its power stroke to the position shown in broken lines in Figure 3 it carries the bracket 186 rearwardly, drawing the rod 190 through the sleeve until the latter is engaged by, and sufficiently moved by, the stop 194 to tilt the lever 198 and thus forwardly push the rod 202, and thus, through the pawl advance the roll 166 a step, which in turn, cooperating with the roll 165, advances a nail into alignment with the plunger 145 preparatory to the next power stroke of the hammer.

The following mechanism is employed for returning the hammer to rearmost position after the cam 138, acting on the latch lever 127, has released the clutch. When the hammer has reached nearly a horizontal position in its downward forward travel, a stud 218 thereon, as shown in Figure 3, strikes and depresses a vertical rod 219 slidable in a bore 220 in the web 16. The lower end of the rod is pivotally connected, as at 222, to a lever 223 passing through an opening 224 in the housing wall 30 and pivoted intermediate its length to a stud 226 on the wall 28 of the extension. Near its rear end the lever has a pin 227 to which is attached a helical spring 228 whose lower end is attached to an eye 229 in the floor 25. The lock lever 223 will be hereinafter adverted to.

Slidable in a transverse groove 231 in the floor is the base 232 of a block 233 beside the rear end of the lever 223, as shown in Figures 2 and 3, in which block is journaled a shaft 235 which passes through an oblong opening 236 in the wall 28, and upon whose outer end, as shown in Figure 4, is mounted a friction roll 238 engaging the periphery of the driving disk 55 through an opening 240 in the housing. Fast to the opposite end of the shaft 235 is a winding roll 242, to which is attached one end of a cord or the like 244 passing over a guide roll or sheave 246 mounted on a pin 247 in a bracket 249 fast to the back wall 26 of the extension, and attached at its forward end to a pin 251 in the upper portion of a fulcrum arm 254 whose lower or hub portion 256 is loose on the shaft 67 and, in this instance, located in the space 75 between the bearing heads 73 and 74. Also attached to the pin 251 is one end of a cord or the like 258 whose other end is attached to a lug 260.

The driving disk 55 thus returns the hammer from its working position to its idle position through the operation of the roll 238, shaft 235, winding roll 242, and the cords fulcrumed by the lever 254. The described winding operation is discontinued prior to the working stroke of the hammer by the following means. By utilizing the fulcruming device it is possible to secure an arc of movement of the hammer of about 180 degrees, resulting in increased momentum.

Near its rear end the web 16 is provided with a vertical bore 262, as shown in Figure 3, to slidably receive therethrough a rod or plunger 264 having upon its upper end a head or shoulder 265. A spring 266 upon the rod has its ends engaging the head and upper face of the web. A bell crank lever 268 includes a rock shaft 269 journaled in a sleeve 270 upon the end of a rearwardly directed bracket 272 fixed to the extension wall 26; an upwardly inclined forked lever arm 275 upon one end of the shaft with slots 277 to receive a pin 279 in the lower portion of the rod 264; and a downwardly directed forked lever arm 281 having slots 283 to receive a pin 284 in the rear end of a horizontal thrust rod 286 slidable in a bearing 288 in the wall 26 with a broad head 290 adapted

to abut against the block 233 and extending laterally thereof below the end of the lock lever 223. A helical spring 292 on the rod 286 presses against the head 290 and the wall 26.

The described means is operated as follows. As the hammer in its retreat stroke approaches the broken line position it strikes and depresses the plunger 264, which rocks the bell crank lever 268 thereby withdrawing the head 290 of the rod 286 from the slidable block 233, which through the impulse of a spring 294, attached to a pin 295 in the block and an eye 296 on the wall 26 impels the friction wheel 238, carried by the block, out of contact with the driving disk 55.

Instantly upon the withdrawal of the plunger 286 the spring 228 has forced the rear end of the lock lever 223 downwardly into a substantially horizontal position abutting against the front face of the head 290, so as to lock the latter against forward movement until the next power stroke of the hammer through the rod 219 against trips the lock lever 223.

The employment of a rotary driving member for imparting the working stroke of the swinging hammer is more powerful than is attainable by the use of rectilineally reciprocating hammers. This power is further enhanced by the possible extent of movement of the hammer in an arc of approximately 180 degrees whereby increased momentum is afforded. By virtue of the swinging movement of the hammer, back thrust against the machine frame is absent, hence even a light machine will retain its seated position.

I claim:—

1. In a nailing machine, a driving shaft, a driving clutch member on the shaft, a longitudinally reciprocable rock shaft, a driven clutch member on the rock shaft moving into and out of contact with the driving clutch member, a spring for actuating the rock shaft in one direction, a toggle device for intermittently actuating the rock shaft in the other direction, an oscillatory hammer comprising a helve mounted at one end upon the rock shaft, and a head upon the other end of the helve, and a nailing anvil in the path of the head.

2. In a nailing machine, a driving shaft, a driving clutch member on the shaft, a longitudinally reciprocable rock shaft, a driven clutch member on the rock shaft movable into and out of contact with the driving clutch, a spring for moving the rock shaft in one direction, means for alternately moving the rock shaft in the other direction, a hammer splined to the shaft, and a nailing anvil in the path of the hammer.

3. In a nailing machine, a driving shaft, a driving clutch member fast to the shaft, a longitudinally reciprocable rock shaft, a driven clutch fast to the rock shaft movable into and out of contact with the driving clutch member, means for reciprocating the rock shaft, interspaced bearings in which the rock shaft is mounted, an oscillatory hammer longitudinally loose upon the shaft and retained against movement longitudinally thereof by the bearing heads, and a nailing anvil in the path of the hammer.

4. In a nailing machine, a driving shaft, a clutch member on the shaft, a longitudinally reciprocable rock shaft, a clutch member on the rock shaft engageable with the first clutch member when the rock shaft is moved longitudinally in one direction, stationary bearings in which the rock shaft is loosely mounted, a hammer splined to the shaft between the bearings, a shoulder fast to the rock shaft, a spring on the rock shaft engaging one side of the shoulder for separating the clutch member, a compressibly toggle device acting upon the opposite side of the shoulder for interengaging the clutch members when the toggle device is compressed, a vibratory latch lever for compressing the toggle device, and a cam on the rock shaft timed to trip the latch lever and release the toggle device after the clutch members have been interengaged.

5. In a nailing machine, a continuously rotating driving shaft, a clutch member fast to the shaft, a longitudinally reciprocatory rock shaft, a clutch member fast to the rock shaft and engageable with the first clutch member, a hammer mounted on the rock shaft, means for forcing the second clutch member into engagement with the first clutch member during a partial revolution only of the first clutch member to impart a power stroke to the hammer, and a nailing anvil in the path of the hammer.

6. In a nailing machine, a continuously rotating driving shaft, a clutch member fast to the shaft, a longitudinally reciprocatory rock shaft, a clutch member fast to the rock shaft and engagable with the first member, a swinging hammer fast to the rock shaft free to travel approximately 180 degrees, and means for forcing the second clutch member into engagement with the first clutch member to impart a power stroke to the hammer.

7. In a nailing machine, a continuously rotating driving shaft, a driving clutch member fast to the shaft, a longitudinally reciprocatory rock shaft, a driven clutch member fast to the rock shaft and engageable with the driving clutch member, an oscillatory hammer mounted on the rock shaft, means for forcing the driven clutch member into engagement with the driving clutch member during a partial revolution only of the driving clutch member to impart a power stroke to the hammer, a nail-

ing anvil in the path of the hammer, and means actuated by the driving clutch member during its continued revolution for reversing the stroke of the hammer.

8. In a nailing machine, a continuously rotating driving shaft, a clutch member fast to the shaft, a longitudinally reciprocatory rock shaft, a clutch member fast to the rock shaft engageable with the first clutch member, stationary bearings in which the rock shaft is journaled, a hammer retained between the bearing and splined to the shaft, means for forcing the second clutch member into engagement with the first clutch member during a partial revolution of the driving clutch to impart a power stroke to the hammer, a fulcrum arm pivotally mounted on the rock shaft adjacent the hammer, a strand connecting the outer end of the hammer with the upper portion of the fulcrum arm, a rotary winding roll in the rear of the path of the hammer, a flexible member supported at one end by the upper portion of the fulcrum arm and attached at its rear end to the winding roll, and means operated by the first clutch member during its continued revolution for actuating the winding roll.

9. In a nailing machine, a continuously rotating driving shaft, a clutch member fast to the shaft, a longitudinally reciprocatory rock shaft, a clutch member fast to the rock shaft engageable with the first clutch member, stationary bearings in which the rock shaft is journaled, a hammer retained between the bearings and splined to the shaft, means for forcing the second clutch member into engagement with the first clutch member during a partial revolution of the driving clutch member to impart a power stroke to the hammer, a nailing anvil in the path of the hammer, means actuated by the first clutch member during its continued revolution for reversing the direction of travel of the hammer, a nail carrying strip in the path of the anvil, intermittently rotatable rolls for advancing the strip to the anvil, and means actuated by the hammer for operating the rolls.

10. In a nailing machine, a continuously rotating driving shaft, a clutch member fast to the shaft, a longitudinally reciprocatory rock shaft, a clutch member fast to the rock shaft engageable with the first clutch member, stationary bearings in which the rock shaft is journaled, a hammer retained between the bearings and splined to the shaft, means for forcing the second clutch member into engagement with the first clutch member during a partial revolution of the driving clutch member to impart a power stroke to the hammer, a nailing anvil in the path of the hammer, means actuated by the first clutch member during its continued revolution for reversing the direction of travel of the hammer, a nail carrying strip in the path of the anvil, intermittently rotatable rolls for advancing the strip transversely of the anvil, and means actuated by the hammer during its reverse travel for operating the rolls.

In testimony whereof I have affixed my signature.

RALPH COSSOCK.