W. C. STEWART.

HOLN CONTROLLING MECHANISM FOR FASTENER INSERTING MACHINES.

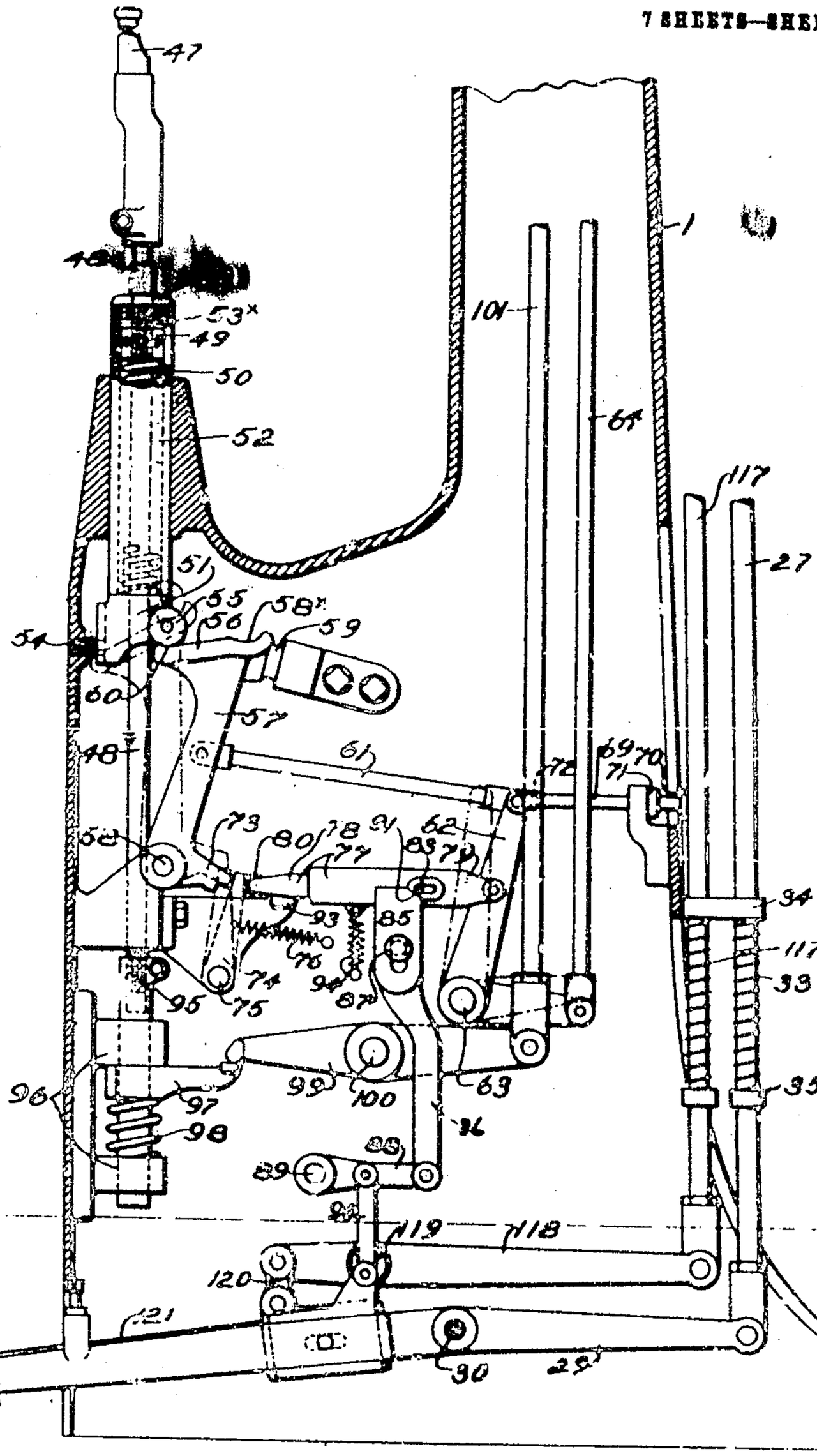
APPLICATION FILED NOV. 22, 1907. RENEWED NOV. 22, 1909.

958,036.

Patented May 17, 1910.

7 SHEETS—SHEET 1.

FIG 1.



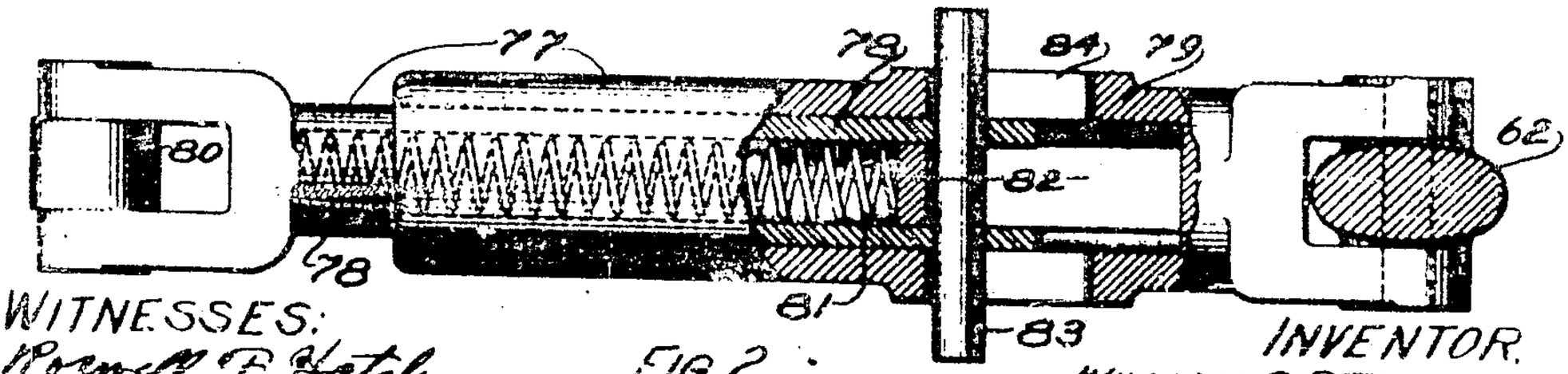


FIG 2.

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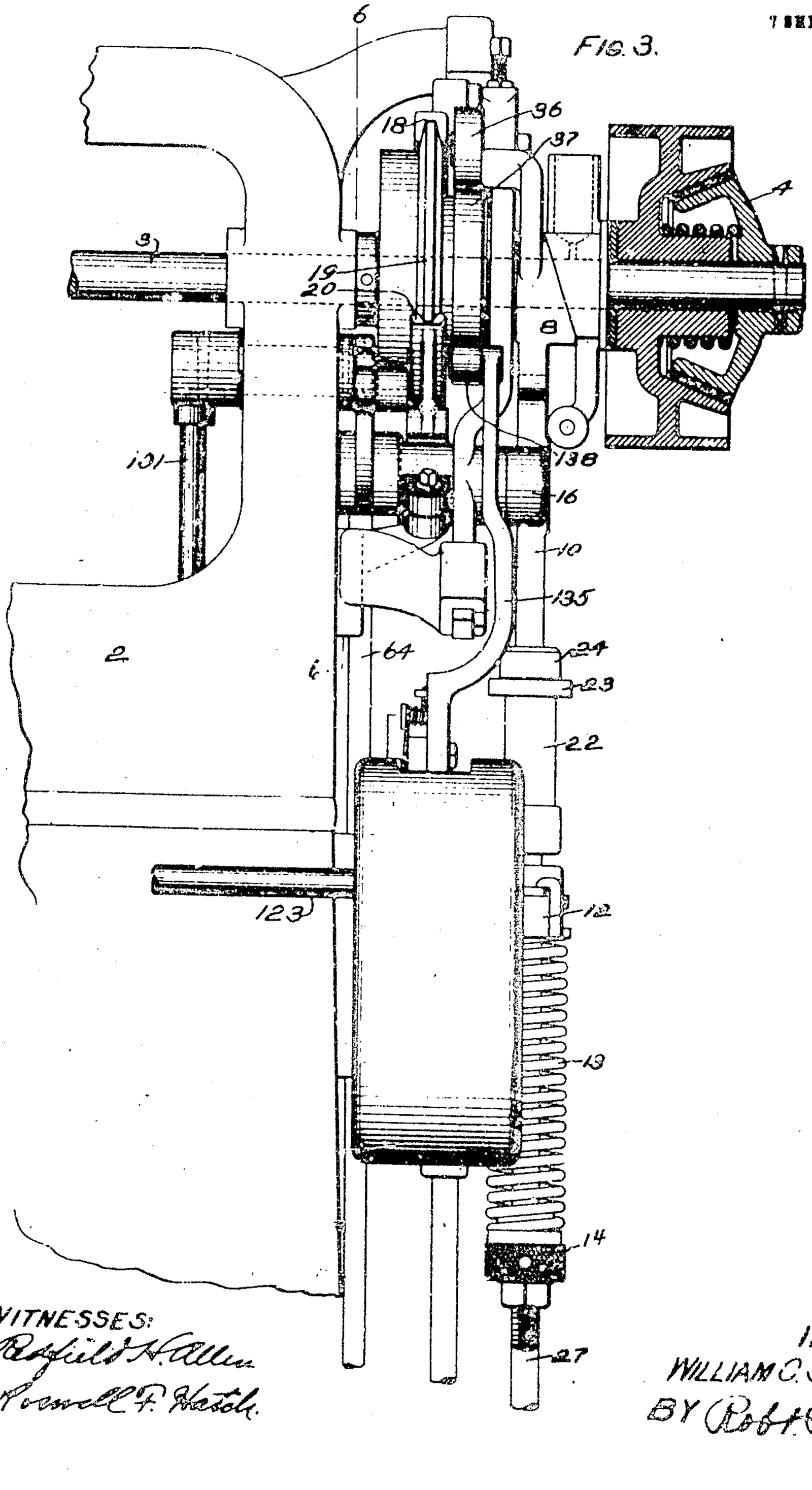
7 SHEETS—SHEET 2.

Fig. 3.



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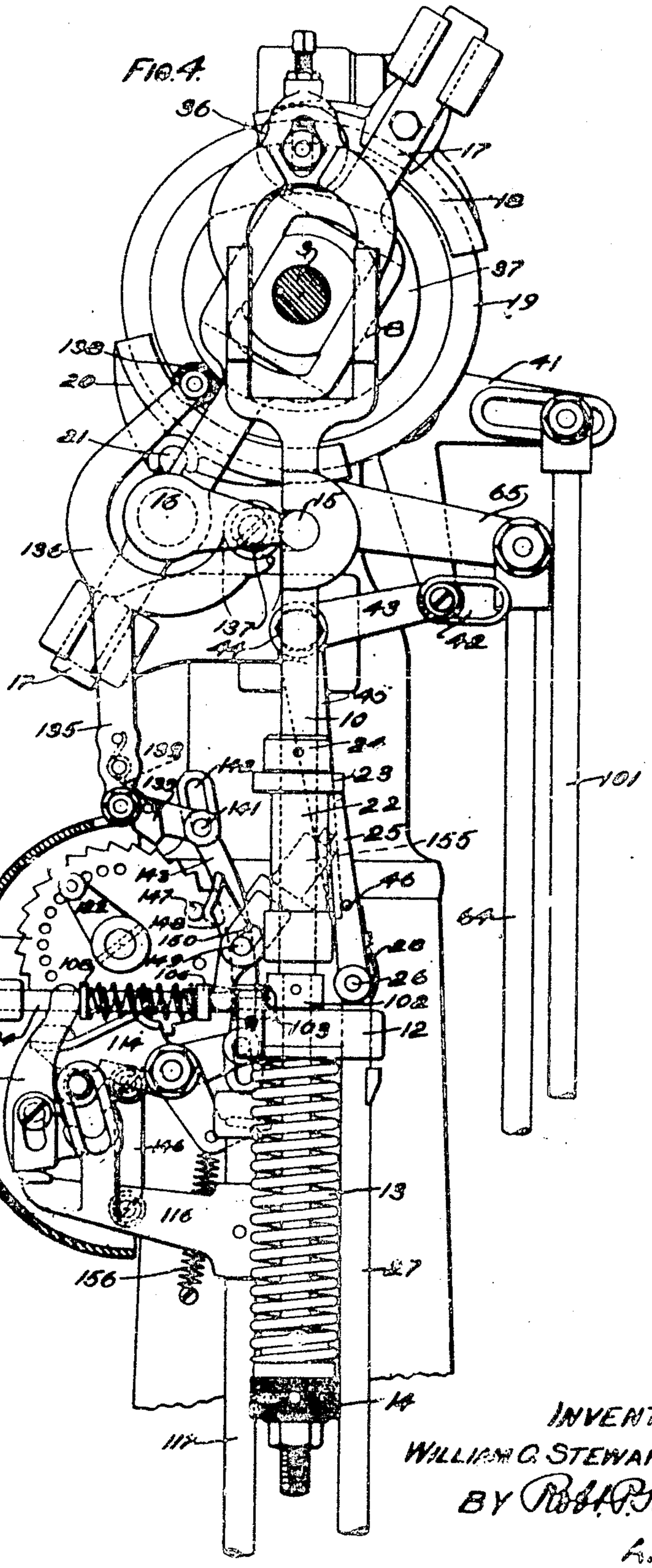
7 SHEETS—SHEET 3.

FIG. 4.



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7 SHEETS—SHEET 4.

FIG. 5.

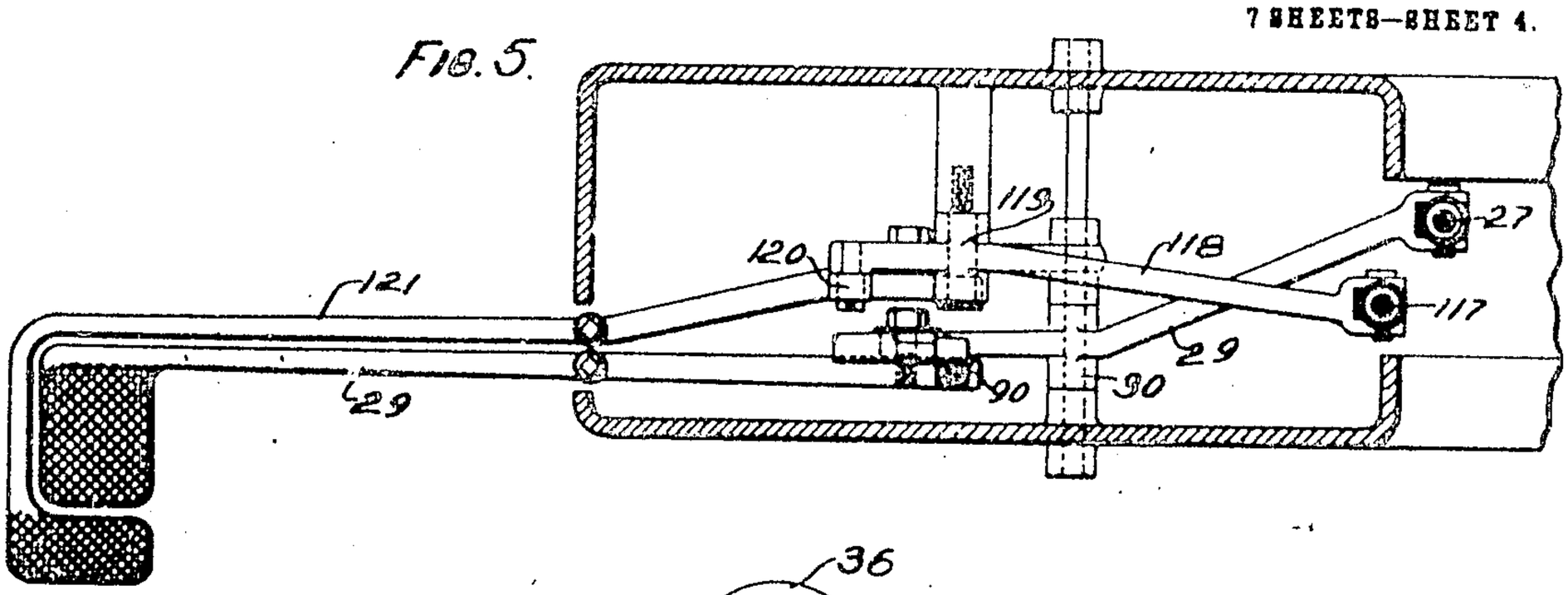
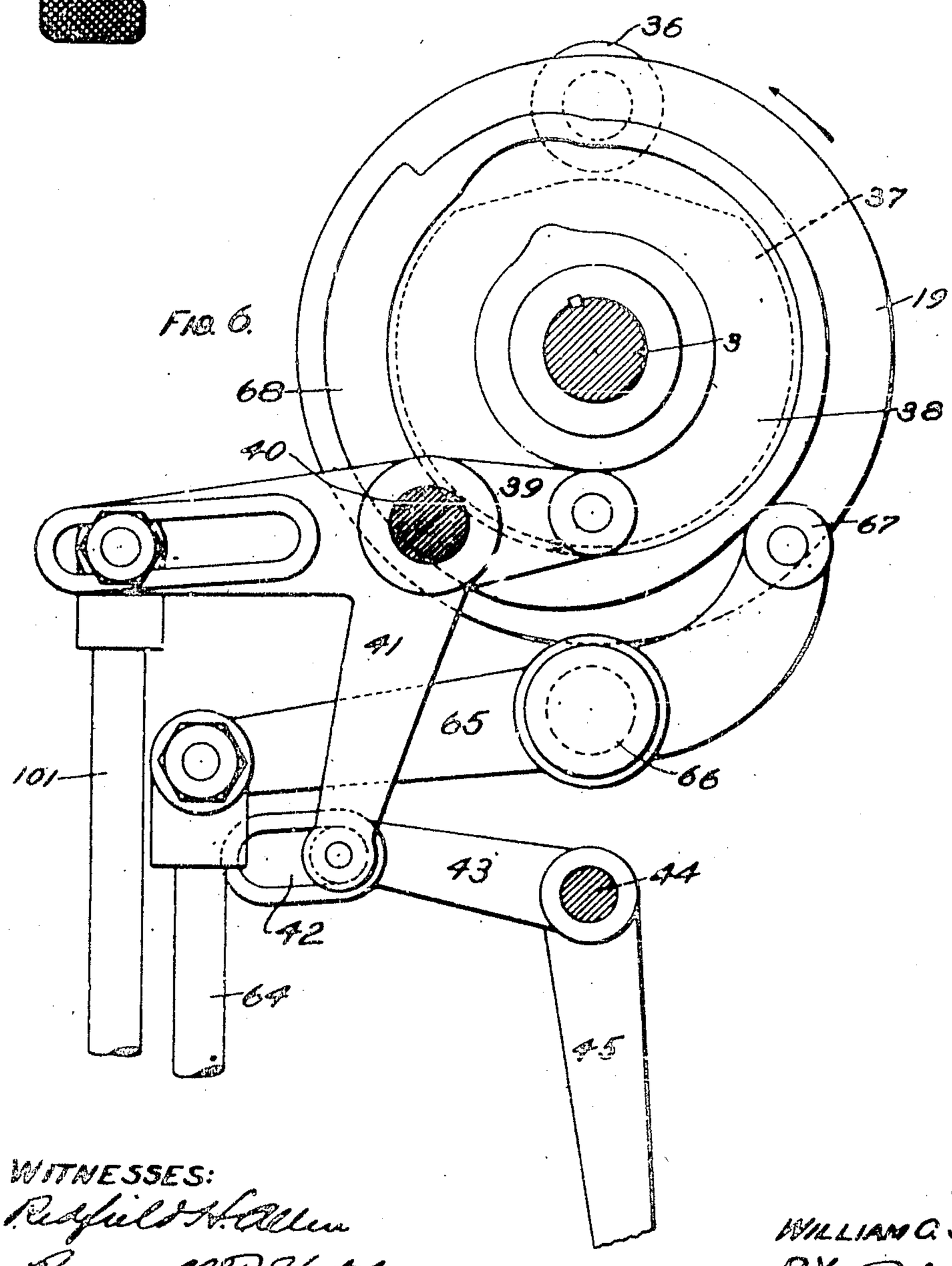


FIG. 6.



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7 SHEETS—SHEET 5.

FIG. 8.

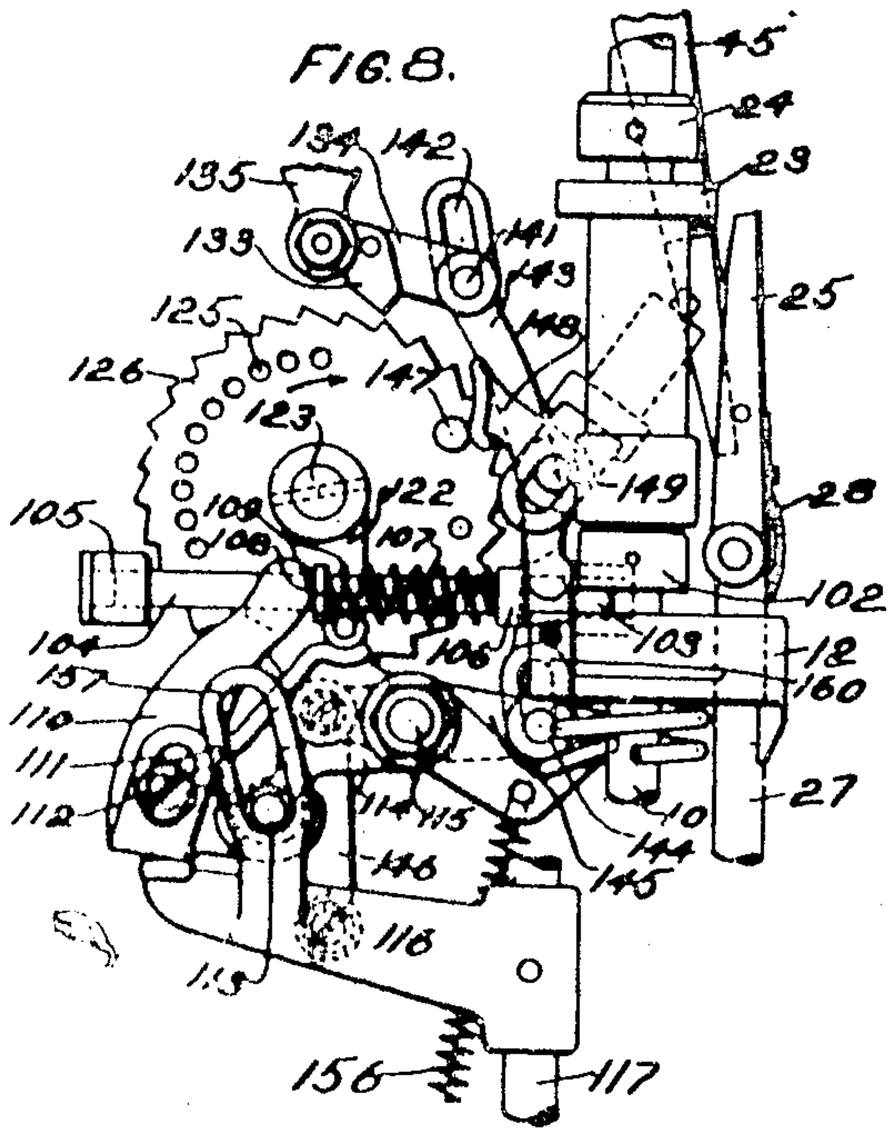


FIG. 7.

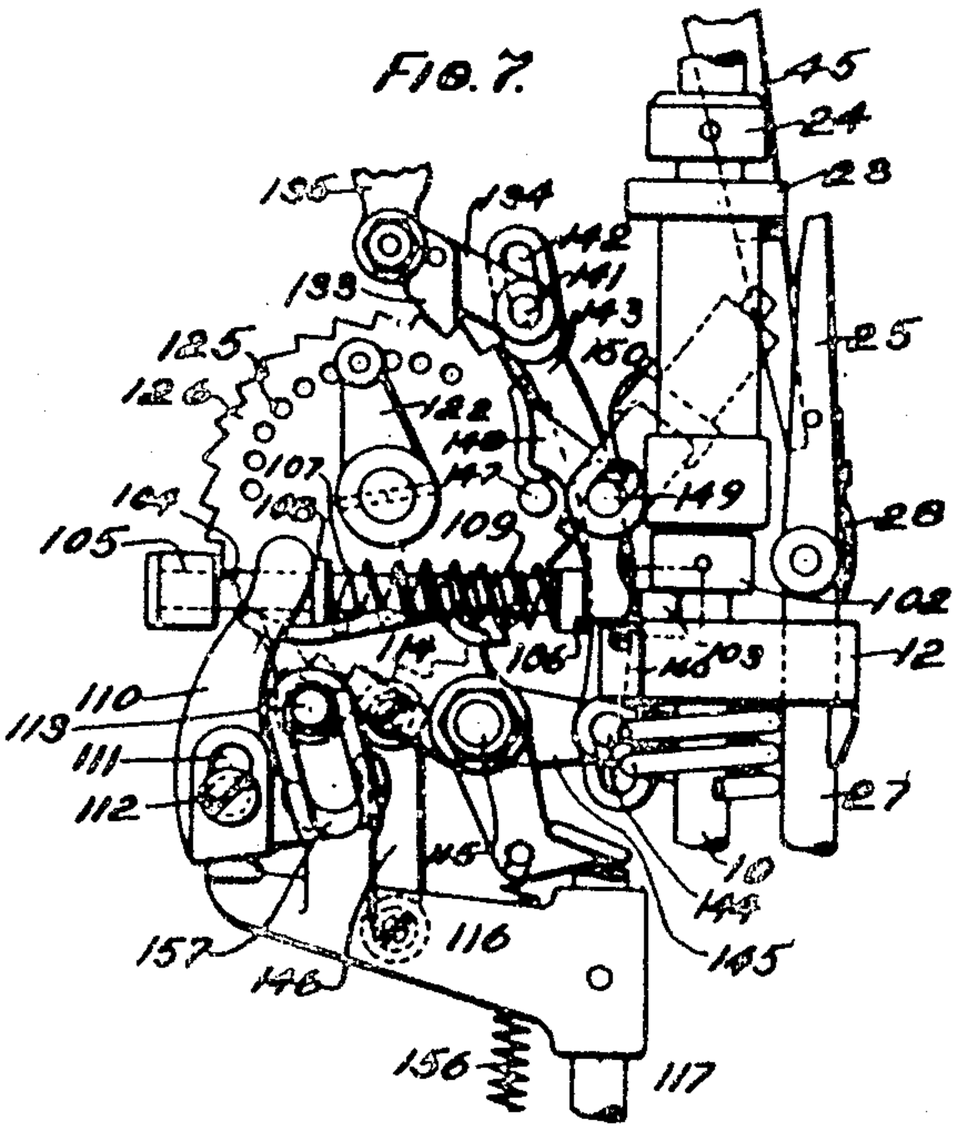


FIG. 9

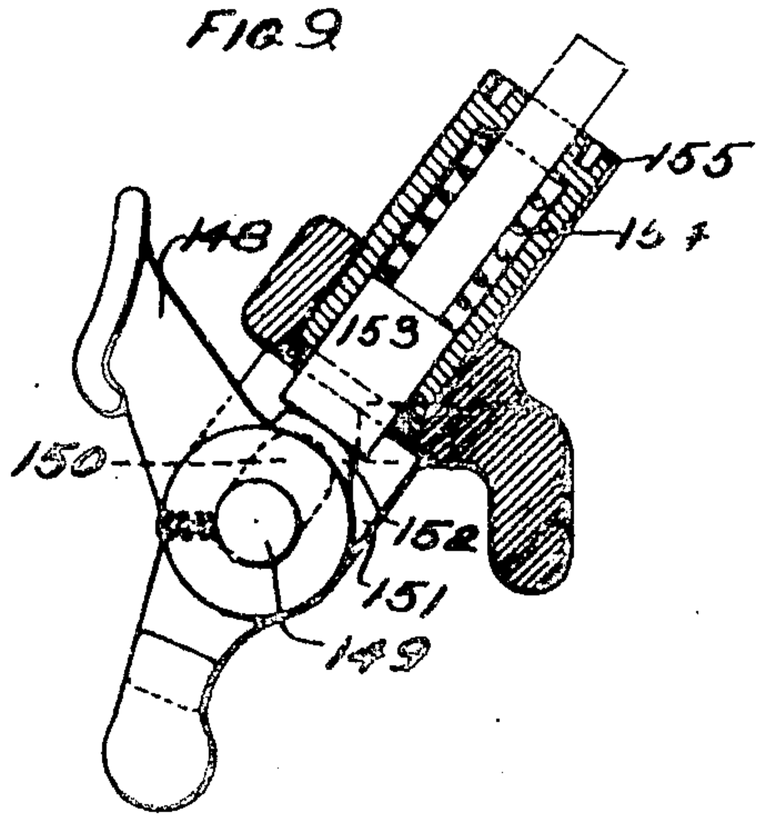
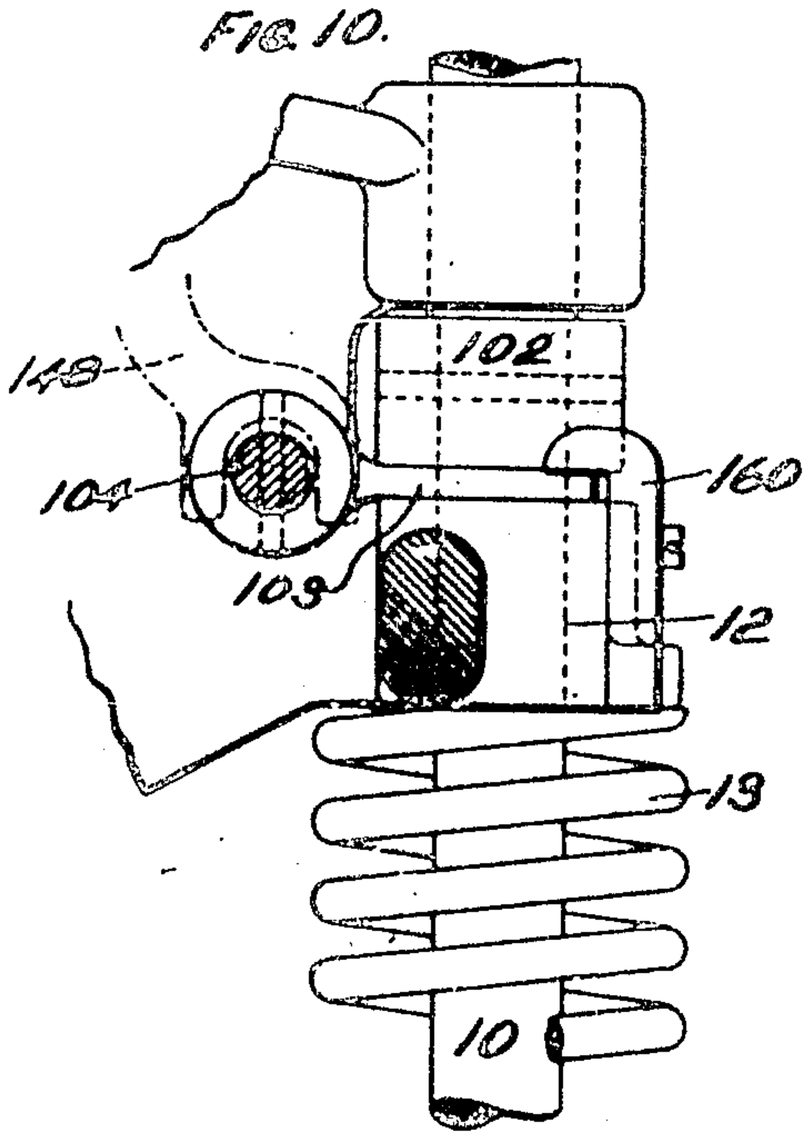


FIG. 10.



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7 SHEETS—SHEET 6.

FIG. 11.

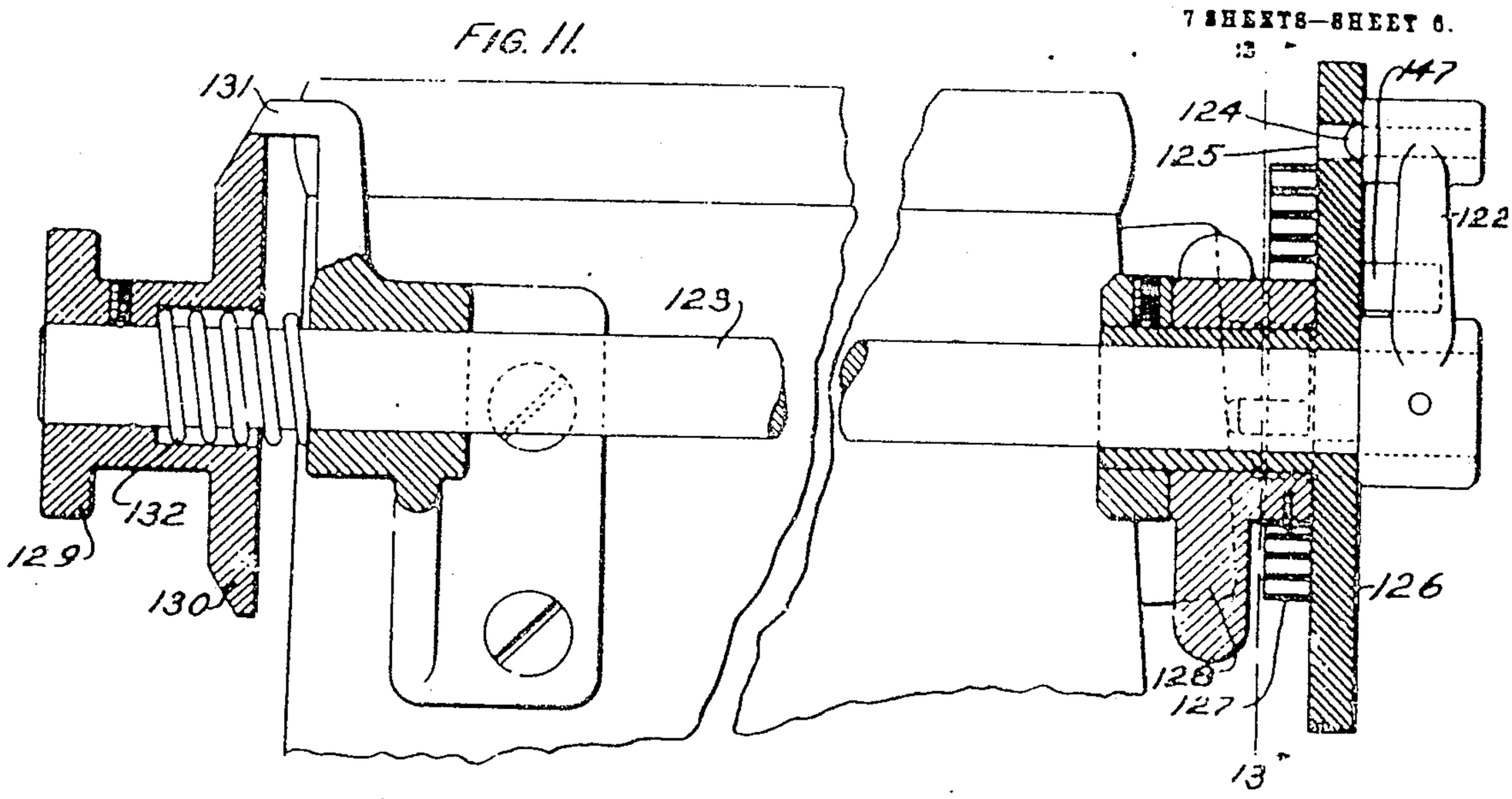


FIG. 12.

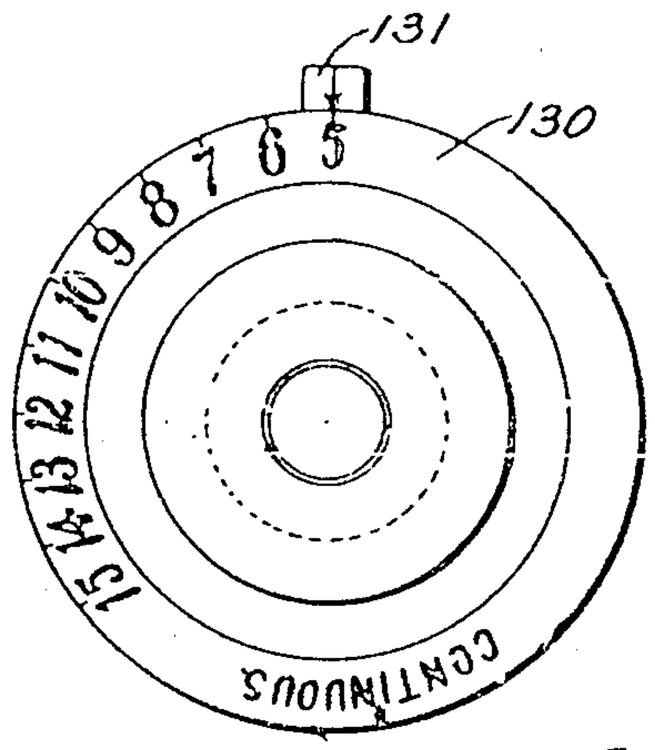


FIG. 13.

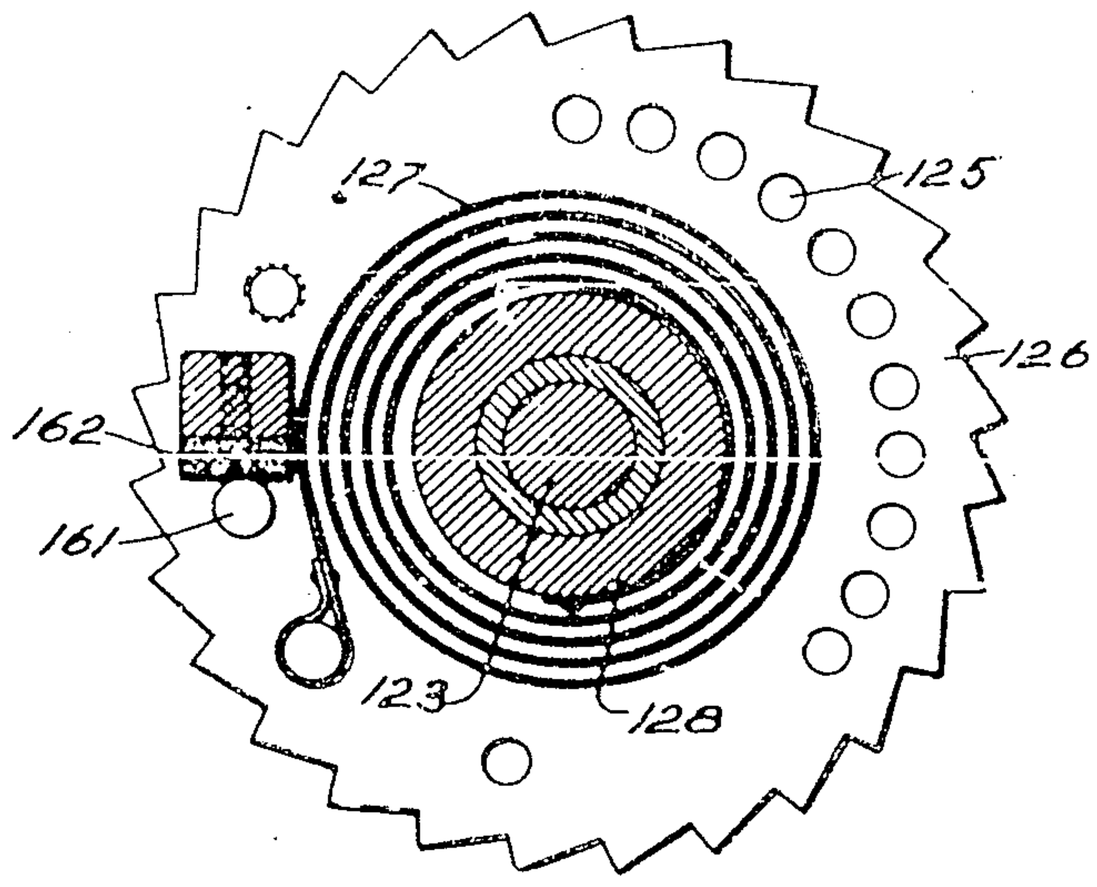
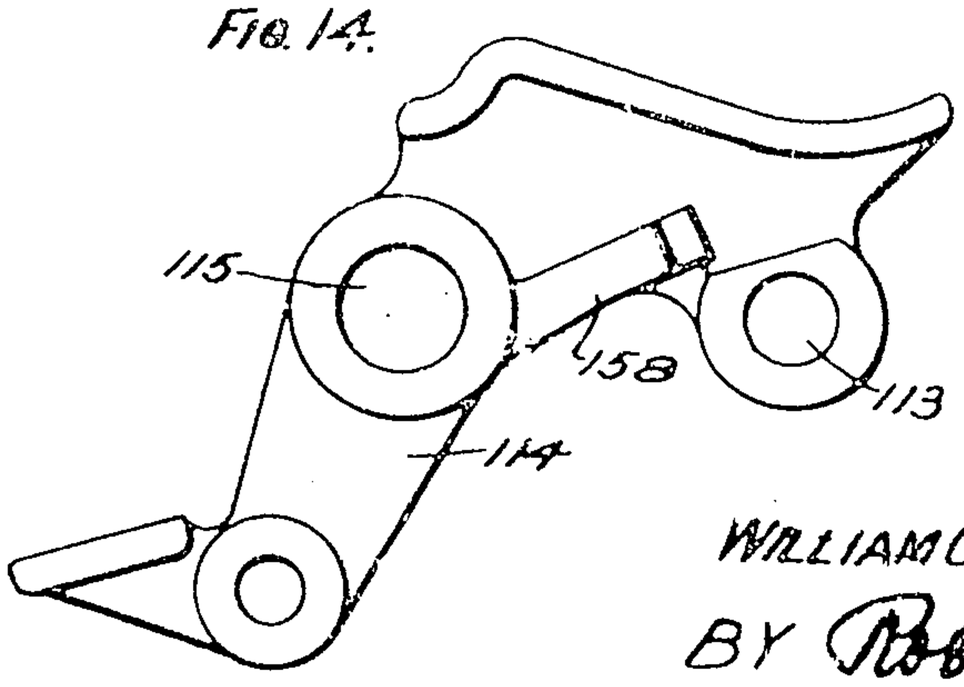


FIG. 14.



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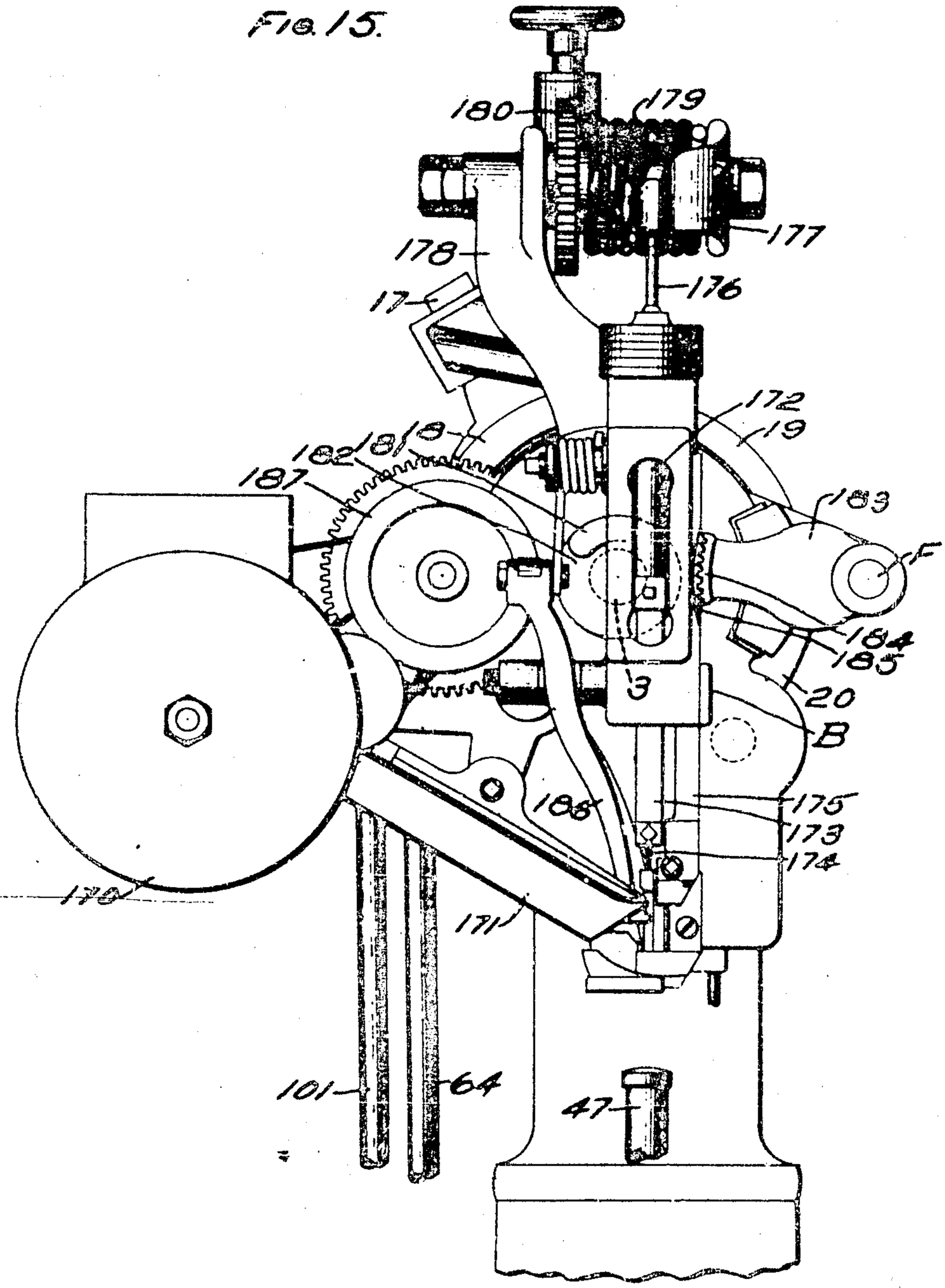
7 SHEETS—SHEET 7.

Fig. 15.



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HORN-CONTROLLING MECHANISM FOR FASTENER-INSERTING MACHINES.

958,036. Specification of Letters Patent. Patented May 17, 1910.

Application filed November 22, 1907, Serial No. 403,306. Renewed November 22, 1909. Serial No. 529,308.

To all whom it may concern:

Be it known that I, WILLIAM C. STEWART, a subject of the King of Great Britain, residing at Lynn, in the county of Essex and State of Massachusetts, have invented an Improvement in Horn-Controlling Mechanism for Fastener-Inserting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

This invention relates to machines for inserting fasteners and more especially to machines adapted among other uses for inserting fasteners in the heel seats and heels of boots and shoes. Machines of this type are provided usually with work supports in the form of horns or jacks and my invention relates more particularly to the means for effecting the necessary relative changes of position of such work support and the fastener inserting means and also for determining the number of fasteners to be driven.

My invention comprises various features and combinations of parts to be hereinafter more particularly referred to.

In the accompanying drawings, Figure 1, is a vertical longitudinal section and partial elevation of the lower portion of a machine illustrating one embodiment of my invention; Fig. 2 is an enlarged detail and partial section to be referred to; Fig. 3 on an enlarged scale shows a part of the machine head, the driving pulley and clutch being shown in section; Fig. 4 is a right hand elevation of the parts shown in Fig. 3, this being a view from what would commonly be the back of the machine; Fig. 5 is a horizontal section on the dotted line, 5—5, Fig. 1, illustrating one arrangement of controlling devices, shown as treadles; Fig. 6 is a diagrammatic view of a portion of the work support controlling means, the view being in part a vertical section on the dotted line, 6—6, Fig. 3; Fig. 7 is a detail in rear elevation of the counting or series determining device for predeterminately limiting the number of fasteners to be driven; Fig. 8 is a similar view showing the parts adjusted for permitting continuous driving, not controlled by the said counting mechanism; Figs. 9 and 10, sectional details to be referred to; Fig. 11, a full size sectional detail showing the connections from the counting mechanism to the dial device for varying the number of fasteners of a given series; Fig. 12, a face view of the dial itself; Fig. 13, a sectional detail on the dotted line, 13—13, Fig. 11; Fig. 14, a detail to be referred to; and Fig. 15 is a front view showing more particularly one form of fastener inserting mechanism actuated from the driving shaft.

Referring to the drawings, first to Figs. 1 to 4 inclusive, in the particular machine selected for illustration herein, the column 1 sustains at its upper end the machine head 2, of any desired machine for inserting fasteners and fitted with any suitable work plate. For the purposes of the present disclosure, this head may be assumed to be the head of a usual machine for driving loose nails in the manufacture of boots and shoes. Such a machine is typified by United States Letters Patent No. 490,624 issued January 24, 1893, to which reference may be had if a detailed description of such machine is desired. For the present disclosure it is sufficient to state that the machine is constructed to insert one nail or fastener at each rotation of its main shaft, the period of operation of the machine determining the number of fasteners that are driven, it being necessary to stop the machine to arrest the insertion of the fasteners.

Referring now particularly to Figs. 3 and 4, the machine head 2 is provided with the usual main shaft 3 provided at its outer end with a suitable friction clutch 4, controlled by the vertically movable wedge 8 on a slide rod 10. This wedge rod (Fig. 4) depends through the bracket or lug 12, rearwardly extending from the column of the machine. Below the lug 12 said rod is surrounded by a spiral spring 13, seated at its lower end against a nut 14 upon the lower end of said rod and tending normally to depress the wedge rod and stop the machine. Just below the wedge 8 the wedge rod (see Fig. 4) is provided with a lateral recess which receives the end of a brake controlling arm 15, which controls a brake of any desired construction, here typified by the brake wheel 19, and the brake shoes 18 and 20. When the wedge 8 is depressed by its spring to release the clutch the arm 15 (Fig. 4) is moved to cause said brake to stop the machine. When the wedge is elevated to start the machine, the reverse movement of said arm 15 will release the brake. To control

the wedge 8, its depending rod 10 above the lug 12 (Fig. 4) is surrounded by a sleeve 22, provided at its upper end with a flange 23. Immediately above this sleeve is a collar 24, fast upon said rod 10. Standing normally beneath the flange 23 of said sleeve is the upper end of a lift pawl 25, fulcrumed at its lower end at 26, to the upper end of a treadle rod 27 and controlled by a spring 28 (Fig. 4). This treadle rod is connected at its lower end (see Fig. 1) to the rear end of a foot treadle 29, fulcrumed at 30, a spring 33 on the treadle rod serving to depress the treadle rod and elevate the treadle after the latter has been released by the foot.

Referring again to Fig. 4 the wedge rod 10 is provided at its upper end with a roller stud 36, shown also in Figs. 3 and 6, which overlies a cam 37, on the main shaft. The shape of this cam is such that when once the wedge has been elevated to start the machine, initial rotation of the main shaft will turn said cam beneath the roller 36, thereby further lifting it slightly so as to enforce sufficient frictional engagement between the clutch members and thereafter to hold said roller and wedge in their elevated positions until the shaft has substantially completed one rotation, whereupon the low spot of the cam reaches a position beneath the said roller and then, and not until then, it is possible to depress the wedge to stop the machine. The purpose of this is to enforce always a full rotation of the main shaft when once it has entered upon a rotation, in order that a fastener just feeding or forming may be completely fed or formed and driven before the machine comes to rest, it being impossible to stop the machine when a fastener is partly fed or formed or partly driven. When, therefore, the operator depresses the treadle and lifts the starting pawl 25 to start the machine, if a single fastener only is to be driven, he may instantly release his treadle and permit the pawl to drop, leaving the wedge locked in its elevated position by its cam 37 to complete the rotation of the shaft and the driving of the fastener, after which said wedge is dropped by its own spring 13 and the machine is arrested by the brake described.

The brake wheel 19 (see Fig. 6) is provided at its front face with a cam groove 38, in which travels a roller stud on a short arm 39, fast on one end of a short horizontal shaft 40, mounted in the machine head. At its opposite end said shaft 40 is provided with a two arm lever 41, the depending arm of which is provided with a stud that enters a slot 42, of a bell crank lever 43, fulcrumed at 44 on the machine column. The depending arm 45 of said bell crank lever stands in front of a pin 46 on the starting pawl 25. At the first rotation of the main shaft, the bell crank lever 43 is turned to swing the starting pawl 25 from beneath the flange 23, as in Figs. 7 and 8, so that should the operator retain his treadle depressed, the starting pawl will be automatically disengaged from the flanged sleeve, to permit the wedge sustained by it to drop at the end of the first turn of the shaft and thereby render it impossible to obtain more than a single driven fastener, however long the treadle may be retained depressed. This is of advantage in what is known as single nail work, where it is required to drive fasteners one at a time in different positions, the work being fed between the driving of successive fasteners. The work support is shown (Fig. 1) in the form of a horn 47. This horn is removably mounted upon the upper end of a supporting rod 48, mounted to slide vertically in a part of the column provided therefor. In the construction shown, said supporting rod is provided with a nut 49, supported upon a coil spring 50, surrounding said rod 48, and seated at its lower end upon a head 51, at the lower end of a barrel 52, that surrounds said spring and its contained rod. This barrel at its upper end is closed by a screw plug 53, which serves also as a guide for the rod, and seated against the under side of this screw plug is a stop collar 53* fast on said rod and serving to limit the upward spring pressed movement of the horn, relative to said barrel. Elevation of the barrel serves also through the spring 50 to elevate the rod 48 and the work supporting horn, thereby to raise the work against the work plate of the machines. When the work meets the work plate, further elevation of said barrel compresses the spring 50, which presses the work firmly against said work plate to receive the fastener driven therethrough. When the barrel referred to is dropped, it first releases the spring 50, and then drops the horn.

The nut 49 is shown as a barrel nut with pin holes in its periphery to receive a pin inserted through an aperture in the barrel, whereby the nut may be turned to vary the normal tension of the spring 50. To prevent the barrel from turning, the head 51 (Fig. 1) is slotted at its front side to receive the guide screw 54.

The horn and spring carrying barrel described are normally in their lowermost positions so as to leave ample separation between the horn and the work plate above it, for the renewal and insertion of the work. It becomes necessary, therefore, after the work has been placed upon the horn, to elevate the latter to position the work against the work plate before the first fastener can be driven. This is accomplished by positioning means which herein, lifts the spring barrel 52 and thereby through the contained spring, lifts the horn and work.

Referring still to Fig. 1, the barrel head 51 is provided with rollers 55, which rest upon the cam face 56, at the upper forked end of a lifting lever 57, fulcrumed at 58, within and upon the column. The cam face 56 of this lifting lever is shaped to provide a gradually inclined lifting surface, terminating at its upper end in a nearly concentric raised portion 58x, behind which is a stop 59, to prevent the rollers from running off the cam surface, said face terminating at its lower end in substantially concentric seats 60, to support the rollers 55 and the horn in their depressed positions.

The lifting lever 57 is swung from right to left (Fig. 1) to lift the barrel and thereby the horn by a connecting rod 61, jointed thereto and to the upright arm of the bell crank lever 62, fulcrumed at 63. The horizontal arm of this bell crank lever is connected to the lower end of a lift rod 64, which (see Fig. 4) extends upward and is jointed at its upper end to the free arm of a lever 65. This lever (see Fig. 6) is fulcrumed at 66, upon the frame and is provided at its opposite end with a roller stud 67, which runs in contact with a surface cam 68 on the main shaft.

When the machine is set in motion, initial rotation of the main shaft operates through said cam 68 to lift the rod 64 and thereby through the bell crank 62 and connecting rod 61 (Fig. 1) pushes the lifting lever 57 forward to cause it to elevate the horn to press the work against the work plate in readiness to be operated upon for the driving of the first fastener.

To limit the forward swing of the lifting lever 57, I have connected to the upper end of the bell crank lever 62, a stop rod 69, which is provided at its rear end with a head 70, adapted to contact with a yielding or other stop 71, on the column. The stopping position may be varied suitably by adjustably connecting the stop rod itself with a threaded clamp socket 72 on the bell crank lever 62.

To retain the lifting lever 57 in its forward position with the horn elevated I have provided said lever with a toe 73, which stands normally in front of a prop 74, fulcrumed at 75 in the column. A spring 76 tends to draw said prop away from said foot, but it may be pressed forward thereunder, to hold the lever in horn elevating position, by a pusher 77, connected with the upright arm of the bell crank lever 62 and pushed forward by said lever as the latter moves to push forward the lifting lever.

The prop pusher 77 as herein constructed, is shown separately in Fig. 2. Referring to this figure it is shown as comprising two telescopic members 78 and 79, the member 78 carrying at its front end the roller 30, to act upon the prop 74, the member 79 being connected to the bell crank lever 62. The inner telescopic member 78 is itself socketed to receive a spring 81, seated at its opposite end against a block 82, in and near the open end of said socket and forked to straddle a pin 83, extended transversely through the end of said socket member. The pin 83 has its ends extended through the outer telescoping member 79, which latter is slotted at 84 therefor to permit the two telescoping members to be moved one within the other to vary the effective length of the connection under the action of the contained spring 81. The protruding ends of the pin 83 overlie the upper cam-shaped end 85 (Fig. 1) of a tripping member 86, slotted near its upper end to receive a guide pin 87 on the column and, at its lower end, jointed to the free end of a lever 88, fulcrumed at 89 on the column. Between its ends said lever 88 is connected by a depending link 90 with the treadle 29. The upper end of the tripping device is forked to straddle the pusher 77 and is provided at its right-hand end with an inclined surface 91. In the normal condition of the parts the protruding ends of the pin 83 stand behind, or below the tops of these inclined faces 91, with the front end of the pusher 77 resting on a support 93, secured to the column. Preferably the pusher 77 is drawn yieldingly downward toward said support by a spring 94.

When the foot treadle is depressed to start the machine, the releasing device 86 is similarly depressed and the moment the machine starts rotation of the main shaft operates through the cam 68 (Fig. 6) to lift the rod 64 to throw the bell crank lever 62 forward (Fig. 1), thereby to swing the lifting member 57 similarly forward to lift the horn and at the same time through the pusher 77, push the prop 74 into position under the toe 73, thereby to lock the said lifting member 57 in position sustaining the elevated horn. It is evident that the prop 74 cannot be pushed under the toe 73 until after the lifting member 57 has been turned into substantially vertical position and because of this the pusher 77 is made telescoping, as described, to permit it to compress or shorten until the end of the toe clears the upper end of the prop 74, whereupon the compressed spring of the pusher extends and pushes the prop under the toe to sustain the lifting member. The parts remain in these positions with the horn elevated, so long as the operator retains his foot upon the treadle. In single nail work, the first rotation of the main shaft causes the starting pawl 25 on the rod 27 (Fig. 4) to be tripped and at the end of said first rotation the cam 37 permits the rod 10 to drop and stop the machine. The operator, however, retaining the treadle depressed retains

the horn in elevated position until after the machine has come to rest to make certain that the fastener is completely driven. Thereupon he releases the treadle and permits it to rise under the action of its spring 33 (Fig. 1) similarly lifting the releasing device 86 to cause the latter to engage the overlying ends of the pin 83, thereby to lift the forward end of the pusher 77. This frees the prop 74, which is promptly drawn rearward by its spring to release the lifting member 57. The lifting member in its turn is returned to its original position by the weight of the drop rod 64 and its connected parts, so that, as will be obvious to one skilled in the art, the horn depression is controlled by the operator through the treadle.

In actual practice upon single nail work, the operator will ordinarily depress the foot treadle to start the machine, and will, in order to gain speed, immediately release said treadle, without waiting for the machine to complete its first cycle or rotation of the main shaft, upon the completion of which the machine will stop by reason of the wedge block 8 dropping under the action of spring 18. The actual release and depression of the horn is, however, delayed somewhat following the release of the treadle, by reason of the fact that after the pusher 77 has been raised to release the prop 74, it takes an appreciable period for the prop to be drawn from under the toe of the lifter 57; also for the latter to be withdrawn from beneath the work supporting horn and for the horn to drop, this delay being sufficient to insure the complete driving of the fastener before the horn drops, said parts in their action thus constituting a delaying device for the horn depression.

A large proportion of boot and shoe work requires the insertion of fasteners or nails in series, for example in a series extending completely around the heel from one to the other breast corner thereof and commonly called "continuous" nailing, or in a series of sufficient length to extend around the outer curved portion of the heel only, where the greatest wear comes in use. In either case, when once the treadle has been depressed to start the machine it has been necessary that the operator retain said treadle depressed for a sufficient time to cause the machine to drive the required series of fasteners in rapid succession. During this time the horn must remain in elevated position, except that it must be periodically depressed slightly to permit feed of the work between the driving of successive nails. In machines of this type an awl is generally utilized as a feeding device, it being given a transverse movement while in the work, to feed the latter, whereupon it is withdrawn and the fastener driven in the awl hole. The periodical depression of the horn for feeding, takes place ordinarily at about the time of insertion of the awl, to permit the latter to feed the work without resistance, after which the horn is again lifted substantially simultaneously with the withdrawal of the awl to permit insertion of the nail. This periodical depression of the horn for feeding must take place automatically to keep pace with the speed of the machine, and this is accomplished in the present instance (see Fig. 1) by providing the horn supporting rod 48 with a depending extension or grip bar 95, preferably squared in cross section and arranged to slide in bearings 96 in the column. Between these bearings said grip bar receives the grip arm 97, having an aperture with walls to fit opposite gripping surfaces of the grip bar but normally separated by a distance slightly exceeding the diameter of said bar. Between this grip arm 97 and the lower bearing 96 is interposed a spring 98, which serves to retain the grip arm normally in its uppermost and truly horizontal position in contact with the under side of the upper bearing 96. If the projecting end of grip arm 97 be depressed, it first tips relative to the grip bar 95, whereupon further depression of said arm will cause the bar and its connected horn to be similarly depressed to release the work for feeding. This depression of the grip arm is herein effected by means of a lever 99 (Fig. 1), fulcrumed at 100 and having its rear end connected by a rod 101 (Fig. 4) with the slotted arm of the two-arm lever 41 (Fig. 6) previously referred to as operated by the cam 38 on the main shaft. At each rotation of the main shaft this two-arm lever is rocked to produce periodical depression of the lever 99 (Fig. 1) and the horn, always at the moment when the awl or other feeding device is to feed the work.

The elevation of the horn 47 varies, of course, with the thickness of the work interposed between it and the work-plate above, the thinner the work, the higher the elevation of the horn. This variation is provided for between the lifting lever 57 and the horn by the varying compression of the spring 50. The elevated position of the horn may vary following each feed of the work, according to the changing thickness of the work, but the grip device 97 catches the grip bar 96 wherever it finds it and depresses it a given distance for the feed, thereafter releasing it and permitting it to rise with the horn to find the work whatever the thickness of the latter in its new position.

To prevent the first turn of the main shaft from stopping the machine at the end of the first turn of the shaft when "continuous" or series nailing is desired, I have provided a mechanism which I will now describe and said mechanism as herein illustrated is also constructed to permit it to be

set to a given or predetermined number of nails at the end of the driving of which it will cause the machine automatically to stop, thus preventing the driving of more than the desired number of nails in a series of limited extent. This mechanism, for convenience, I will refer to as a counting mechanism or counter, it being useful for series nailing and availed of herein for "continuous" nailing, although my invention is not necessarily restricted to its use therefor.

The depending wedge actuating rod 10 (Fig. 4) immediately above the bearing lug 12 is provided with a fast collar 102 which, when said rod is elevated to start the machine, is raised above the said lug 12 sufficiently to permit the insertion thereunder of a plug or finger 103 (Fig. 8). This finger projects laterally from a horizontal sliding rod 104 (Fig. 10), mounted in bearings 105 on the column, one only of which is shown in Figs. 7 and 8. This sliding rod (Fig. 8) is provided with a fast collar 106, seated against which is a relatively light spring 107, surrounding said sliding rod and seated at its opposite end against a loose collar 108 also on said sliding rod, said spring being normally in compression. Interposed between said fast and loose collars is a second and relatively heavier spring 109, which surrounds the lighter spring 107 and is shorter than said lighter spring this heavier spring being availed of at certain times only upon compression of the lighter spring.

Behind the sliding collar 108 stands the end of the vertical arm of a bell crank 110, provided at the elbow with a slot 111, which receives a screw 112 on a counter casting or bracket secured to the column. The horizontal arm of the bell crank 110 is recessed to receive a pin 113 in and near one end of a lever 114 fulcrumed at 115 also on the counter bracket. This lever 114 is shown separately in Fig. 14, but looking from the opposite or front side thereof.

Underlying the slotted elbow of the bell crank lever 110 is a laterally extended arm 116, fast on the upper end of a lift rod 117, which (Fig. 1) reaches downward behind the column, controlled by a spring 117× (Fig. 1) and is connected at its lower end with the long arm of a lever 118. This lever is fulcrumed at 119 on the column and has its short arm connected by a link 120 with a second or series treadle 121. This treadle is shown as fulcrumed at the same point 30 as the starting treadle and (Fig. 5) extends outward to the front of the machine in substantial parallelism with the starting treadle, having its outer end turned around to embrace the tread end of said starting lever, so that the tread ends of the two levers stand side by side facing toward the machine in position to be acted upon as desired by the heel of the operator's shoe (see Fig. 5). If the starting treadle alone be depressed, the machine will be set in operation and will stop automatically after having driven the first fastener as hereinbefore described. If, however, the operator swings his foot slightly to the right, so as to depress both treadles simultaneously, the second or series treadle will lift the rod 117 (Fig. 4) and thereby through the arm 116 at its upper end (Fig. 8) also lift the elbow of the bell crank lever 110, causing the said lever to swing about the pin 113 as a fulcrum to cause its upper arm to swing to the right, compressing the lighter spring 107 and through the heavier spring 109, tending to push the slide rod 104 to the right. This however, is resisted, because the finger 103 rests against the side of the lug 102, as in Fig. 4, hence the heavier spring 109 is also compressed. Simultaneously, however, with the lifting of the rod 117 the starting rod 27 operated by the starting treadle, was lifted, causing its pawl 25 (Fig. 4) to raise the flanged sleeve 22 and the wedge rod 10 to start the machine, and the moment the collar 102 on said wedge rod is lifted above the said finger 103, the latter acted upon by said springs, is immediately pushed between said collar and the bearing lug, as in Figs. 8 and 10. This retains the wedge rod in its elevated position to maintain the operation of the machine for the driving of a series of nails for notwithstanding the lifting pawl 25 is thrown out during the first rotation of the shaft precisely as in single nail work and releases the flanged sleeve 22, permitting the latter to drop behind said dog, the wedge rod itself remains supported by the finger 103 and maintains the machine in operation.

When the desired number of nails have been driven, the operator releases both treadles, the starting wedge 8 being restrained from dropping by the cam 37 until the last fastener has been completely driven; the series treadle, rising immediately upon its release and permitting its arm 116 (Fig. 8) to drop. This frees the finger 108, which is immediately returned (by a spring to be described) to its original position at the left, freeing the wedge rod 10 and leaving the latter to drop and stop the machine at the end of a complete rotation of the shaft. Thus the operator may by depressing the starting treadle alone drive nails single and separated by any desired distances through which he may shift the work, or by depressing both treadles he may cause nails to be driven in continuous series of indefinite number determined only by the length of time during which both treadles are maintained depressed. This single nail and "continuous" driving may be alternated by depressing first the starting treadle and then both treadles, so as to drive the nails singly,

as at the corners of a heel, with a series of indefinite number between, as, for instance, around the outer rear portion of the heel.

Frequently it will be unnecessary to provide more than the foregoing mechanism, relying upon the operator's ability and skill in handling the machine to stop the latter after the required number of nails in a series have been driven. It may be, however, that a new operator or a careless one would drive more than the desired number of nails in series, thus causing a waste of nails, and to prevent this, as well as to insure uniformity of work, I have provided the counter mechanism which I will now describe.

Referring to Figs. 8 to 10, the lever 114 during "continuous" nailing is maintained with its left-hand end depressed, as in Fig. 8, by the end of an arm 122, fast on the end of a horizontal shaft 123, shown in full size in Fig. 11. This arm is provided at its end (Fig. 11) with a round ended projection or pin 124, adapted when the arm is turned into proper position, to engage one or another of a series of apertures or recesses 125 in a ratchet wheel 126 loosely mounted on said shaft 123. The hub of this wheel is surrounded by a coil or clock spring 127 (Fig. 13) secured at its outer end to the wheel and at its inner end to the stationary bearing 128, which surrounds the hub of said wheel and through said hub furnishes sufficient support for that end of the shaft 123. When the wheel is ratcheted to the right (Fig. 8), it serves to wind the said spring, the latter returning the wheel to its original position when released.

At its left and front end the shaft 123 (see Fig. 11) has fast upon it a knob 129 provided with a dial 130 (Fig. 12) graduated to correspond with the apertures or recesses 125 in the ratchet wheel and adapted to be turned into different positions relative to a stationary gage 131. Between the dial end of the knob and the adjacent bearing for the shaft, is interposed a spring 132 which presses the said shaft normally forward, so as to retain the projection 124 on the arm 122 at its opposite end in contact with the face of the ratchet wheel or in one or another of the recesses 125. By pressing the said knob and its shaft axially rearward, the arm 122 is freed to be turned to any desired position, and when released will at once spring forward into engagement with the ratchet wheel.

To rotate the ratchet wheel I have provided above it a pawl 133 forming part of a link 134. This link is hung from the lower end of a pawl carrier arm 135 which (Fig. 4) depends from a U-shaped lever 136 fulcrumed at 137 on a suitable support. The upper end of this lever is provided with a roller stud 138, which runs upon the same cam 37 that controls the dropping of the wedge for stopping the machine. At each rotation of the main shaft the pawl 133 is swung inward to engage a tooth of the ratchet wheel and push the same forward a distance represented by the length of the tooth as represented in Fig. 7. The pawl is pressed downward toward the ratchet teeth by a spring 139, (Fig. 4).

The position of the link 134 that carries the pawl is elevated or depressed to hold the pawl out of or in engagement with its ratchet by a pin 141 in its end, which pin enters a slot 142 in the upper end of a supporting bar 143. This bar extends downward and is again slotted at its lower end to receive a pin 144 in one end of a lever 145 fulcrumed at 115 upon the same fulcrum stud as the lever 114 previously described. The outer end of this lever 145 is connected by a depending link 146 with the arm 116 on the lift rod 117 referred to.

When the series treadle remains undisturbed in its elevated position the arm 116 on the lift rod 117 is depressed and through the lever 145 lifts the bar 143 and the pawl carrying link 134 and maintains the pawl 133 out of engagement with its ratchet wheel and therefore prevents any rotation of said wheel. When, however, said series lever is depressed, if the counter is appropriately adjusted, as will be described, the lifting of the arm 116 will cause the bar 143 to be dropped, thereby to drop the pawl 133 into effective engagement with the ratchet wheel.

Fast upon the face of the ratchet wheel 126 (Fig. 4) is a stud 147, which stands normally in front of the upper end of a short lever 148, which at its lower end, engages the horizontal slide rod 104 at a point between its fast collar 106 and the hub of the finger 103. The fulcrum of this lever 148 is a pin 149 seated in the lower end of two slots 150, in bearings 151 on the counter frame. The hub of this lever 148 (Fig. 9) between said bearings is provided with a bearing surface 152, against which rests the head of a sliding pin 153, the shank of which is surmounted by a spring 154 seated in an adjustable socket 155 also mounted in said frame. The spring 154 maintains the fulcrum pin 149 normally at the bottom of said slots.

In describing "continuous" nailing it was stated that the slide rod 104 and finger 103 were returned to the left at the close of "continuous" nailing by a spring to be described; that spring is the spring 154 just described. When the slide bar was pushed to the right to cause the finger 103 to pass under the lug 102 on the wedge shaft, the lower end of the lever 148 was of course correspondingly pushed to the right and since the upper end of said lever rests normally against the stud 147 on the ratchet

wheel the effect was to crowd the fulcrum pin 149 upward in its slots, compressing the spring 154, and this spring, upon release of the slide rod 104, caused the latter to be returned to its position at the left. For "continuous" nailing the arm 122 on the end of the countershaft 123 is permitted to remain in its position (Fig. 8), depressing the outer end of the lever 114, the inner end of said lever lifting the bar 143 and thereby lifting the feeding pawl 133 away from the ratchet wheel and preventing operation of the latter, leaving the stopping of the machine wholly in the control of the series treadle. For series nailing, however, where the series is to contain a predetermined number of nails only, said arm 122 is turned upward (Figs. 4 and 7), and its rounded pin 124 is permitted to engage one or another of the recesses 125, according to the number of nails to comprise the series. This frees the lever 114, whereupon a spring 156 connected with the inner end thereof (Fig. 8) turns the lever to drop the inner or right-hand end thereof, thereby to drop the pawl 133 into engagement with the ratchet wheel. When the said lever 114 is freed and moves, as stated, the pin 113 at its outer end is lifted to its position Fig. 7, said pin traveling in a slot 157 in the arm 116 on the lift rod. Upon the front side of the lever 114 (Fig. 14) is formed a back stop pawl 158, which, as said lever is turned under the influence of its springs 156, is raised against the ratchet wheel to prevent retrograde movement thereof as it is ratcheted forward.

With the counter-arm 122 turned into position, *e. g.*, as indicated in Figs. 4 and 7, if both treadles of the machine be now depressed, the starting treadle will lift the wedge to start the machine and the series treadle will, through its arm 116 and lever 145, permit the pawl 133 to engage the teeth of the wheel 126. The first turn of the shaft of the machine causes the pawl 133 to feed the ratchet wheel one tooth forward, sufficiently to cause the stud 147 to be moved from its position Fig. 8 to its position Fig. 7, clearing the upper end of the lever 148, which permits the light spring 107, surrounding the slide bar 104, and stated to be normally under compression, to throw the slide bar 104 to the right to carry its finger 103 under the elevated collar 102 on the wedge rod to prevent the latter dropping to stop the machine at the end of the first rotation of the shaft. At each turn of the shaft thereafter the ratchet wheel is fed an additional tooth until said arm 122 reaches the upper end of the lever 148, whereupon the feed of the ratchet wheel will cause said arm to turn the said lever to withdraw the finger 103 from beneath the wedge shaft, leaving the latter supported by the cam 37 which will drop it to stop the machine at the end of the complete rotation.

By placing the end of the arm 122 at different points in the series of depressions on the ratchet wheel the number of turns of the shaft and the number of the nails to be driven before said arm reaches the lever 148 and stops the machine, will be varied; and by adjusting this arm according to the dial (Fig. 12) the number of nails in any given series may be varied predeterminately and the machine stopped at the end of that predetermined number.

When the operator releases the treadles after the machine has come to rest, or during the last turn of the shaft at the close of the series nailing, the arm 116 (Fig. 7) drops, lifting the slotted bar 143 to remove the feed pawl from the ratchet wheel. At the same time the slot 157 on the said arm 116 pulls down upon the pin 113 and drops the lever 114 to remove the back stop pawl also from the ratchet wheel, whereupon the clock spring at the front thereof, which has been wound during rotation of the ratchet wheel, turns said wheel to its normal position in readiness for the timing of a new series of nails.

With the counter in action, as just described, after the ratchet wheel has been turned one tooth to cause its pin 147 to clear the upper end of the lever 148, the latter was free to turn about its fulcrum pin 149 and the light spring 107 was then sufficient to turn such lever and push the finger 103 under the wedge rod to hold the wedge in running position. With the counter cut out of action, as, for instance, when the parts are adjusted as in Fig. 8, for "continuous" nailing, there is no feed of the ratchet to remove the pin 147 from in front of the lever 148 and in such case the slide bar can be moved to carry the finger 103 under the wedge rod, only by turning said lever about said pin 147, which means that the socket spring 154 must yield, and it is made to so yield by lifting the arm 116 which will cause the bell crank lever 110 to be rocked about said pin 113 and act through the heavier spring 109 to slide the finger 103 into position, said spring 109 being heavier than the socket spring 154 and causing the latter to yield to permit such movement.

Referring to Fig. 10, the outer end of the finger 103 slides under an overhanging guide 160, this guide being broken away in the other figures. When the counter is in operation and the driving of a predetermined series of nails is in progress, if the operator releases the treadle and drops the arm 116 both the feed and back stop pawls will be removed from the ratchet wheel and the latter will spring quickly back to its normal position, deflecting the lever 148 in

its return movement by the pin 147 striking the cam end of said lever, thereby to withdraw the finger 103 and stop the machine. It is therefore possible for the operator when nailing with the counter, as well as when nailing "continuously," to stop the machine at any moment. With the "continuous" nailing, however, the machine will continue to run so long as the treadles are retained depressed, while in series nailing after the full series has been driven, the machine will come to rest automatically even though the operator continues to hold the treadles depressed.

With the counter in operation if both treadles be depressed and instantly released, a single nail only will be driven, because the return of the treadles and their connected parts will cause release of the ratchet and its instant return to normal position after the first nail has been driven. With the counter mechanism, therefore, nails may be driven singly or in series of predetermined numbers, according to the period of depression of the series treadle. In ordinary practice, however, the starting treadle only is preferably used for single nailing. The spring actuated return of the ratchet wheel brings the latter always to a given normal position by reason of a stop pin shown in Fig. 13 at 161, which brings up against a stop 162 on the frame.

In Fig. 15 is shown one form of fastener inserting mechanism for driving fasteners supplied from a hopper 170 and directed to the point of insertion by a chute 171. The usual oscillatory head B has a vertical passage 172 for a driver bar 173 carrying a driver 174, and is provided with a proper bearing, as usual, for an awl bar 175. A strut 176 is jointed to the upper end of the driver bar and a lever 177 pivoted to a bracket 178. A coil spring 179 is interposed between the lever arm and a fixed part of the frame to drive the bar downward, suitable adjusting means 180 being provided to adjust the spring tension. To lift the driver bar against the action of the spring 179, there is provided a lug 181 on a cam 182 mounted upon the front end of the drive shaft 3, which lifts the driver bar at each rotation of the shaft, permitting it to drop from the projection, and, under the action of its spring, drive the fastening, as will be clearly understood by those skilled in the art. The usual rock shaft F mounted on the side of the machine head is provided with an inwardly projecting arm 183 having a segmental gear 184 to engage suitable teeth or a rack 185 formed upon the awl bar 175.

The above described means for inserting a fastener may be of usual or of any desired construction, and where nails are supplied from a hopper, as in the type of fastener inserting means illustrated, a nail separator 186 is provided which may be actuated by a cam 187 preferably driven by suitable gear connection from the driving shaft 3. The illustration of Fig. 15, together with the above general description, will be sufficient for those skilled in the art to understand the characteristic of a fastener inserting mechanism for use in combination with the other features of the present invention without further elucidation.

While I have shown details of mechanical devices which have been found well adapted to carry the invention into effect, it is to be understood that said invention is not restricted or circumscribed thereby, the essentials of the invention being defined in the claims by intentionally broad language comprehensive of various forms or embodiments thereof.

Claims.

1. A machine for inserting fasteners, comprising in combination, a driving shaft, fastener inserting means in operating relation thereto, a work support, means operable from the driving shaft for raising the work support to position the work, starting and stopping mechanism for said driving shaft, mechanism operable from the driving shaft for periodically depressing the work support for feeding, and means independent of the driving shaft and stopping mechanism for effecting the final depression of the work support.

2. A machine for inserting fasteners, comprising in combination, fastener inserting mechanism, a work support, power operated means for raising the work support to position the work with relation to the fastener inserting mechanism, starting and stopping mechanism, power operated means for periodically depressing the work support to permit feeding of the work, and treadle operated means independent of the driving shaft and stopping mechanism to secure the final depression of the work support.

3. In a nailing machine, the combination of a nailing head, a driving shaft thereon, a work support, means actuated from the driving shaft for raising said support to position the work with relation to the head, a catch to hold the work support in the position to which it has been raised, starting and stopping mechanism for said driving shaft, and treadle operated means operable independent of the stopping mechanism to trip the catch and effect depression of the work support.

4. In a nailing machine of the character described, the combination of a nailing head, a driving shaft mounted thereon, a work support, power operated positioning means actuated by the driving shaft to raise the work support and position the work, stopping mechanism for said shaft operable independent of said positioning means, and

treadle controlled devices independent of the stopping mechanism to effect final depression of the work support at the will of the operator.

5. In a nailing machine, the combination of a nailing head, fastener inserting means mounted thereon, a work support, positioning means to produce relative approach of said fastener inserting means and work support to position the work with reference to the head, treadle operated starting and stopping means for said fastener inserting means, series means for rendering the starting and stopping means ineffective for stopping the inserting means for variable predetermined nail driving periods, and a series treadle independent of the first named treadle for causing the series means to become effective for the purposes stated, and means for separating the work support and fastener inserting means at the will of the operator.

6. In a machine for inserting fasteners, the combination of a nailing head, fastener inserting means mounted thereon, a work support, power operated means for raising said support to position the work with reference to the head, stopping mechanism for said inserting means, and means to suspend the action of the stopping mechanism for predetermined nail driving periods, a treadle for bringing said suspending means into action and means independent of the stopping mechanism for effecting the final depression of the work support.

7. In a machine for inserting fasteners, the combination of a head, fastener inserting means mounted thereon, a driving shaft for said fastener inserting means, a work-support, means actuated from the driving shaft to raise the work-support to position the work for the action of the fastener inserting means, starting and stopping mechanism for said shaft, a treadle for engaging and actuating the said mechanism to start the machine, means for then disengaging said treadle from said mechanism, means for continuing the machine in operation and permitting it to stop after a number of fasteners have been inserted, and means operative by said treadle to effect the final depression of the work support independent of the stopping mechanism.

8. In a machine for inserting fasteners, the combination of a nailing head, a work support to sustain the work in proper position with reference to the head, fastener inserting means mounted on the head and constructed and arranged to selectively insert fasteners singly and in predetermined series, means to automatically stop the machine upon the completion of either of the selected fastener inserting operations and manually operated means for causing final depression of the work support.

9. In a machine for inserting fasteners the combination of a nailing head, fastener inserting mechanism mounted thereon, operating devices therefor, a work support to sustain the work in position with respect to the head, and controlling means for said operating devices comprising starting and stopping mechanism for said fastener inserting mechanism, provisions for selectively suspending the operation of the stopping mechanism to effect either predetermined series or continuous driving and means independent of the stopping mechanism for effecting the final depression of the work support.

10. In a fastener inserting machine, the combination of a work support, a head, a fastener inserting mechanism mounted thereon, operating devices therefor, including a driving shaft, treadle controlled means for starting said operating devices, means acting normally to stop said operating devices upon a complete rotation of the driving shaft and the insertion of a single fastener, means to suspend the action of the said normally acting means, and mechanism to automatically free the stopping devices to the action of the normally acting means and stop the machine when a predetermined number of fasteners have been inserted.

11. In a fastener inserting machine, the combination of a head, fastener inserting mechanism mounted on said head, operating means therefor, a work support to sustain the work with reference to the head, a counter mechanism for controlling the operation of said means and effect the insertion of a predetermined variable number of fasteners, means for rendering the counter mechanism inoperative and effect the insertion of varying numbers of fasteners and means independent of the stopping mechanism for separating the head and work support.

12. In a machine for inserting fasteners, the combination of a work support, fastener inserting mechanism, a driving shaft and actuating means therefor, means actuated from the driving shaft for raising the work support, devices for operatively connecting the driving shaft with its actuating means, treadle actuated means for operating said devices, a trip to free said devices from the treadle actuated means upon rotation of the driving shaft, and separate means to maintain the said devices in position operatively connecting the shaft and its driving means for variable nail driving periods when said devices are freed from treadle control, and means independent of the operative condition of the machine for effecting the final depression of the work support.

13. In a machine for inserting fasteners singly or in series, a work support to sustain the work with respect thereto, fastener inserting mechanism, means predete[illegible]inatel

to vary the number of fasteners comprising a series, and automatic controlling devices for said fastener inserting mechanism, one operable to effect the insertion of fasteners singly and the other operable to effect the insertion of fasteners in series.

14. A machine for inserting fasteners comprising in combination fastener inserting means, stopping and starting mechanism therefor, a vertically movable work support, means to elevate it and means independent of the stopping mechanism and including a series of successively releasing props to effect delayed depression of said work support to permit the fastener inserting means to completely drive the last fastener prior to the final depression of the work support.

15. A machine for inserting fasteners comprising in combination fastener inserting means, stopping and starting mechanism, a vertically movable work support, means to elevate and depress it, a prop to sustain said work support in elevated position and a second prop controlling the release of said sustaining prop and means actuated by the attendant and operable independent of the stopping mechanism for releasing said props.

16. A machine for inserting fasteners, comprising in combination, fastener inserting mechanism, starting and stopping mechanism therefor, a work support, a lifter for raising said work support, a prop for maintaining the lifter in position to hold the work support raised, means for operating the lifter, a prop pusher for operating the prop, and treadle controlled means operable independent of the stopping mechanism for tripping the prop.

17. In a machine for inserting fasteners, the combination of fastener inserting mechanism, a work supporting horn, a lifter for raising said horn to position the work, a prop to hold the lifter in horn supporting position, a clutch member and operating means therefor, means to periodically depress the horn for feeding, and treadle controlled means operable independent of the machine operation to trip the prop.

18. In a machine for inserting fasteners, the combination of fastener inserting mechanism, a work supporting horn, a horn supporting rod, means for raising said horn to position the work, a grip bar connected to said horn supporting rod, a grip arm loosely mounted thereon, a lever 99, power operated means to periodically act upon the one end of the lever to depress its actuating end against the grip arm to tip the same into biting contact with the grip bar and then depress the horn, and means for again raising the horn.

19. In a machine for inserting metallic fasteners, the combination of nail driving mechanism, a work support and means to raise the work support with respect to the nail driving mechanism for positioning the work a driving shaft and means for operating the same, means for connecting the shaft to its operating means for actuating the nail driving mechanism, a treadle operated starting pawl, a trip to throw said pawl out of operating position, means to maintain operative connection between the shaft and its operating means for driving a plurality of fasteners after the starting pawl has been tripped, and means independent of the machine operation for effecting the final depression of the work support.

20. In a fastener inserting machine, the combination of a driving shaft, fastener inserting means in operative relation thereto, a vertically movable horn or work support, means operated from the driving shaft for periodically depressing said horn to permit feeding the work, means also operated from the driving shaft to raise the horn or work support as the machine is started to position the work for the action of the fastener inserting means, stopping mechanism for bringing the fastener inserting means to rest, and a treadle for manually controlling the final depression of the horn independent of the action of the stopping mechanism.

21. In a fastener inserting machine, the combination of a driving shaft, fastener inserting means in operative relation thereto, a horn or work support, a treadle, means operated thereby to start the machine, means operated from the driving shaft for periodically operating said horn or work support to permit feeding the work, power operated means for raising the horn or work support to position the work for the action of the fastener inserting means as the machine is started, stopping mechanism acting independent of said treadle for stopping the action of the fastener inserting means, and means controlled by said treadle for effecting the final depression of the horn.

22. In a fastener inserting machine, the combination of a driving shaft, fastener inserting means in operative relation thereto, a horn or work support movable up and down, a cam on said driving shaft, connections between said cam and horn or work support operated by said cam to automatically raise said horn or work support when the machine is started, means independent of said shaft for holding the horn or work support in raised position, stopping mechanism for said fastener inserting means, and a treadle for manually controlling the final depression of the horn independent of the stopping mechanism.

23. In a fastener inserting machine, the combination of a driving shaft, fastener inserting means operatively associated therewith, a horn or work support, connecting mechanism between said shaft and horn or work support to periodically depress said

horn or work support to allow feeding the stock, independent mechanism actuated by said shaft and operating on said horn or work support to raise the same when the machine is started, means independent of said shaft for holding the horn or work support in raised position, a treadle for starting the machine, means effective to stop the machine independent of the said treadle, and means controlled by the treadle to trip the horn or work support holding means.

24. In a fastener inserting machine, the combination of a driving shaft, fastener inserting means associated therewith, a horn or work support, a treadle, means for starting the machine upon depression of said treadle and for stopping the machine independent of said treadle, means connected to the driving shaft for raising the horn or work support as the machine is started, means operated from the driving shaft for periodically operating the horn or work support to permit the work to be fed, and means controlled by said treadle for effecting the final depression of the horn or work support.

25. In a nailing machine, the combination of a driving shaft, fastener inserting means operatively associated therewith, a work support, a lifting lever for said work support, means operated from the driving shaft to cause the lifting lever to raise the work support as the machine is started, means operated from the driving shaft to periodically depress the work to permit the work to be fed, means to hold the lifting lever in position with the work support raised, and a treadle operable after the fastener inserting means has been stopped for tripping the holding means to effect a final depression of the work support.

26. In a nailing machine, the combination of a driving shaft, fastener inserting means operatively connected thereto, a work support, means operable from the driving shaft to raise the work support with relation to the fastener inserting means as the machine is started, means operable from the driving shaft for periodically depressing the work support to permit the work to be fed, a treadle for starting the machine into operation, a second treadle and connected mechanism to cause the machine to continue in operation, and means controlled by the first named treadle to effect the final depression of the horn after the fastener inserting means has been stopped.

27. In a nailing machine, the combination of a driving shaft, fastener inserting means operatively connected thereto, a work support, means operable from the driving shaft for raising it as the machine is started, clutch members associated with said shaft, a clutch controller for operatively connecting and disconnecting said clutch members, means for operating the clutch controller including a lift pawl or finger, a treadle connected to said lift pawl or finger, means operable from the driving shaft for tripping the said pawl or finger to permit the machine to stop independent of the treadle, and means controlled by the said treadle to effect the final depression of the work support.

28. In a nailing machine, the combination of a driving shaft, fastener inserting means operatively connected therewith, a work support for sustaining the work for the action of the fastener inserting means, means operated from the driving shaft for raising the work support into operative relation with the fastener inserting means as the machine is started, means to start the machine into operation, including a treadle, independent means for continuing the machine in operation, and means controlled by said treadle to effect the final depression of said work support.

29. In a nailing machine, the combination of a driving shaft, fastener inserting means operatively connected thereto, a work support for sustaining the work for the action of the fastener inserting means, means operated from the driving shaft for raising the work support into operative relation with the fastener inserting means, operating means for said shaft, a treadle, means connected to the treadle for starting the said operating means into action, said means then becoming inoperative with respect to the said operating means, and means controlled by said treadle for manually effecting the final depression of the work support.

30. In a nailing machine, the combination of a driving shaft, fastener inserting means operatively connected thereto, operating means for said shaft, a work support, a lifting lever connected to said driving shaft for raising the work support as the machine is started, a toe and prop for holding the work support in the position to which it is raised by the lifting lever, a tripping member to effect disengagement of the toe and prop, and a treadle controlling said tripping member.

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

WILLIAM C. STEWART.

Witnesses:
ROSWELL F. HATCH,
GEORGE F. STEWART.