J. M. BENJAMIN.

HEELING MACHINE.

APPLICATION FILED JULY 28, 1917.

1,301,898.

Patented Apr. 29, 1919.

3 SHEETS—SHEET 1.

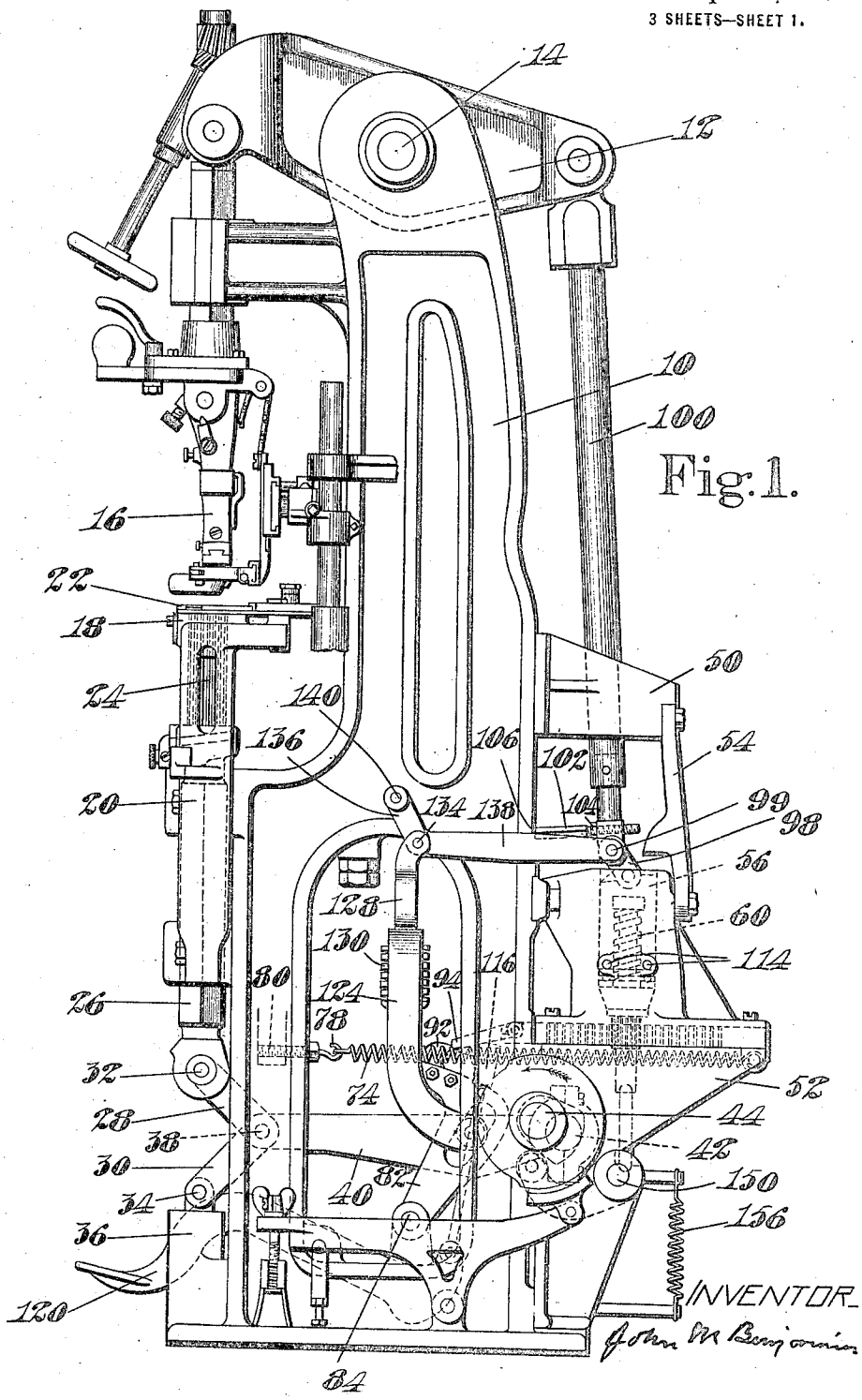


Fig. 1.

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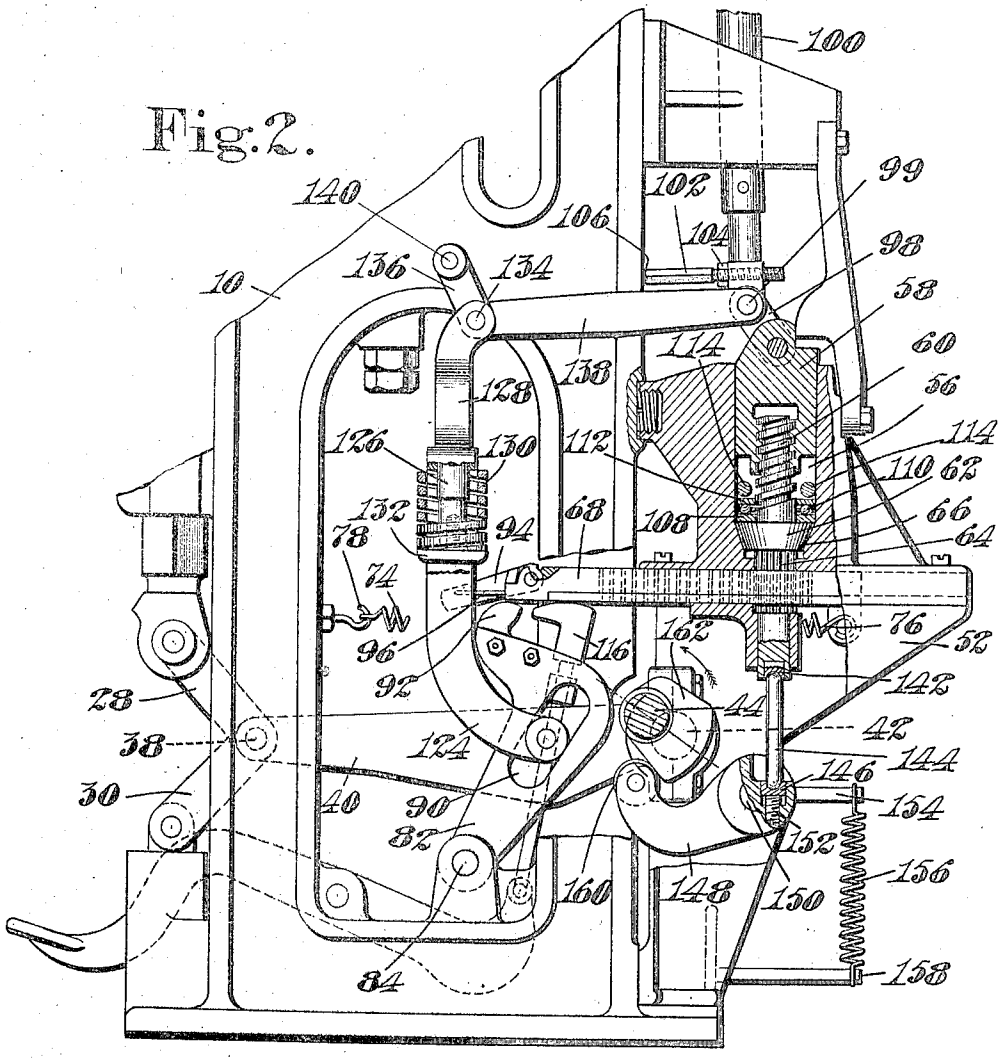
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3 SHEETS—SHEET 2.

Fig. 2.



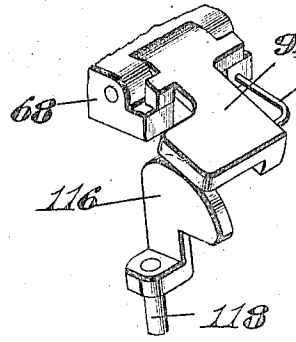


Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 3.

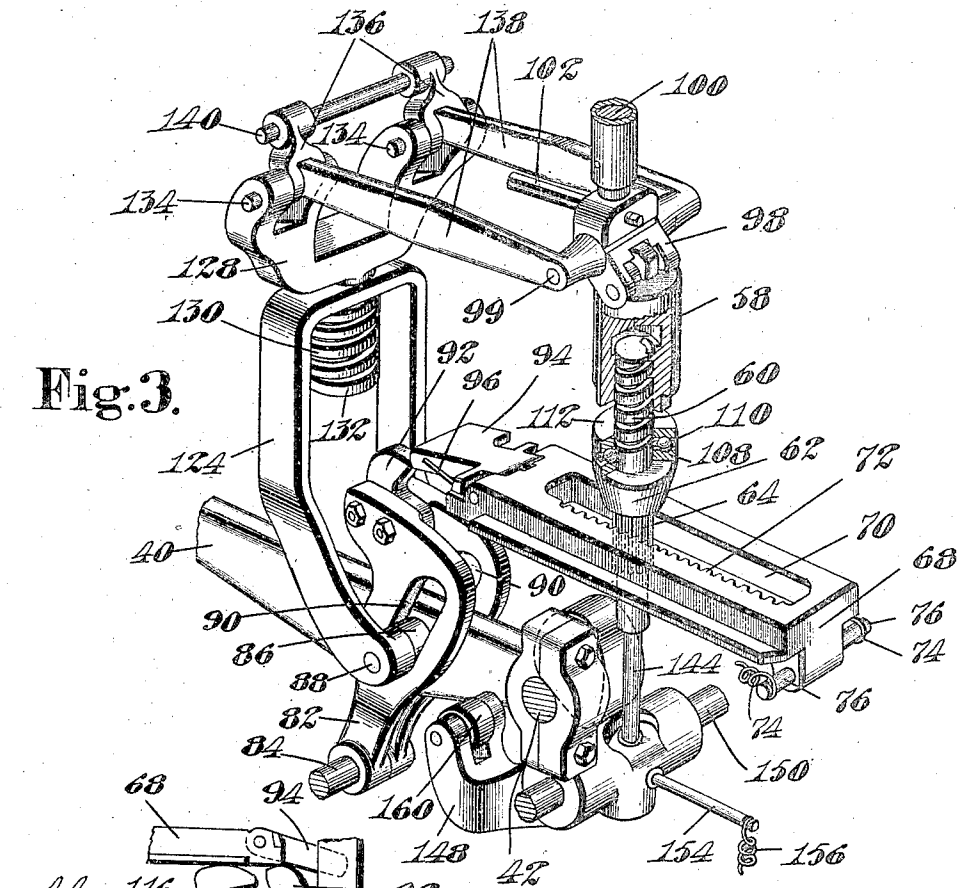


Fig. 4.

INVENTOR.

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UNITED STATES PATENT OFFICE.

JOHN M. BENJAMIN, OF BEVERLY, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

HEELING-MACHINE.

1,301,898. Specification of Letters Patent. Patented Apr. 29, 1919.

Application filed July 28, 1917. Serial No. 183,314.

To all whom it may concern:

Be it known that I, JOHN M. BENJAMIN, a citizen of the United States, residing at Beverly, in the county of Essex and State of Massachusetts, have invented certain Improvements in Heeling-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to heeling machines and more particularly to a type of heeling machine suitable for attaching heels to shoes while the latter are still upon the wooden lasts upon which they are made.

As is well known to those skilled in the art, more or less damage to wooden lasts occurs during the heel attaching operation. This damage is usually the result of the application of excessive pressure to the work, either prior to or during the driving of the heel attaching nails.

Improvements have been made in heeling machines with the object in view of securing better control of the application of pressure to the work and thus reducing the loss resulting from the breakage of lasts. One of the most important inventions in this connection is that disclosed in United States Patent No. 1,157,688, granted Oct. 26, 1915, upon the application of L. L. Glidden, and a large number of machines embodying the invention of this patent are in successful daily commercial use in shoe factories throughout the country.

The objects of the present invention are still further to improve the smoothness, ease, speed and accuracy of operation of machines of the general type disclosed in the above mentioned patent.

In accordance with these objects, an important feature of the invention resides in eliminating the usual lost motion connection between the driver actuating toggle and the drivers, with a consequent elimination of the noise and shock due to the sudden bringing up of the toggle connection against the driver spindle when the lost motion has been taken up in the operation of the machine. The purpose of this lost motion connection has been to allow sufficient time for the measuring operation and the application of the final pressure prior to the initiation of the nail driving. With a construction embodying the present invention it becomes possible to provide positive connections between the drivers and their actuating toggle. This feature of the invention is preferably embodied in means for initially retracting the drivers and then advancing them to drive the nails. Time for the measuring and final pressure operations is allowed by the retraction and advance of the drivers to their initial position which is approximately the point at which the driving of the nails begins. As a convenient device for securing this mode of operation, I have selected for illustration and description in the present instance, mechanism so arranged and timed that the main crank of the machine shall be caused to stop before reaching dead center; consequently, when the machine is started, the drivers will be retracted until the crank reaches center, after which they will be advanced.

In another aspect of the invention, it relates to a construction of the measuring and final pressure mechanisms wherein the final pressure mechanism is interposed between the measuring mechanism and the work support. More specifically, the measuring may be effected by movement of a pressure supporting member, which is then held stationary while connections between it and the work support are extended, to exert the final pressure upon the work. In this connection, the term "work support" may equally well be applied either to the jack upon which the shoe is held or to the nailing die upon which the heel and top lift are supported, whichever is to be moved to bring the parts of the work together and exert pressure upon them. The measuring mechanism may conveniently be operated by a screw: the connections between the measuring screw and the work support may include a normally broken toggle and may be extended to apply the final pressure by straightening the toggle.

A further feature of the invention consists in measuring mechanism embodying the combination of a measuring screw and frictional means for locking it against rotation at the desired time in the operation of the machine. The locking means may conveniently be embodied in coöperating, conical locking members, one of which moves with

the screw, and the other of which is held against movement.

Other features and advantages, more or less specific, incident to and resulting from the use of the invention, will be apparent from a reading of the following specification in connection with the accompanying drawings and the scope of the invention will be defined in the appended claims.

In the drawings,

Figure 1 is a view in side elevation of a heeling machine embodying the invention;

Fig. 2 is a fragmentary view, partly in elevation and partly in section, showing the measuring and final pressure mechanisms;

Fig. 3 is a perspective view of certain details of the measuring and pressure mechanisms;

Fig. 4 is a view in side elevation of the clutch controlling mechanism; and

Fig. 5 illustrates a detail of the device for controlling the holding and release of the measuring mechanism.

The numeral 10 indicates a suitably formed base or frame, upon which the working parts of the machine are mounted. A top lever 12 pivoted in the frame at 14 supports at its front end the usual jack or shoe support 16.

A stationary nailing die 18 is carried by a bracket 20 bolted to the frame 10 and, in addition to acting as a nail holder and guide, constitutes a support for the heel and top lift, the location of which, relative to the shoe, is determined by a heel and top lift holder 22. A set of nail drivers 24 is arranged to move in the driver passages in the nailing die and is carried upon the upper end of a reciprocating spindle 26. The links 28, 30 of a toggle are pivotally connected, respectively, at 32, 34 to the driver spindle 26 and a stationary bracket 36 upon the frame 10. The center 38 of the toggle forms a pivotal connection for the front end of a connecting rod 40, the rear end of which has a bearing for the main crank pin 42 upon the crank shaft 44 of the machine. The usual Horton clutch 46, see Fig. 4, controls the connection and disconnection of the crank shaft to and from a source of power and is held in disconnected position by the clutch stop arm 48. The construction and arrangement are such that the machine is stopped before the crank pin has reached dead center and before the breaking of the toggle 28, 30 has reached its ultimate limit. This stopped position of the crank pin is clearly apparent in Figs. 1 and 2. It is desirable that the ends of the drivers always remain in the nailing die and, consequently, it is preferable in the present construction that the die be made somewhat thicker than the length of the nails to be used.

By reason of the construction just described, the connecting rod 40 will be retracted when the machine is first started, until the crank pin reaches dead center; and as a consequence of this, the drivers initially will descend; then, as the crank advances farther in the direction indicated by the arrow in Fig. 1, the toggle 28, 30 will be straightened and the drivers will be advanced until, when the crank pin reaches a point the same distance above the axis of the crank shaft that it was below said axis at the time of starting, the drivers will again be in their initial position, ready to be advanced farther to drive the nails. As the crank moves on through a revolution, the nails are driven and the drivers retracted to initial position, where the machine is stopped with the crank pin again below dead center, as shown in Figs. 1 and 2.

Secured to the rear of the frame 10 is a pair of brackets 50, 52, connected by a strut 54, and constituting means for supporting the principal elements of the measuring and final pressure mechanisms.

The bracket 52 is bored out at 56 to receive a vertically movable pressure supporting member 58, which is internally threaded to form a nut coöperating with a measuring screw 60. The screw 60 has a frusto-conical head 62 formed upon or secured to it, and below the cone 62 is formed a pinion 64. The lower portion of the bore 56 is conically formed at 66 to correspond to the formation of the cone 62.

The measuring rack bar 68 is mounted for horizontal reciprocatory movement, forwardly and rearwardly of the machine, in guides formed in the bracket 52. A slot 70 is formed in the bar and rack teeth 72, meshing with the teeth of the pinion 64, are formed in one face of the slot. Pull springs 74, attached at their rear ends to pins 76 mounted on the bar 68, are attached at their front ends to the frame 10, as by hooks 78 which are adjustable to increase or diminish the tension of the springs by means of screws 80.

The tendency of the springs 74 is always to draw the rack bar 68 forwardly and to rotate the measuring screw 60 in a direction to raise the pressure supporting member 58. For the purpose of rotating the measuring screw in the reverse direction and placing the springs 74 under tension the following mechanism is provided. A lever 82 is pivotally mounted at 84 in the machine frame. Rolls 86, carried loosely upon a pin 88 passing through the connecting rod 40, engage in slots 90 formed in the lever 82. A hook 92, secured in the upper end of the lever 82, is arranged for engagement with the pawl 94, pivoted to the front end of the rack bar 68 and normally pressed downwardly by a spring 96. When the machine is in stopped position, the parts just described are in the relation illustrated in

Figs. 1 and 3, with the pawl 94 in engagement with the hook 92, the springs 74 being held under tension and the rack bar moved rearwardly.

A toggle link 98 is pivoted to the upper end of the pressure supporting nut 58 and, at 99, to a back rod 100, the upper end of which is pivotally connected to the rear end of the top lever 12.

A screw 102 is threaded horizontally through the lower end of the back rod and held in adjusted position by a check nut 104. The head of the screw is arranged to bear against the rear face of the frame 10 at 106 and thus to control the minimum distance between the axis of the pivot 99 and the frame. The function of this screw is to provide for adjustment of the amount of final pressure, as will appear more clearly hereinafter.

A ball race 108 is seated upon the top of the cone 62 and forms a bearing for a series of balls 110. A plate 112 rests upon the balls, and a pair of rods 114, spaced slightly above the plate 112, is inserted in the casting forming the bracket 52.

For the purpose of releasing the pawl 94 from the hook 92, a pawl release 116 is provided. This pawl release is carried upon the upper end of a rod 118, pivotally connected to the rear end of a treadle 120 which is pivoted in the machine frame at 122. When the machine is at rest the pawl 94 rests upon the pawl release 116 and, being engaged with the hook 92, the springs 74 are held under tension. When the treadle 120 is depressed slightly, the pawl release operates to disengage the pawl from the hook 92, and the rack bar 68 is quickly drawn forward by the springs, rapidly rotating the measuring screw and raising the pressure supporting member 58. The weight of the parts depending from the front end of the top lever 12 exceeds the weight of the parts connected to the rear end of the lever sufficiently to draw the plate 112 upwardly against the rods 114, and the ball bearing 110 at this time acts as an antifriction thrust bearing, permitting free rotation of the measuring screw. When, however, the downward movement of the jack 16 meets resistance as, for example, when the shoe is seated upon the heel, the further rotation of the measuring screw causes it to be forced downwardly slightly until the cone 62 is firmly seated frictionally in the conical seat 66. The amount of pressure upon the work secured in the measuring operation is thus dependent upon the tension of the springs 74 and the friction in the conical locking device formed by the members 62 and 66.

In order to place the work under a heavy final pressure and hold it there while the nails are being driven, mechanism is provided which will now be described. A yoke 124 has its lower forked end journaled upon the ends of the pin 88, mounted in the connecting rod 40, and its central upper portion pierced to allow a depending cylindrical portion 126 of a member 128 to pass loosely through it. A heavy spring 130 surrounds the cylindrical portion 126 and is held under compression between the yoke 124 and a cap screw 132 at the end of the cylindrical member. The spring 130 tends to seat the member 128 on the top of the yoke. The upper end of the member 128 is pivoted at 134 to the central joint of a toggle formed by the links 136, 138. The links 136 are pivoted to the machine frame at 140, and the ends of the links 138 are journaled upon the ends of the pivot 99. As the pin 88 in the connecting rod is moved upwardly and forwardly after the machine is started, the yoke 124 and member 128 are raised, straightening the toggle 136, 138 which, in turn, straightens the toggle formed by the back rod 100 and the link 98 and causes the application of the final pressure to the work.

After the nails are driven, the toggles just referred to are broken, during the downward movement of the connecting rod 40, relieving the work from pressure. The application of the final pressure to the work has caused the cone 62 to be seated very tightly in the coöperating locking member 66 and the greater the final pressure the more tightly the conical members are engaged. Slipping of the measuring screw is thus effectually and automatically prevented.

After the release of the final pressure the hook 92, in its rearward movement, engages the pawl 94 and moves the rack bar 68 rearwardly. This causes the cone 62 to become dislodged from its seat, whereupon the measuring screw rotates reversely, drawing the back rod 100 downwardly and raising the jack 16. When the cone is tightly seated in the member 66, considerable power may be required to dislodge it in the manner just described, and in the machine illustrated in the drawings provision is made for disengaging the cone more or less from its seat in order to permit the reverse rotation of the measuring screw without undue waste of power. This disengaging mechanism however, is not of my invention, but forms the subject-matter of an application Serial No. 183,488, filed July 30, 1917 by Benjamin F. Mayo.

Referring to Fig. 2, a plug 142, having a hemispherical cavity, is inserted in the lower end of the measuring screw and one end of a pin 144, having hemispherical ends, is seated in the cavity. The other end of the pin is seated in a similar hemispherical cavity in a plug 146 mounted in a cam lever 148, which is pivoted in the frame 10 at 150. The plug 146 is seated upon a screw 152 threaded into the cam lever, to provide for adjustment

of the plug. Projecting rearwardly from the cam lever 148 is a pin 154, to the outer end of which is attached one end of a tension spring 156. The other end of the spring is anchored at a stationary point 158. The purpose of the spring is to hold a cam roll 160, mounted in the inner end of the cam lever 148, in engagement with a cam 162 rigidly mounted upon the crank shaft 44. When the machine is at rest, and during the measuring, final pressure, and nail driving, the cam does not operate upon the cam roll 160; but immediately after the release of the final pressure, the cam depresses the cam roll and, consequently, raises the pin 144 and the measuring screw, moving the cone 62 axially until it is disengaged from its seat 66. The measuring screw is now free to rotate and is automatically reset, prior to the stopping of the machine.

The mechanical construction of the illustrative machine having been described, its operation and the timing of the parts relatively to each other will now be explained in sequence.

Let it be assumed that the parts of the machine are initially in the positions shown in Fig. 1. A load of nails having been inserted in the nailing die and a heel and a top lift in the heel and top lift holder, a shoe is jacked upon the support 16 and the treadle depressed slightly. This causes the pawl 94 to be tripped. The measuring springs 74 act quickly, through the rack bar 68, to rotate the measuring screw until the shoe is seated firmly upon the heel and the locked cone 62 is seated in the member 66. At this time, the work can be inspected to ascertain that the shoe and heel are in proper relation to each other, and if their condition is satisfactory to the operator, he depresses the treadle farther. The rear end of the treadle, acting upon a short arm 164 keyed to the shaft 166, upon which the clutch stop arm 148 is also keyed, when raised sufficiently, throws the clutch stop arm out of engagement with the clutch 46 and permits the crank shaft to be turned through a single revolution. By reason of the fact that the crank starts below dead center, the nail drivers are first retracted and then advanced. In the interval between the starting of the machine and the time when the drivers again reach their initial position, the pressure toggles are straightened and the final pressure applied to the work. The measuring screw is held locked against rotation and the pressure upon the work is maintained during the farther advancing movement of the drivers to drive the attaching nails through the heel into the shoe. As the return stroke of the crank begins, the final pressure toggles are broken, releasing the pressure upon the work, the cam lever 148 is rocked, unlocking or disengaging the conical locking members 62, 66 and the hook 92 which, in the forward stroke of the connecting rod, has advanced to a position in front of the pawl 94, during the rearward movement of the connecting rod, engages the pawl and moves the rack bar 68 rearwardly. This causes a reverse rotation of the measuring screw which occurs freely, by reason of the ball thrust bearing 110, drawing the back rod 100 downwardly and raising the jack 16. Finally, as the machine comes to a stop, with the crank in the position as shown in Figs. 1 and 2, the cam roll 160 rides off the high part of the cam 162, and the unlocking device is thrown out of operation.

By adjustment of the screws 102, the amount by which the toggle 100, 98 is broken may be regulated, with a consequent regulation of the amount by which the connection between the pressure supporting block 58 and the top lever 12 shall be extended by straightening the toggle, thus affording effective means for varying the amount of the final pressure within the limits desired. The spring 130 acts as a yielding connection to permit the yoke 124, which is positively connected to the connecting rod 40, always to have the same movement, although the movement of the member 128 is stopped by engagement of the screw 102 with the frame at 106 and is varied in amount by adjustment of the said screw.

The screw 152 permits such adjustment of the measuring screw relatively to the unlocking mechanism as to allow the cone 62 to be seated properly, and to be disengaged at the proper time in the operation of the machine.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. In a heeling machine, the combination of a stationary nailing die, nail drivers maintained permanently in the die but vertically reciprocable therein, measuring and final pressure mechanisms coöperating with the die to apply pressure to the work, and means for initially retracting the drivers from a position of rest and then advancing them to drive the nails.

2. In a heeling machine, the combination of measuring mechanism, final pressure mechanism, nail drivers, means for, during a single cycle of operation of the machine, first retracting the drivers, then advancing them to and beyond their starting point, and then retracting them to starting position, and means for actuating both the measuring and final pressure mechanisms prior to the arrival of the drivers at starting position in their advancing movement.

3. In a heeling machine, the combination of measuring mechanism, final pressure mechanism, nail drivers, a crank for retract-

ing and advancing the drivers, connections between the crank and the drivers and between the crank and the pressure mechanism, and means for causing the crank to stop before reaching dead center at the end of a cycle of operation of the machine.

4. In a heeling machine, the combination of measuring mechanism, final pressure mechanism, nail drivers, a crank for retracting and advancing the drivers, positive connections between the crank and the drivers, connections between the crank and the pressure mechanism, and means for causing the crank to stop before reaching dead center at the end of a cycle of operation of the machine.

5. In a heeling machine, the combination of a pressure supporting member, a work support, connections between the work support and the pressure supporting member, means for moving the pressure supporting member and, through said connections, the work support, to measure the work, and for then holding said member against movement, and means for extending said connections while said member is stationary, to exert additional final pressure upon the work.

6. In a heeling machine, the combination of a pressure supporting member, a work support, connections between the work support and the pressure supporting member, means for moving said member and work support to measure the work, and means for extending said connections to exert additional final pressure upon the work.

7. In a heeling machine, the combination of a work support, means for moving the work support to measure the work, and means interposed between the measuring means and the work support for imparting additional movement to the work support to exert additional, final pressure upon the work.

8. In a heeling machine, the combination of a work support, a pressure supporting member, a screw engaging said member, means for rotating the screw to measure the work, means for locking the screw against rotation, and means interposed between the pressure supporting member and work support for moving the work support to exert pressure upon the work.

9. In a heeling machine, the combination of a work support, screw operated measuring mechanism acting upon the work support, and compound toggle operated final pressure mechanism also acting upon said work support.

10. In a heeling machine, the combination of a work support, screw operated measuring mechanism acting upon the work support, and toggle operated final pressure mechanism interposed, between the measuring mechanism and the work support.

11. In a heeling machine, the combination of a work support, measuring mechanism, and final pressure mechanism interposed between the work support and the measuring mechanism.

In testimony whereof I have signed my name to this specification.

JOHN M. BENJAMIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."