E. E. WINKLEY.

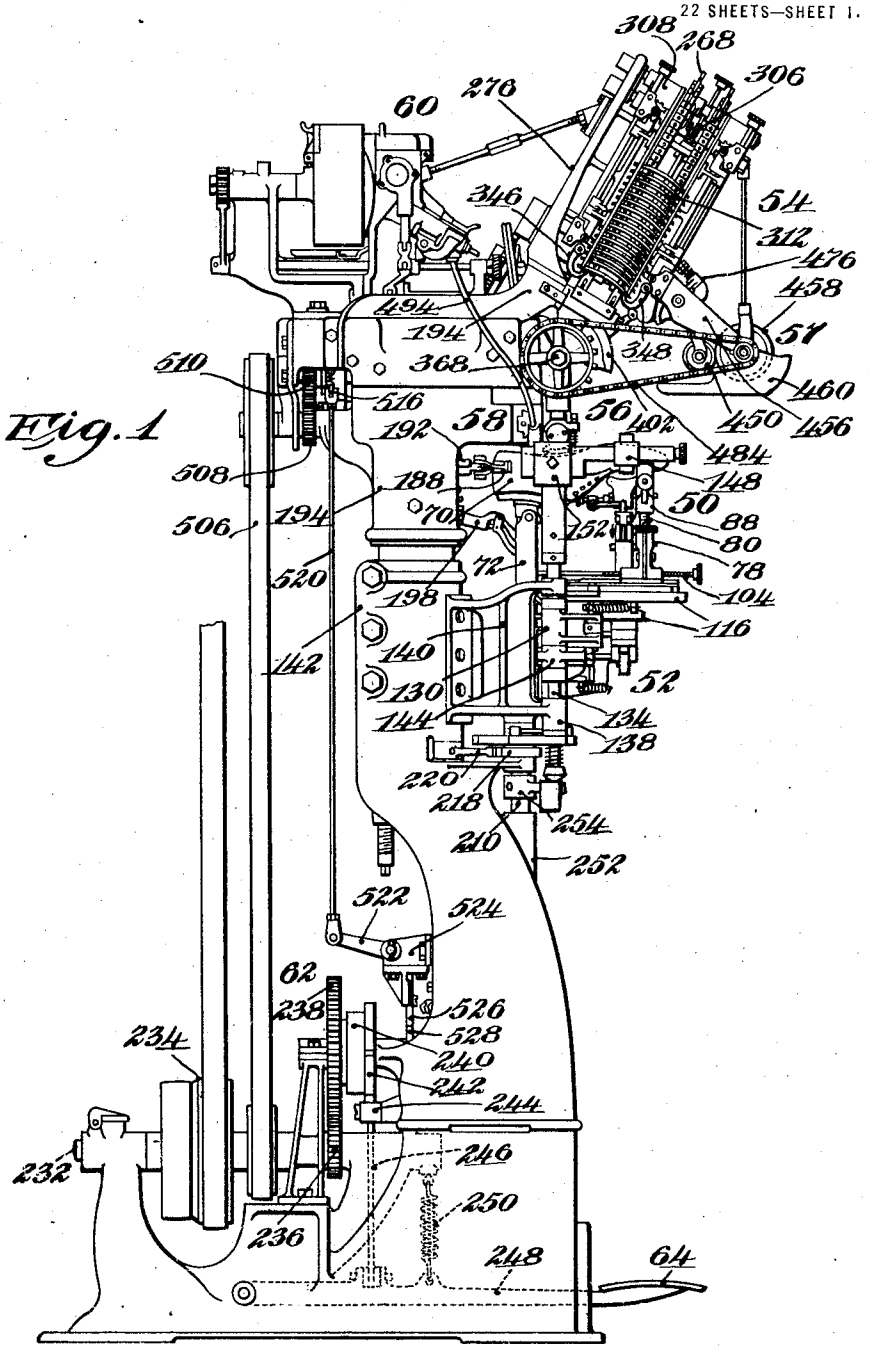
SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781. Patented June 29, 1920.

22 SHEETS—SHEET 1.

Fig. 1



Witness

Edward L. Day

Inventor

Charles E. Winkley

by his attorneys

Phillips, Van Etten & Phillips

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 2.

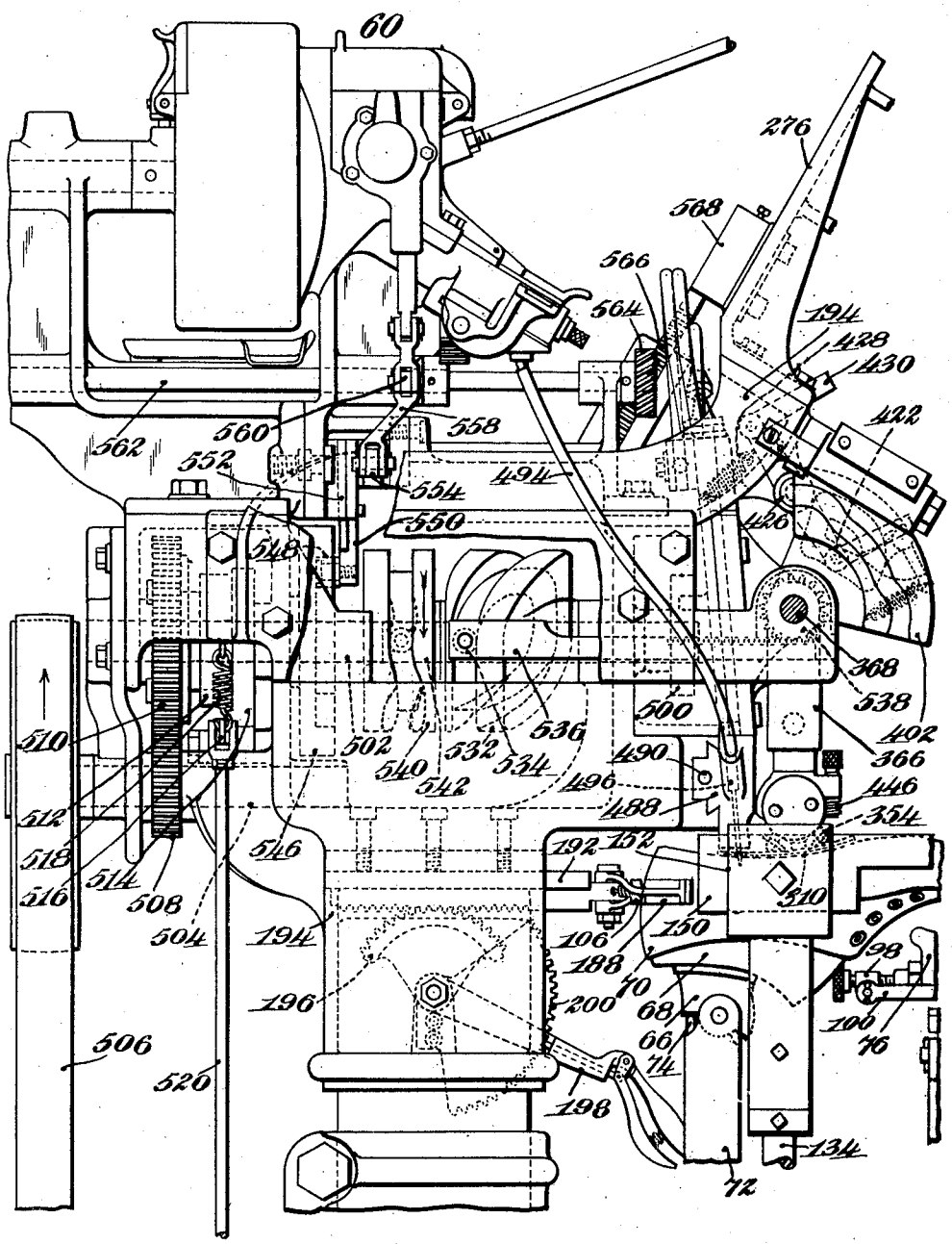


Fig. 2

Witness

Edward S. Day

Inventor

Erastus E. Winkley

by his attorneys

Phillips, Van Tuyl & Fish

E. E. WINKLEY.

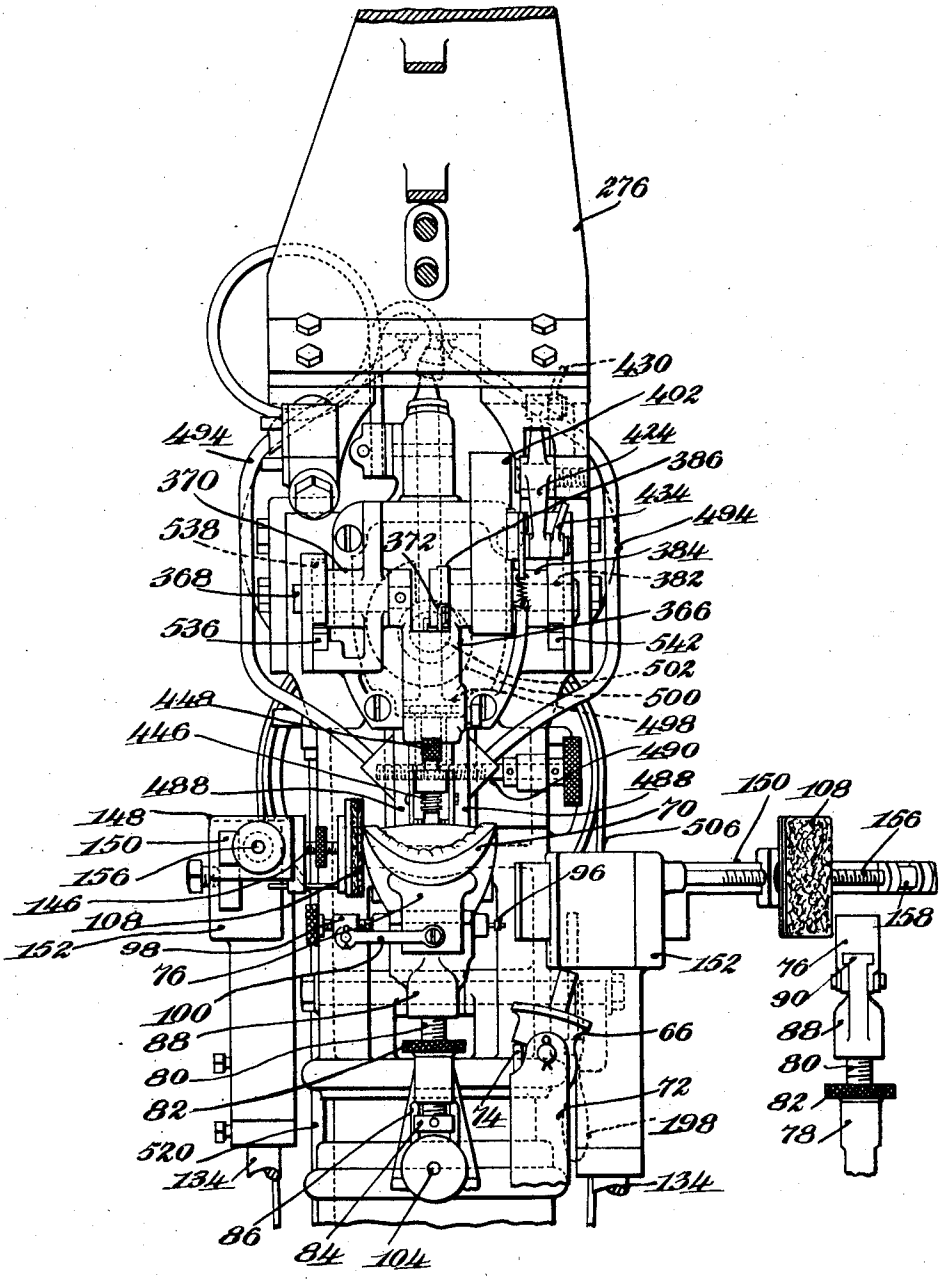
SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 3.



Witness
Edward S. Day

Fig. 3

Inventor
Erastus E. Winkley
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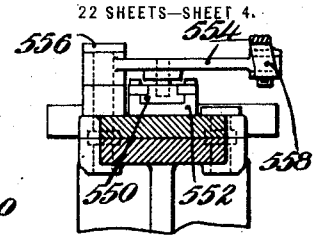
E. E. WINKLEY.
SHANK PIECE LAYING MACHINE.
APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 4.



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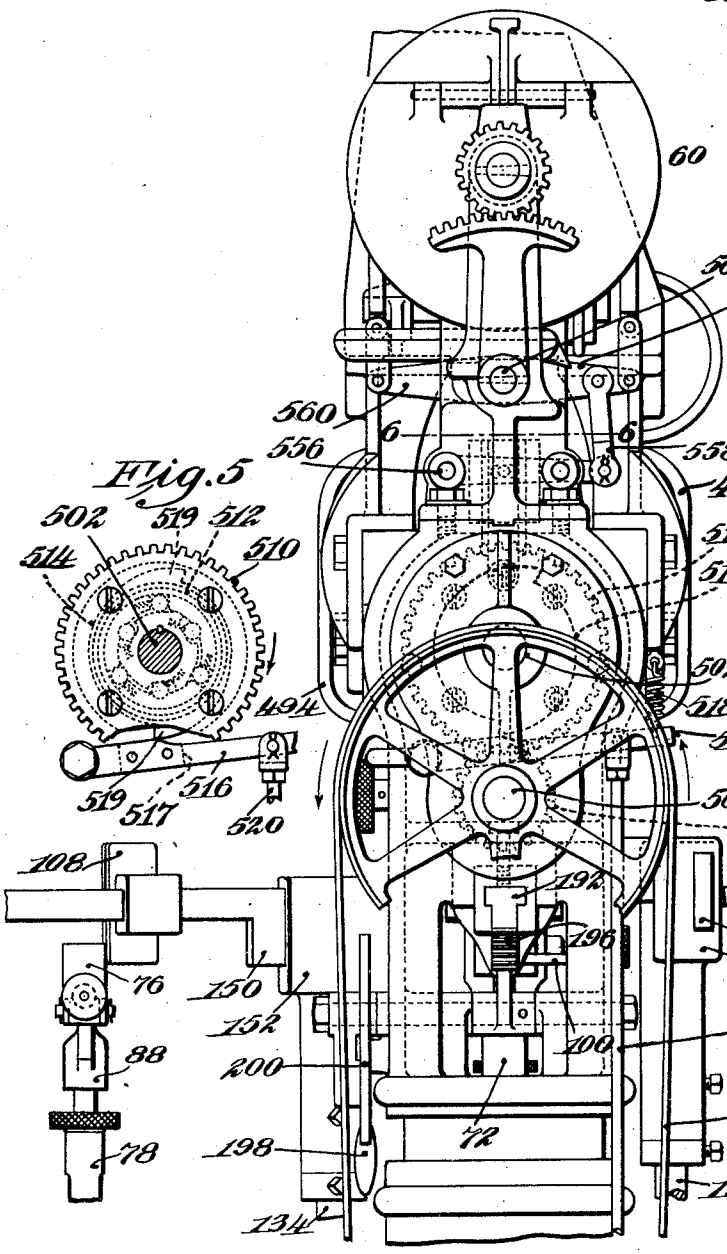

Fig. 4

Fig. 5

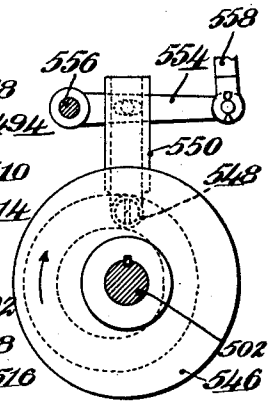

Fig. 7.

Witness
Edward S. Day

Inventor
Charles E. Winkley
by his attorneys
Phillips, Van Tassel & Fish

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781. Patented June 29, 1920.

22 SHEETS—SHEET 5.

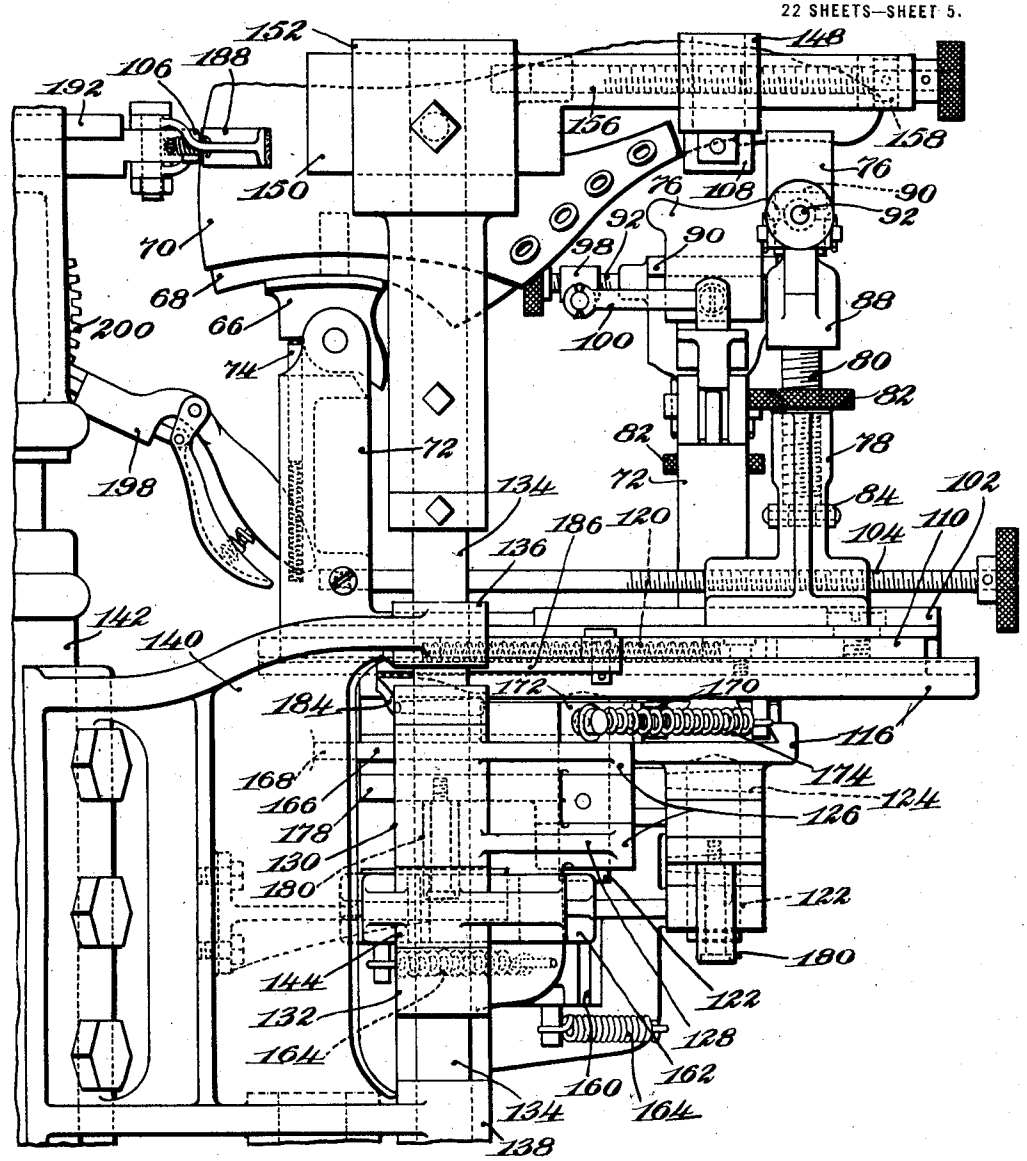

Fig. 8

Witness
Edward S. Day

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Van Etten & Fish

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

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22 SHEETS—SHEET 6.

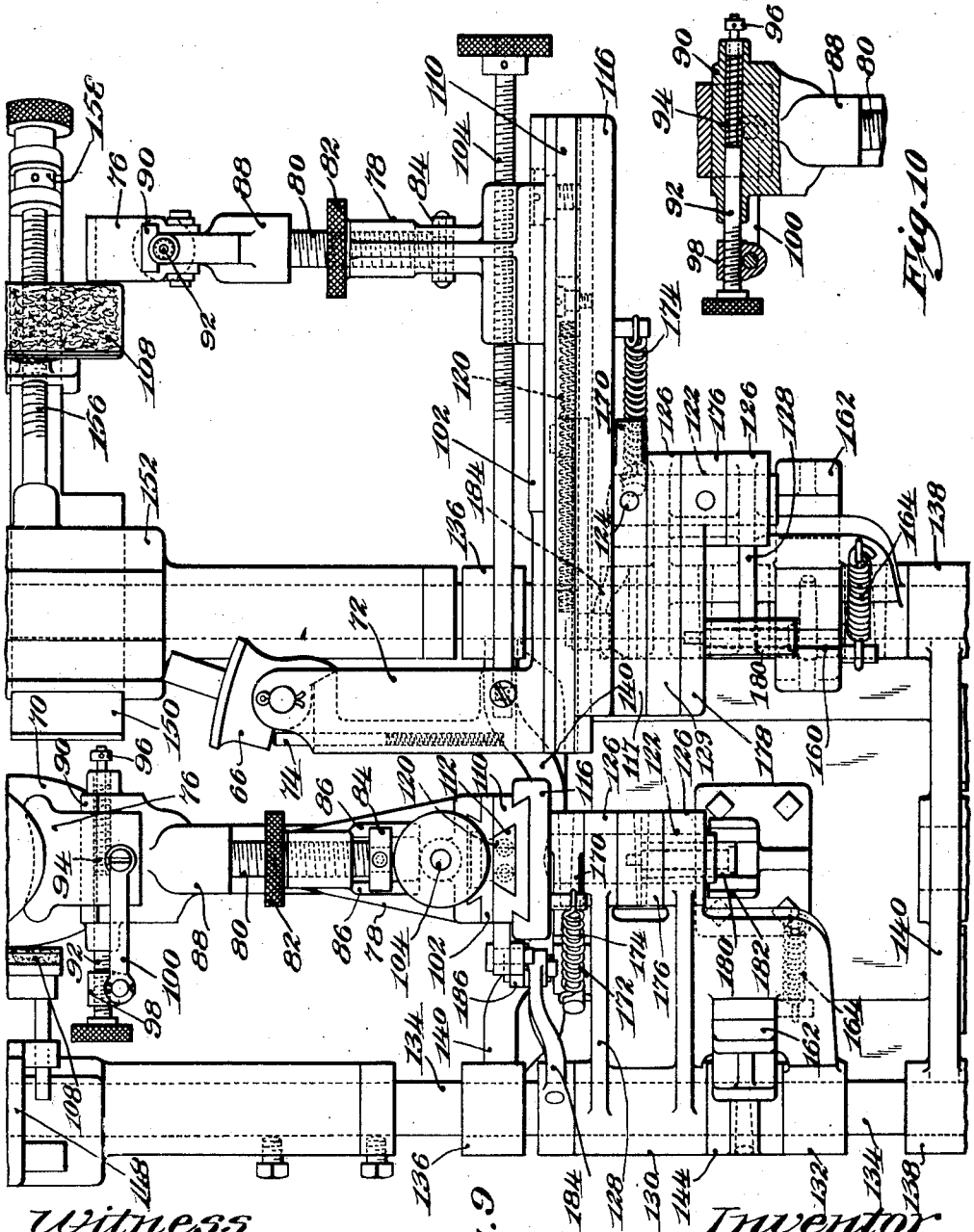

Fig. 9

Fig. 10

Witness
Edward S. Day

Inventor
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Phillips, Van Tassel & Fitch

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

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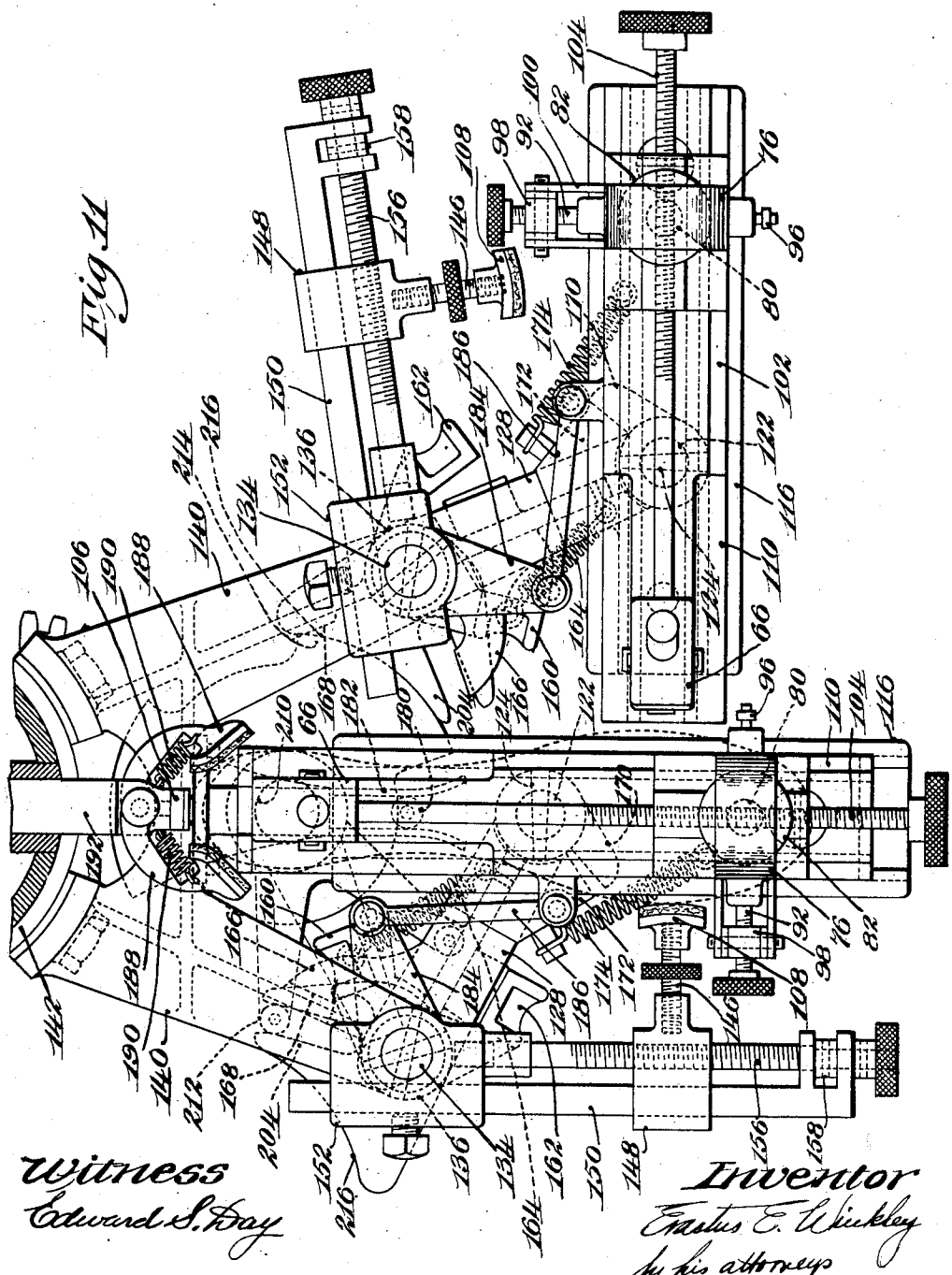
22 SHEETS—SHEET 7.

Fig 11



Witness
Edward S. Gray

Inventor
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Phillips, Moulton & Fish

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781. Patented June 29, 1920.

22 SHEETS—SHEET 8.

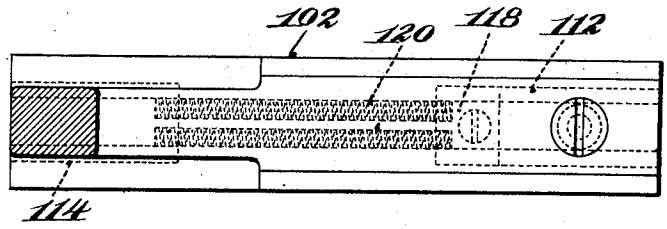


Fig. 12

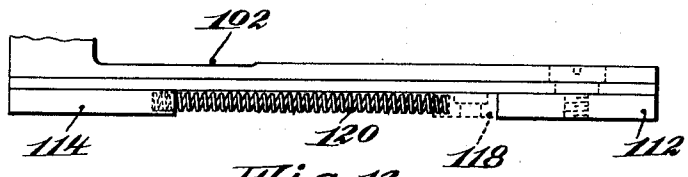


Fig. 13

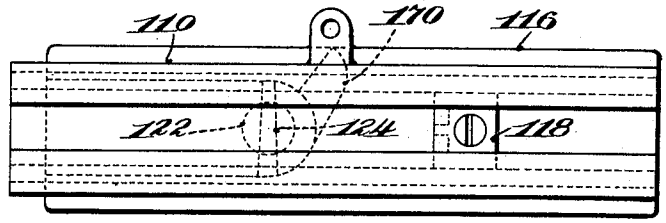


Fig. 14

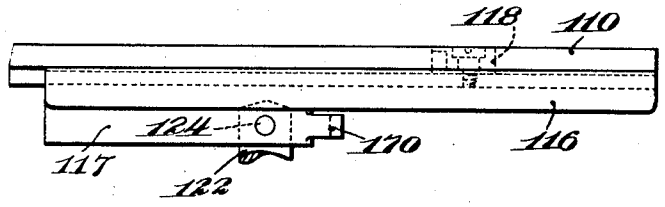


Fig. 15

Witness
Edward S. Day

Inventor
Erastus E. Winkley
by his attorneys
Phillips, VanTassel & Finch

E. E. WINKLEY.

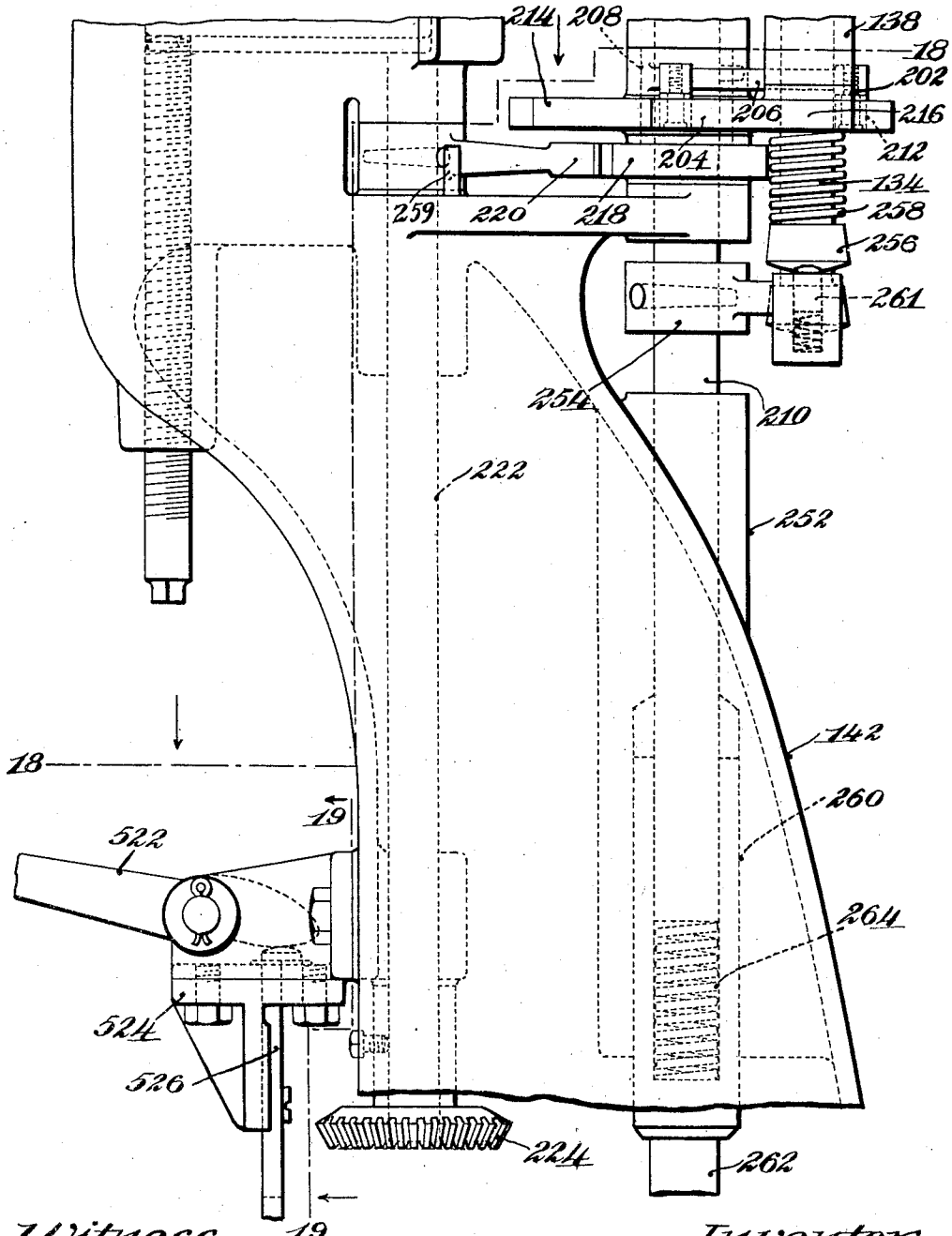
SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 9.



Witness
Edward S. Day

Fig. 16

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Moore, Lyon & Page

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 10.

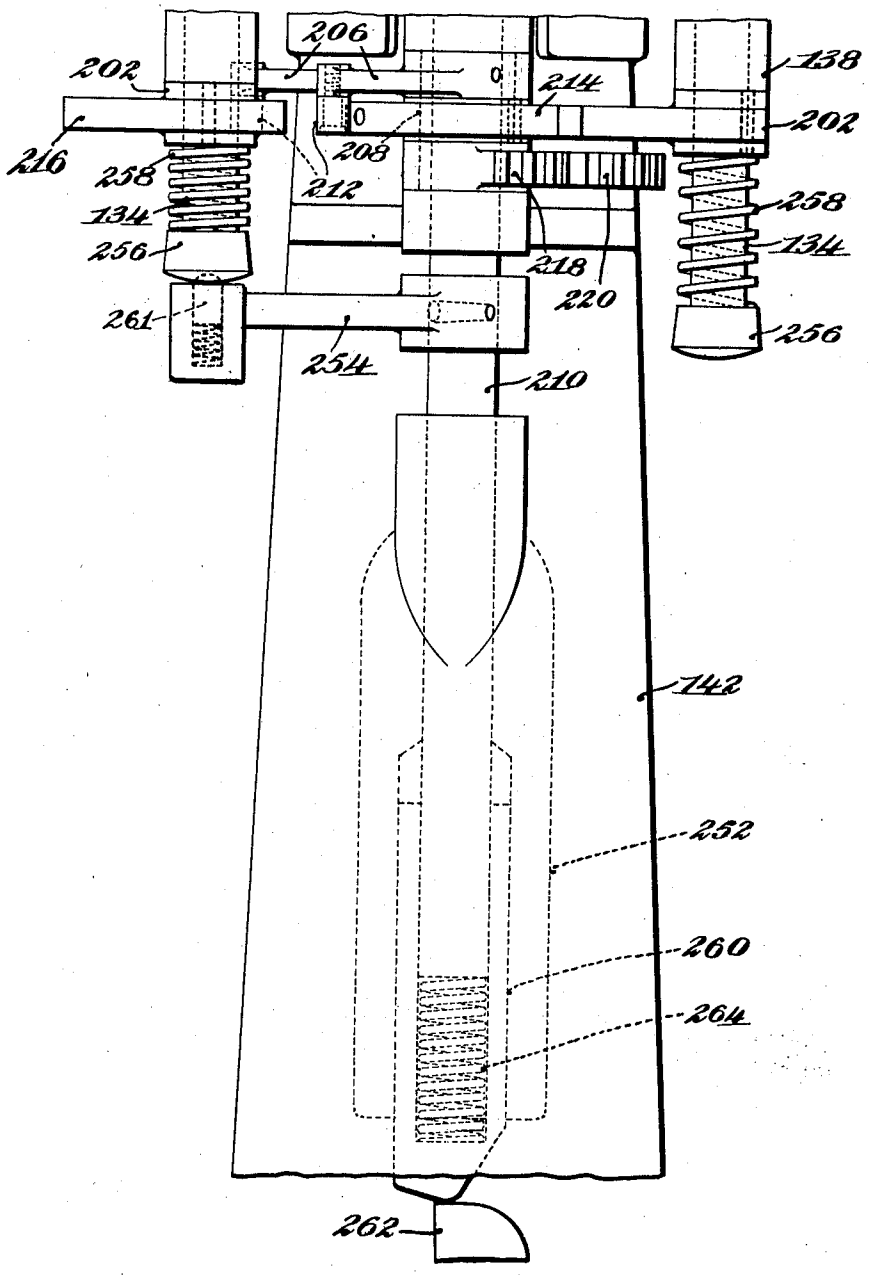


Fig. 17

Witness
Edward S. Ray

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Van Tassel & Frisk

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

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Patented June 29, 1920.

22 SHEETS—SHEET 11.

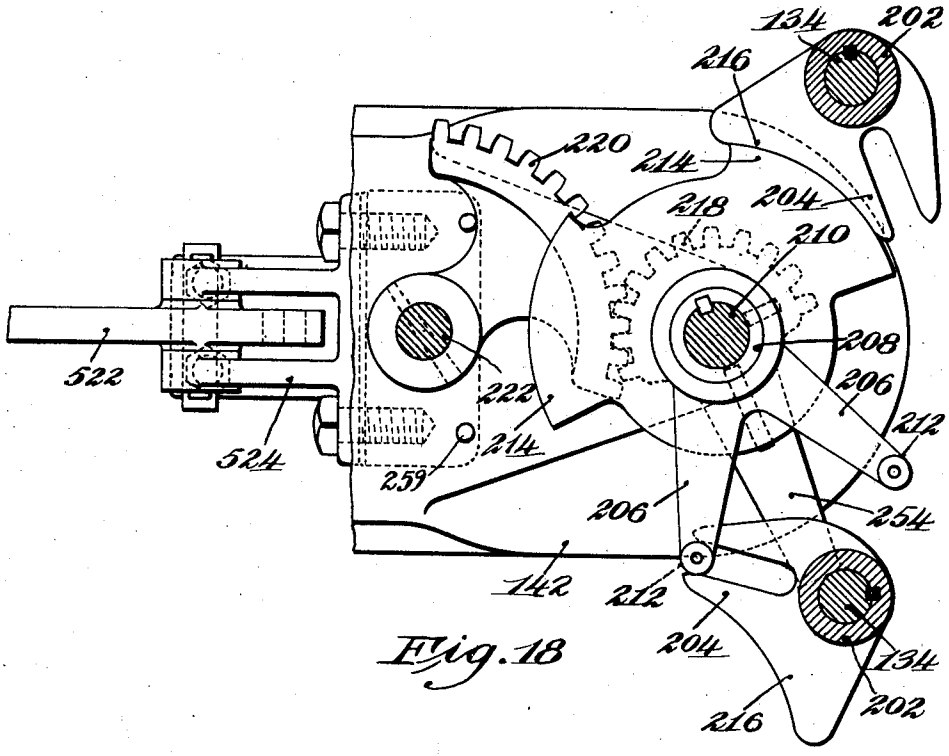

Fig. 18

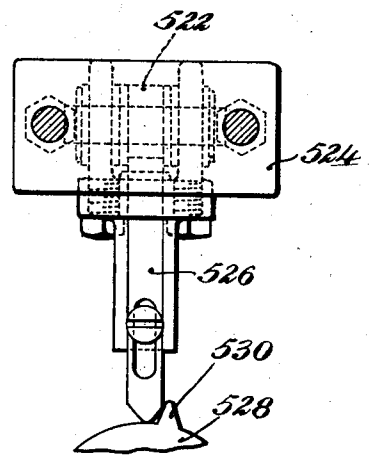

Fig. 19

Witness
Edward S. Day

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Van Etten & Finch

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

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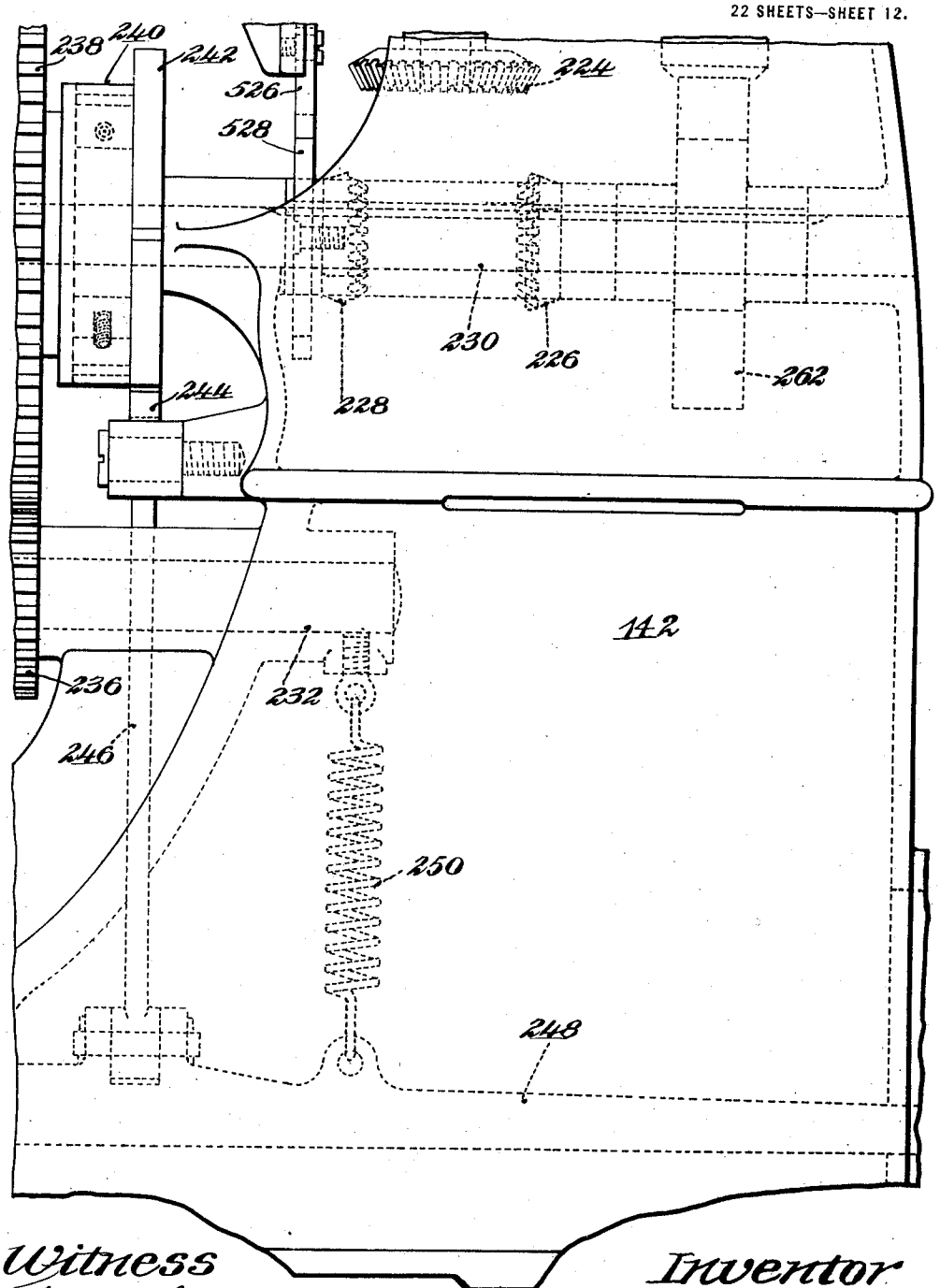
22 SHEETS—SHEET 12.



Witness
Edward S. Day

Fig. 20

Inventor
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Phillips, Moore, Lemon & Finch

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

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22 SHEETS—SHEET 13.

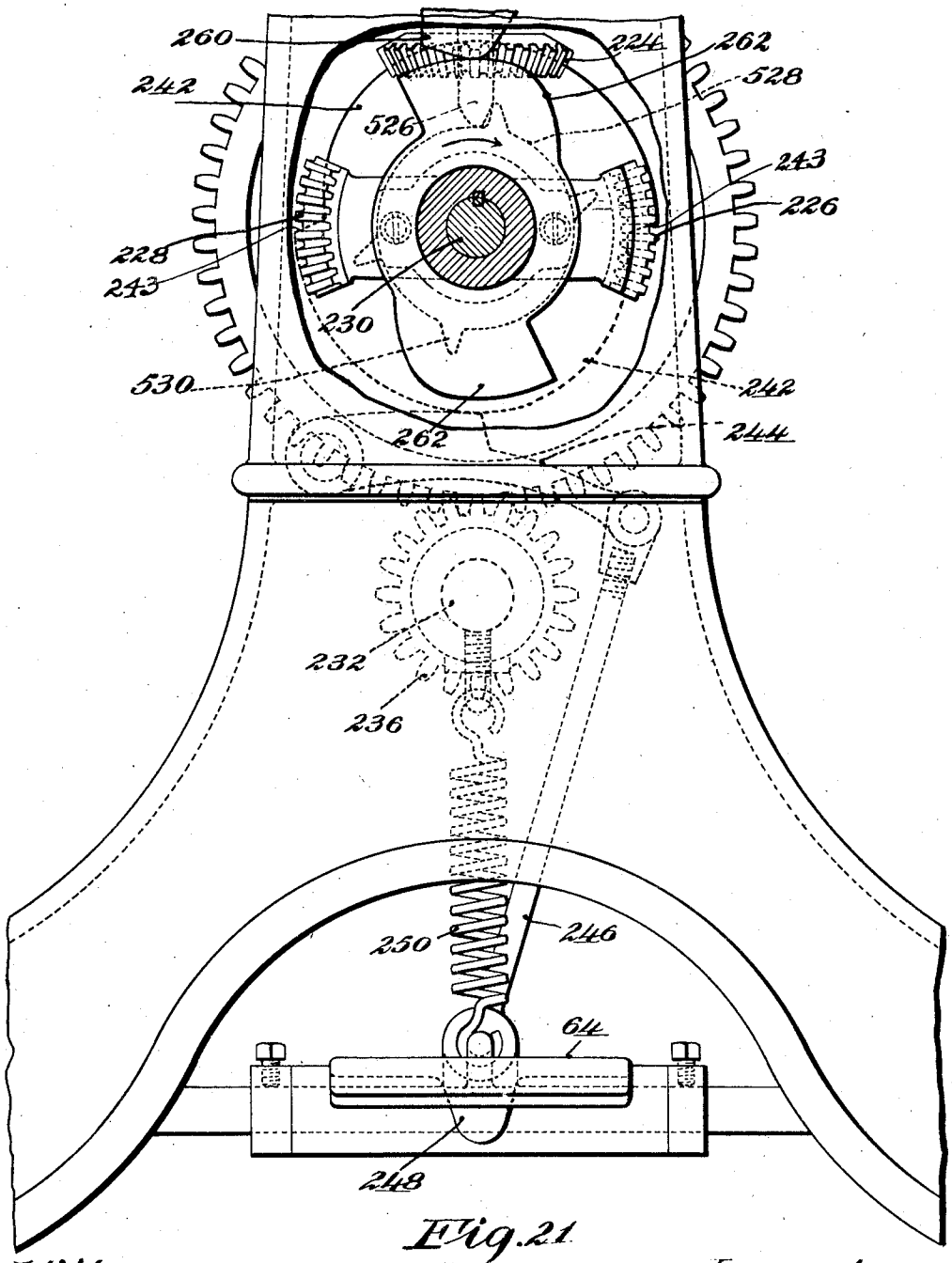


Fig. 21.

Witness
Edward S. Kay

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Moore, Lane & Fish

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 14.

Fig. 22

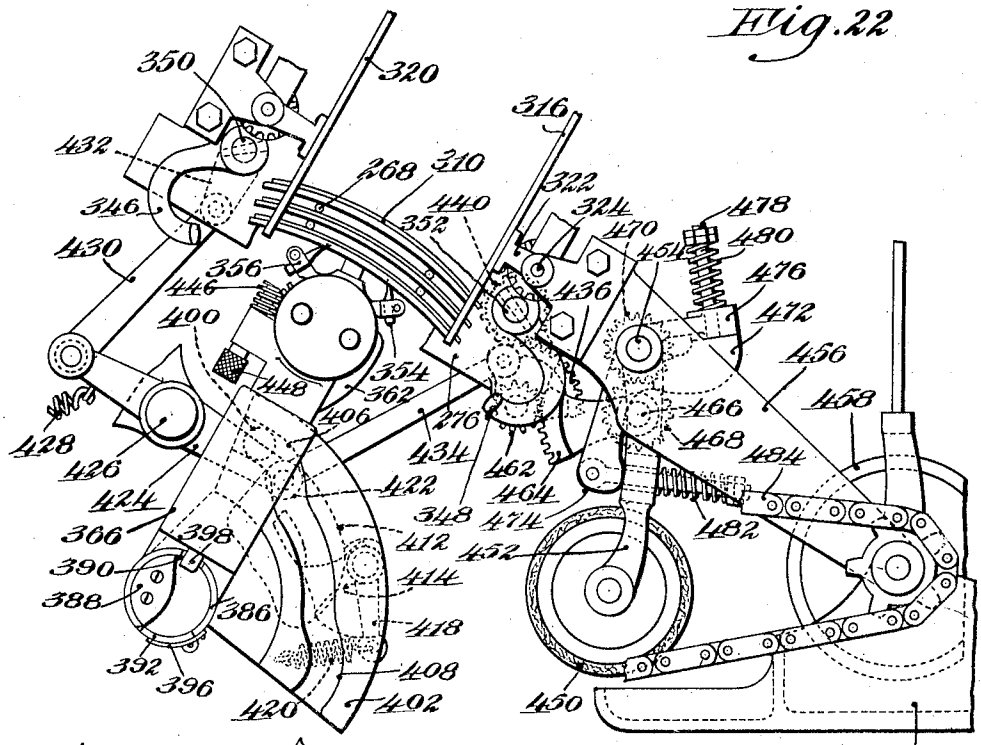


Fig. 23

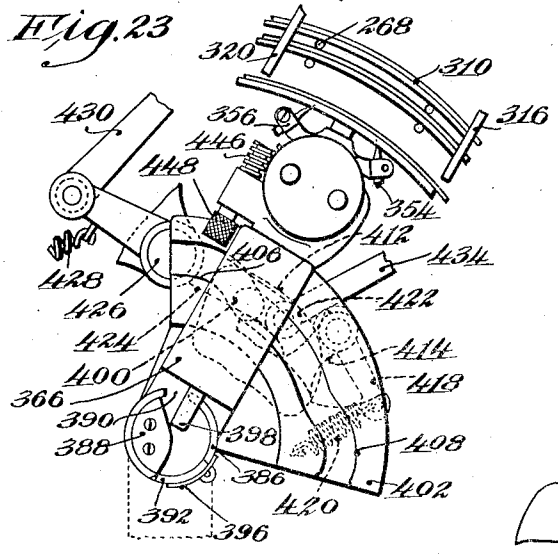
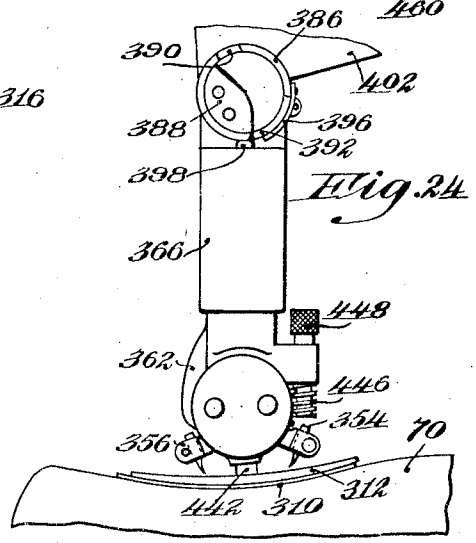


Fig. 24



Witness

Edward S. Bay

Inventor

Emsley E. Winkley

by his attorneys

Phillips, Buttorman & Fish

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 15.

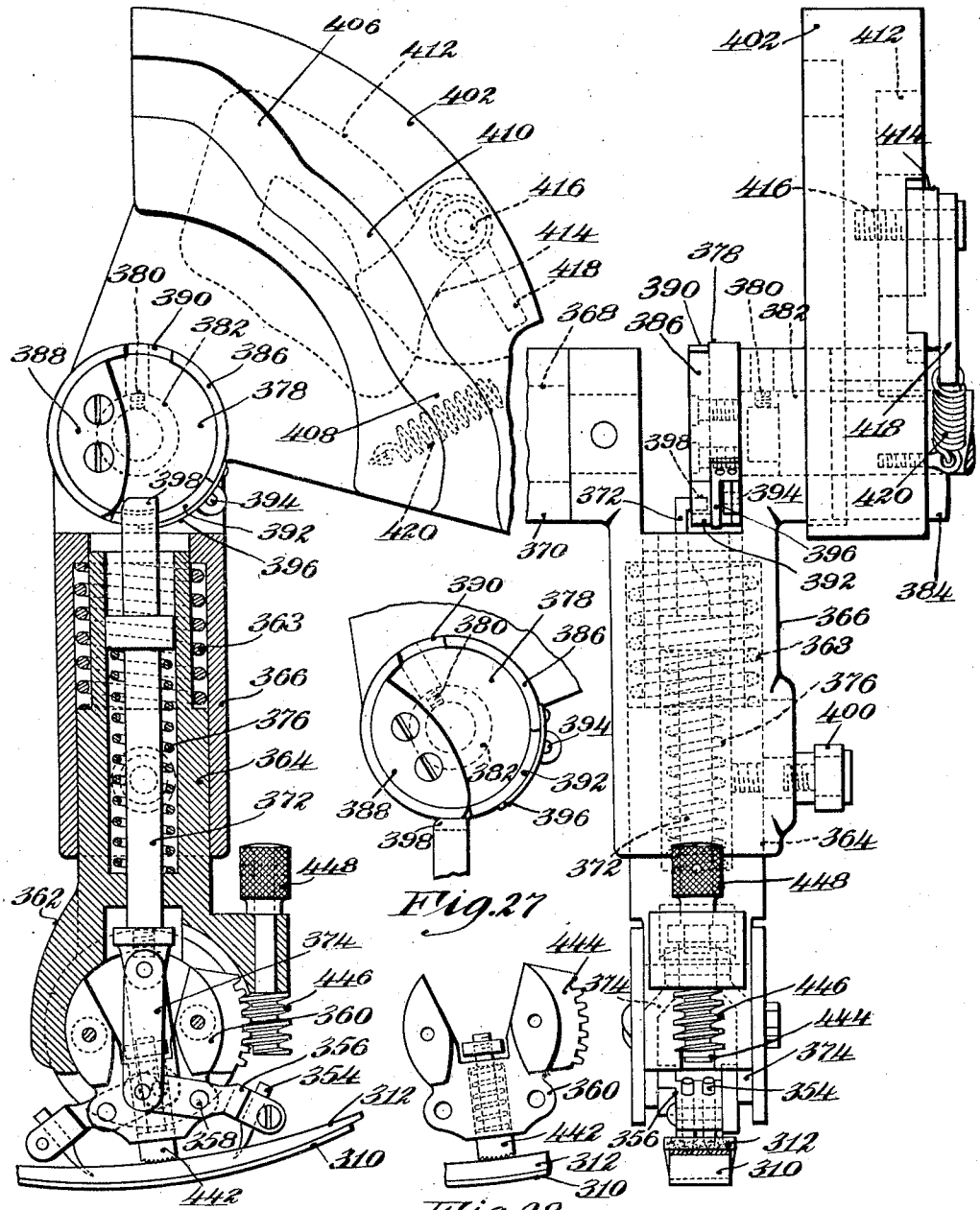


Fig.25.

Fig.27

Fig.28

Fig.26

Witness

Edward S. Day

Inventor

Erastus E. Winkley

by his attorneys

Philip, Van Tarnut & Keech

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

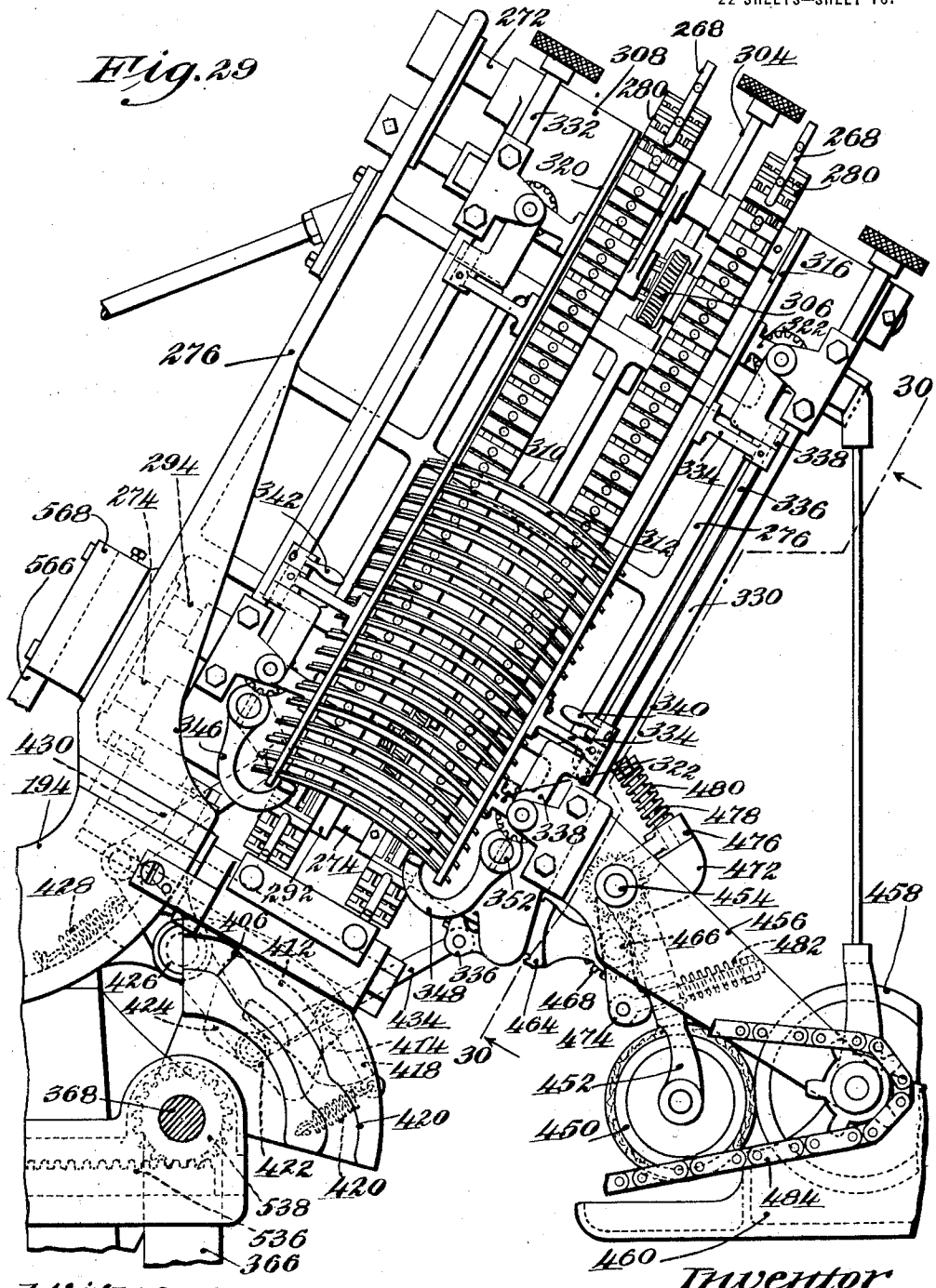
APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 16.

Fig. 29



Witness

Edward S. Day

Inventor

Erastus E. Winkley

by his attorneys

Phillips, Van Etten & Hicks

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

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22 SHEETS—SHEET 17.

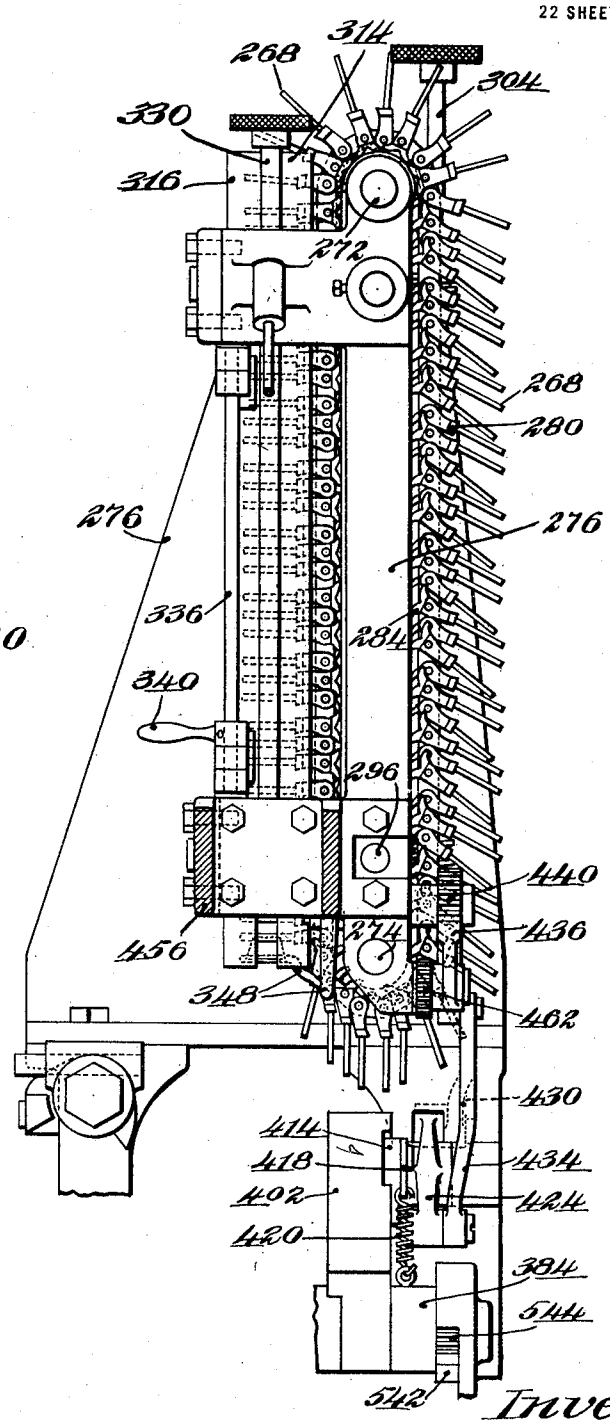

Fig. 30

Witness
Edward S. Day

Inventor
Trustus E. Winkley
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Phillips, Moore & Fish

E. E. WINKLEY.

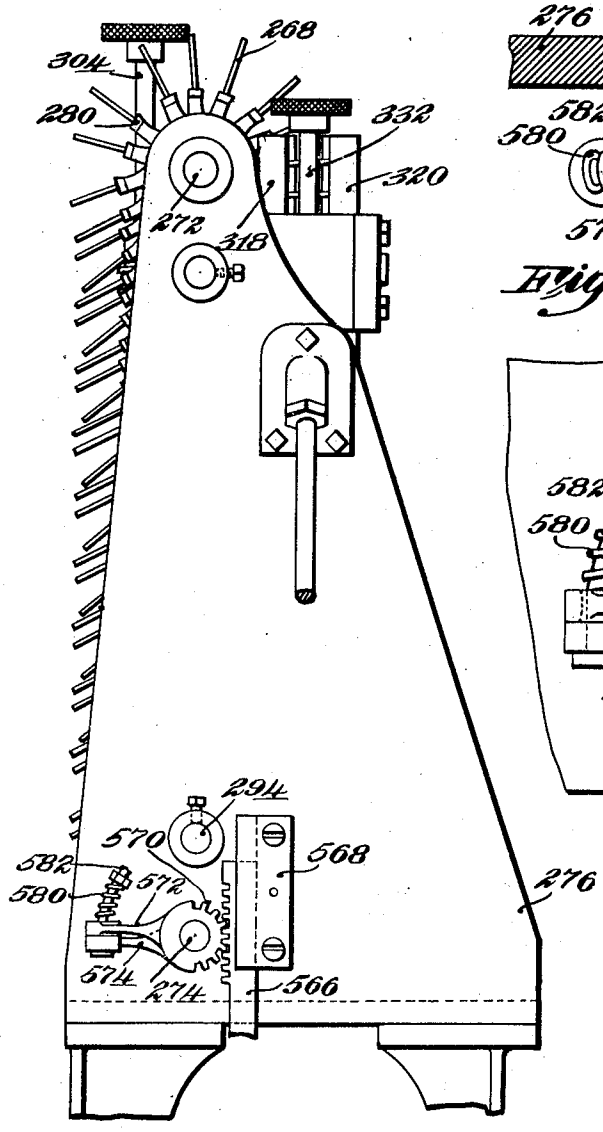
SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 18.



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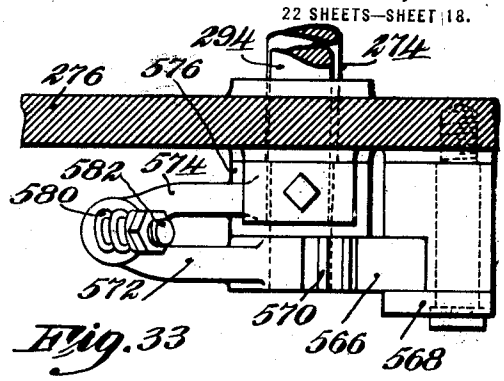

Fig. 33

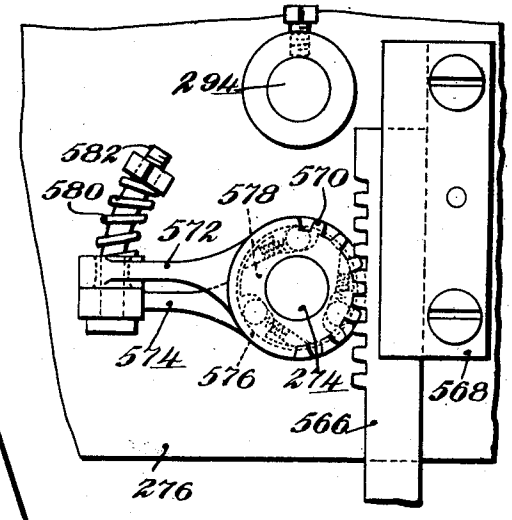

Fig. 32

Witness

Edward S. Day

Inventor

Erastus E. Winkley

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Phillips, Van Everen & Fair

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781. Patented June 29, 1920.

22 SHEETS—SHEET 19.

Fig. 34

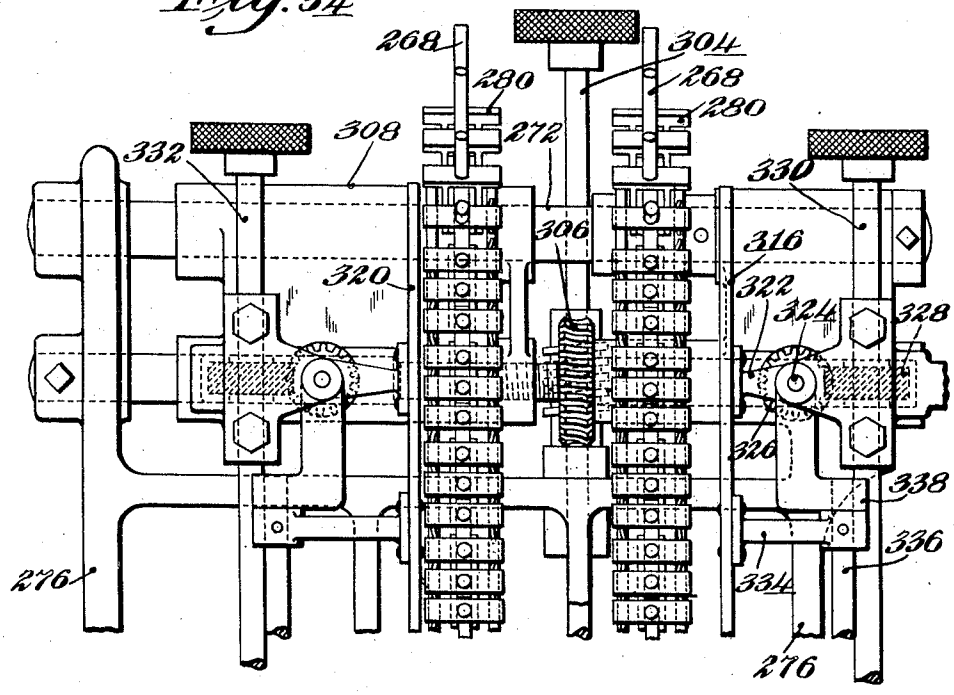
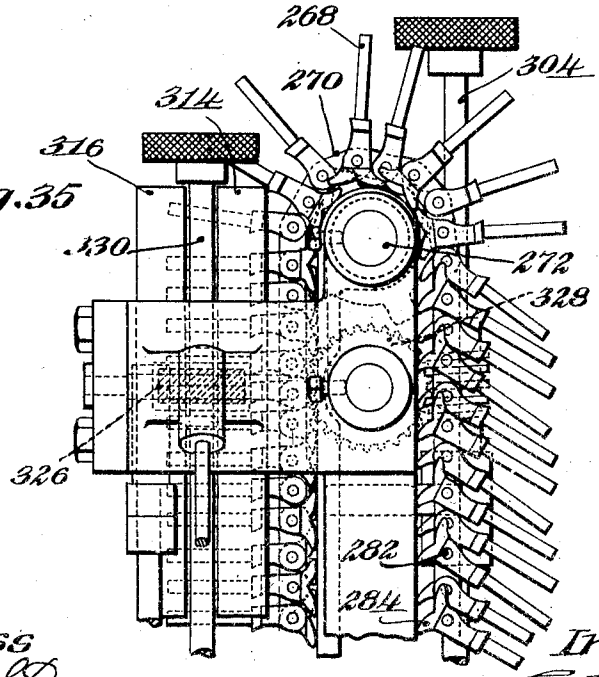


Fig. 35



Witness
Edward S. Day

Inventor
Frastus E. Winkley
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Phillips, Van Everen & Fisher

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 20.

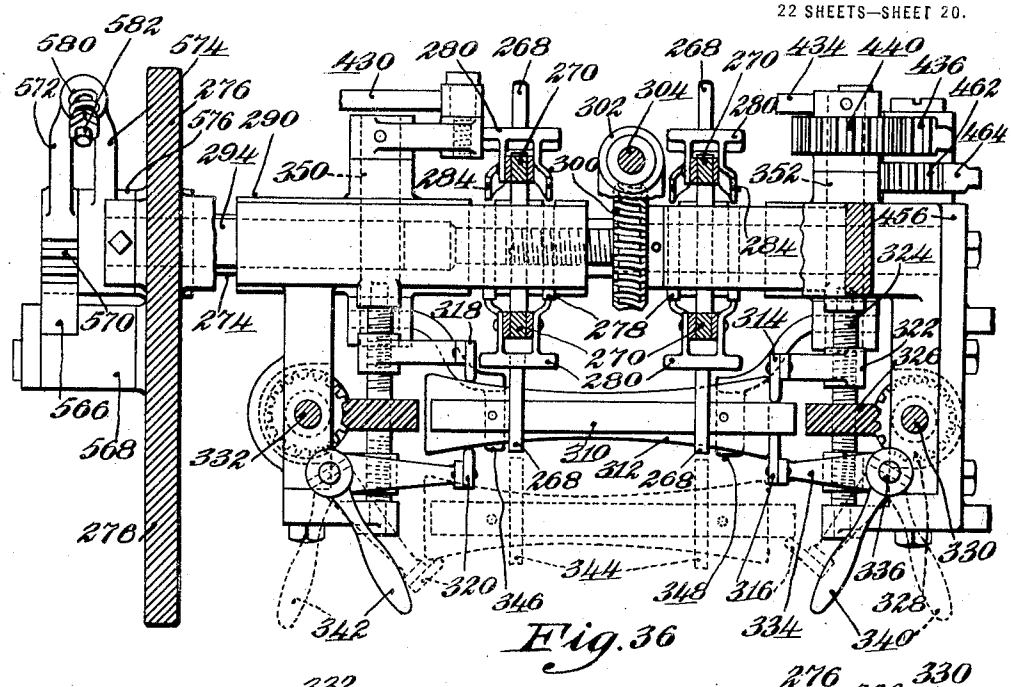


Fig. 36

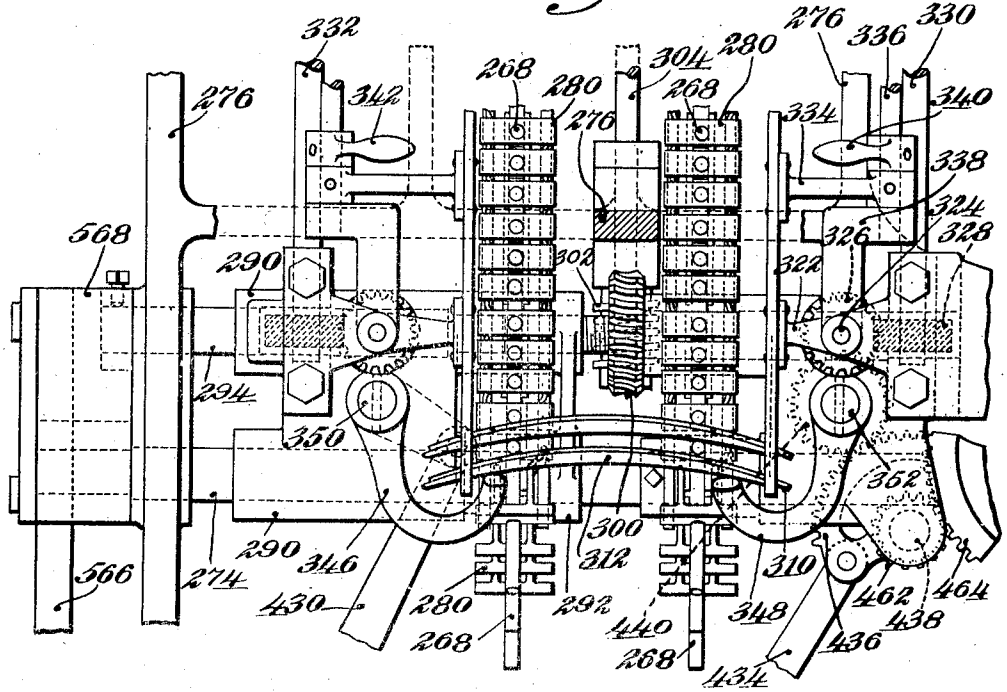


Fig. 37

Witness
Edward S. Day

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Moore, Weissenbach & Strawn

E. E. WINKLEY.

SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781. Patented June 29, 1920.

22 SHEETS—SHEET 21.

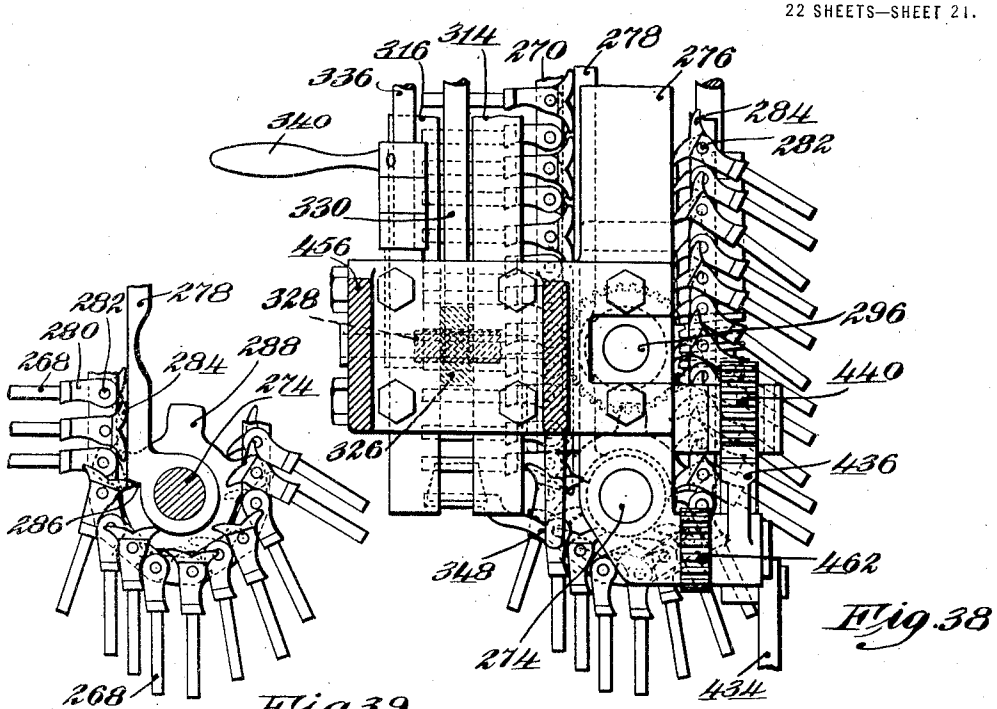
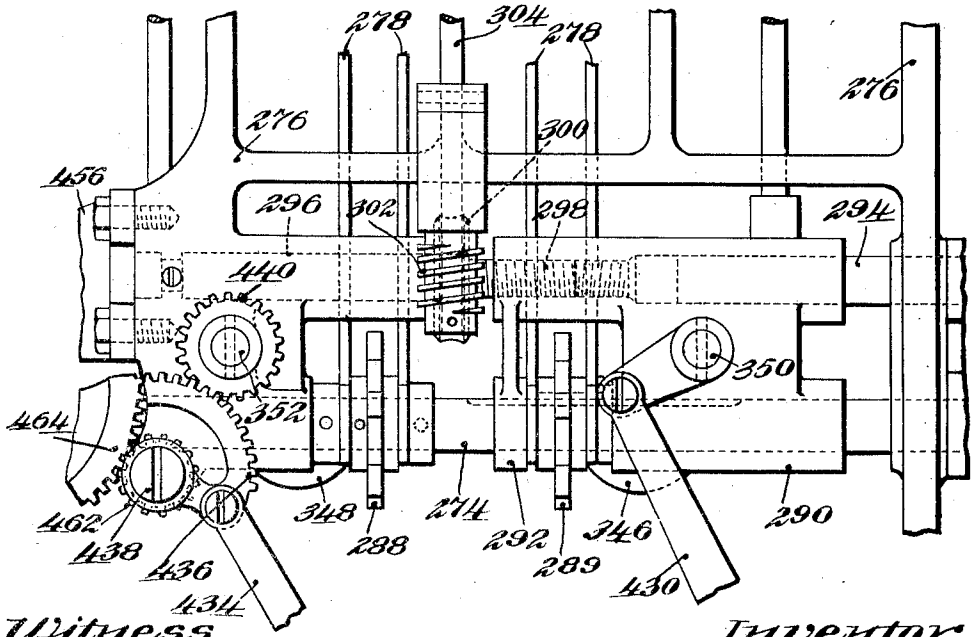


Fig. 38

Fig. 39



Witness
Edward S Day

Fig. 40

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Van Etten & Fish

E. E. WINKLEY.

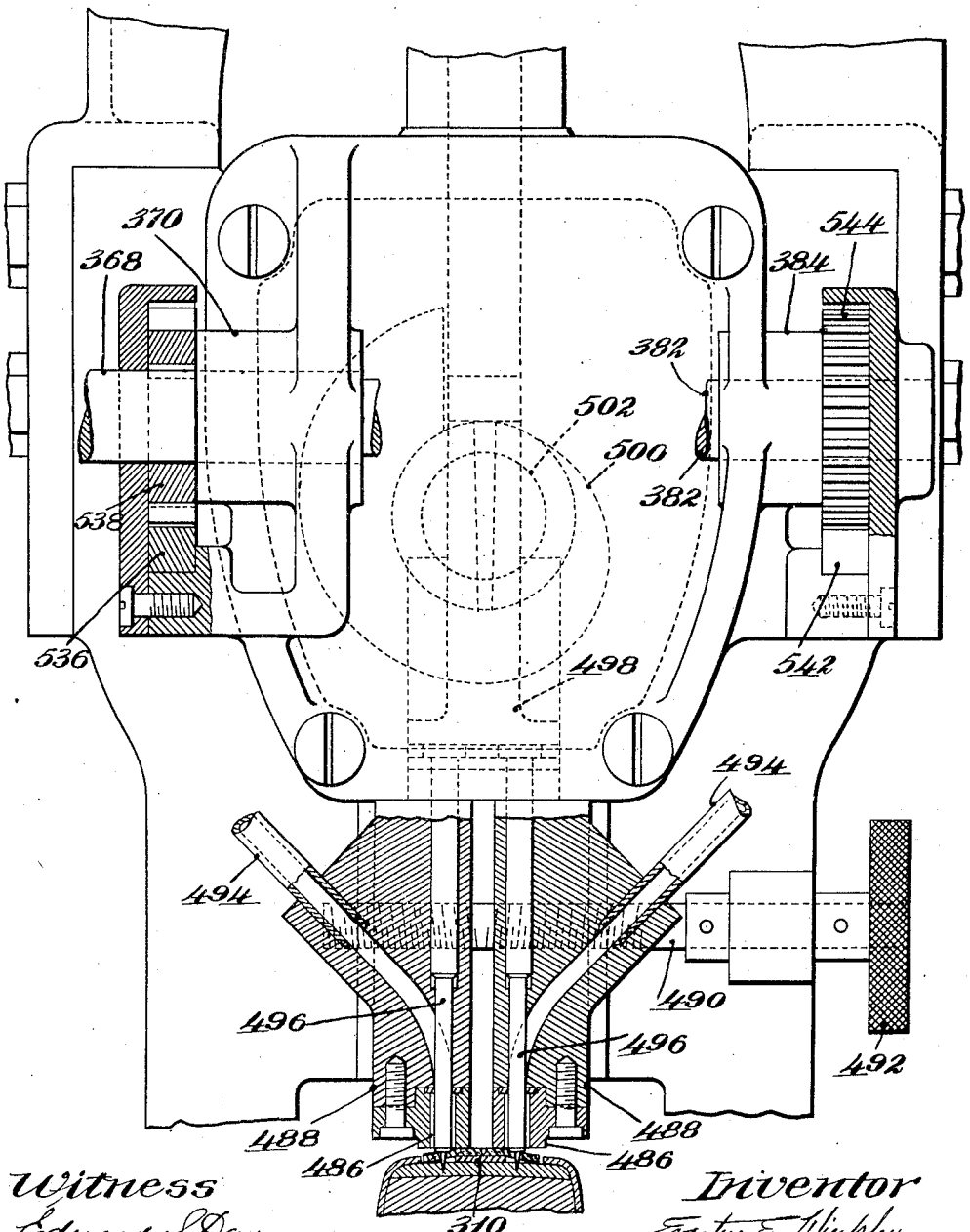
SHANK PIECE LAYING MACHINE.

APPLICATION FILED DEC. 11, 1916.

1,344,781.

Patented June 29, 1920.

22 SHEETS—SHEET 22.



Witness
Edward S. Day

Fig. 41

Inventor
Erastus E. Winkley
by his attorneys
Phillips, Van Tassel & Fish

UNITED STATES PATENT OFFICE.

ERASTUS E. WINKLEY, OF LYNN, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

SHANK-PIECE-LAYING MACHINE.

1,344,781. Specification of Letters Patent. Patented June 29, 1920.

Application filed December 11, 1916. Serial No. 136,356.

To all whom it may concern:

Be it known that I, ERASTUS E. WINKLEY, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Shank-Piece-Laying Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In the manufacture of boots and shoes it is common to employ what are usually designated as "shank-pieces" or "shank-stiffeners," for the purpose of reinforcing the sole of the boot or shoe at the shank. The shank-piece is applied to the lasted shoe prior to the laying of the outer sole, and this operation is usually performed by hand, the shank-piece being secured in place by tacks and cement. The present invention relates to a machine for performing this operation in a more or less automatic manner.

The object of the invention is to produce a machine by which a shank-piece may be accurately positioned upon a shoe and then secured thereto, and also, preferably, in which the shank-piece so applied is held in and withdrawn from a supply contained within the machine. For the performance of these operations the machine is provided with means for supporting and accurately positioning a lasted shoe, and with coöperating means for applying and securing a shank-piece to the shoe so held, in a predetermined position thereon. The machine is also provided, in its preferred form, with means for retaining a stack of shank-pieces, from which the pieces are withdrawn automatically, and with power mechanism operating automatically to cause the various functions of the machine to be performed in a predetermined order.

Other objects of the invention, and the features of construction and operation by which the various objects are attained, will be set forth hereinafter, in connection with the description of the illustrated embodiment of the invention.

In the accompanying drawings Figure 1 is a side-elevation of a machine embodying the present invention. Fig. 2 is a partial side-elevation of the upper portion or head of the machine, on a larger scale than Fig. 1. Fig. 3 is a front-elevation of the parts shown in Fig. 2. Fig. 4 is a rear-elevation of the upper part of the machine, with a portion of the drive-pulley broken away. Fig. 5 is a detail view showing, in rear elevation, the Horton clutch through which the head-mechanism is driven. Fig. 6 is a detail plan-view, in section on the line 6—6 in Fig. 4, showing a part of the mechanism for operating the shank-piece feeding-means. Fig. 7 is a detail-view, in rear elevation, of parts of the same mechanism. Fig. 8 is a side-elevation, on a larger scale than the preceding figures, of the shoe-supporting jacks and the mechanism immediately associated therewith, together with a lasted shoe in position for the application of a shank-piece. Fig. 9 is a front-elevation of the parts shown in Fig. 8. Fig. 10 is a detail-view, partly in section, showing the provision for lateral accommodation of the toe-rest. Fig. 11 is a plan-view of the parts shown in Figs. 8 and 9, but with the shoe shown only in dotted lines. Figs. 12 and 13 are, respectively, a plan-view and a side-elevation showing, in detail, the base-member of one of the shoe-supporting jacks. Figs. 14 and 15 are a plan-view and a side-elevation of the intermediate slide and guideway of one of the jacks. Figs. 16 and 17 are a side-elevation and a front-elevation, respectively, of the middle portion of the machine, showing certain parts of the jack-actuating mechanism. Fig. 18 is a plan-view, in section on the line 18—18 in Fig. 16. Fig. 19 is a front-elevation, in section on the line 19—19 in Fig. 16, showing particularly part of the devices for throwing the head-mechanism into operation. Figs. 20 and 21 are a side-elevation and a front-elevation, respectively, of the lowermost part of the machine, showing particularly the construction of the power-mechanism. Fig. 22 is a fragmentary side-elevation, showing particularly the picker-mechanism and the cement-applying mechanism. Figs. 23 and 24 are side-elevations showing the picker-mechanism in different operative position from that shown in Fig. 22. Figs. 25 and 26 are a side-elevation and a front-elevation, respectively, of the picker-mechanism, on a larger scale than the preceding figures, Fig. 25 being partly in sec-

tion. Fig. 27 is a detail-view in side-elevation, showing the claw-actuating head in a different position from that of Fig. 25. Fig. 28 is a detail-view in side-elevation, showing particularly the presser-foot and the means by which it is supported. Fig. 29 is a side-elevation showing the complete shank-piece supplying mechanism, together with the cementing-mechanism and a part of the picker-mechanism. Fig. 30 is a front-view of the shank-piece supplying mechanism, in section on the line 30—30 of Fig. 29 and looking in the upwardly-inclined direction of the arrows applied to that line. Fig. 31 is a rear-view of the shank-piece supplying mechanism, looking in the opposite direction from Fig. 30. Fig. 32 is a detail of Fig. 31, on a larger scale, showing particularly the mechanism for producing intermittent feed-movement. Fig. 33 is a plan-view of the parts shown in Fig. 32. Fig. 34 is a side-elevation of the upper part of the shank-piece supplying-mechanism turned, for convenience of illustration, into upright position. Fig. 35 is an elevation of the same part, looking from the right in Fig. 34. Fig. 36 is a fragmentary view, in plan and horizontal section, of the lower part of the shank-piece supplying-mechanism with the parts in the same position as in Figs. 34 and 35. Fig. 37 is a side-elevation of the parts shown in Fig. 36. Fig. 38 is a front-view of the lower part of the shank-supplying mechanism, with the parts shown in upright position. Fig. 39 is a detail-view showing a part of the mechanism shown in Fig. 38, and particularly illustrating the coöperation of the fingers with the bars by which they are controlled. Fig. 40 is a side-elevation of some of the parts shown in Fig. 37, but looking in the opposite direction. Fig. 41 is a front-elevation, partly in vertical section, showing particularly the nailing-mechanism and part of the picker-actuating mechanism.

The invention is illustrated as embodied in a machine in which a shank-piece is automatically withdrawn from a supply, by means of picker-mechanism, and is then applied to the shoe and secured in place by both tacks and cement. Referring to Fig. 1, the shoe-supporting jacks, of which two are used, are indicated generally by the number 50, and the mechanism by which the jacks and associated parts are moved is indicated by the number 52. The means by which the supply of shank-pieces are retained, and fed one by one as required, are indicated by the number 54, while the picker-mechanism is shown at 56. The cement-applying mechanism is shown at 57, and the tacking mechanism at 58. The tacks are supplied to the tacking-mechanism by the tack-feeding devices 60 at the top of the machine. The power-mechanism, by which the various parts of the machine are driven in timed coördination is indicated generally by the number 62 at the lower part of the machine. This mechanism is controlled by the operator of the machine, by means of a treadle 64 at the front of the machine.

The shoe-supporting jacks will be first described. Two jacks are employed, so that while one is supporting a shoe in position for the reception of a shank-piece, the other may be in position for the convenient removal of the shoe thereon and the substitution of another shoe by the operator. Each jack comprises a heel-block 66 (Figs. 8 to 11) which is provided with a pin to enter the usual socket in the heel of the last 68, upon which the partly manufactured shoe 70 is supported. The heel-block is pivoted to the upper end of a heel-post 72, and a spring-pressed plunger 74, engaging the heel-block, tends to rock it in a direction to depress the toe-end of the last against the toe-rest 76, as is common in such devices. The toe-rest is hollowed on its upper surface to form a seat for the toe of the shoe, and it is supported by a toe-post 78.

In order that the height of the toe-rest may be adjusted, as may be necessary to adapt the machine for operating on shoes of different styles, the toe-post is bored to receive a screw-threaded stem 80, which coöperates with a nut 82 resting on the top of the toe-post. Rotation of the stem is prevented by a collar 84 fixed to its lower end, this collar having lugs which engage slide-guides 86 on the toe-post. By turning the nut 82 the stem may be raised or lowered, and this stem supports a head 88 upon which the toe-rest is mounted.

To provide for transverse adjustment of the toe-rest, and also for a yielding movement, or accommodation, which is desirable for a purpose which will be hereinafter referred to, the head 88 is provided with a T-shaped guideway 90, upon which the toe-rest is mounted to slide. A rod 92 also slides within a bore in the head (Fig. 10) this rod being controlled by a spring 94 coiled around it, while its movement is limited by a collar 96. A nut 98, threaded on the rod, is connected, by links 100, with the toe-rest. By turning the knurled head of the rod 92 the nut may be moved along the rod, thus changing the normal position of the toe-rest on the head 88. The spring 94 permits the toe-rest also to yield in one direction from its normal position.

The heel-post and the toe-post are supported and connected by a base-member 102. The heel-post is integral with this base-member, but the toe-post is made separate, in order that it may be adjusted toward and from the heel-post to accommodate the jack to shoes of different lengths. The base-

member is accordingly provided with a dove-tail guideway upon which the base of the toe-post is fitted to slide, as shown in Fig. 9, and the adjusting movement of the toe-post is produced by a screw-threaded rod 104 which is provided with a knurled head by which it may be turned.

When the lasted shoe is held, by the jack, in the position in which it receives the shank-piece, the longitudinal position of the shoe is determined by its engagement with a stationary heel-gage 106 (Figs. 8 and 11), the shoe being pressed yieldingly against the gage by means which will be described. Since the necessity for accurate application of the shank-piece requires that the lateral position of the shoe be accurately gaged, dependence for this function is not placed upon the support provided by the jack, but a fore-part gage 108 is employed. The fore-part gage operates, as shown Fig. 11, to press against one side of the fore-part of the lasted shoe and thus to swing it accurately into a predetermined position upon the heel-pin as a fulcrum. This slight lateral movement of the fore-part is permitted by the yielding support of the toe-rest, which has been described.

In order that the heel of the shoe may be pressed against the heel-gage firmly in all cases, notwithstanding slight variations in the shoes or inaccuracies in the adjustment of the machine, provision is made for a yielding rearward movement of the jack for securing the engagement in question. The base-member 102 is mounted upon an intermediate slide 110 (Fig. 9 and Figs. 12 to 15). This slide has, on its upper surface, a dove-tail guideway, and the base-member is provided with correspondingly formed slide-blocks 112 and 114 at its forward and rear ends, so that the base-member slides longitudinally on the slide 110. The slide is mounted, in turn, upon a slide-guide 116, with which it has dove-tail connections. A block 118, fixed in the guideway on the slide 110, serves as an abutment for two compression-springs 120, which are interposed between the block 118 and the slide-block 114. These springs tend to maintain the base-member in its innermost or rearmost position, movement in this direction being limited by engagement of the slide-block 112 with the block 118.

As is shown in Fig. 11, each of the two jacks is movable into two alternative positions. In one of these positions, the jack supports the shoe with its length in a fore-and-aft direction and in position to receive a shank-piece. In the other position of the jack, it is swung to the right or the left, as the case may be, so that its length is in a transverse position at one side of the jack which is in operative position. To provide for the movements of the jacks from one position to the other, each of the slide-guides 116 is fixed to the upper end of a short rock-shaft 122, and this rock-shaft is journaled in bearings 126 at the outer end of an arm 128, this arm constituting the supporting-means for the jack. The arms 128 are supported, in turn, by vertical shafts 134, each shaft passing through bearing-sleeves 130 and 132 on the corresponding arm 128. The shafts 134 are supported in upper and lower bearings, 136 and 138, at the outer ends of a double bracket 140 which projects rigidly from a column 142 forming the framework of the lower part of the machine. A hub 144, fixed to the shaft 134 between the sleeves 130 and 132 of the corresponding arm 128, supports the arm, but the arm is free to swing upon the shaft through an angle of movement which is limited by means which will be described.

The shafts 134 serve not only to support, but also to actuate the jacks. They serve also to support and actuate the forepart-gages 108. As shown in Fig. 11, each gage is mounted upon a stem 146 threaded into a block 148, and the block slides along an arm 150 which is adjustably fixed, by means of a set-screw, upon the upper end of the corresponding shaft 134 (Figs. 8, 9 and 11). The stem 146 is threaded right and left, and it may be turned by means of a knurled disk at its middle, so as to afford a slight adjustment of the gage. To adjust the gage for use with shoes of different lengths, the block 148 is moved along the arm 150, and for the purpose of this adjustment a threaded rod 156 is employed, this rod passing through a correspondingly threaded opening in the block and being mounted in bearings on the arm 150, but prevented from longitudinal movement by a collar 158.

The forepart-gages are actuated by rocking movements of the shafts 134, these movements being produced by means which will be described. The swinging movements of the jacks are also produced by the rocking movements of the shafts. Each hub 144, fixed to the shaft 134 as above described, is provided with two arms 160 and 162, which embrace the corresponding arm 128, as shown particularly in Fig. 11. The arm 128 is provided with projections which cooperate with the arms 160 and 162, but which are formed to afford a certain space for lost motion between the parts. Each arm 160 is connected with the corresponding arm 128 by a spring 164, which tends to rock the arm 128 in a direction such as to maintain it in engagement with the arm 160, as shown in the case of the right-hand jack in Fig. 11. When the shaft 134 is rocked, the parts maintain this relative position until the jack has been swung into the position occupied by the left-hand jack in Fig. 11. The swinging movement of the

arm 128 is then arrested by means of a stop-lug 166 which projects from the inner side of the arm. This lug coöperates with a surface 168 on the bracket 140, and when the swinging movement of the arm 128 and the jack has been arrested by these means, further rocking movement of the shaft 134 results in the stretching of the spring 164. At the completion of the rocking movement, however, the arm 162 is brought into engagement with the arm 128, so as to retain the latter positively in the position to which it has been moved.

The slide-guide 116 has provision for a limited rocking movement relative to the arm 128, owing to its connection with this arm through the rock-shaft 122. This rocking movement is controlled, however, by a stop-lug 170 which projects from the bottom of the slide-guide and coöperates with a lug 172 on the top of the arm 128. A spring 174, which connects the slide-guides and the arm, tends to maintain the two stop-lugs in engagement, as shown in the case of the right-hand jack in Fig. 11.

The relative position of the slide-guide and the arm 128 when the jack is in operative position, as in the case of the left-hand jack (Fig. 11), is determined by means other than those just described. For this purpose, a collar 176, fixed to the rock-shaft 122 between the bearings 126, is provided with an arm 178 which carries a depending roller 180. This roller coöperates with a forked guide 182 projecting forwardly from the bracket 140. When the arm 128 swings inwardly, the roller engages the guide near the last part of this movement, and the slide-guide 116 is thus guided to exact fore-and-aft position, and is held in this position more positively than would be accomplished by dependence upon the rigidity of the arm 128 alone. The relative movement of the slide-guide and the arm produced by the roller and the guide is permitted by the yielding of the spring 174, as shown in the case of the left-hand jack, (Fig. 11).

To support the jack securely against any tendency to cant when subjected to the pressure with which the shoe is forced against the shank-piece, the arm 128 is provided with a lateral extension 129 (Fig. 9) which is closely embraced between the arm 178 and a downward projection 117 on the slide-guide 116, thus affording a more extended bearing than is provided by the rock-shaft 122 and the sleeves 126.

The rearward movement of the jack, to engage the shoe with the heel-gage, is secured by a sliding movement of the slide 110 upon the slide-guide 116, after the arm 128 has come to rest, and this movement also is produced by the rocking movement of the shaft 134. For this purpose, an arm 184 is fixed to the shaft and is connected, by a link 186, with a lug on the side of the slide 110. During the swinging movement of the jack, no relative movement of these parts occurs, but after the inward movement of the slide-guide has ceased, owing to the arrest of the arm 128 by the stop-lug 166, the continued rocking movement of the shaft 134 causes the link 186 to draw the slide 110 rearwardly, this movement continuing until the end of the rocking movement of the shaft 134, which is coincident with the engagement of the arm 128 by the arm 162.

The movement of the slide 110 just described is positive, but the parts are so adjusted that, prior to the termination of this movement, the heel of the shoe engages the heel-gage, and thereafter the continued movement of the slide 110 is not participated in by the jack, but results merely in further compressing the springs 120 which are interposed between the slide and the base-member. By this operation the shoe is pressed firmly against the heel-gage regardless of slight variations in its dimensions.

To assist in the proper registration of the heel-end of the shoe with the heel-gage, two arms 188 are associated with the heel-gage, these arms being pivoted together at their rear ends and provided with convex faces for engagement with the convex surface of the heel-end of the shoe. Springs 190 tend to draw the arms together, so that they clasp the shoe yieldingly and tend to prevent its lateral displacement in either direction.

To adjust the machine for operation upon shoes of different lengths, provision is made for a fore-and-aft adjustment of the heel-gage 106. This gage is mounted upon a slide-rod 192 which slides in a fore-and-aft direction in a bearing in the head-frame 194 of the machine. The rod 192 is provided with rack-teeth which engage a segmental gear 196 journaled in the head-frame, as shown in dotted lines in Fig. 2. A hand-lever 198, projecting at the front of the machine, is used to rock the segmental gear and thus to move the slide-rod, and the parts are secured in adjusted position by latch-mechanism coöperating with a toothed segment 200.

After the jack has been swung into the operative position shown at the left of Fig. 11, it is elevated so as to bring the shoe into engagement with a shank-piece held in proper position by the picker-mechanism. This rising movement is produced by a vertical sliding movement of the shaft 134, carrying with it the arm 128 and the parts supported thereby.

The mechanism for imparting to the shaft 134 the rocking movements and the vertical movements before referred to will now be described. This mechanism is shown particularly in Fig. 1 and Figs. 16 to 20. Be-

low the bearing 138 a hub 202 is splined to each shaft 134, this hub being provided with arms 204 forming between them a slot. Two arms 206 project from a hub which is pinned to a sleeve 208, and the sleeve is splined to a shaft 210 journaled, in vertical position, on the column 142. Each arm 206 carries a depending roller 212 which is adapted to coöperate with the arms 204 by engagement with the slot between them. Fixed to the sleeve 208, immediately beneath the arms 206, is a stop-plate having segmental projections 214 which are adapted to coöperate with concave locking-plates 216 integral with the sleeves 202 and the arms 204.

In Fig. 18, the parts are shown in the position occupied when the left-hand jack is in operative position. At this time, swinging movement of the jack is prevented by engagement of the roller 212 with the arms 204. At the same time, swinging movement of the right-hand jack from its inoperative position is prevented by the coöperation of the locking-plate 216 and one of the projections 214. When the position of the jacks is to be reversed, the sleeve 208 is swung in a counter-clockwise direction, and the first effect of this movement is to cause the left-hand shaft 134 to be rocked in a clockwise direction, through the coöperation of the roller 212 and the arms 204. Before the roller leaves its engagement with the arms, this shaft is in turn locked by one of the projections 214, and the roller on the other arm 206 then engages the arms 204 on the right-hand shaft 134, thus causing this shaft to have a partial clockwise rotation and to bring the corresponding jack from inoperative to operative position. At the next operation of the mechanism these movements take place in reverse order.

To produce the rocking movements of the sleeve 208, this sleeve is provided with a segmental gear 218 which meshes with a segmental gear 220 fixed on a vertical rock-shaft 222. The shaft 222 turns in bearings on the column 142 and is actuated by a bevel-pinion 224 on its lower end. This pinion coöperates with two segmental bevel-gears 226 and 228, which are fixed on a horizontal drive-shaft 230. The drive-shaft is journaled in the column, and is rotated intermittently but always in the same direction (clockwise in Fig. 21). Owing to the opposite positions of the gears 226 and 228, these gears act to turn the pinion 224 through partial rotations in opposite directions alternately. These movements are arrested by stop-pins 259 with which the segment 220 coöperates.

The machine is driven through a power-shaft 232, which is rotated constantly by a pulley 234, belted to any suitable source of power. The power-shaft is provided with a pinion 236, which drives a gear 238 loosely journaled on the drive-shaft 230, the gear 238 being therefore in constant rotation. In order that the drive-shaft may be turned intermittently, it is connected with the gear 238 through a Horton clutch 240. Since devices of this character are well known, the construction of the clutch need not be described, but it will be understood that its operation is controlled by the usual controller-ring 242. This ring is provided with two stop-shoulders 243 (Fig. 21) which coöperate with a detent-arm 244 pivotally mounted on the column. The detent-arm is connected, by a rod 246, with the treadle-lever 248 by which the treadle 64 is carried, and a spring 250 normally retains the treadle-lever in raised position and holds the detent-arm in engagement with one or another of the stop-shoulders on the controller-ring. With the parts in this position the clutch is maintained in inoperative condition, but when the treadle is depressed, thus releasing the controller-ring, the clutch acts and causes the drive shaft to rotate until the controller-ring is again arrested by the detent-arm.

The means for imparting vertical movement to the shafts 134, and thence to the jacks, include the shaft 210. This shaft is arranged to turn and slide in a sleeve 252 on the column, and the lower portion of the shaft is surrounded by a hollow plunger 260, which also slides in the sleeve, a spring 264 being interposed between the shaft and the plunger so that the shaft tends to participate in the upward movement of the plunger. At its lower end the plunger coöperates with a cam 262 fixed on the drive-shaft 230, this cam having two opposite projections by which the plunger may be raised.

Fixed to the shaft 210 is an arm 254, and the rocking movements of the shaft, due to its splined connection with the sleeve 208, are such as to bring the end of this arm below the lower end of the shaft 134 which has been turned to bring the corresponding jack into operative position (Fig. 18). Accordingly, when the shaft 210 is thereafter raised the arm 254 engages a head 256 on the lower end of the shaft 134, and transmits this movement to the shaft 134, which slides freely through the sleeve 202. The movement continues until the shoe on the jack has been pressed into engagement with the shank-piece supported by the picker mechanism. The upward movement of the shoe is thereby arrested, so that both the shaft 134 and the shaft 210 are brought to rest, and further upward movement of the plunger 260 results merely in compression of the spring 264. In this manner the shoe is pressed firmly against the shank-piece, but with a pressure which is yielding, so as to accommodate itself to slight variations in

the size of the shoe. A spring 258, interposed between the head 256 and the sleeve 202, supplements gravity in insuring the downward movement of the shaft.

To retain the parts in the position of Fig. 18, or in the corresponding opposite position, against any tendency to move accidentally therefrom, the arm 254 is provided, at its end, with a spring-pressed detent 261 which coöperates with the convex lower surface of the head 258.

The mechanism 54 by which a supply of shank-pieces is retained, and by which they are fed one-by-one to the picker-mechanism, is shown particularly in Figs. 29 to 40. The shank-pieces are held in a series, supported individually by means of fingers 268 which project in pairs from two sprocket-chains 270. These chains are supported, in parallel position, upon sprocket-wheels which are mounted on two parallel shafts 272 and 274, these shafts being journaled, respectively, at the upper and lower ends of a frame 276. This frame is mounted on the head-frame 194 of the machine, and is forwardly inclined for a purpose which will be described.

The shank-pieces are supported by those fingers which project from the descending portions of the chains, the fingers being maintained, during their descent, in horizontal positions. For this purpose two guide-bars 278 (Figs. 36, 39 and 40) are associated with each chain, being mounted at their ends, for convenience, upon the shafts 272 and 274. Each finger is fixed to a yoke 280, which is pivoted on one of the pivot-pins 282 of the chain. Projecting rearwardly from the sides of the yoke 280 are feet 284, which rest against the surfaces of the guide-bars 278, as shown in Fig. 39. Each guide-bar has, throughout the greater part of its length, a straight surface which acts, by its engagement with the feet 284, to hold the fingers in the horizontal position in which they support the shank-pieces. At their lower ends, however, the guide-bars have cut-away portions or shoulders 286, and when the feet reach these points they are permitted to turn, so that the fingers 268 can swing downwardly. In this manner, each pair of fingers, when it arrives at the proper point, moves away from the shank-piece previously supported by the fingers, thus permitting the removal of this shank-piece by the picker-mechanism.

As shown in Fig. 40, the lower sprocket-wheel 288, about which the forward feed-chain passes, is fixed upon the shaft 274, and the corresponding guide-bars 278 are journaled loosely between the sprocket-wheel and two collars fixed to the shaft. The sprocket-wheel 289 by which the other chain is supported at the bottom is not fixed to the shaft, but is splined thereto so that it may move longitudinally upon the shaft. This is for the purpose of adjusting the feed-mechanism for operation upon shank-pieces of different lengths, this adjustment requiring variation in the distance between the two chains. A carriage 290 is mounted to slide upon the shaft 274, and also upon a guide-rod 294 which projects from the frame 276, and the sprocket-wheel 289, and also the corresponding guide-rods 278, are embraced between the body of this carriage and an arm 292 integral with the carriage, so that by moving the carriage along the shaft the sprocket-wheel and the guide-rods may be adjusted, thus changing the distance between the chains.

To produce the adjusting movement just referred to, a shaft 296, parallel with the shaft 274, is arranged to turn in a bearing at the bottom of the frame 276, and this shaft has a threaded end 298, which is screwed into the carriage 290. By rotation of the shaft 296, the carriage is moved as aforesaid. The shaft is rotated through a worm-gear 300 fixed upon it, this gear being driven by a worm 302 at the lower end of a shaft 304, which shaft is journaled, in upright position, in the frame 276. The shaft 304 is provided, at its upper end, with a knurled head by which it may be conveniently turned. The upper portion of the inner chain is adjusted in the same manner as the lower portion, the shaft 304 being provided with a second worm which engages a second worm-wheel 306 (Fig. 34) by which adjusting movements may be imparted to a carriage 308, corresponding in function and operation with the carriage 290.

The machine is illustrated as adapted particularly for handling shank-pieces of the kind in which a strip of spring-steel is combined with a strip or body of leather-board. As shown in Figs. 36 and 37, the steel strip 310 is fixed to the inner surface of the leather-board 312, and at the forward end of the shank-piece the steel projects beyond the end of the leather-board. In order to aline the shank-pieces directly one above another upon the fingers 268, and to control the position occupied by each shank-piece when it is removed from the feed-mechanism by the picker-mechanism, four guide-rails are employed. Two of these rails, 314 and 316 respectively, are arranged to embrace the projecting forward end of the steel strip 310, and to engage the end of the leather-board body. The rails 318 and 320 engage the shank-pieces laterally near their rear ends. The forward inclination of the frame 276 and the parts supported thereby causes the shank-pieces to tend, through the action of gravity, to move forwardly, and in this way the forward ends of the bodies 312 are maintained in engagement with the rails 314 and 316, so that the longi-

tudinal position of the shank-pieces is accurately determined with particular reference to their forward ends. Any accidental variation in the length of the shank-pieces which may occur will not, accordingly, affect the location of the forward end of each shank-piece in the shoe to which it is applied.

In order that the machine may handle shank-pieces of different widths, provision is made for adjusting the rails of each pair toward and from each other. For this purpose the rail 314 is mounted, near its ends, on two members 322 (Figs. 34, 36 and 37) which have screw-thread engagement with shafts 324 journaled horizontally in the frame 276. The shafts 324 are provided with skew-gears 326 which engage skew-gears 328 on a shaft 330. The shaft 330 is journaled, in inclined position, on the frame 276 and is provided, at its upper end, with a knurled head by which it may be conveniently turned to effect the adjustment in question. The rail 318 is supported and adjusted by a similar mechanism, including a shaft 332 having a knurled head.

The rails 316 and 320 not only are adjustable simultaneously with the respective rails 314 and 318, but are also so mounted that they may be swung out of the way to permit the introduction of the shanks to the feed-mechanism. Accordingly, the rail 316 is mounted, near its ends, on two arms 334 which are fixed to an upright rock-shaft 336. This rock-shaft is journaled in members 338 which have screw-thread engagement with the shafts 324. The threads of these shafts are right and left, so that the rails 314 and 316 are adjusted equally and simultaneously in opposite directions. By this arrangement it is insured that the shank-piece, whatever its width, shall always be properly centered over the picker-mechanism.

The rock-shaft 336 is provided with a handle 340. The parts are normally retained, by friction, in the position shown in Fig. 36, but when it is necessary to introduce shank-pieces to the feed-mechanism the rock-shaft may be turned by means of the handle, thus swinging the rail 316 away from operative position. The rail 320 is mounted and adjusted in the same way as the rail 316, and it may also be swung out of operative position by means of a handle 342.

In filling the feed-machanism, the shank-pieces may be introduced singly between the fingers 268, but a more convenient method is to employ a rack having fingers or pins 344 (Fig. 36) arranged in series spaced the same as the fingers 268. This rack is filled with shank-pieces, and when the feed-mechanism is to be supplied, the rails 316 and 320 are swung back, and the rack is then presented to the feed-mechanism with its pins in alinement with the fingers 268. By manipulating the handles 340 and 342 the rails 316 and 320 may then be swung back to operative position, and in this movement they encounter the ends of the shank-pieces and slide them from the rack to the fingers 268.

Prior to the removal of each shank-piece from the feed-mechanism by the picker-mechanism, it is necessary that the fingers 268 upon which the shank-piece has been supported be moved away from the path of the shank-piece. This movement of the fingers is permitted by the means already described, but after it has occurred, it is necessary that the shank-piece be otherwise supported until it has been seized by the picker-mechanism. For this purpose two retainers 346 and 348 (Figs. 36 and 37) are employed, these retainers being arranged to engage the lowermost shank-piece near its ends. The retainer 346 is fixed on the end of a rock-shaft 350, which turns in a bearing in the carriage 290, while the retainer 348 is fixed on a rock-shaft 352, which turns in a bearing on the frame 276. To move the retainers into and out of operation, the rock-shafts are turned by a mechanism which will be described later.

The picker-mechanism is shown particularly in Fig. 3 and Figs. 22 to 28. The picker is arranged to seize and hold a shank-piece by engagement with only that surface of the leather-board body which constitutes the outer surface of the shank-piece when it is applied to the shoe. For this purpose the picker is provided with two pairs of claws 354, having sharp points which are adapted to be introduced obliquely into the substance of the shank-piece, as shown in Fig. 25. These claws are fixed in two levers 356, which are pivoted at 358 on a head 360. This head is held adjustably in a housing 362 integral with a cylindrical shank 364 which is slidingly mounted in a hollow arm 366. The arm is fixed, at its upper end, to a rock-shaft 368 which turns in a bearing member 370 (Figs. 2 and 3) projecting forwardly from the head-frame 194 of the machine.

The claws 354 are moved into and out of engagement with the shank-piece by rocking the levers 356 on the pivots 358, and for this purpose a stem 372 is mounted to slide within the shank 364 and is connected with the levers 356 by links 374. A compression-spring 376, coiled around the stem and engaging a shoulder thereon, tends to move the stem in a direction to swing the claws into engagement with the shank-piece. The movements of the stem 372 are controlled by mechanism including a disk-like head 378, which is fixed, by a set-screw 380 (Figs. 25 and 26) upon the reduced end of a rock-shaft 382. This rock-shaft is coaxial with

the rock-shaft 368, and it turns in a bearing 384 projecting forwardly from the head-frame of the machine.

The head 378 is provided with a cylindrical flange 386, and within this flange a cam 388 is fixed. An opening 390 is formed in the flange, and a section 392 of the flange is movably mounted, in the manner of a gate, to swing outwardly about a pivot 394. The gate is normally held in closed position, as shown in Fig. 25, by means of a spring 396. The stem 372 is provided, at its upper end, with a lateral lug 398 which coöperates with the parts just described.

The sliding movement of the shank 364 within the arm 366 is employed, first, to move the picker into position to engage the shank-piece in the feed-mechanism, then to withdraw the shank-piece from the feed-mechanism, then to present the shank-piece to the lasted shoe, and thereafter to retract the picker from the shank-piece. The shank 364 is controlled partly by a compression-spring 363, which is coiled around it and which acts to move the shank outwardly within the arm. Positive means for moving the shank at certain times are also provided. For this purpose a stud projects laterally from the shank, through a slot in the arm 366, and is provided, at its outer end, with a roller 400. This roller coöperates with a cam 402 which is fixed on and actuated by the rock-shaft 382. The cam has a groove, in one of its lateral faces, adapted to receive the roller 400, and this groove comprises two inclined portions 406 and 408, by which the roller may be moved toward the center of oscillation of the cam, and an intermediate concentric portion 410, in which no motion of the roller is produced.

The cam 402 is employed also to actuate the retainers 346 and 348 (Fig. 37) previously referred to. For this purpose it is provided, on its opposite face, with an endless path 412, as shown in dotted lines in Figs. 25 and 26, this path comprising inner and outer portions approximately concentric with the rock-shaft 382, an approximately radial end-portion connecting the inner and outer portions, and an inclined portion, also connecting the inner and outer portions. The inclined end-portion is provided with a gate 414, which is mounted to swing upon a stud 416 projecting from the body of the cam. This gate is normally retained in the position shown in Fig. 25, by means of an arm 418 fixed to the gate, and a spring 420 connecting the arm with the body of the cam.

As shown particularly in Fig. 22, a roller 422 engages the cam-path just described, this roller being journaled on the end of a lever 424 which is pivoted at 426 on the frame of the machine. A spring 428, connected with the lever, tends to swing it in a direction to move the roller radially from the rock-shaft 382, so that when the cam 402 assumes the position shown in Fig. 22 the roller traverses the radial end-portion of the cam-path and reaches the outer portion thereof. The lever 424 is connected, by a link 430, with an arm 432 fixed on the rock-shaft 350, so that rocking movements of the retainer 346 result from the movements of the cam-roller 422. In order that the same roller may actuate the retainer 348, a link 434, pivoted concentrically with the roller, is pivoted, at its upper end, to a gear-segment 436 (Figs. 22, 37 and 40) which turns upon a stud 438 on the frame 276. The gear-segment meshes with a pinion 440 fixed on the rock-shaft 352, and thus acts to swing the retainer 348 simultaneously with the retainer 346.

The operation of the several mechanisms last described may now be explained. Fig. 22 shows the parts in the position in which the picker has seized a shank-piece at the bottom of the supply-mechanism. The cam-roller 400 is in one end of the cam-path, in which the spring 363 has been permitted to thrust the shank 364 upwardly so as to move the picker into coöperative relation with the shank-piece. The lug 398 on the stem 372 has been brought to the opening 390 in the flange 386, and has been moved downwardly through this opening, by the action of the spring 376, thus causing the claws to be swung into engagement with the shank-piece. The cam 402 is in such a position that the roller 422 has been moved to the outer portion of the cam-path 412 by the action of the spring 428, thus swinging the retainers 346 and 348 out of engagement with the shank-piece.

The next operation of the mechanism involves a slight movement of the cam 402 in a counter-clockwise direction, this movement being produced by a movement of the rock-shaft 382, through mechanism which will be described later. The parts then assume the position shown in Fig. 23. The inclined portion 406 of the cam-groove has caused the shank of the picker to be moved inwardly, whereby the picker has withdrawn the shank-piece, held by it, from beneath the lower ends of the rails by which the shank-piece was previously retained. The movement, just described, of the cam 402 has no effect upon the retainers, owing to the fact that the roller 422 is still in the concentric outer portion of the cam-path 412.

The next movement of the parts is produced by a partial rotation of the rock-shaft 368 in a clockwise direction, whereby the picker is swung downwardly into position to present the shank-piece to a lasted shoe supported on one of the jacks. By this swinging movement the roller 400 is moved out of engagement with the cam 402, so that

the spring 363 projects the picker from the arm 366. At this time, the parts have the position shown in Fig. 25, and the lug 398 on picker-stem is still within the flange 386. The next operation of the machine is the rising movement of the jack, by which the shoe is brought into engagement with the shank-piece held by the picker.

After the engagement just described has occurred, the picker is operated to release the shank-piece held by it. For this purpose, a rocking movement is imparted to the shaft 382, in a counter-clockwise direction. This movement causes the cam 388 to depress the lug 398, as shown in Figs. 24 and 27, the lug thereby swinging the gate 392 open and coming into engagement with the outer surface of the flange 386. The gate is immediately swung back to its closed position by the action of the spring 396. The downward movement of the stem 372 causes the claws to be disengaged from the shank-piece, which is thereby released, so that the lasted shoe may be retracted, carrying the shank-piece with it.

The rocking movement of the shaft 382, last described, causes a movement of the cam 402 by which the roller 422 is moved from the outer to the inner portion of the cam-path 412. During this movement it swings open the gate 414, and the gate is then closed behind the roller by the action of the spring 420, so that upon the next clockwise movement of the cam the roller remains in the inner portion of the cam-path. By this movement of the cam-roller, the retainers 346 and 348 are swung back into operative position, ready to support the next shank-piece after its release by the fingers 268 upon which it is previously supported.

The rock-shaft 368 is next turned in a counter-clockwise direction, thus swinging the picker back to the position of Fig. 22. During this movement, the lug 398 rides over the outer surface of the gate 392 and the adjacent fixed portion of the flange 386, and the head 378 is at this time in such a position that when the picker reaches the position of Fig. 22, the lug is still supported upon the flange, so that the claws remain in retracted position. The roller 400 is also, at this moment, in the position relative to the cam 402 which is shown in Fig. 23, so that the picker as a whole is in its retracted position. The final movement of the parts is produced by a slight movement of the shaft 382 and the cam 402 in a clockwise direction, by which the cam is brought to the position of Fig. 22. By this movement of the cam, the picker is permitted to advance into coöperative relation with the lowermost shank-piece, and at the end of the motion, the opening 390 is brought beneath the lug 398, so that the stem 372 is retracted and the claws are thrown into engagement with the shank-piece, thus initiating again the cycle of operations which has been described.

When the claws are retracted from engagement with the shank-piece, after the latter has been applied to a shoe, it is desirable that the shank-piece be pressed against the shoe to prevent it from following the movement of the claws. It is also desirable that the shank-piece be pressed firmly against the shoe in order to promote its adhesion to the shoe through the action of the cement which is used to affix it. Accordingly, the picker is provided with a spring-supported presser-foot or stripper 442, which is mounted, as shown in Fig. 28, in a socket in the head 360, and this presser-foot continues to engage the shank-piece after the retraction of the claws, as shown in Fig. 24.

Owing to the variations in the shapes of the shoes and the shank-pieces which are to be operated upon, it may be desirable to change the angular position in which the picker presents the shank-piece to the shoe. For this purpose the head 360 is employed, this head being rotatable, through a slight angle, within the housing 362. The head is provided with a gear-segment 444, which is engaged by a worm 446. The worm is mounted on a rod, which turns in a bearing in the housing and is provided with a knurled head 448 by which it may be conveniently turned.

The cement-applying devices 57 are shown particularly in Figs. 22 and 29. A cement-roller 450 is so located that it will be engaged by the shank-piece during the swinging movement of the picker by which the shank-piece is transferred from the supply mechanism to the shoe. This cement-roller is journaled in a fork 452, which is pivoted loosely on a rock-shaft 454, and the rock-shaft is journaled in a bracket 456 which projects forwardly from the frame 276. The cement-roller is supplied with cement by intermittent engagement with a feed-roller 458, which dips into a cement-trough 460 supported on the bracket 456.

The cement-roller is swung alternately into engagement with the feed-roller, as shown in Fig. 29, and then into position to engage the shank-piece, as shown in Fig. 22, by the same mechanism by which the retainer 348 is actuated. For this purpose a pinion 462 is fixed to the segmental gear 436, and this pinion engages a segmental gear 464 which turns on a stud 466 projecting from the bracket 456. A pinion 468, fixed to the gear 464, turns a pinion 470 fixed on the rock-shaft 454. A bell-crank lever, comprising arms 472 and 474, is mounted to turn loosely on the rock-shaft 454. An arm 476 is fixed upon the rock-shaft so as to turn therewith. This arm is perforated to embrace a guide-rod 478, upon

which is coiled a spring 480 which presses against the arm 476, thus normally retaining the arms 476 and 472 in engagement. When the rock-shaft 454 is turned in a counter-clockwise direction, by the gearing just described, the arm 476, acting through the spring 480, rocks the bell-crank lever so that the arm 474 thereof swings the fork 452 forwardly, thus engaging the cement-roller with the feed-roller 458. This engagement is yielding, owing to the action of a spring 480. When the rock-shaft is turned in the opposite direction, the arm 476, acting against the arm 472, rocks the bell-crank lever positively, and the movement of this lever is transmitted to the fork 452 by means of a spring 482, which surrounds a guide-rod pivoted to the arm 474 and passing through the fork. The cement-roller is thus brought to and held in position to engage the shank-piece during the downward movement of the latter, but the spring 482 permits this engagement to be yielding.

To maintain the supply of cement upon the feed-roller 458, the roller is rotated, and for this purpose it is connected, by sprocket-wheels and a chain 484, with the outer end of the rock-shaft 368 by which the picker-arm is actuated.

After the shank-piece has been applied to the lasted shoe by the picker-mechanism, it is secured in place, as before stated, not only by the cement, but also by fastening-devices driven through the leatherboard into the insole of the shoe. These fastening-devices have preferably the form of short tacks, and they are driven near the rear end of the shank-piece and on opposite sides of the steel portion 310 thereof.

The mechanism used in the illustrated machine for driving the tacks is of a well known type, and as its particular construction and mode of operation are not of any consequence in connection with this invention, they will not be fully described. As shown in Fig. 41, the tacking-mechanism comprises two nozzles 486, which are fixed, at the bottom of two blocks 488, in position to be engaged with the upper surface of the shank-piece as it lies upon the lasted shoe. The blocks 488 are adjustable toward and from each other, in order that the distance between the two tacks may be varied in accordance with the width of the shank-piece. For this purpose the blocks are provided with dove-tailed rearward projections (Fig. 2) which move in a transverse guide-way at the front of the head-frame 194, and they are controlled by a right and left-hand screw-threaded adjusting rod 490, which is provided with a knurled head 492 (Fig. 41) by which it may be turned.

The tacks are fed to the nozzles through flexible tubes 494, which extend from the tack-feeding mechanism 60. The tacks are driven by two plungers 496, which move vertically through bores in the blocks 488, and these drivers are actuated by a spring-pressed hammer 498 of the usual form, the hammer being actuated, in the usual manner, by a spiral cam 500 mounted on a shaft 502 (dotted lines in Fig. 41).

The shaft 502 constitutes the cam-shaft by which all of the mechanisms at the head of the machine are driven, and this shaft is journaled horizontally in the head-frame (Figs. 1, 2, 3, 4). The mechanism at the head of the machine is thrown into operation intermittently, at certain points in the rotation of the power-shaft 230, and it is driven through a countershaft 504, which is journaled in the head-frame, below the cam-shaft 502, and is connected, by pulleys and a belt 506, with the power-shaft 232, so that the countershaft is driven constantly. A pinion 508 on the countershaft engages a gear 510 on the cam-shaft 502, this gear 510 being driven constantly. The gear turns loosely on the cam-shaft, but is connected to one member of a Horton clutch 512, the other member of which is fixed to the cam-shaft. The clutch (Fig. 5) is of a well known form which need not be particularly described, but it will be understood that it has the usual controller-ring 514, which coöperates with a detent-arm 516 pivoted on the head-frame. A spring 518 holds the detent-arm normally in raised position, in which a block 517 on the arm is engaged, at its right-hand end, by a lug 519 on the controller-ring, so as to prevent rotation of the latter, and in this manner the clutch is normally held inoperative. Whenever the detent-lever is depressed, so as to release the controller-ring (as shown in Fig. 5), the clutch operates and rotates the cam-shaft. The detent-arm is actuated by a rod 520 which is connected, at its lower end, with a trip-lever 522, and the trip-lever is pivoted to a bracket 524 which projects at the rear of the column 142 (Figs. 1 and 16).

The trip-lever is operated automatically by the rotation of the drive-shaft 230. For this purpose a slide 526 is mounted to move vertically on the bracket 524 (Fig. 19) and the upper end of this slide engages the inner end of the trip-lever 522, while the lower end of the slide coöperates with a cam 528 fixed on the drive-shaft 230. The cam has four projections 530, which lift the slide and cause operation of the Horton clutch at suitable times in the operation of the machine.

The rock-shafts 368 and 382, by which the picker-mechanism is actuated, are driven by connections with the cam-shaft 502. For this purpose two cams 532 and 540 are fixed on the shaft (Fig. 2). The cam 532 is en-

gaged by a roller 534 mounted on a slide 536 which moves forwardly and rearwardly in a bearing on the head-frame, and this slide is provided, at its forward end, with rack-teeth which engage a pinion 538 (Figs. 2 and 41) fixed to the rock-shaft 368. The cam 540 similarly operates a second slide 542 (Fig. 41) which engages a pinion 544 fixed on the rock-shaft 382. These cams are formed to produce the movements of the rock-shafts hereinbefore described.

The mechanism for producing the intermittent feeding-movement of the chains 270, by which the supply of shank-pieces is supported, is actuated by connection with the cam-shaft 502. For this purpose, a cam 546 is fixed on the cam-shaft (Figs. 2, 4, 6 and 7) and this cam engages a roller 548, journaled on the lower end of a slide 550 which moves in a vertical guideway 552 on the head-frame. A lever 554 is pivoted at 556 alongside the slide, and is connected with the slide by a pin-and-slot connection. This lever is connected, by an offset link 558, with an arm 560 projecting laterally from a rock-shaft 562. This rock-shaft is a part of the usual mechanism of the tack-feeding devices, its movement being utilized through mechanism which need not be here described, for feeding the tacks through the tubes 494. The rock-shaft is extended forwardly, however, and provided with a skew-gear 564 which drives a rack-bar 566. This rack-bar is inclined parallel with the frame 276, and it moves in fixed bearings of which the upper one 568 is fixed to the rear of the frame 276, (Figs. 2, 31, 32, and 33). The rack-bar is provided with teeth which mesh with teeth on a segmental gear 570, and this gear turns loosely upon the end of the shaft 274 which carries the lower sprockets on which the chains 270 are supported, as before described. An arm 572 projects integrally from the pinion 570, and alongside this arm is a second arm 574 which projects integrally from a shell 576. This shell constitutes the outer member of a roller wedge clutch, which is of ordinary construction, as shown in dotted lines in Fig. 32, the inner clutch-member 578 being fixed to the shaft 274. The arms 572 and 574 are connected through the interposition of a spring 580, which is coiled about a guide-rod 582 projecting, from the arm 574, through an opening in the arm 572. Movement of the arm 572 in a counter-clockwise direction causes an idle movement of the clutch-member 576, but upon the opposite movement of the arm 572 the clutch becomes operative and turns the shaft 274. This turning movement continues until the lowermost shank-piece remaining in the feed-mechanism is brought into engagement with the retainers 346 and 348. The movement of the chains is thereby arrested, so that further rotation of the shaft 274 cannot occur, and further movement of the arm 572 results merely in compression of the spring 580.

The operation of the machine as a whole may now be described, starting with the parts in the position in which they are shown in the principal figures of the drawings. In this position the left-hand jack is in operative position, supporting a lasted shoe, (Figs. 1, 2, 3, 8, 9, 11) and a shank-piece has been applied to this shoe, but it is still held by the picker-mechanism. The tacking-mechanism has just operated (Fig. 41) and the cam-shaft 502 is rotating (Figs. 5 and 2), the Horton clutch 512 having been started by one of the trips 530 (Fig. 21). The drive-shaft 230 is also rotating, and the first result is that the left-hand jack is lowered by the removal of the cam-projection 262 from beneath the plunger 260. Immediately afterward, the picker is swung upwardly and grasps another shank-piece, and the cam-shaft then comes to rest after completing a half-rotation. The gear-segment 226 then engages the pinion 224 and swings the left-hand jack outwardly, and the drive-shaft then comes to rest, with both jacks out.

While the foregoing operations have been taking place, the operator has placed a lasted shoe on the right-hand jack, and he then momentarily depresses the treadle. Thereupon the Horton clutch 240 starts the drive-shaft 230 again into motion, with the immediate result of swinging the right-hand jack into operative position. At the same time, one of the trips 530 has acted to start the cam-shaft 502 into motion, and it performs a half-rotation, causing the picker to descend with the shank-piece which it has previously grasped, and to wipe this shank-piece over the cement-roller and then hold it in position for application. The cam-shaft then comes momentarily to rest. Near the middle of the half rotation of the drive-shaft 230, the second cam-projection 262 acts to raise the jack so as to press the shoe against the shank-piece which is held by the picker, and at the same time, the clutch 512 is again tripped so as to permit another half-rotation of the cam-shaft. The first effect is to drive the tacks, and the machine has thus again arrived at the point in its cycle of operations shown in the drawings (Figs. 1, 2, etc.,) except that the positions of the two jacks are reversed. The cycle of operations is completed by the continued rotation of the cam-shaft and the drive-shaft, the picker being disengaged from the shank-piece and raised, and the right-hand jack being lowered and swinging out, whereupon the cam-shaft and the drive-shaft both come to rest, the latter in a position removed 90° from that shown in Fig. 21, with the gear-segment 228 engaged with the pinion 224.

It will be apparent that the machine operates in such a manner as to entirely relieve the operator from the labor and responsibility of positioning the shank-pieces accurately upon the shoes, the only task of the operator being to remove and replace the shoes and to throw the machine into operation by depressing the treadle at the proper time.

The invention is not limited to the embodiment thereof hereinbefore described and illustrated in the accompanying drawings, but it may be embodied in various other forms within the scope of the following claims.

Having thus described the invention, and the preferred manner of practising it, it is definitely stated in its true scope in the following claims.

What is claimed as new, is:—

1. A shank-piece laying machine having, in combination, means for supporting a shoe; and means for applying a shank-piece to the shoe in a predetermined position by a movement normal to the face of the shank piece.

2. A shank-piece laying machine having, in combination, means for supporting a shoe; and means for automatically applying and thereafter securing a shank-piece to the shoe in a predetermined position.

3. A shank-piece laying machine having, in combination, means for moving a shank-piece into position for application to a shoe; and means for gaging the position of the shoe relatively to the shank-piece to determine the position in which the shank-piece is applied to the shoe.

4. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; and means for withdrawing pieces singly from said supply and presenting them in position for application to a shoe.

5. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; means for withdrawing pieces singly from said supply and presenting them in position for application to a shoe; and means for supporting a shoe in position for the reception of a shank-piece.

6. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; and means for supporting a shoe and for transferring a shank-piece from said supply to the shank of the shoe.

7. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; and means for supporting a shoe, for transferring a shank-piece from said supply to the shank of the shoe, and for securing the shank-piece to the shoe.

8. A shank-piece laying machine having, in combination, means for applying a shank-piece to a shoe; and means independent of said shank-piece for securing the shank-piece to the shoe.

9. A shank-piece laying machine having, in combination, means for applying adhesive to a shank-piece, and means for supporting the shank-piece in position for application to a shoe.

10. A shank-piece laying machine having, in combination, means for supporting a shoe; means for applying adhesive to one of the two surfaces of engagement of the shoe and a shank-piece; and means for applying the shank-piece to the shoe.

11. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; and means for withdrawing a shank-piece from said supply, for applying adhesive to the shank-piece, and for holding the shank-piece in position for application to a shoe.

12. A shank-piece laying machine having, in combination, means for retaining a series of shank-pieces and for moving them successively into a position of presentation to a shoe; and means for applying adhesive to each shank-piece before its application to the shoe.

13. A shank-piece laying machine having, in combination, means for gaging the position of a shoe longitudinally by engagement with the heel-end thereof; and means for moving a shank-piece into a predetermined position for application to the shoe when the shoe is in the position gaged as aforesaid.

14. A shank-piece laying machine having, in combination, means for gaging the position of a shoe by engagement with one end and one side thereof; and means for moving a shank-piece into a predetermined position for application to the shoe when the shoe is in the position gaged as aforesaid.

15. A shank-piece laying machine having, in combination, means for presenting a shank-piece in position for attachment to a shoe; and means for driving a fastening device through the shank-piece when in said position.

16. A shank-piece laying machine having, in combination, means for supporting a shoe; means for applying a shank-piece to the shoe; and means for driving a fastening-device through the shank-piece after such application.

17. A shank-piece laying machine having, in combination, means for supporting a shoe in position for the reception of a shank-piece; and means for driving an independent fastening-device into the shank of the shoe to secure in place a shank-piece applied thereto.

18. A shank-piece laying machine having, in combination, means for supporting a shoe; means for retaining a supply of shank-pieces and for applying them singly to shoes

on said supporting-means; and means for driving a fastening-device through each shank-piece after its application to a shoe.

19. A shank-piece laying machine having, in combination, shank-piece holding means; means comprising a jack for supporting a lasted shoe; and mechanism for actuating one of said means in different planes to apply the shank-piece to the shoe on the jack.

20. A shank-piece laying machine having, in combination, means for holding a shank-piece by engagement with the outer surface thereof; and means for supporting a shoe and presenting its shank-portion to the disengaged inner surface of the shank-piece.

21. A shank-piece laying machine having, in combination, means for seizing and holding a shank-piece by engagement with one surface only; means for applying adhesive to the opposite surface of the shank-piece; and means for guiding a shoe into engagement with the surface of the shank-piece to which the adhesive has been applied.

22. A shank-piece laying machine having, in combination, means for holding a shank-piece by engagement with its outer surface only; and means for applying adhesive to the opposite surface of the shank-piece.

23. A shank-piece laying machine having, in combination, means for holding a shank-piece by engagement with its outer surface only; and means for driving a fastening device into said surface and through the shank-piece.

24. A shank-piece laying machine having, in combination, a support for a shank-piece; a picker provided with claws adapted to enter one surface of a shank-piece and to hold the shank-piece with its opposite surface disengaged; and mechanism for producing relative movements of said support and picker whereby the picker is engaged with a shank-piece on the support and the shank-piece is exposed to permit the presentation of a shoe to the disengaged surface thereof.

25. A shank-piece laying machine having, in combination, a jack for supporting a lasted shoe in inverted position; means, located above the jack, for retaining a supply of shank-pieces; and a picker movable to seize a shank-piece from said supply and then turn it into inverted position for presentation to a shoe on the jack.

26. A shank-piece laying machine having, in combination, means for presenting shank-pieces successively to lasted shoes; a plurality of jacks for supporting such shoes; and mechanism for moving the jacks alternately into and out of position for reception of the shank-pieces from said means.

27. A shank-piece laying machine having, in combination, tack-driving mechanism for securing a shank-piece to a shoe; a support, for the shoe, movable into and out of co-operative relation with said securing-means; and mechanism, operable, under the control of an operator, for first moving the shoe-support into said relation and then actuating the securing-means.

28. In a machine for laying shank-pieces, means for holding a shank-piece comprising a plurality of claws adapted to enter the surface of the material of the shank-piece; and a spring-pressed presser-foot arranged to yieldingly engage the surface engaged by the claws and to strip the material from the claws when the claws are withdrawn.

29. A shank-piece laying machine having, in combination, means for supporting a shoe; and means for moving a shank-piece into position for application to the shoe in a predetermined position.

30. A shank-piece laying machine having, in combination, means for supporting a shoe; means for retaining a shank-piece; and means for transferring said shank-piece from said retaining means and applying it to said shoe.

31. A shank-piece laying machine having, in combination, means for supporting a shoe; means for holding a shank-piece; means for moving said supporting means and said holding means to position said shank-piece for application to said shoe; and means for applying and securing said shank-piece to said shoe.

32. A shank-piece laying machine having, in combination, means for supporting a shoe; means for holding a shank-piece and moving it into position for application to said shoe; and means for longitudinally and laterally positioning said shoe with respect to said shank-piece.

33. A shank-piece laying machine having, in combination, means for intermittently feeding a plurality of shank-pieces; and means for successively transferring said shank-pieces into position for application to a shoe.

34. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; and means for transferring said shank-pieces into position for application to shoes.

35. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; means for transferring said shank-pieces into position for application to shoes; and plural means for supporting shoes in position to receive said shank-pieces.

36. A shank-piece laying machine having, in combination, means for retaining a shank-piece; means for supporting a shoe; and means for gripping said shank-piece and transferring and applying it to said shoe.

37. A shank-piece laying machine having,

in combination, means for retaining a shank-piece, means for supporting a shoe; and means for gripping said shank-piece and rotating it into position for application to said shoe.

38. A shank-piece laying machine having, in combination, means for holding a shank-piece and transferring it into position for application to a shoe; and means for supporting a shoe in position to receive said shank-piece.

39. A shank-piece laying machine having, in combination, means for retaining a shank-piece; means for supporting a shoe; means for transferring and applying said shank-piece to said shoe; and means for securing said shank-piece thereto.

40. A shank-piece laying machine having, in combination, means for applying a shank-piece to a shoe; and means for tacking said shank-piece to said shoe.

41. A shank-piece laying machine having, in combination, means for applying a shank-piece to a shoe; and means for simultaneously driving a plurality of tacks through said shank-piece and into said shoe.

42. A shank-piece laying machine having, in combination, means for supporting a shoe in inverted position; means for laying a shank-piece thereon; and means for simultaneously driving a plurality of fastening means through said shank-piece and into said shoe.

43. A shank-piece laying machine having, in combination, means for supporting a shoe in inverted position; means for laying a shank-piece thereon; and means for positioning and simultaneously driving a plurality of tacks into said shoe at one end of said shank-piece.

44. A shank-piece laying machine having, in combination, means for supporting a shoe in inverted position; means for laying a shank-piece thereon; means for feeding tacks to opposite sides of said shank-piece; means for simultaneously driving said tacks into said shoe; and means for adjusting the positions of said feeding means and said driving means to adapt the machine for use with shank-pieces of different widths.

45. A shank-piece laying machine having, in combination, means for applying a shank-piece to a shoe; and a plurality of means of different character for securing said shank-piece to said shoe.

46. A shank-piece laying machine having, in combination, means for applying to a shoe a shank-piece comprising a narrow metal strip and an overlapping portion of relatively soft material; and means for driving tacks through said relatively soft portion and on opposite sides of said metal strip and into said shoe.

47. A shank-piece laying machine having, in combination, means for supporting a shoe; means for moving a shank-piece into position for application to said shoe; and means for cementing said shank-piece to said shoe.

48. A shank-piece laying machine having, in combination, means for applying a shank-piece to a shoe; means for applying adhesive to said shank-piece; and additional means for securing said shank-piece to said shoe.

49. A shank-piece laying machine having, in combination, means for supporting a shoe; means for applying a shank-piece to said shoe; means for coating with adhesive one of the two surfaces of engagement of said shoe and said shank-piece; and additional means for securing said shank-piece to said shoe.

50. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; means for successively transferring said shank-pieces into position for application to shoes; and means for coating said shank-pieces with adhesive during the transferring operation.

51. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; means for successively transferring said shank-pieces into position for application to shoes; means for coating said shank-pieces with adhesive during the transferring operation; and additional means for securing them to shoes.

52. A shank-piece laying machine having, in combination, means for supporting a shoe; a heel-gage for said shoe: means for longitudinally moving said shoe against said heel-gage; and means for applying a shank-piece to said shoe in a definite position.

53. A shank-piece laying machine having, in combination, means for supporting a shoe; a heel-gage for said shoe; a side gage therefor; means for effecting relative movements between said shoe and the respective gages whereby said shoe is definitely positioned; and means for applying a shank-piece to said shoe.

54. A shank-piece laying machine having, in combination, shank-piece holding means; a jack for supporting a shoe; means for producing both lateral and vertical movements of said jack to apply said shank-piece to said shoe; and means for securing said shank-piece to said shoe.

55. A shank-piece laying machine having, in combination, shank-piece holding means; a jack for supporting a shoe; and means for swinging the jack into position beneath the shank-piece held by said holding means.

56. A shank-piece laying machine having, in combination, shank-piece holding means; a jack for supporting a shoe; means for swinging the jack into position beneath the shank-piece held by said holding means; and means for securing said shank-piece to the shoe upon said jack.

57. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces; means for periodically transferring a shank-piece from said retaining means into position for application to a shoe; a jack for supporting a shoe and adapted to be periodically moved into and out of a shank-piece receiving position; and means for securing each shank-piece to a shoe upon said jack when said jack occupies its shank-piece receiving position.

58. A shank-piece laying machine having, in combination, a jack for supporting a shoe and adapted to be periodically moved into and out of a shank-piece receiving position; and means acting when the jack occupies its receiving position for applying and securing a shank-piece to a shoe upon said jack.

59. A shank-piece laying machine having, in combination, means for retaining a shank-piece; means for gripping said shank-piece by engagement with one surface thereof and transferring it into position for application to a shoe; and means for supporting a shoe for engagement with the free surface of said shank-piece.

60. A shank-piece laying machine having, in combination, means for holding a shank-piece by engagement with one of its surfaces only; means for applying adhesive to its other surface; means for supporting a shoe in engagement with the coated surface of said shank-piece; and means for driving a fastening device through said shank-piece and into said shoe.

61. A shank-piece laying machine having, in combination, means for retaining a shank-piece; transferring means including a pointed member; and means for causing the pointed member of said transferring means to pierce one surface of said shank-piece to hold said shank-piece and for removing said shank-piece from said retaining means into position for application to a shoe.

62. A shank-piece laying machine having, in combination, means for retaining a shank-piece; transferring means including a pointed member; and means for causing the pointed member of said transferring means to pierce one surface of said shank-piece to hold said shank-piece; means for causing said transferring means to remove said shank-piece from said retaining means and to rotate it into position for application to a shoe; and means engaged by the free surface of the impaled shank-piece during the rotative movement for applying adhesive thereto.

63. A shank-piece laying machine having, in combination, means for holding a shank-piece; a jack for supporting a shoe below said holding means; and means for inverting said shank-piece and applying it to said shoe.

64. A shank-piece laying machine having, in combination, means for retaining a supply of shank-pieces, a plurality of jacks for supporting shoes and adapted to be alternately moved into and out of a shank-piece receiving position; and means for intermittently transferring shank-pieces from said supply and applying them to the shoes upon the jacks as they alternately occupy the receiving position.

65. A shank-piece laying machine having, in combination, a plurality of shoe supporting jacks; a plurality of arms to which the jacks are respectively pivotally mounted; means for alternately swinging said arms and associated jacks into a common position; and means for applying shank-pieces to the shoes upon said jacks when they occupy said common position.

66. A blank-handling mechanism comprising a plurality of claws adapted to enter the surface of the blank, and a spring-pressed presser-foot arranged to yieldingly engage the surface engaged by the claws and to strip the blank from the claws when the claws are withdrawn.

67. A blank-handling mechanism comprising a plurality of claws, means for actuating said claws to cause them to penetrate the surface of the blank and to effect their withdrawal therefrom, and yielding means for pressing against the surface of the blank and stripping the blank from said claws when said claws are withdrawn.

68. A blank-handling mechanism comprising a plurality of movable claws adapted to penetrate the surface of the blank, supporting means upon which the claws are mounted, and an independently mounted yielding presser-foot for engaging the surface of the blank and stripping said blank from said claws when the claws are withdrawn.

ERASTUS E. WINKLEY.