Jan. 1, 1935. W. J. YOUNG 1,986,458

HEEL DOWELING MACHINE

Filed Aug. 25, 1931 3 Sheets-Sheet 1

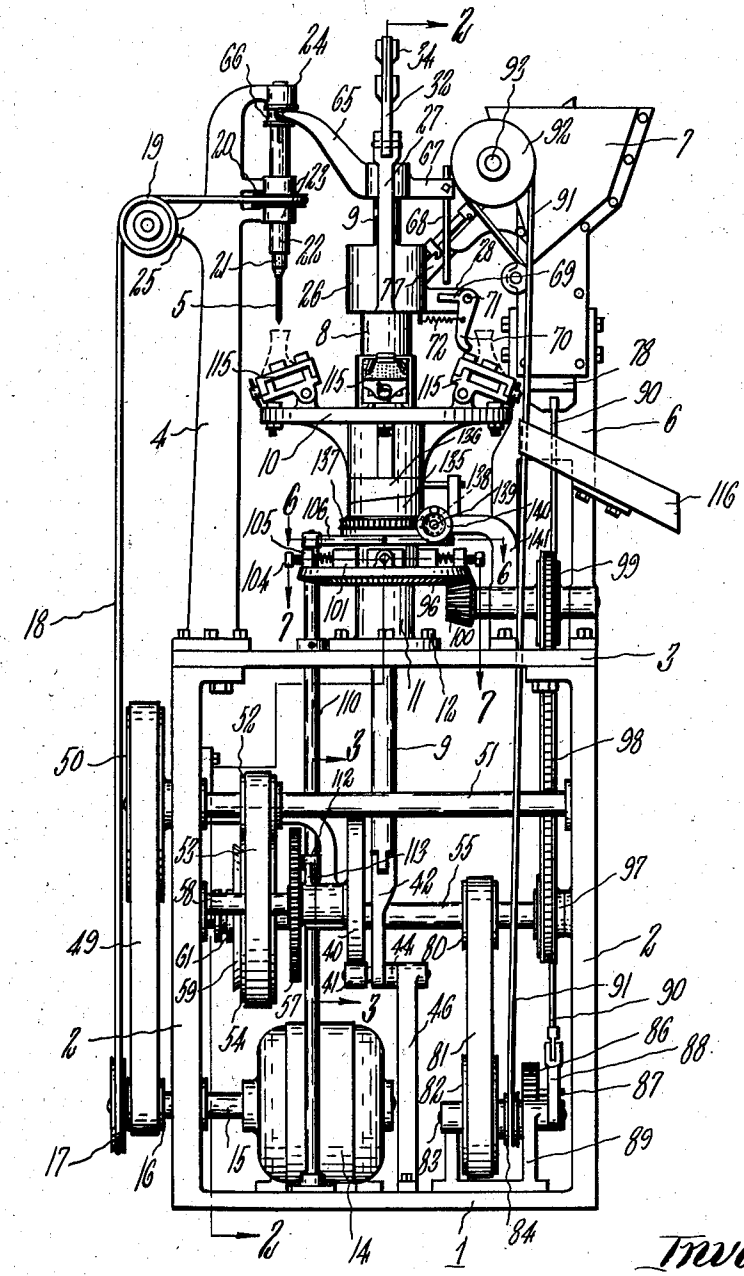


Fig. 1.

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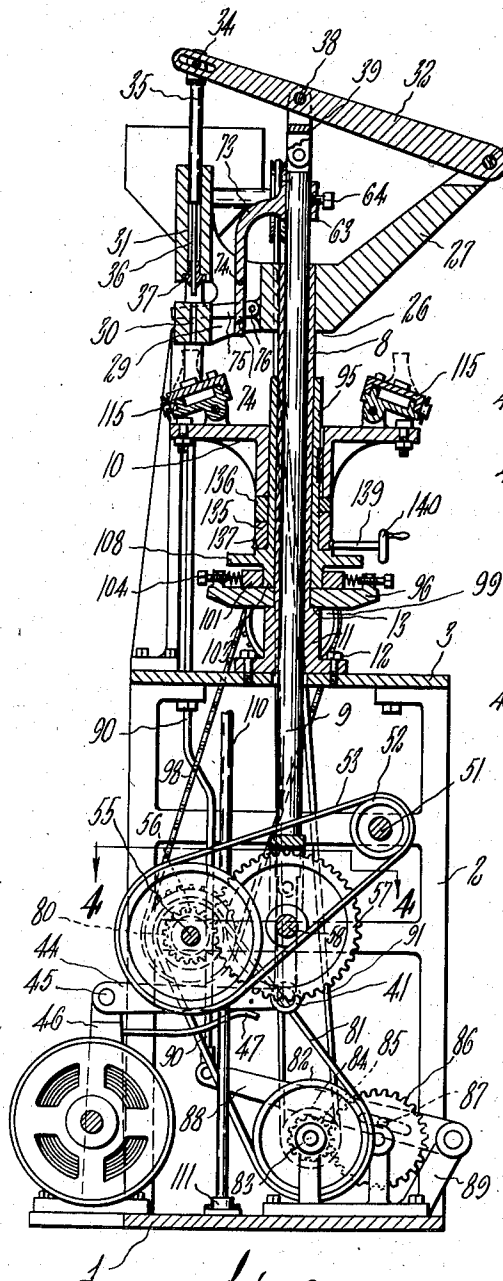


Fig. 2.

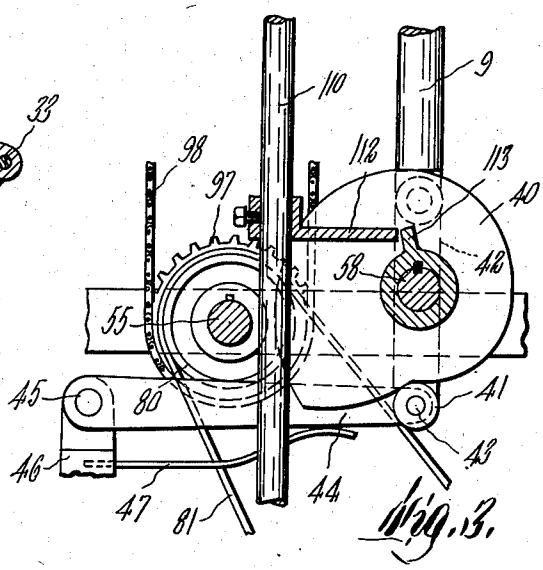


Fig. 3.

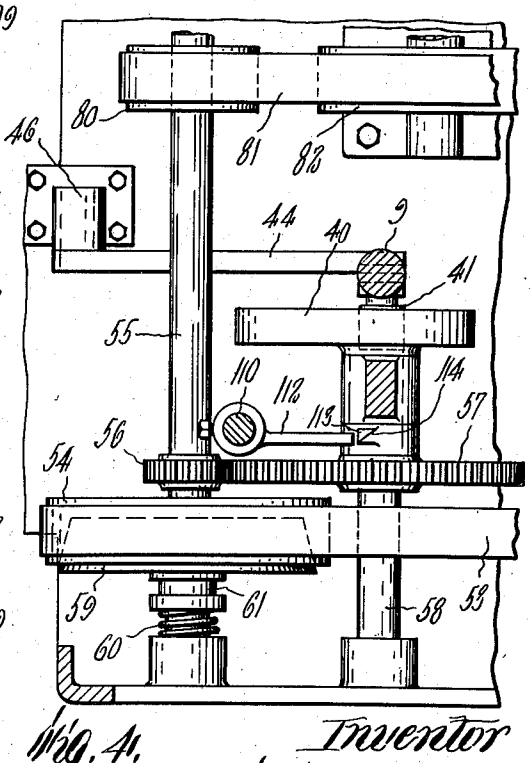


Fig. 4.

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HEEL DOWELING MACHINE

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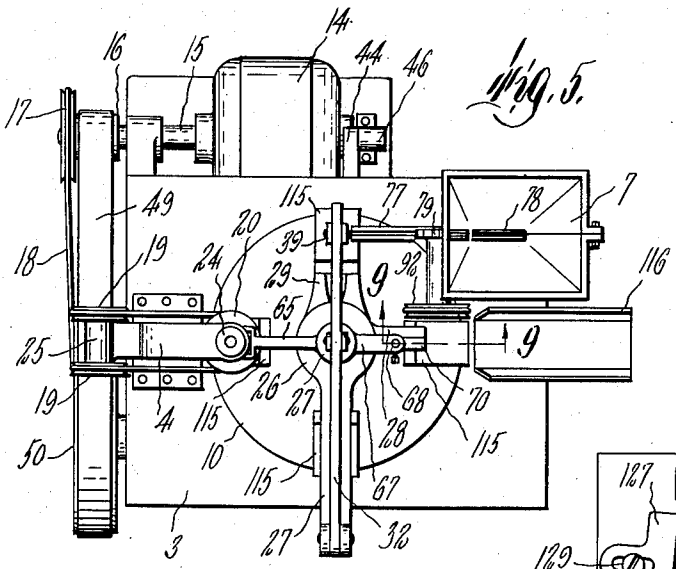


Fig. 5.

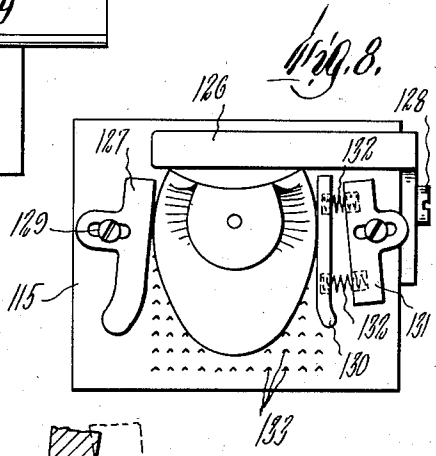


Fig. 8.

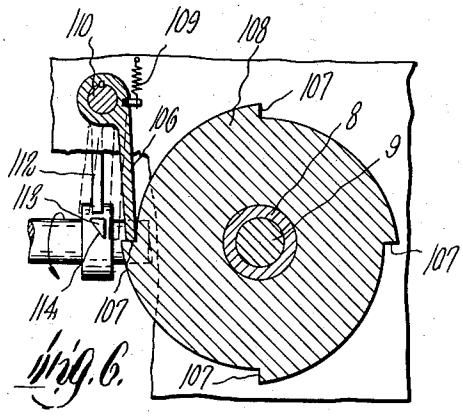


Fig. 6.

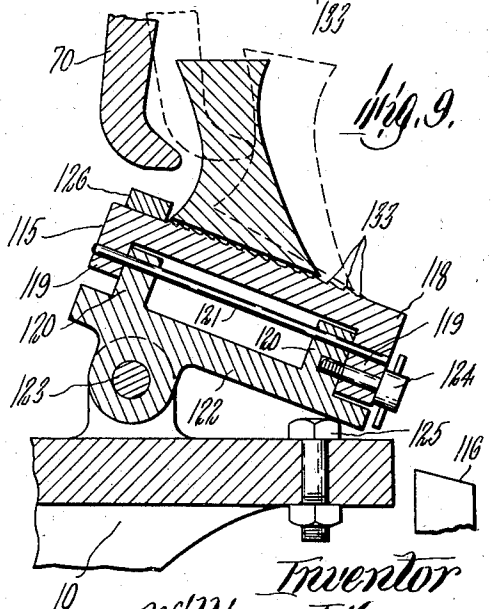


Fig. 9.

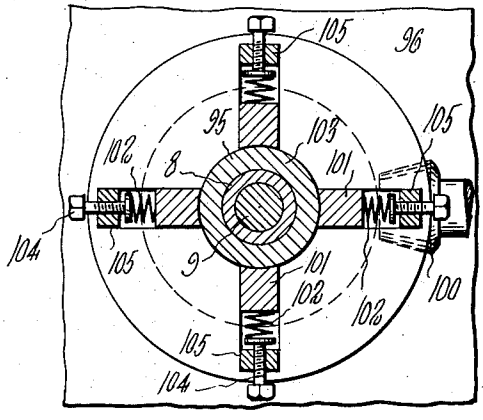


Fig. 7.

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UNITED STATES PATENT OFFICE

1,986,458

HEEL DOWELING MACHINE

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Application August 25, 1931, Serial No. 559,177

5 Claims. (Cl. 144—31)

The present invention relates to the art of placing strengthening dowels in wood heels of such height and slenderness as to require reinforcement. The dowels commonly used for this purpose are steel pins or rods about ⅛" in diameter and of a length appropriate to the height of the heel, but they may be of any other suitable material and of any serviceable diameter. My object is to provide a combined machine uniting the functions of preparing a heel to receive a dowel, feeding dowels one by one to a driving point, and driving the dowels into the holes prepared for their reception in heels; all as related parts of a continuous process and with performance of the operations of drilling and dowel driving simultaneously upon two different heels appropriately placed in the machine. With this object in view, the machine is provided with a rotatable carrier having a plurality of holders adapted to be driven step by step, and to stop with each holder successively in different ones of a number of working stations. The machine has a drill at one of these stations operable to drill a hole for receiving a dowel in a heel temporarily occupying such station; and a dowel driver at another station to which heels are brought after being drilled, with automatic means for delivering dowels from a magazine to the driving station in position to be forced by the driver into a heel at that station. There is also an automatic remover for displacing the heels at a delivery station to which they are brought after having received a dowel. After discharge of the heel, each holder is brought to a loading station where heel blanks are placed successively upon them by the operator.

A specific machine having an embodiment of the means above recited, for the objects specified, is shown in the drawings herewith and described in detail in the following specification, for illustration of the principles and characteristics of the invention, but without intent to limit the invention to such details.

In the drawings,—

Fig. 1 is a front elevation of the machine above referred to;

Fig. 2 is a vertical section taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary vertical section taken on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary horizontal section taken on line 4—4 of Fig. 2;

Fig. 5 is a plan view of the machine;

Figs. 6 and 7 are horizontal fragmentary sections taken on lines 6—6 and 7—7 respectively of Fig. 1;

Fig. 8 is a plan view enlarged of one of the heel holders;

Fig. 9 is a sectional view enlarged of one of the holders, such section being taken on line 9—9 of Fig. 5.

Like reference characters designate the same parts wherever they occur in all the figures.

The frame structure of the machine comprises a base 1, from which uprights or posts 2, 2 rise, supporting on their upper ends a table or plate 3. From the table rises a column 4 by which the drill 5 is supported, a post or upper frame 6 holding at its upper end a magazine 7 for dowels, and a central tubular post 8, the interior bore of which provides a guideway for an actuating rod or bar 9, and the exterior of which provides a bearing for a rotary work carrier 10. The hollow post 8 has a flanged foot 11 which is secured to the top plate 3 of the base frame by bolts 12. An upwardly facing shoulder 13 on the foot 11 serves as a thrust bearing to support the weight of the work carrier 10 and parts associated therewith.

Power is supplied by electric motor 14 mounted on the base plate 1, from which a shaft 15 extends carrying pulleys 16 and 17. Pulley 17 drives a belt or band 18 which passes over guide pulleys 19 and around a driving pulley 20 on the drill spindle 21 which carries a drill 5. Said drill spindle has splined and sliding connection with a sleeve 22 on which the pulley 20 is directly mounted and secured, and such sleeve is rotatably mounted in bearings 23, 23 connected with the post 4 and closely flanking the pulley 20. A third bearing 24 is provided for the sleeve at a distance above the upper bearing 23 whereby to provide a space for the drill spindle feeder. Pulleys 19 are mounted on a shaft contained in a bearing bracket 25 which projects from the post 4. The driving means last described are adapted to rotate the drill at high speed, suitable for cutting hard wood.

On the top of the central column 8 is secured a support for certain operating members. This support comprises a hub 26 surrounding the column, an arm 27 for supporting a driver actuating lever, a lug or bracket 28 supporting a knockoff or discharge device, and an arm 29 having its outer part elongated vertically and provided with a dowel receiver and guide 30 and a driver guide 31 above the dowel receiver. Said support with its arms or brackets may be made as a metal casting and secured to the central column by shrinking its hub portion thereon or making the bore of the hub

with a driving fit for the column, and pressing it on; or in any other suitable way.

A driver actuating lever 32 is pivoted at 33 to arm 27 of the before named support and extends over the driver guide, where it is connected by a pin and slot connection 34 with a driver bar 35 fitted to reciprocate in said guide 31. A dowel driver 36 of smaller diameter than the bar 35 is secured to the latter and passes through a bushing 37 mounted in the lower end of guide 31. It is of suitable diameter to fit slidingly in the dowel guide 30, and is of such length and position with respect to the stroke of driver bar 35, that it is adapted to follow the dowel placed in the latter guide and force the dowel into a heel on the carrier beneath.

At a point 38, intermediate its length, the lever 32 is pivoted to a link 39 which couples it with the actuating rod 9, as previously mentioned. This rod slides in the bore of the hollow column 8 and protrudes from both the upper and lower ends thereof. It is reciprocated by means of a cam 40 (shown best in Fig. 3) through the medium of a cam follower 41 which is coupled to the rod 9 by a link 42. Said cam follower is conveniently a roll mounted on a stud 43 carried by an arm 44 which is pivoted at 45 to a post 46 rising from the base 1. A spring 47 is anchored on post 46 and constantly presses arm 44 toward the cam. Stud 43 serves also as the connection between the link 42 and the cam follower. Arm 44 is simply one convenient form of means for holding and guiding the cam follower in correct relation to the cam.

Cam 40 is driven by the motor 14 through the pulley 16 previously mentioned, a belt 49, pulley 50 on shaft 51, pulley 52 on shaft 51, belt 53, pulley 54, shaft 55, gear 56 secured to shaft 55, and gear 57 in mesh with 56 and fast to shaft 58 on which the cam is also made fast. Preferably the pulley 54 is loose on shaft 55 and driving connection with the latter is made through a cone friction clutch 59 which is splined to the shaft and normally pressed against a complemental clutching part of the pulley by a spring 60. The clutch may be disengaged at will from the pulley by an operator controlled shifter, of well known character, engaging a grooved hub 61 of the clutch.

In addition to working the driver, the rod 9 also feeds the drill endwise, operates the knock-off or discharge device, and controls the delivery of dowels to the receiver 30. To accomplish these additional purposes, a collar 63 is applied to the rod and secured thereto by suitable means, such as a set screw 64. This collar carries a rigid forked arm 65, the branches of which engage a grooved collar 66 slidable on the drill holding sleeve 22 and connected with the drill spindle so as to transmit endwise movement thereto. The collar 63 also carries an arm 67 fitted with a rod 68 which is adapted to bear on and move a finger or arm 69 which projects in its path from a knock-off dog 70 pivoted to the lug 28 at 71. This knock-off dog is normally held retracted by a spring 72. The collar 63 also carries an arm 73 which extends outward from the collar and then downward through an opening in the guide arm 29 carrying separated stops 74, 74, which embrace, with lost motion, an arm 75 pivoted to the support 26 at 76.

The endwise travel of the drill is determined by the throw of cam 40 and is made long enough to feed the drill through nearly the entire height of the highest heel, and to raise it sufficiently to clear such heels when carried into and out of drilling position. The driver, however, travels at the same time by propulsion of the same cam through a greater distance, due to the fact that the arm of lever 32 (comprised between the pivots 33 and 34) which propels the driver is longer than the arm (comprised between pivots 33 and 38) to which the actuating rod 9 is connected; thereby giving sufficient clearance for the placement of dowels in driving position by the means disclosed in my Patent No. 1,819,584, dated August 18, 1931. That is, by virtue of the motion-amplifying means for reciprocating the driver, I am enabled to propel both the drill and the driver by means of a single cam, which makes for simplicity and economy in building the machine; to make the feed stroke of the drill the shortest possible consistent with accommodating the highest heels and drilling to the required depth therein, thus avoiding the lost motion and loss of time incident to giving the drill as long a travel as the driver; and at the same time, give the driver the additional movement necessary to accommodate the dowel.

Dowels pass from the magazine 7 to the receiver 30 along a raceway 77, and their delivery one at a time to the receiver is effected by a combined gate and escapement element which is shifted at the end of each driving stroke of the driver to take a dowel from the raceway, and is again shifted at the end of each up stroke of the driver to transfer the dowel so taken into the guideway on the receiver 30. These motions are effected by the arm 75 and the stops 74. The transfer mechanism above referred to, used in this machine, is identical with that fully described in my Patent No. 1,819,584, dated August 18, 1931, to which reference is directed to supplement the description herein given.

78 (Fig. 1) is a lifter plate which reciprocates vertically in the magazine 7 for raising dowels to the magazine end of raceway 77, and 79 (Fig. 5) is a toothed knock-off wheel for displacing from the raceway any dowels which fail to enter properly the guiding channel thereof. These parts are essentially like corresponding parts disclosed in my said patent, and are driven by the motor 14 through shaft 55 by the following means. A pulley 80 on shaft 55 drives, by belt 81, a pulley 82 on shaft 83 (Fig. 2), on which are a band pulley 84 and a pinion 85. This pinion drives a gear 86 carrying a pin 87 which travels in a slot in a lever 88, said lever being pivoted on a fixed bracket 89 and pivoted to a long link rod 90 which rises to a connection with lifter 78. Pulley 84 drives a belt 91 which passes around a pulley 92 on a shaft 93 which carries the knock-off wheel 79.

It will be noted from the drawings, and particularly Fig. 5, that the drill, the dowel driving means, and the knock-off, are equiangularly spaced about the axis of the central column 8, and that the drill 5 and driver 36 are equidistant from this axis. The angles between these instruments may be 90° and may correspond with three of the four stopping positions of holders carried by the rotatable heel carrier 10; the fourth position being a loading station. However, they may be spaced at smaller angles and the carrier may be provided with more than four holders and stopped in more than four different positions, if desired, in order to give more time for loading or to permit performance of other operations on the heels.

Carrier 10 is a circular table having a hub

which surrounds, and is splined or otherwise non-rotatably fixed to, a sleeve 95 which fits rotatably about the central column 8 and rests at its lower end on a driver 96. Said driver is preferably a bevel gear which rests, and has a thrust bearing, on the shoulder 13 previously mentioned. This gear or driver is continuously rotated by shaft 55 through the medium of a sprocket 97 on said shaft, chain 98, sprocket 99 and bevel pinion 100 on the shaft of the last named sprocket and in mesh with driver 96. Said driver is not positively connected to the sleeve 95, but transmits power yieldingly thereto so that the carrier may be stopped at the proper times. A friction clutch device is provided for so driving the carrier comprising four (more or less) shoes 101 (see Fig. 7) pressed individually by springs 102 against a cylindrical surface 103 on the lower end of sleeve 95. Springs 102 react aganst adjustable abutment screws 104 threaded through lugs 105 on the driver, whereby the frictional driving force applied may be regulated. Arrest of the carrier at each of its stopping places is caused by a stop dog 106 (Fig. 6) cooperating with shoulders or abutments 107 on an arresting disk or flange 108 which is rigidly joined to the sleeve 95. A spring 109 normally holds the stop dog against the periphery of the arresting disk, and returns it thereto after displacement.

Stop dog 106 is secured, keyed for instance, to an oscillative upright rod 110 supported in a step bearing 111 on the base and having a control arm 112 secured upon it in cooperating relation with a cam finger 113 fast on shaft 58 (see Figs. 3 and 4). This cam finger has a beveled or inclined face 114 so arranged as to engage the side of arm 112 in passing and displace such arm far enough to withdraw the stop dog out of the path of the abutment shoulder 107 with which it is then engaged, as shown by dotted lines in Fig. 6. As soon as the cam finger passes arm 112 after its brief engagement therewith, which is of less duration than the time needed for the carrier to turn through the angle between two abutments 107, the stop dog is returned into contact with the arresting disk, ready to block the next abutment thereof.

Heel holders 115 are mounted on the carrier 10 in such positions that, at each arrest of the carrier, one of them holds a heel in correct relation to the drill 5, another holds a heel with its previously drilled hole in line with the driver, and the third holds a doweled heel in the path of the knock-off device. Thus with each descent of the main actuating rod 9, one heel is drilled, a second receives a dowel, and a third one is discharged into a chute 116 which conducts it to any receiver. At each stop, an empty holder is brought to the front of the machine ready to be loaded with a heel blank by the operator.

The individual holders are all alike, and one of them is shown in detail in Figs. 8 and 9. The holder comprises a supporting plate 118 coupled by overlapping lugs 119 and 120, and a pivot rod 121, with a holder bottom or base 122 which is coupled to the carrier by a horizontal pivot 123 transverse to the pivot rod 121 and tangential to the carrier. By these adjustments the surface of the plate may be tilted to any angle necessary for bringing the desired location of the dowel within the heel into a vertical line. Adjustments about the pivot 121 are made fast by a screw 124 passing through an arcuate slot in one of the lugs 119 into a tapped hole in the adjacent lug 120. The holder is adjusted around pivot 123 and supported by a stop screw 125 mounted in the table.

Heels are positioned correctly on the holder by a breast gauge 126 and a side gauge 127, both being adjustably secured to the holder by clamp screws 128 and 129 respectively passing into the holder through slotted lugs of the respective gauges. The side gauge is also one member of a clamp, the cooperating member of which is a bar 130 connected with an abutment 131 by springs 132. The abutment is adjustably fastened to the holder in a similar manner to clamp 127, and is arranged so that springs 132 press clamp 130 toward 127. The supporting surface of table 118 is preferably formed with upstanding spurs 133 or is otherwise roughened to aid the clamps in preventing the heel from slipping off. I have found in practice these means are effective to that end, notwithstanding the considerable inclination given to the holder when the highest heels are operated upon.

The rotary carrier is adjustable vertically in order to accommodate heels of different heights, its splined connection with sleeve 95 permitting the motion necessary for that purpose. Such adjustment comprises a cylindrical cam 135 and cam follower 136 surrounding the sleeve 95, supported on the arresting disk 108 and on which the carrier rests. The cam is rotatable about the sleeve and the follower is withheld from rotation, and they have complemental helical abutting faces arranged to cause axial movement of the follower and the carrier 10 when the cam is turned. A worm gear element 137 is associated with the cam, as an integral part thereof or otherwise, and meshes with a worm 138 on a shaft 139 to which a hand wheel 140 is connected. A bracket 141 on table 3 provides a bearing for the worm and its shaft and also supports a key member 142 by which the cam follower is restrained from rotation. The weight of the carrier is sufficient to cause its descent when the cam is turned in the withdrawing direction, but may be supplemented if desired by a spring, which may be placed to surround the column 8 under compression between the carrier 10 and the under side of the support 26.

It will be apparent from the foregoing description and the drawings that in the operation of this machine the operator's task is simply to place heels on the empty holders as they pause in the loading position, and that the operations are all automatic, effected successively on each individual heel and simultaneously on different heels.

I claim:

1. A machine for preparing articles to receive dowels and inserting dowels in such articles, comprising a drill, a dowel driver, means for carrying an article into position to be bored by said drill and for transporting it thence to another position where the hole so prepared is in line with the driver, means for rotating the drill, means for placing a dowel in line with the driver and between it and the article, and a single cam for moving the drill and driver back and forth endwise, combined with connections whereby the driver is given a longer movement than the drill.

2. In a machine of the character set forth, an endwise movable drill, a driver movable endwise in parallel with the drill, an actuating element having a fixed arm engaged with the drill, and a lever having a longer arm connected with the driver and a shorter arm connected with the ac-

tuating element whereby to impart to the driver a longer movement than is given to the drill.

3. A doweling machine comprising a frame having an upright tubular column, an actuating rod contained in said column for movement endwise therein and protruding at opposite ends therefrom, means acting on the lower end of said rod for reciprocating it, a support secured to the upper end of said tubular column having an arm at one side and a driver guide at the other side of the column, a driver reciprocatively mounted in said guide, a lever pivoted to said arm and coupled with said driver and being connected at an intermediate point with said actuating rod, a drill separately mounted and guided for movement parallel to the driver, and an arm carried by the actuating rod and engaging the drill for advancing and retracting the latter simultaneously with corresponding movements of the driver.

4. A doweling machine comprising a frame having an upright tubular column, an actuating rod mounted to reciprocate in said column and protruding above and below the same, a drill and a dowel driver mounted equidistant from the axis of said column, connections through which said rod moves the drill and driver, means for reciprocating the rod, a work carrier rotatable about said column, means for rotating the work carrier, and means for adjusting the work carrier endwise of the column comprising a sleeve cam rotatable about the column, a cam follower sleeve intermediate the cam and carrier, said cam and sleeve having complemental abutting helical faces.

5. A doweling machine comprising a frame having a lever-supporting arm, a lever pivoted to said arm, a dowel driver connected with said lever and guided to move in a prescribed path, a drill guided for feeding movement in a path parallel to that of the driver, means for carrying work pieces in turn to the drill and to the dowel driver, a cam, and means whereby said cam drives both the drill and driver in the same direction at the same time, said means including a rod connected with said lever at a point nearer to the pivot of the lever than the connection of the lever with the driver, and a rigid propelling arm extending from said rod to the drill, whereby the cam causes a longer movement to be given to the driver than to the drill.

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