

Nov. 21, 1933.

W. J. HUBBARD, JR

1,935,979

MACHINE FOR DOWELING HEELS

Filed Nov. 15, 1932

6 Sheets-Sheet 1

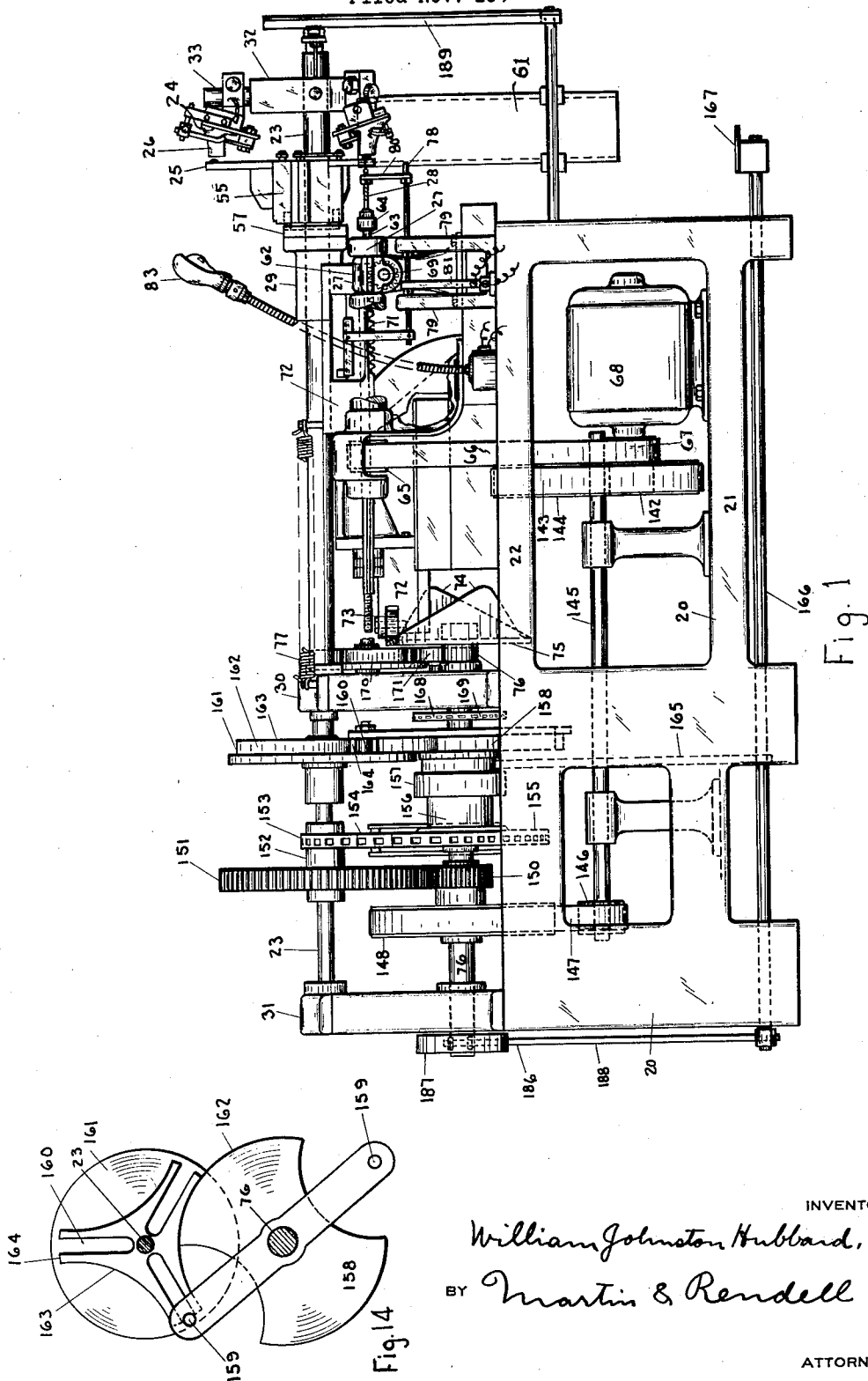


Fig. 1

Fig. 14

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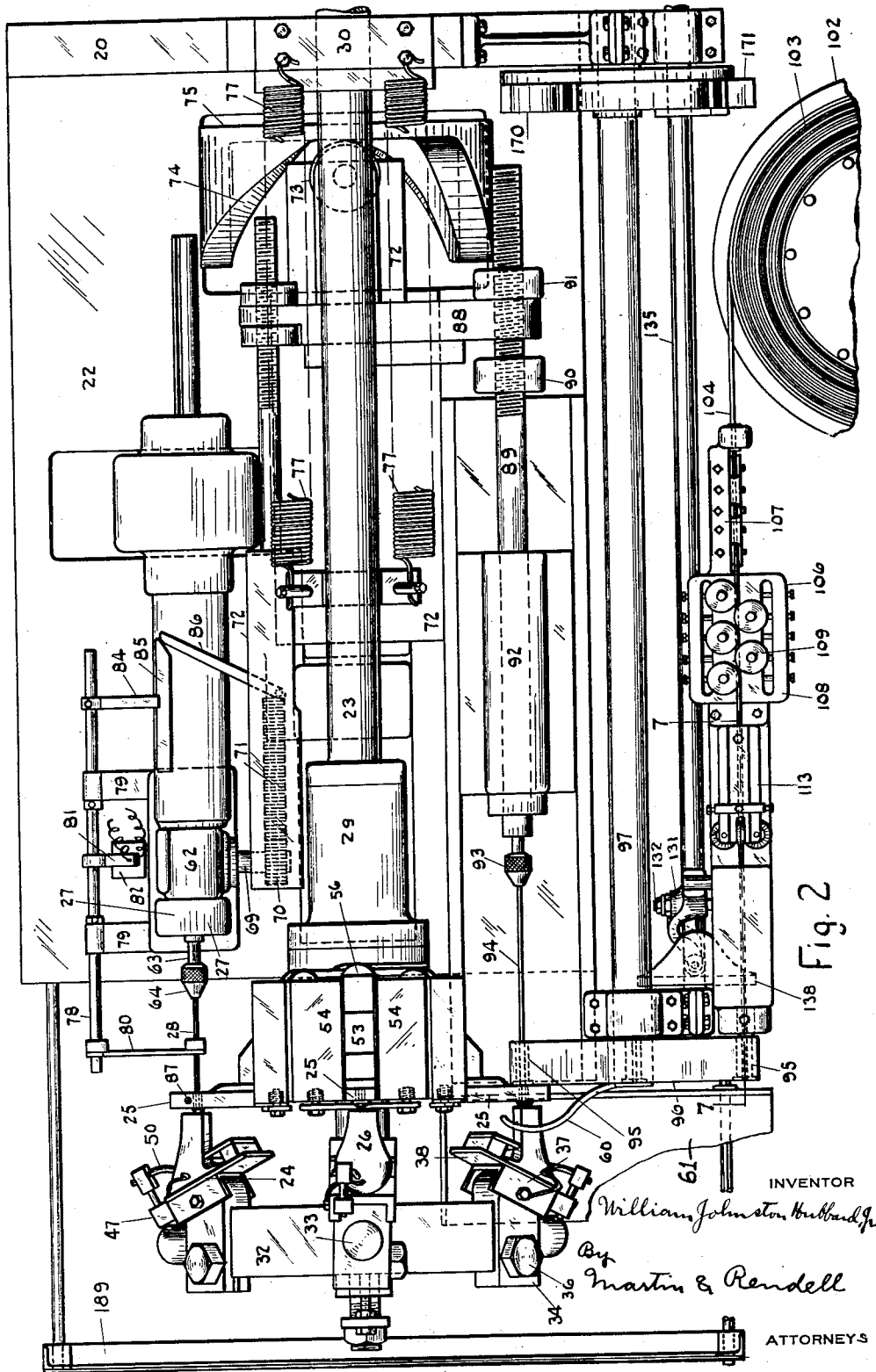
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MACHINE FOR DOWELING HEELS

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6 Sheets-Sheet 2



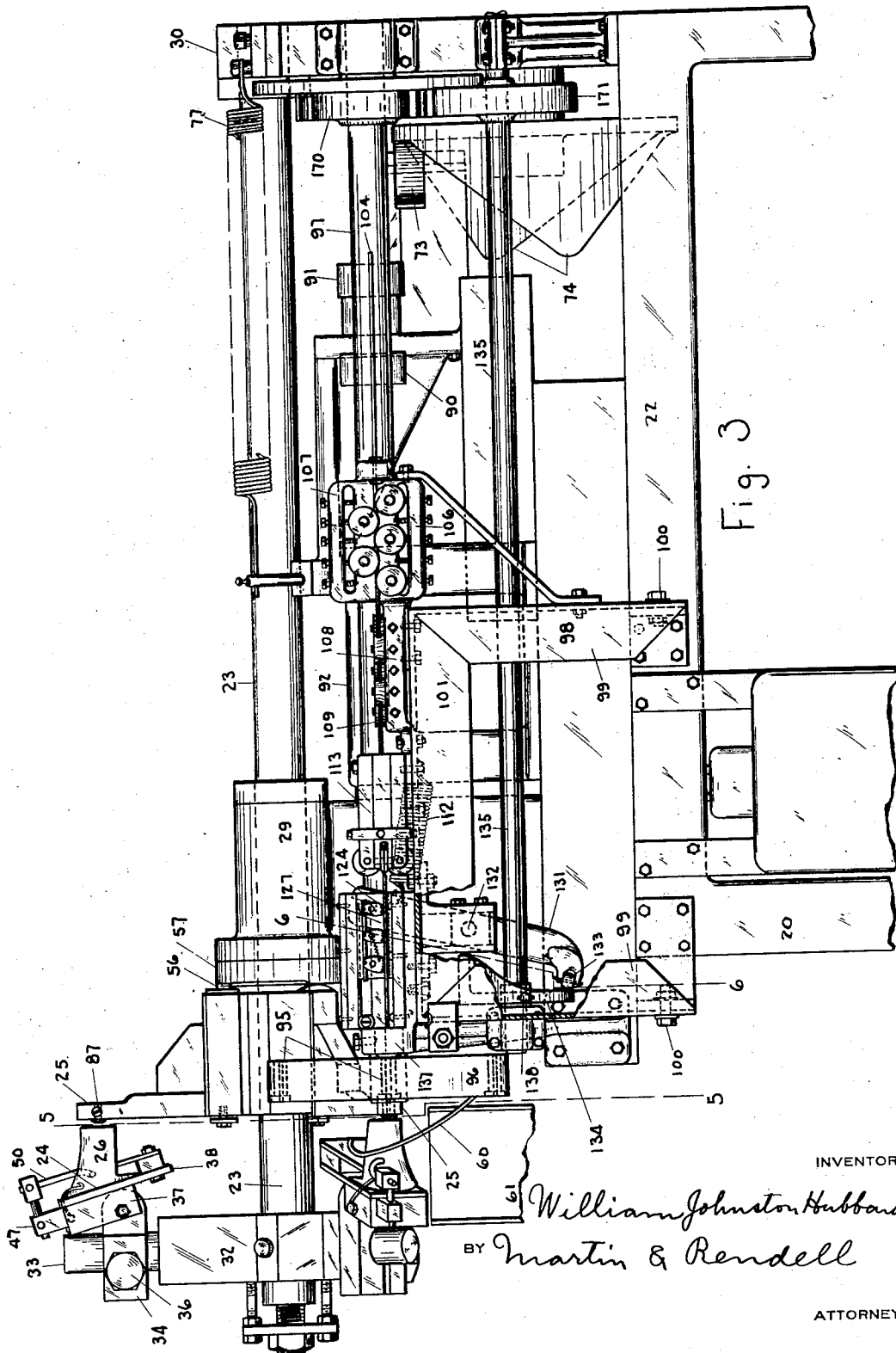
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1,935,979

Filed Nov. 15, 1932

6 Sheets-Sheet 3



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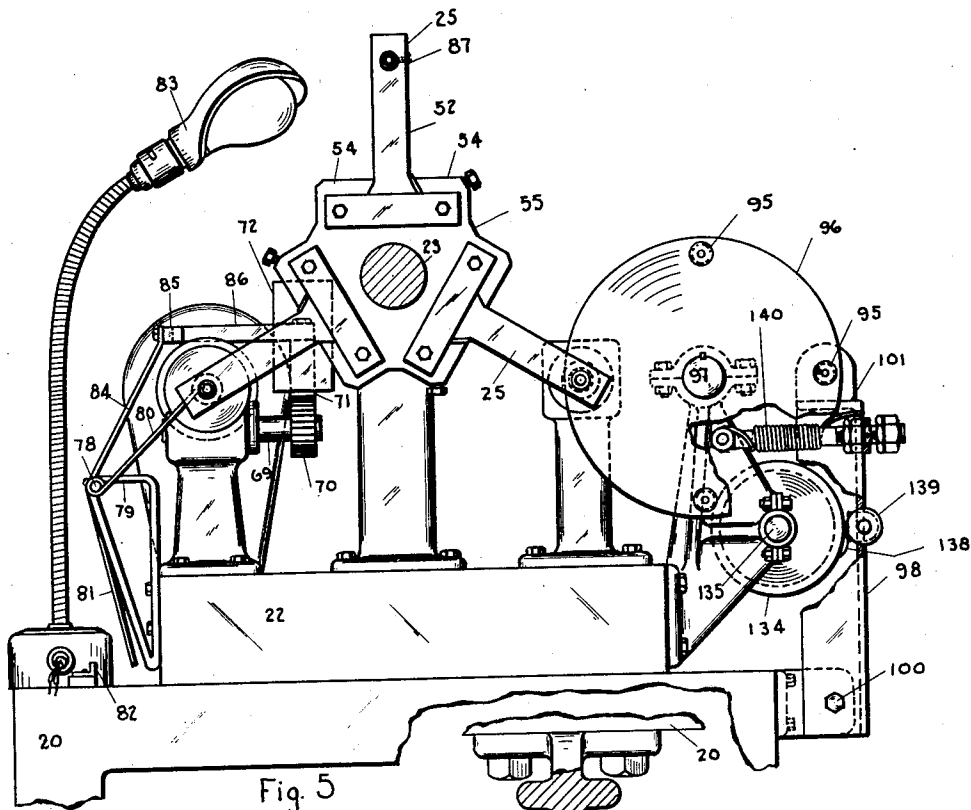


Fig. 5

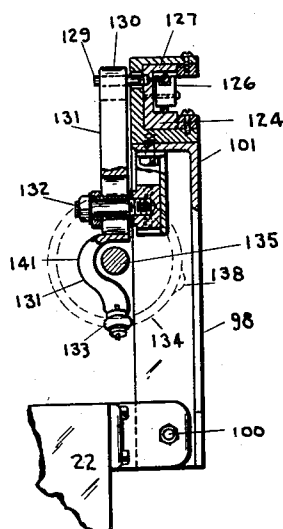


Fig. 6

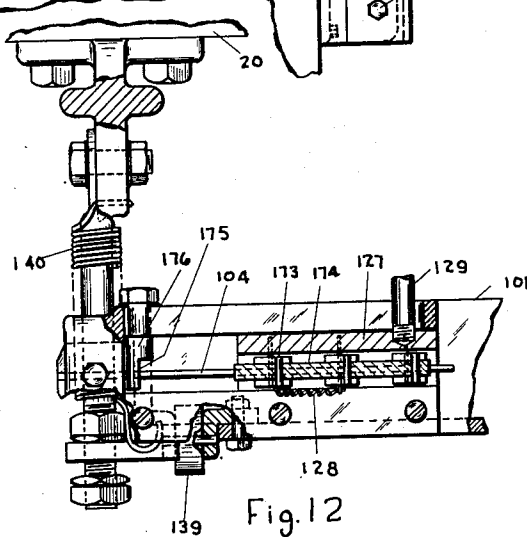


Fig. 12

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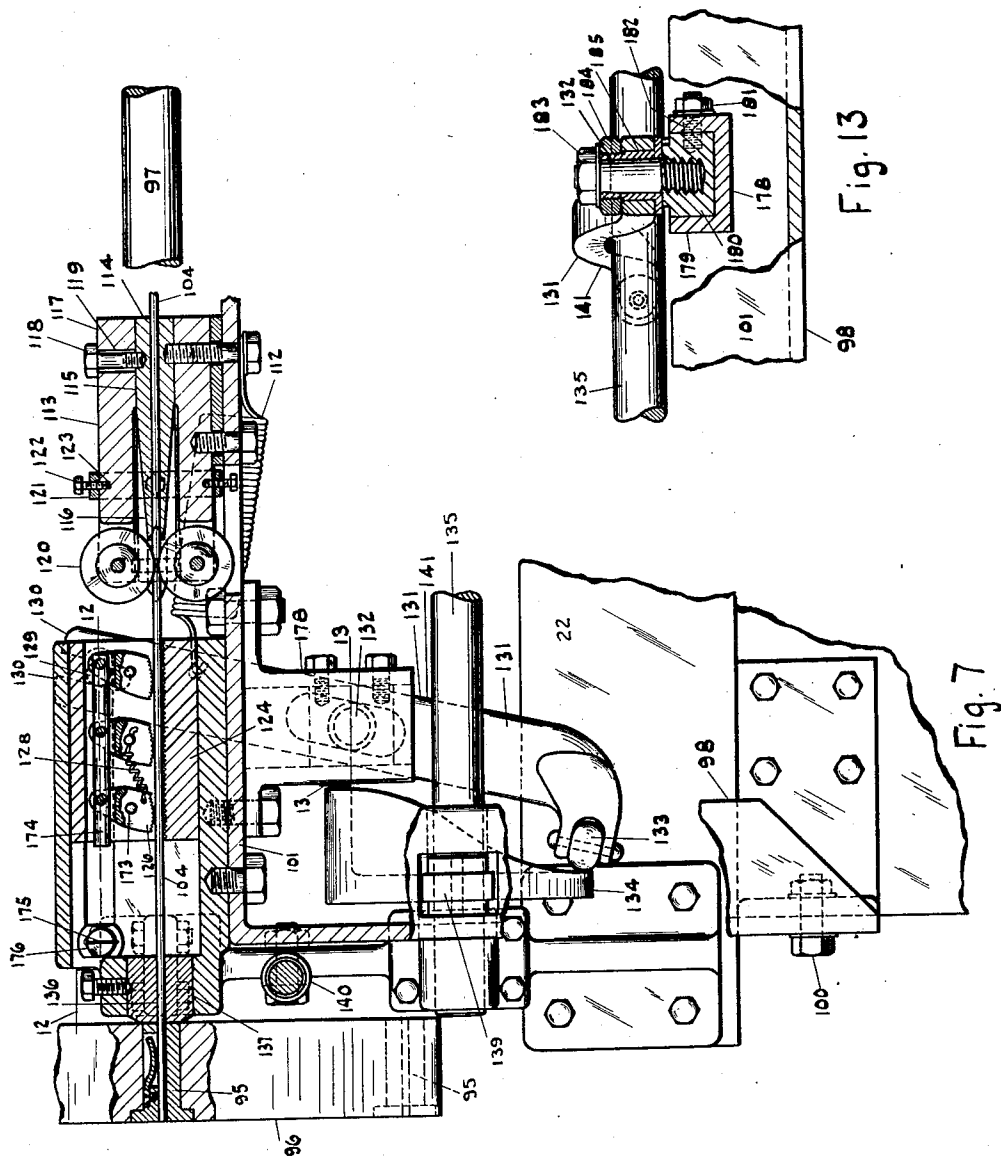
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MACHINE FOR DOWELING HEELS

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

1,935,979

MACHINE FOR DOWELING HEELS

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Application November 15, 1932
 Serial No. 642,771

20 Claims. (Cl. 29—38)

This invention relates to a machine for dowe-
 ling heels including thereby the making of a hole
 in the heel for the dowel and the insertion of the
 dowel therein and in certain forms of the inven-
 tion including also the making and shaping of
 the dowel.

The purposes of this invention are to provide a
 machine for doweeling heels of the type mentioned
 and which is of new and improved construction,
 form and operation; to provide a machine of the
 type indicated where the heels usually of wood
 are readily and lightly placed in successive heel
 seats and soon after held therein by the heel
 being engaged with necessary pressure by a co-
 operating movable jaw for each heel seat and
 wherein the successive pairs of heel-holding seats
 and jaws are progressively and in rotation
 brought to and stopped at a position where a
 drilling mechanism is operative to advance and
 drill a hole in the heel and then be withdrawn
 therefrom and thereafter to have the heel car-
 ried by its said holders to a subsequent position
 herein called the driving position where the heel
 is again stopped and operated upon by the dowe-
 ling inserting mechanism and to provide in the ma-
 chine mechanism for placing a dowel in line with
 the hole in the said heel and then driving said
 dowel into the hole of the heel and then passing
 said heel to a subsequent position where the heel
 seat and holding jaw are relatively moved so as
 to release the heel; further to provide in such a
 machine means for readily and securely mount-
 ing the several pairs of heel holders so that the
 heels placed therein will be accurately presented
 to and securely held at the different positions for
 drilling the hole and inserting the dowel therein
 and to have said means for carrying said heel
 holders and the heel holders themselves of such
 character that the heel-holding members may be
 readily adjusted to carry in proper operative po-
 sition with the rest of the machine any of the great
 variety of sizes, shapes and character of wooden
 heels used in present day footwear; to provide in
 a machine of the character described and as a
 part of the doweeling inserting mechanism means for
 forming metal dowels of the right length and
 right cross-sectional shape and with the desired
 holding barbs upon part of the length of the
 dowels out of a coil of plain round wire by mech-
 anism for cutting said indefinite length of wire
 into pieces the length of the dowel and shaping it
 in cross section to the desired non-circular shape
 and impressing or forming upon part of the
 length of the wire so cut the desired burrs or
 barbs for preventing the dowel coming out of the

heel when once driven therein; to provide a ma-
 chine of the type described of such form and with
 such co-operation of its parts that said machine
 will constantly operate to intermittently advance
 and stop at the desired positions the heel holders
 opposite the different loading, drilling and dowe-
 ling inserting positions and to have the other mecha-
 nism co-operate therewith so as to allow for
 loading the heels, drilling the heels and inserting
 the dowels when the respective heel holders are
 at rest at the different positions for such opera-
 tions; to provide in combination with such ma-
 chine mechanism for indicating at each opera-
 tion whether the drill is still intact so that the
 operator can stop the machine if a drill has been
 broken and thus avoid the machine delivering
 defective heels and also prevent a heel that may
 have a broken drill therein from being subjected
 to the strain of having a dowel pressed against
 the hole where the broken drill is.

Fig. 1 is a side elevation of the left hand side
 of an entire machine embodying this invention.

Fig. 2 is a plan view on a larger scale than
 Fig. 1 of the front two-thirds of the said machine
 but with the front of the machine at the left,
 the driving and gearing parts forming the rear
 third of the machine being omitted.

Fig. 3 is a side elevation on the same scale as
 Fig. 2 of said forward two-thirds of the machine
 as seen from the right side or doweeling inserting
 side of the machine, certain parts being broken
 away to more clearly show the construction.

Fig. 4 is a side elevation from the right hand
 side on a still larger scale of the front end of
 the turret shaft and one pair of heel holders;
 that is a heel-receiving seat and a movable jaw
 co-operating therewith and showing a heel in
 place between said holders; said view also shows
 the adjacent part of the cam ring co-operating
 with said holding jaw.

Fig. 5 is a vertical cross sectional view on line
 5—5 of Fig. 3 looking towards the rear of the
 machine but showing only parts immediately
 beyond said line.

Fig. 6 is a vertical cross sectional view on line
 6—6 of Fig. 3 of the doweeling inserting and dowe-
 ling forming mechanism.

Fig. 7 is a vertical longitudinal sectional view
 on an enlarged scale on line 7—7 of Fig. 2.

Fig. 8 is a longitudinal sectional view through
 one form of a wood heel with the hole bored
 therein.

Fig. 9 is a similar view of another form of heel
 with a metal dowel inserted therein.

Fig. 10 is a side view of a dowel, full size, as formed by this machine.

Fig. 11 is a cross sectional view of said dowel on an enlarged scale.

5 Fig. 12 is a horizontal sectional view mostly on line 12—12 of Fig. 7.

Fig. 13 is a detail horizontal sectional view on line 13—13 of Fig. 7.

10 Fig. 14 is a detail showing a side elevation of the main Geneva wheels 158 and 161 as seen from the front of the machine.

General construction

Referring to the drawings in a more particular description it will be seen that this machine has a framework generally designated by the numeral 20 having suitable longitudinal, upright and transverse members to provide a lower platform 21, an upper platform or table 22 and various supports for the required bearings of the machine and that the machine consists of this framework, a turret shaft 23 carrying three pairs of heel holders, each pair comprising a heel-receiving seat 24 and a jaw 25 movably mounted relative to its heel-receiving seat and that the turret shaft 23 is mounted and connected so as to be progressively rotated one-third of a revolution by a step-by-step motion followed by a pause so that the several pairs of heel holders carrying therebetween a heel 26 are separately but progressively moved from the loading position where the heel is inserted between the holders to the drilling position where during the pause of said turret shaft and its parts carried thereon a drilling mechanism generally denoted by the numeral 27 and provided with an advanceably rotated drill 28 advances the drill into the wood heel held by the heel holders at that position and then retracts the drill from the hole so bored and that then that pair of heel holders is carried by another one-third rotation of the turret shaft 23 to the opposite or right hand side of the machine to the dowel-inserting position; that when the drill heel is then held at this dowel-inserting position a dowel already provided and in alignment with the hole drilled in the heel is driven into the heel and that after the dowel has been inserted in the heel the pair of heel holders carrying the heel are moved by a one-third rotation of the turret shaft to loading position and that during this last travel of the heel holders the movable jaw 25 has been withdrawn from its tight grip against the heel so that the heel may be readily removed from between the heel holders and is so removed from the heel holders before this pair comes to the loading position and that at the loading position another heel is inserted by hand into the heel-receiving seat 24 and lightly held therein by a spring or similar means but adapted to be tightly held upon the seat by the advancing movement of the jaw 25 which is so advanced by the first part of the motion of the turret shaft and its carried parts from the said holding position.

Heel holders and turret shaft

As this machine is organized the turret shaft is mounted in the upper part of the framework in a forward bearing 29, a middle bearing 30 and rear bearing 31 with one end, namely the forward end of the shaft, projecting a considerable distance beyond the forward bearing 29. For the purpose of convenience in this description and for the reason that the single operator of the machine ordinarily stands at the end of the machine shown at the right in Fig. 1, this end of

the machine is called the front end of the machine and the side of the machine shown in elevation in Fig. 1 is called the left side of the machine.

Upon this front projecting end of the turret shaft 23 are mounted the three pairs of oppositely disposed radially arranged heel-receiving seats 24 and movable jaws 25. As appears particularly from Figs. 1, 2, 3 and 5 the set of heel-receiving seats 24 are mounted in equally spaced radial position in a circle about the turret shaft 23 as by means of a generally triangular shaped forward head 32 being securely fastened to said shaft and being provided with three radially projecting equally spaced strong posts 33. One heel-receiving seat 24 is secured upon each of these posts in a similar manner so that a description of one heel-receiving seat and its mounting upon said post will be sufficient. Securely but adjustably secured upon the post 33 there is provided and placed the clamping bracket 34. This bracket is of the split eye type with the eye of the bracket fitting upon the circular post 33 or adjusted circumferentially in desired adjusted position by tightening the nut 35 on the end of clamping bolt 36. The inner or rear end of this bracket from its right hand end as seen in Fig. 4 is preferably of reduced thickness so as to receive against its opposite sides the spaced flanges 37 of plate 38 the inner plain surface of which is the face of the heel-receiving seat as a whole which engages the larger or shoe end 39 of the heel 26. The plate 38 is mounted upon the bracket 34 to rotate to a considerable extent and to be secured so that the face of the plate 38 is at the desired angle required by the particular shape of the heel being operated upon or the angle at which the dowel is to be placed therein. This is accomplished and the fastening of the plate 38 at the desired angle is accomplished by clamping the nut 40 of the bolt 41 which extends through the flanges 37 of the plate 38 and through the reduced inner end of the bracket 34.

Upon the lower portion of the plate 38 there is provided an adjustably located finger 42 which is spaced from plate 38 and projects upwardly parallel therewith with its upper end engaging the forward surface or breast 43 of the heel. This finger thus forms a stop determining the extent to which the heel 26 will be slipped down upon the face of the plate 38 when the heel is placed in position thereon by the operator. The finger 42 is held in such spaced relation to the plate 38 by means of an apertured block 44 interposed between the plate 38 and the finger 42 and with said three parts clamped together with a bolt 45 going through said parts and engaging a nut 46. Spacing the stop finger 42 out from the plate 38 gives a more definite support initially for the placing of the heel in place in the heel-receiving seat and avoids the sharply slanting or curved surface that is present in many forms of heels closer towards the shoe end of the heel.

The heel-receiving seat 24 is further provided with a small projection 47 extending upwardly and at its upward end there is mounted in the projection an arm 48 extending from the projection rearwardly of the machine or over the heel in the seat. Conveniently, this arm 48 is adjustably held relative to the projection 47 by set screw 49. At the outer end of arm 48 is a small block upon which there is mounted in adjustable position a downwardly projecting finger 50. This extends downwardly generally parallel with the plate 38 but upon the farther side of the heel as

the parts are seen in Fig. 4 so that the intumed lower end of said finger 50 forms a stop to determine the position of the heel 26 laterally of the plate 38. Preferably the lower extremity of the finger 50 is provided with a rubber tip to prevent the marring of the heels by contact with said stop. The heel seat is further provided with a resilient spring holder 51 projecting from a suitable part of the plate 38 or one of its flanges and with the free end of the spring engaging the near side of the heel as it is seen in Fig. 4 slightly out from the shoe end of the heel and towards the rear of the heel. The tension of this spring is very light so that the operator may readily force it aside enough to insert the heel into its place against the plate 38 and against the other two rigid stops at the lower end of the finger 50 and the upper end of the finger 42. The purpose of this slightly tensioned spring 51 is simply to gently urge the heel against the other rigid stops and the plate 38 and to hold the heel lightly in its proper position until the real or positively acting jaw 25 can be brought into strong contact with the small end of the heel and yet allow the heel to be readily pushed from beneath said spring 51 after the holding jaw 25 has been retracted from the heel after the drilling and dowel-inserting operations have been performed.

The outer head 32 carrying the three heel-receiving seats is adjustable longitudinally of the turret shaft 23 so as to adapt the machine to different heights and types of heels by any suitable means such as screw-threaded members that will provide accurate adjustment and tight securing of the head in desired position.

In order to provide the three jaws 25 co-operating safely with the heel-receiving seats 24 and for the said jaws to be separately movable towards their respective heel-receiving seats the said jaws are formed as strong L-shaped members the long arm 52 of which projects radially and at right angles from the turret shaft 23 while the base end 53 is widened and suitably shaped to slide in oppositely disposed guideways 54 provided upon the inner head 55. This inner head is shaped to provide these three sets of guideways for the equally spaced jaws 25 and said inner head is slidably mounted but securely fastened upon the turret shaft 23. At the rear end of the base portion 53 of each jaw 25 there is provided an anti-friction roller 56 adapted to engage and to receive pressure from the cam ring 57 mounted upon the frame just forward of the front bearing 29. Engaging a suitable part of the base of jaw 25 there is provided an expansion spring 58 so arranged as to tend to push the jaw 25 rearwardly or away from its co-operating heel seat but adapted to yield and allow the said movable jaw to be moved forward into holding contact with the heel 26 upon its heel seat when the high part of the cam ring 57 comes into co-operative connection with the said movable jaw as through said high part of the ring engaging the roller 56. As will be seen by reference to Figs. 2, 3 and 4 of the drawings the high part upon the fixed cam ring 57 begins just after the upper pair of heel holders, namely heel-receiving seat 24 and jaw 25 move from the top or loading position shown in Fig. 4 to go towards the next or drilling position and lasts until a point a little beyond the dowel-inserting position. It will be seen, therefore, that immediately after a set of heel holders start from the loading position shown in Fig. 4 the jaw 25 will be advanced to the dotted line position shown in said Fig. 4 and the per-

forated boss 59 on the front of said jaw will come into positive and firm engagement with said heel. This pressure and firm gripping of the heel between the advanced jaw 25 and the heel-receiving seat will continue without interruption while the heel travels to the drilling position and is being drilled at that position and while the heel is traveling towards the dowel-inserting position and is having the dowel inserted therein.

It will thus be seen that this ready placing of the heel lightly in position adapts the machine to be tended by any sort of machine operator and that thereafter the machine automatically tightly grips and holds the heel in desired position during all the subsequent operations of the machine thereupon and particularly holds the heel in the same position at the two successive operations, namely the drilling operation and the dowel-inserting operation so that when the machine is once properly set and adjusted the holes will be drilled in the proper position and the dowels will be inserted without strain in the holes so placed.

It will be understood that by driving and gearing mechanism hereinafter described the turret shaft is rotated by a step-by-step motion one-third of a revolution at a time with a pause at the end of each period of travel and that as the machine is organized as here illustrated the position of a pair of heel holders at the top of the circle of travel is called and used as the loading position and that as the pairs of heel holders successively travel from the upright position one-third of a revolution in an anticlockwise direction as seen from the front of the machine a pair of heel holders will be brought with its heel therebetween to the drilling position and there held during the drilling operation, and that after another one-third rotation of the turret shaft this heel and its heel holders will be moved still in an anticlockwise direction to the right hand side of the machine to the dowel-inserting position and held there during the insertion of the dowel, and that after the dowel has been so inserted the next third of a revolution will carry said heel holders towards and to the loading position. During a part of this last one-third rotation the movable jaw 25 will be released from the high part of the cam ring 57 and the co-operating expansion spring 58 will move said jaw from its heel and the heel will be pushed from its place upon the heel seat against the yielding tension of spring 51. As the heel is so pushed from the heel seat as by a projecting arm 60 suitably fastened to an adjacent part of the frame the heel will fall into a chute 61 provided therefor and carry the successive heels into any suitable container.

Drilling mechanism

The drilling mechanism 27 and its advanceable drill 28 are located upon the left hand side of the machine and are shown in side elevation in Fig. 1 and in plan view in Fig. 2. This mechanism is of the common drilling machine form wherein a casing 62 houses the parts so that the rotating spindle 63 projects from one end of the casing with a chuck 64 for holding the drill 28, the said spindle being advanceable relative to the casing 62 so as to carry the drill forward for its working stroke and to retract it thereafter. Near the other end of the casing 62 is the small pulley 65 for rotating the spindle at all positions of the said spindle in a way common to such drilling machines and not necessary to be explained herein. The pulley 65 is driven by belt 66 passing

over pulley 67 on the shaft of the motor 68 used for driving the whole machine. The advancement of the spindle 63 and therewith the drill 28 is here shown as being brought about by the
 5 toothed rack on the inside of the casing 62 and co-operatively connected to the spindle 63, but not shown in the drawings being given a movement longitudinally of the casing 62 by a toothed
 10 wheel below the spindle 63 and mounted on short cross shaft 69. This shaft 69 has at its inner end another toothed wheel 70 which is in mesh below with a toothed rack 71 mounted upon or
 15 carried as a part of sliding carriage 72. This carriage is suitably mounted upon guideways in the frame above the table 22 and has a lengthwise movement imparted thereto by means of an anti-friction roller 73 depending from the carriage engaging the flange cam 74 of cam wheel 75. As the machine is shown and organized the cam
 20 wheel 75 has two similar cams 74 on the flange of the wheel and the cam shaft 76 is driven at the proper speed as hereinafter described so that one cam 74 makes an operative or advancing movement of the carriage 72 and consequently
 25 causes a forward movement of the drill 28 while a heel is held by the heel holders at the drilling position. Strong springs 77 having their opposite ends attached respectively to the said carriage 72 and to a suitable part of the framework
 30 yield when the carriage 72 is positively forced forward by a cam 74 and immediately retract the carriage and consequently the rack 71 after the advance movement has been completed.

It will be understood that the drill 28 in its
 35 forward movement advances through an aperture extending through the movable jaw 25 opposite the drilling position and through the already mentioned perforated boss 59 on the front of the jaw. Preferably the boss 59 has a crowned outer
 40 face so as to make the pressure of the jaw 25 exerted therethrough be concentrated upon a relatively small part of the small end of the heel. This insures a tight hold upon the heel even though as sometimes happens the dowel is not
 45 inserted on a line at right angles with the small end of the heel. The boss 59 is preferably provided with a rearwardly extending shank inserted in the aperture of the jaw 35 and held therein by set screw 87. The perforation spoken of as extending
 50 through the boss of course extends through the rearwardly projecting shank of the boss. The boss mechanically of course is a part of the jaw and is provided as a separate replaceable part for mechanical efficiency.

55 *Drill testing and signalling mechanism*

On account of the amount of drilling done by the drilling mechanism and the speed with which it is done, there is a considerable liability of the
 60 drill 28 breaking. In case a drill does so break, heels subsequently brought to the drilling position would not be drilled and such undrilled heels when moved to the dowel-inserting position would cause trouble because the machine would
 65 try to force a dowel into an undrilled heel. On the other hand, the tip end of a broken drill is very apt to stay in the heel that was being drilled when the break occurred. A heel with such a broken drill tip therein when moved to the next position would cause trouble because the
 70 hole would be partly filled by the tip and would not allow room for the full length of the dowel to be inserted therein. Either of these situations might cause damage to the machine and
 75 would result in mutilated or damaged heels.

Consequently I have provided in connection with the drilling mechanism a device for testing the drill after each drilling operation and means for giving a visible signal to the operator in case a
 80 drill is found by such test to be broken. This testing mechanism consists of a rock shaft 78 rockingly mounted in brackets 79 and having at the forward end of the rock shaft an arm 80 adapted to engage at its outer end and rest upon
 85 the drill 28 some distance out beyond the drill chuck 64. In case the end of the drill has been broken off the outer end of arm 80 will not find support by coming into engagement with the drill 28, but will drop farther and bring contact
 90 arm 81 mounted on the rock shaft 78 into contact with a fixed contact plate 82 of an electric circuit having its wires leading respectively from the swinging contact arm 81 and the fixed contact plate 82. It will be understood that if
 95 the drill 28 is intact when the arm 80 is allowed to swing down against the drill the movable contact arm 81 will not reach the fixed electric contact 82, but if the drill is not intact the arm 80 will swing through the position normally occupied by the drill and then the movable
 100 contact arm 81 will be brought into contact with the fixed plate 82 and thereby the circuit through said wires will be completed and light an electric lamp 83 which will be suitably mounted as on a common adjustable bracket near the front end
 105 of the machine. As soon as the lamp is lit the operator can quickly stop the operation of the machine and thus prevent damage to the machine and prevent the making of mutilated heels or of heels not provided with a dowel. The drill
 110 testing device is preferably so arranged as to swing the arm 80 against the drill 28 not during advancement or ordinary working of the drill but only after the drill has been retracted. In this way the testing arm does not increase the
 115 liability of breaking the drill nor interfere with the working movement of the drill. To bring this result about the arm 80 is lifted from contact with the drill 28 as soon as the forward motion of the drill begins. The lifting of said arm
 120 80 is accomplished by the rock shaft 78 being equipped at its rear end with another arm 84 having at its outer end a long shoe 85 against which the end of slanting plate 86 rigidly projecting from the carriage 72 comes into camming
 125 engagement so as to raise the shoe 85 as soon as the said carriage starts on its forward movement. The raising of said shoe through arm 84 moves the rock shaft 78 so as to raise the correspondingly projecting arm 80 from the drill
 130 and holds it up from the drill until the carriage has completed its forward and also its backward movement. At the completion of the backward movement the plate 86 ceases to lift the shoe 85 and thereupon the actual testing
 135 movement by arm 80 takes place by the said arm falling towards the drill.

Dowel-inserting mechanism

The dowel-inserting mechanism consists of
 140 dowel-placing and dowel-driving mechanism and also preferably as this machine is organized, of dowel-forming mechanism. It is within the scope of this machine to use ready-made dowels which may then be placed in position and then
 145 driven into the heels by the mechanism herein described. Preferably, however, I form the machine so that it will automatically make metal dowels of the right length and of the proper
 150 formation by taking an indefinite length of wire

from a spool and shaping such wire to the desired shape and cross section and then cutting it into the proper lengths for dowels.

The driving mechanism consists of a strong arm 88 projecting from the right hand side of the sliding carriage 72 already mentioned and operatively connected to plunger 89 as by the end of said arm 88 straddling the rear end of said plunger between spaced nuts 90 and 91 on said plunger. The forward end of said plunger is slidingly mounted in casing 92 and carries at its forward end outside the casing a chuck 93 whereby the driver 94 is held in forwardly projecting position in alignment with the driving position and adapted to reciprocate at the proper time back and forth through a dowel-holding throat 95 in the dowel-holding wheel 96 and through the movable jaw 25 located at the driving position. The parts of the mechanism so far described are particularly shown in plan view in Fig. 2. The nuts 90 and 91 located upon the rear end of plunger 89 allow the machine to be set to give the right amount of effective travel according to the length of dowels being used and other conditions of an operation. It will be seen also that by the driver 94 and its operated plunger 89 being connected by arm 88 to the sliding carriage 72 which as already mentioned advances the drill 28, the performing of the dowel driving operation on a heel held at the dowel-inserting position will occur at the same time as a drilling operation occurs on a heel held at the drilling position of the machine and that the driver 94 will be retracted from the jaw 25 and its apertured boss 59 and from the dowel-holding wheel 96 before the heel holders are advanced by the next one-third rotation of the turret shaft.

The dowel-placing mechanism consists of the dowel-holding wheel 96 preferably formed as the machine is herein organized with the four longitudinally arranged dowel-holding throats 95 situated near the periphery of the wheel and ninety degrees apart. This wheel is mounted on the forward end of shaft 97 extending longitudinally of the machine and supported by suitable brackets and bearings upon the framework of the machine with the wheel 96 immediately to the rear of the circular path traveled by the outer ends of the jaws 25. The shaft 97 and the wheel 96 are so mounted and proportioned as to bring one throat of the wheel 96 into the center line of the dowel-inserting position and so in line with the aperture of the jaw 25 at the dowel-inserting position each time a heel is brought to the dowel-inserting position.

As this machine is organized, as it will be seen particularly from an inspection of Fig. 5, when one throat 95 of the wheel 96 is at the driving position the throat directly opposite thereto will be at the dowel-receiving position; that is it will be in line with the mechanism hereinafter described for forming the separate short dowels out of an indefinite length of wire. This dowel-forming mechanism is seen in top view in Fig. 2 and partly in side elevation and partly in longitudinal section in Fig. 3. Most of this dowel-forming mechanism is situated upon or located close to a movable frame 98. The body of this frame is roughly U-shaped with its legs 99 spaced widely apart and pivoted at their lower ends on pivots 100 provided upon the main frame while the upper end of the legs are connected by a relatively long horizontal member 101. Conveniently the said frame 98 may be formed of a suitable length of strong angle iron mitered at

the bends and with the upper surface of the horizontal web of the part of the angle iron forming the horizontal member 101 forming a platform upon which may be conveniently placed and fastened the different parts of the dowel-forming mechanism.

The movable frame 98 at the proper time moves on its fulcrum quickly a small fraction of an inch to cut the length of the wire fed into the throat at the receiving position from the remaining rearwardly extending wire as will be hereinafter described, but otherwise the frame 98 remains stationary and its said slight bodily movement does not interfere with the operation of shaping the wire into the proper form for a dowel.

Upon an open-topped rotatable rack 102 preferably having a vertical axis and with the rack conveniently supported as by a suitable standard upstanding from or adjacent the framework of the machine there is placed the coil 103 of wire 104 of proper size and character for forming the metal dowels 105. From this coil the wire 104 is intermittently drawn forward through the wire straightening device generally denoted by the numeral 106. This device is a well known commercial unit consisting of a frame having its two longitudinally extending halves 107 and 108 at right angles to each other and each carrying a plurality of closely arranged grooved wheels 109 engaging the wire and bringing it to a straight line. As this mechanism is here shown the grooved wheels 109 upon the first frame are arranged upon horizontal shafts and the wheels upon the second reached frame 108 are arranged upon vertical shafts.

The next mechanism reached by the wire is a mechanism especially devised by me to form four lengthwise grooves 110 spaced about the periphery of the wire as seen in cross section as will appear particularly in detailed view Fig. 11. The operation of the device is such as to throw up a burr or ridge 111 and 111 on the opposite sides of each groove 110. The purpose of these grooves and ridges is to give the dowels when finally formed by my machine an irregular or fluted shape as the dowel is seen in cross section that will prevent the parts of the heel from rotating upon the dowel in case a heel provided with one of my dowels should split. The fact that these flutings extend for the full length of the dowel does not interfere with the straight and regular driving of the dowel into the heel. The ridges 111 and 111 are large enough to press into the wood of the heel sufficiently to prevent the threatened rotation of the parts of a split heel, but the projection of these ridges is not sufficient to prevent the dowel from being driven into a round hole nor to subject the heel to undue strain through the driving of such dowel therein. This ridge-shaping mechanism is generally denoted by the numeral 113 and is shown in top plan view in Fig. 2 and in side elevation in Fig. 3. A more detailed view thereof is shown in Fig. 7. This unit consists of a central longitudinally extending square block 114. About the right hand quarter 115 of this block remains of the same size, but thereafter the remaining three-quarters of the block 114 forms an elongated pyramid-shaped member 116 as is particularly apparent from Fig. 7. The block 114 is provided with a round hole throughout its length for feeding of the wire there-through. On each of the four sides of the block 114 there is secured to the right hand end

a movable arm 117 extending to the left to a point somewhat beyond the end of the pyramid-shaped holder 116. The right hand end of each arm 117 is fastened to portion 115 of the block as by a strong headed screw 118 projecting loosely through a hole 119 in the arm 117 and with the end of the screw screw-threaded into the block 114. This arrangement holds the arms 117 from lengthwise movement relative to the block 114, but allows the arms a slight swinging movement relative to the central block 114 due to the loose fit of the arm 117 to the shank of screw 118.

The outer end of each arm 117 is centrally slotted and between the forked extremities thus provided there is rotatably mounted a cutting disk 120 having its periphery formed in the shape of a relatively sharp V. These cutting disks are similar to the cutting disks in a pipe-cutting tool, but operate upon the wire drawn longitudinally between the four cutters operating upon the wire to make the four grooves 110 and the eight ridges 111 and 111. The four arms 117 of this device are kept in proper relation to each other and the disks 120 in shaping relation to the wire by the said arms 117 being enclosed by a hollow square clamp 121 which encircles the four arms 117. Opposite each arm 117 there extends through the clamp 121 the shank of an adjusting bolt 122. The shank of said bolt is screw-threaded through the clamp but the inner end of the screw rotates in a plain or non-threaded hole 123 in the arm whereby rotation of the bolt 122 may adjust any arm inwardly relative to its portion of the clamp 121.

Next to the left after the ridge-forming mechanism just described and as the parts are seen in Figs. 2 and 3, the wire comes to the wire-drawing and wire-feeding mechanism being the device by which the wire is drawn from the rack 102 and then through the wire-straightening device and the ridge-forming device already described. This drawing mechanism consists of a traveling clamp reciprocating back and forth and clamping the wire on its forward or left hand stroke, but releasing itself from the wire on its backward or right hand stroke. This clamp is illustrated as having the lower jaw 124 with its upper face the working face and preferably provided with crosswise extending small ridges so as to assist in gripping the wire and also so as to form by the act of tightly gripping the wire a series of burrs 125 transversely of the wire. These burrs operate as barbs when the wire dowels are forced into the wooden heels and serve to prevent the dowels from coming out of the wood and thus operate to keep the parts of a heel together if a heel should split.

Opposite to the lower jaw 124 and above the wire 104 there is mounted a plurality of pivotally mounted wedging cams 126 which are pivoted on suitable horizontal pins 173 mounted in the upper traveling jaw 127. (Figs. 6, 7 and 12). These wedging cams 126 as shown in Fig. 7 are of increasing diameter towards the left and are held lightly and yieldingly in contact with the wire therebelow, partly by the gravity of the cams and directly by the use of a spring 128 operatively connected thereto. As the two jaws 124 and 127 advance or are moved forward to the left the wedging cams 126 swing in an obvious manner to quickly come into locking engagement with the wire and so hold it positively between said cams and the opposite jaw 124 and so effect a drawing of the wire to the left to the proper

extent needed. On the backward movement of the jaws the rotating cams 126 swing out of working engagement with the wire and so allow the jaws and cams to move backward without moving the wire backward. The wire-engaging surface of these cams are also provided with transverse ridges to form further burrs on the engaged side of the wire like the burrs 125 already mentioned and for the same purpose. The jaws 124 and 127 are mounted as a unit in suitable guideways for this reciprocating movement. These guideways are conveniently mounted upon the horizontal member 101 of the movable frame 98 and the jaws are so reciprocated by means of a pin 129 projecting rearwardly from one of said jaws being engaged between the forks 130 at the upper end of a lever 131. This lever 131 is pivoted intermediate its length on a stud bolt 132 suitably provided upon the movable frame 98 towards its left hand end with the lever in a generally upstanding position. The said lever is moved by reason of a roller 133 at its lower end being in engagement with the face of a cam wheel 134, the cam face being on the edge of a flange on said wheel facing towards the right as the machine is shown in Figs. 2, 3 and 7. The cam wheel 134 is rigidly mounted upon the shaft 135 extending longitudinally of the main frame and suitably mounted thereon in convenient bearings. On the basis of there being one cam upon the cam wheel 134 the said shaft 135 is rotated so as to produce one working or drawing action of the wire feeding jaws 124 and 127 each time a throat 95 in the dowel-holding wheel 96 is brought into position in line with the wire feeding mechanism.

Immediately after passing through the wire-feeding jaws just mentioned the wire passes into aperture 136 of the shearing jaw 137. This jaw is rigidly mounted directly or indirectly upon the upper part of the movable frame 98 as by being formed as a projection on the left hand end of the guideway members of the wire-drawing mechanism. Upon a forward movement of the wire-feeding mechanism the proper length of wire to form the required dowel is fed through the aperture of the shearing jaw 137 into the aligned throat 95 of the dowel-holding wheel 96, such throat being theretofore empty. After the length of wire has been so fed into the said empty throat 95 the whole movable frame 98 is given a quick movement on its pivots 100. This movement carries the upper part of the frame 98 and therewith the shearing jaw 137 laterally or substantially horizontally for only a fraction of an inch, that is a little more than the diameter of the wire being formed into dowels. This movement of the shearing jaw laterally while the end of the wire is in the relatively fixed or stationary loading throat operates to cut or shear the wire at the adjacent edges of said shearing jaw 137 and the throat 95 that is at loading position. It is to effect this shearing operation that the frame 98 carrying the wire-straightening mechanism, the wire-ridging mechanism and the wire-feeding mechanism is movably mounted. As the wire-drawing, the wire-ridging and the wire-straightening devices are all rigidly mounted in a line with the shearing jaw on top of the movable frame, the movement of said frame and its parts does not interfere with the co-operation of said parts or the operation of said parts upon the wire. The very slight movement of the said parts when the movable frame makes this lateral movement is not

enough to interfere with the periodical drawing of the wire from the rack 102.

The slight swinging movement of the frame 98 to give the shearing jaw its cutting action is produced at the right time and after the wire-feeding operation has been completed by a slight peripheral cam 138 on cam wheel 134 already mentioned as being mounted upon the shaft 135. This cam 138 engages a suitable roller as 139 upon the movable frame 98, said engaging roller 139 being so placed relative to the shaft 135 so as to cause an outward swinging of the movable frame on its pivots 100. As this particular machine is organized, the cam shaft 135 is to the left of the body of frame 98 as seen in Fig. 5 so that the engagement of the cam 138 with its co-operating roller 139 on the frame operates to quickly but only temporarily swing the said frame 98 and therewith the shearing jaw to the right. A spring 140 normally but yieldingly holds the said frame 98 in substantially vertical position at all times except when the cam 138 is engaging its roller 139.

The fact that the lever 131 is pivoted upon the movable frame 98 while the cam wheel 134 operating said lever is mounted upon a fixed axis, namely that of the shaft 135, does not interfere with the operation of the said lever leading to the wire-drawing mechanism for the reason that the wire-drawing operation takes place before the shearing operation and the parts are not dislocated or disarranged because the movement of the frame 98 is so slight and for so short a time. A contractile spring 140 conveniently attached at its opposite ends to the upper half of the said lever 131 and a convenient part of the main frame of the machine to the right of said lever as the parts are seen in Fig. 7 serves to retract the wire-feeding jaws 124 and 127.

As this machine is built as will appear from Fig. 6 the lever 131 for operating the wire-feeding jaws is mounted on the inside of the frame 98, that is to the left as the parts are seen in this figure, and this happens to bring said lever in vertical alignment with the shaft 135 carrying the cam which operates said lever. Accordingly the half of said lever 131 below its stud bolt 132 is provided with an offset 141 somewhat larger than and passing to the left of the said shaft 135. Below this offset the lever again resumes its line to carry at its lower end the cam roller 133 already mentioned. It will be understood that the said offset 141 allows the said lever 131 to be carried bodily laterally for the short travel of the movable frame 98 (without interference between said lever and said shaft) when the said frame carries the shearing jaw back and forth.

By referring particularly to Figs. 6, 7, 12 and 13 it will be seen that provision is made for positively disengaging the pivoted wire-engaging cams 126 at the end of the forward stroke or before the end of the forward stroke of wire feed lever 131 and that two methods are provided for independently or concurrently adjusting the machine to feed forward only the desired amount of wire required for a dowel of the desired length.

The means for positively disengaging the swinging cams 126 from the wire consists of a horizontally arranged rod 174 pivoted to each of the said cams above their fulcrum pins 173 and projecting to the left as seen particularly in Fig. 7 through a suitable channel left in the upper jaw 127. The left end of this connecting rod is adapted to come into engagement with a shoulder 175 on stud 176 adjustably mounted in the

guideway provided for said jaws and projecting into the passage opposite the end of the said connecting rod. This stud 176 is so set as to have its stop shoulder 175 engage the opposite end of said connecting rod 174 before the jaws have quite completed their travel to the left due to the swing of lever 131. It will be obvious from an inspection of Fig. 7 that when the left hand end of said connecting rod comes into engagement with said stop shoulder, the movement of said connecting rod will be stopped and further motion of the jaws will operate simply to swing the cams 126 clockwise on their fulcrum pins 173 and so release the grip of said cams upon the wire and consequently the grip of the lower jaw 134 upon the wire.

A positive and very convenient method of adjusting the machine to feed forward a different length of dowel is to loosen the screw-threaded fastening means for stud 176 and adjust said stud to the right through its slot for shortening the length of the dowel to be made or adjusting said dowel to the left for lengthening the dowel to be made. It will be obvious that when this stop shoulder of the stud 176 in combination with the connecting rod 174 is used to make a shorter dowel, the swinging cams will be disengaged from the wire and thereby the wire disengaged from both jaws before the jaws have completed their travel to the left, but that after the said cams have been released from the wire, the travel of the jaws will not be effective to feed any more wire forward. As this machine is organized the adjustment of the location of stud 176 is more adapted for making the final exact regulation of the length of the dowels than for effecting great changes in the length of the dowel.

For considerable changes in the length of the dowel the location of the stud bolt 132, which is the fulcrum for lever 131, is made adjustable both as regards its vertical position in the bracket 178 of the movable frame which carries said stud bolt and also as regards its position lengthwise of the lever 131.

The bracket 178 as seen particularly in Fig. 7 projects downwardly from the top 101 of the movable frame 98 and as seen in Fig. 13 has rearwardly extending flanges 179 on its opposite sides. Between these flanges is mounted the block 180 into which one end of the stud bolt 132 is screw-threaded and set. This block 180 can be readily adjusted vertically by loosening the cap screws 181 the shanks of which project through a slot or slots 182 in one of the flanges 179 whereupon the said block can be moved up or down to the required position and then said cap screws tightened to hold the block in proper position. At the same time the pivoting position of the shank of said stud bolt 132 is adjusted lengthwise of the lever by loosening the nut 183 at the rearward end of said stud bolt and then loosening the lock nut 184 engaging the rearward end of the bushing 185. The forward end of said bushing as shown in Fig. 13 has an annular flange which engages the forward edge of the lever 131 while the lock nut 184 engages the rearward edge of said lever. When the nut 184 is loosened the relative vertical movement may be had between the lever and the said bushing to make the desired adjustment of position, then the lock nut 184 is again tightened to hold the said bushing in longitudinal position upon the lever. It will be understood of course that the pivoting action takes place between the shank of the stud bolt

132 and the bore of said bushing. The nut 183 simply holds the lever in place upon the stud bolt. It will be understood of course that moving the pivoting point between lever 131 and the bracket 178 of the movable frame downwardly increases the relative travel of the working or upper end of shaft 131 and thereby increases the feed of the wire at each forward motion of the lever. On the other hand, adjusting the parts so as to raise the stud bolt shortens the feeding travel of the upper end of the lever and so adapts the machine to make shorter dowels.

A vertically supported guard 139 is provided at the front of the machine to protect the operator from moving parts but allow access to the heel holders at the loading position.

Driving and operating mechanism

It will be understood that the illustration in the drawings and the description now to be given of the means for driving the machine and for operating its different parts and mechanisms at the proper time and in proper co-ordination are given only for definiteness of description and for certainty in understanding the machine and as illustrative of the invention and are not given as limitations upon the invention. It is obvious that various changes particularly in these driving and operating parts may be made without departing from the spirit of my invention.

The already-mentioned main motor 68 of the machine is conveniently located upon the lower platform 21 of the main framework 20. Upon the projecting shaft of this motor there are two pulleys, one, namely 67, engaged by the belt already mentioned as going to the pulley 65 upon the drilling mechanism and the second pulley 142 which carries the belt 143 extending to the larger pulley 144 upon the countershaft 145 supported in suitable bearings upstanding from the said lower platform 21 of the frame.

Towards the rear end of the machine this countershaft 145 is provided with a small pulley 146 engaged by a belt 147 passing upwardly to a larger pulley 148 conveniently floatingly mounted upon shaft 76. Floating upon the same shaft and movable with the pulley 148 there is provided a small gear 150 in mesh with a larger gear 151 located thereabove and secured on a sleeve 152 floating upon the rearward end of the turret shaft 23. It will be seen that this system of pulleys and belts and train of gears will result in reducing the fast speed of the shaft of motor 68 to a much slower speed for the sleeve 152. Secured to this sleeve is a sprocket wheel 153 which is engaged by a chain 154 passing downwardly about toothed wheel 155 which in turn is secured to a sleeve 156 floatingly mounted upon the cam shaft 76.

The sleeve 156 on its side toward the front of the machine engages or forms a part of a continuously controlled clutch 157 carrying at its forward end the driving wheel 158 conveniently of the Geneva wheel type. Each of the two oppositely disposed rollers 159 of this drive wheel engages successively the slots 160 in the three-prong driven Geneva wheel 161 which is rigidly mounted above on the turret shaft 23. Assuming that the clutch 157 is in its normal engaged position it will be seen that the turret shaft 23 will be given a step-by-step rotation for one-third of a revolution and that after each such one-third rotation the turret shaft will be locked from further motion by the engagement of a convex

portion 162 of the driving Geneva wheel 158 with one of the concave faces 163 between the three prongs 164 of the driven wheel 161. There is thus produced the step-by-step rotation of the pairs of heel holders upon the turret and the holding of said heel holders for a pause after each movement of the heel holders during which pause the drilling mechanism and the dowel-inserting mechanism respectively and contemporaneously carry out their respective full operations automatically and a new heel is inserted manually at the loading position.

The clutch 157 normally has its parts in working engagement, but these parts can be quickly moved to disengage the clutch and so stop the movement of the turret shaft 23 and also the movement of cam shaft 76 (which is in line with and moved by the drive wheel 158) by means of a connecting link 165 extending down from said clutch to an arm rigidly projecting from a rock shaft 166 mounted at the bottom of the main frame of the machine and conveniently moved by a projecting pedal 167 at its forward end within reach of the foot of the operator of the machine located at the front of the machine. (See Fig. 1.)

It will be recalled that the cam shaft 76 carrying the cam wheel 75 with its two cams 74 for operating the carriage 72 which advances the drill and the dowel-driver is so geared relative to the turret shaft 23 as to make one and one-half rotations while the turret shaft is making one rotation so as to obtain a drilling operation and simultaneously a dowel-driving operation and allow a manual loading operation after each one-third rotation of the turret shaft and its three pairs of heel holders. At a convenient point upon this cam shaft 76 say immediately back of the middle upright of the machine, said shaft has secured thereto a sprocket wheel 168 which through chain 169 drives sprocket wheel not shown but fixedly mounted upon shaft 135 at twice the speed of shaft 76. This shaft 135 has already been mentioned as being located at the right hand side of the machine and carrying the cam wheel 134. At a convenient place upon the shaft 135 say just forward of the central uprights of the machine, the shaft 135 has fixed thereto the driving wheel 171 which is in operative engagement with the four-pronged driven wheel 170 of a Geneva wheel intermittent gearing device. Wheel 170 is fixedly mounted upon the shaft 97 already mentioned as having mounted thereon the dowel-carrying wheel 96 with its four spaced dowel-receiving throats. It will be seen from the foregoing that at each pause of the turret shaft and while a dowel is being driven from the throat 95 of wheel 96 in line with the driver and with a bored heel at the driving position a dowel will be formed in line with the diametrically opposite throat of the wheel 96 and placed in said throat opposite the dowel-forming mechanism. It will be seen further from an examination of Fig. 5 also that co-incident with the bringing of a succeeding pair of heel holders with its bored heel to the dowel-inserting position the throat 95 formerly ninety degrees away from the dowel-inserting line will be brought by a one-quarter rotation of the wheel 96 in line with the dowel-inserting position and ready to be forced by the driver into the said bored heel which has just arrived at driving position. During this said one-quarter rotation of the dowel-carrying wheel 96 the dowel just previously formed diagonally across from the

dowel-driving position will be moved one-quarter of a rotation or half way to driving position. In other words, the dowel-holding wheel 96 has four throats. When the said wheel is stationary, one throat is in line with the dowel driver. The diametrically opposite throat is in line with the dowel-forming mechanism on frame 98. A third and intermediate throat is at an idle position but carrying a dowel ready to be moved to the driving position and the fourth throat is at an idle position and empty but ready to be moved to receive a dowel when the wheel is moved ninety degrees so as to bring this fourth throat opposite the dowel-making mechanism. This four-throated form of the dowel-carrying wheel 96 is for convenience and efficiency in mechanical construction and operation of the machine and helps in the timing of the parts more easily and accurately and also helps in allowing the dowel-forming mechanisms to be farther away from the center line of the driver of the dowel-inserting mechanism.

The clutch 157 is normally held continually in engaged position by continued depression of said pedal 167 and release of the pedal disengages the clutch and through rod 183 automatically brings a brake band 186 into engagement with brake wheel 187 fixed on the rear end of cam shaft 76.

What I claim as new and desire to secure by Letters Patent is:

1. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, three heel-receiving seats rigidly mounted upon said shaft in spaced positions in a circle about said shaft, three similarly spaced jaws mounted upon said shaft severally opposite the seats and movable separately towards and from the opposite seat whereby an advanced jaw tightly holds a heel between said jaw and the opposite seat, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating with said movable jaws to advance each jaw to holding position before it comes to drilling position and hold it advanced until it leaves driving position and means for retracting said movable jaws when released from said advancing means.

2. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, three heel-receiving seats rigidly mounted upon said shaft in spaced positions in a circle about said shaft, three similarly spaced jaws mounted upon said shaft severally opposite the seats and movable separately towards and from the opposite seat whereby an advanced jaw tightly holds a heel between said jaw and the opposite seat, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, a cam ring mounted on the frame about said turret shaft and co-operating with said movable jaws to advance each jaw to holding position before it comes to drilling position and hold it advanced until it leaves driving position and means for retracting said movable jaws when released from said advancing means.

3. In a machine for doweling heels, the combination of a supporting frame, a turret shaft rev-

olubly mounted thereon, three heel-receiving seats rigidly mounted upon said shaft in spaced positions in a circle about said shaft, three similarly spaced jaws mounted upon said shaft severally opposite the seats and movable separately towards and from the opposite seat whereby an advanced jaw tightly holds a heel between said jaw and the opposite seat, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating with said movable jaws to advance each jaw to holding position before it comes to drilling position and hold it advanced until it leaves driving position, means for retracting said movable jaws when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position and means for advancing said drill into and withdrawing it from a heel held in the drilling position by a co-operating heel seat and jaw, dowel-inserting mechanism located on the frame opposite the driving position and means operative when a heel is held at driving position for causing said dowel-inserting mechanism to place a dowel opposite the previously drilled hole in the said heel and to drive said dowel into said hole.

4. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of heel-receiving seats rigidly mounted upon said shaft in spaced positions in a circle about said shaft, a like number of similarly spaced jaws mounted upon said shaft severally opposite the seats and movable separately towards and from the opposite seat whereby an advanced jaw tightly holds a heel between said jaw and the opposite seat, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating with said movable jaws to advance each jaw to holding position before it comes to drilling position and hold it advanced until it leaves driving position, means for retracting said movable jaws when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position and means for advancing said drill into and withdrawing it from a heel held in the drilling position by a co-operating heel seat and jaw, dowel-inserting mechanism located on the frame opposite the driving position and means operative when a heel is held at driving position for causing said dowel-inserting mechanism to place a dowel opposite the previously drilled hole in the said heel and to drive said dowel into said hole.

5. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-

- operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable member to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position and means for advancing said drill into and withdrawing it from a heel held in the drilling position by a co-operating heel seat and jaw, dowel-inserting mechanism located on the frame opposite the driving position and means operative when a heel is held at driving position for causing said dowel-inserting mechanism to place a dowel opposite the previously drilled hole in the said heel and to drive said dowel into said hole.
6. In a machine for doweling heels, the combination of a supporting frame, drilling mechanism located on the frame and including a rotated drill adapted to be advanced into and withdrawn from a heel held opposite thereto, dowel-inserting mechanism located on the frame and including means for placing a dowel opposite the previously-drilled hole in a heel held opposite and for driving said dowel into said hole, a plurality of bodily-movable pairs of heel-receiving seats and holding jaws, each jaw being movable relative to its seat to be advanced towards its seat to tightly hold a heel placed between said jaw and seat and to release said heel when the jaw is retracted, means to advance progressively by a step-by-step motion said pairs of heel-receiving seats and jaws successively to a position adjacent said drilling mechanism and then adjacent said dowel-inserting mechanism and then to a position where the jaw is retracted, the heel released and another heel may be inserted, means for advancing the said drill when a heel is held opposite thereto by a seat and a jaw, means for operating said dowel-inserting mechanism when a heel is held opposite thereto by a seat and a jaw.
7. In a machine for doweling heels, the combination of a supporting frame, drilling mechanism located on the frame and including a rotated drill adapted to be advanced into and withdrawn from a heel held opposite thereto, dowel-inserting mechanism located on the frame and including means for placing a dowel opposite the previously-drilled hole in a heel held opposite and for driving said dowel into said hole, a plurality of bodily-movable pairs of heel-receiving seats and holding jaws, each jaw being movable relative to its seat to be advanced towards its seat to tightly hold a heel placed between said jaw and seat and to release said heel when the jaw is retracted, means to advance progressively by a step-by-step motion said pairs of heel-receiving seats and jaws successively to a position adjacent said drilling mechanism and then adjacent said dowel-inserting mechanism and then to a position where the jaw is retracted, the heel released and another heel may be inserted, means for advancing the said drill when a heel is held opposite thereto by a seat and a jaw, means for testing the drill after each drilling operation and means for operating said dowel-inserting mechanism when a heel is held opposite thereto by a seat and a jaw.
8. In a machine for doweling heels, the combination of a supporting frame, drilling mechanism located on the frame and including a rotated drill adapted to be advanced into and withdrawn from a heel held opposite thereto, dowel-inserting mechanism located on the frame and including means for placing a dowel opposite the previously-drilled hole in a heel held opposite and for driving said dowel into said hole, a plurality of bodily-movable pairs of heel-receiving seats and holding jaws, each jaw being movable relative to its seat to be advanced towards its seat to tightly hold a heel placed between said jaw and seat and to release said heel when the jaw is retracted, means to advance progressively by a step-by-step motion said pairs of heel-receiving seats and jaws successively to a position adjacent said drilling mechanism and then adjacent said dowel-inserting mechanism and then to a position where the jaw is retracted, the heel released and another heel may be inserted, means for advancing the said drill when a heel is held opposite thereto by a seat and a jaw, means for testing the drill after each drilling operation and for giving a signal if the testing means finds a broken drill, and means for operating said dowel-inserting mechanism when a heel is held opposite thereto by a seat and a jaw.
9. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolvably mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable member to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position and means for advancing said drill into and withdrawing it from a heel held in the drilling position by a co-operating heel seat and jaw, means for testing the drill after each drilling operation and for giving a signal if the testing means finds a broken drill, dowel-inserting mechanism located on the frame opposite the driving position and means operative when a heel is held at driving position for causing said dowel-inserting mechanism to place a dowel opposite the previously drilled hole in the said heel and to drive said dowel into said hole.
10. In a machine for doweling heels, the combination of a supporting frame, drilling mechanism located on the frame and including a rotated drill adapted to be advanced into and withdrawn from a heel held opposite thereto, dowel-inserting mechanism located on the frame and including means for placing a dowel opposite

site the previously-drilled hole in a heel held opposite and for driving said dowel into said hole, a plurality of bodily-movable pairs of heel-receiving seats and holding jaws, each jaw being movable relative to its seat to be advanced towards its seat to tightly hold a heel placed between said jaw and seat and to release said heel when the jaw is retracted, means to advance progressively by a step-by-step motion said pairs of heel-receiving seats and jaws successively to a position adjacent said drilling mechanism and then adjacent said dowel-inserting mechanism and then to a position where the jaw is retracted, the heel released and another heel may be inserted, contemporaneously acting means for advancing the drill into a heel held opposite thereto and for advancing the dowel-driver to drive a dowel into a heel held opposite the driver and then for retracting said drill and said driver.

11. In a machine for doweling heels, the combination of a supporting frame, drilling mechanism located on the frame and including a rotated drill adapted to be advanced into and withdrawn from a heel held opposite thereto, dowel-inserting mechanism located on the frame and including means for placing a dowel opposite the previously-drilled hole in a heel held opposite and for driving said dowel into said hole, a plurality of bodily-movable pairs of heel-receiving seats and holding jaws, each jaw being movable relative to its seat to be advanced towards its seat to tightly hold a heel placed between said jaw and seat and to release said heel when the jaw is retracted, means to advance progressively by a step-by-step motion said pairs of heel-receiving seats and jaws successively to a position adjacent said drilling mechanism and then adjacent said dowel-inserting mechanism and then to a position where the jaw is retracted, the heel released and another heel may be inserted, contemporaneously acting means including a common movable carriage for advancing the drill into a heel held opposite thereto and for advancing the dowel-driver to drive a dowel into a heel held opposite the driver and then for retracting said drill and said driver.

12. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable member to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position, dowel-inserting mechanism located on the frame opposite the driving position and including dowel-placing means and a mov-

able dowel-driver and contemporaneously acting means for advancing the drill into a heel held opposite thereto and for advancing the dowel-driver to drive a dowel into a heel held opposite the driver and then for retracting said drill and said driver.

13. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable member to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position, dowel-inserting mechanism located on the frame opposite the driving position and including dowel-placing means and a movable dowel-driver and contemporaneously acting means including a common movable carriage for advancing the drill into a heel held opposite thereto and for advancing the dowel-driver to drive a dowel into a heel held opposite the driver and then for retracting said drill and said driver.

14. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable member to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position and means for advancing said drill into and withdrawing it from a heel held in the drilling position by a co-operating heel seat and jaw, dowel-inserting mechanism located on the frame opposite the driving position, means operative when a heel is held at driving position for causing said dowel-inserting mechanism to place a dowel opposite

the previously drilled hole in the said heel and to drive said dowel into said hole, means for advancing a length of wire, mechanism for cutting it into dowel-lengths and means for moving said
5 dowels separately and successively into position in front of the retracted driver.

15. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted
10 upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one
15 set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby
20 each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately
25 ly with the movable member of each pair of heel holders to advance said movable member to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable
30 holders when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position and means for advancing said drill into and withdrawing it from a heel held in the drilling
35 position by a co-operating heel seat and jaw, dowel-inserting mechanism located on the frame opposite the driving position, means operative when a heel is held at driving position for causing said dowel-inserting mechanism to place a
40 dowel opposite the previously drilled hole in the said heel and to drive said dowel into said hole, means for advancing a length of wire, means for forming longitudinally extending ridges upon said wire, mechanism for cutting it into dowel-lengths
45 and means for moving said dowels separately and successively into position in front of the retracted driver.

16. In a machine for dowelling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted
50 upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one
55 set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby
60 each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable
65 member to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said
70 advancing means, drilling mechanism located on the frame and having a drill in line with the drilling position and means for advancing said
75 drill into and withdrawing it from a heel held

in the drilling position by a co-operating heel seat and jaw, dowel-inserting mechanism located on the frame opposite the driving position, means operative when a heel is held at driving
80 position for causing said dowel-inserting mechanism to place a dowel opposite the previously drilled hole in the said heel and to drive said dowel into said hole, means for advancing a length of wire, means for forming longitudinally extending ridges and laterally extending burrs
85 upon said wire, mechanism for cutting it into dowel-lengths and means for moving said dowels separately and successively into position in front of the retracted driver.

17. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted
90 upon said shaft in spaced positions in a circle about said shaft, each pair of heel-holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one
95 set of said members being separately movable towards the other member of the pair whereby a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby
100 each pair of seats and jaws will be successively moved to and stopped at loading position, at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable member
105 to holding position before its pair comes to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said advancing means, drilling mechanism located on the frame and having a drill in line with the drill-
110 ing position, means for advancing said drill into and withdrawing it from a heel held in the drilling position by a co-operating heel seat and jaw, a dowel driver located on the frame opposite the driving position, a wheel having a plurality of
115 spaced dowel-holding throats extending there-through, means for moving said wheel to bring the dowel-holding throats successively into line with the driving position and between the retracted driver and a heel held at driving position,
120 means to operate said dowel driver when a heel is held at driving position and means to successively insert a dowel into each of said throats when it is away from dowel-driving position.

18. In a machine for doweling heels, the combination of a supporting frame, a turret shaft revolubly mounted thereon, a plurality of bodily-movable pairs of heel-holding members mounted
125 upon said shaft in spaced positions in a circle about said shaft, each pair of heel holding members consisting of a heel-receiving seat and a holding jaw opposite thereto, the units of one set of said members being separately movable towards the other member of the pair whereby
130 a heel between the members of a pair so relatively contracted will be tightly held, means co-operatively connected to said turret shaft to progressively rotate it by a step-by-step motion whereby each pair of seats and jaws will be successively moved to and stopped at loading position,
135 at drilling position and at driving position, means mounted on the frame and co-operating separately with the movable member of each pair of heel holders to advance said movable member to holding position before its pair comes
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to drilling position and to hold it advanced until its pair leaves driving position, means for retracting said movable holders when released from said advancing means, drilling mechanism
 5 located on the frame and having a drill in line with the drilling position, means for advancing said drill into and withdrawing it from a heel held in the drilling position by a co-operating heel seat and jaw, a dowel driver located on the
 10 frame opposite the driving position, a wheel having a plurality of spaced dowel-holding throats extending therethrough, means for moving said wheel to bring the dowel-holding throats suc-
 15 cessively into line with the driving position and between the retracted driver and a heel held at driving position, means to operate said dowel driver when a heel is held at driving position,
 20 means to draw wire from a coil of wire, means to straighten it, means to form longitudinal ridges upon said wire and to cut it into dowel-lengths and to successively insert one of said dowels into
 25 each of the throats of the dowel-holding wheel when the throat is away from driving position and means to successively insert a dowel into each of said throats when it is away from dowel-driving position.

19. In a heel doweling machine, the combination of a reciprocating dowel driver, heel-holders adapted to hold a bored heel opposite said driver,

a dowel holding wheel having a plurality of throats adapted to be successively interposed between the dowel driver and successive heels held before the dowel driver, means to draw wire from a coil of wire, means to straighten the wire,
 80 means to form longitudinal ridges upon the wire and means to successively insert a dowel length of the end of said wire into each throat of the dowel holding wheel when away from driving position and means to sever the dowel length of
 85 wire in such throat from the remaining wire.

20. In a heel doweling machine, the combination of a reciprocating dowel driver, heel-holders adapted to hold a bored heel opposite said driver, a dowel holding wheel having a plurality of
 90 throats adapted to be successively interposed between the dowel driver and successive heels held before the dowel driver, means to draw wire from a coil of wire, means to straighten the wire,
 95 means to form longitudinal ridges upon the wire and means to successively insert a dowel length of the end of said wire into each throat of the dowel holding wheel when away from driving position and means to sever the dowel length of
 100 wire in such throat from the remaining wire and adjustable means for regulating the length of the dowels made by the machine.

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