No. 617,756. Patented Jan. 17, 1899.

J. A. MEEKS.

WOOD BENDING MACHINE.

(Application filed Apr. 5, 1897.)

(No Model.) 4 Sheets—Sheet 1.

Fig. I.

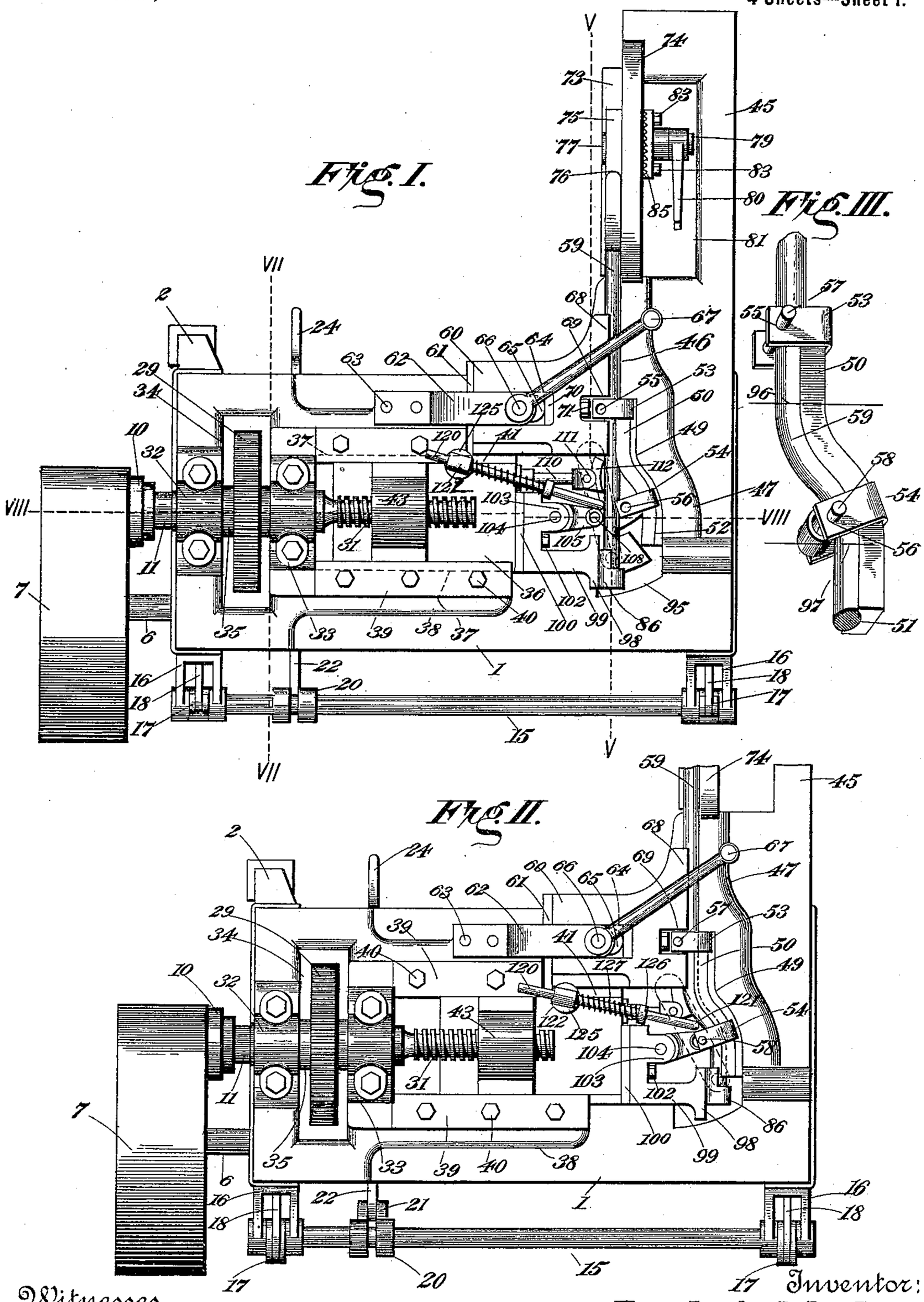

Fig. III.

Fig. II.

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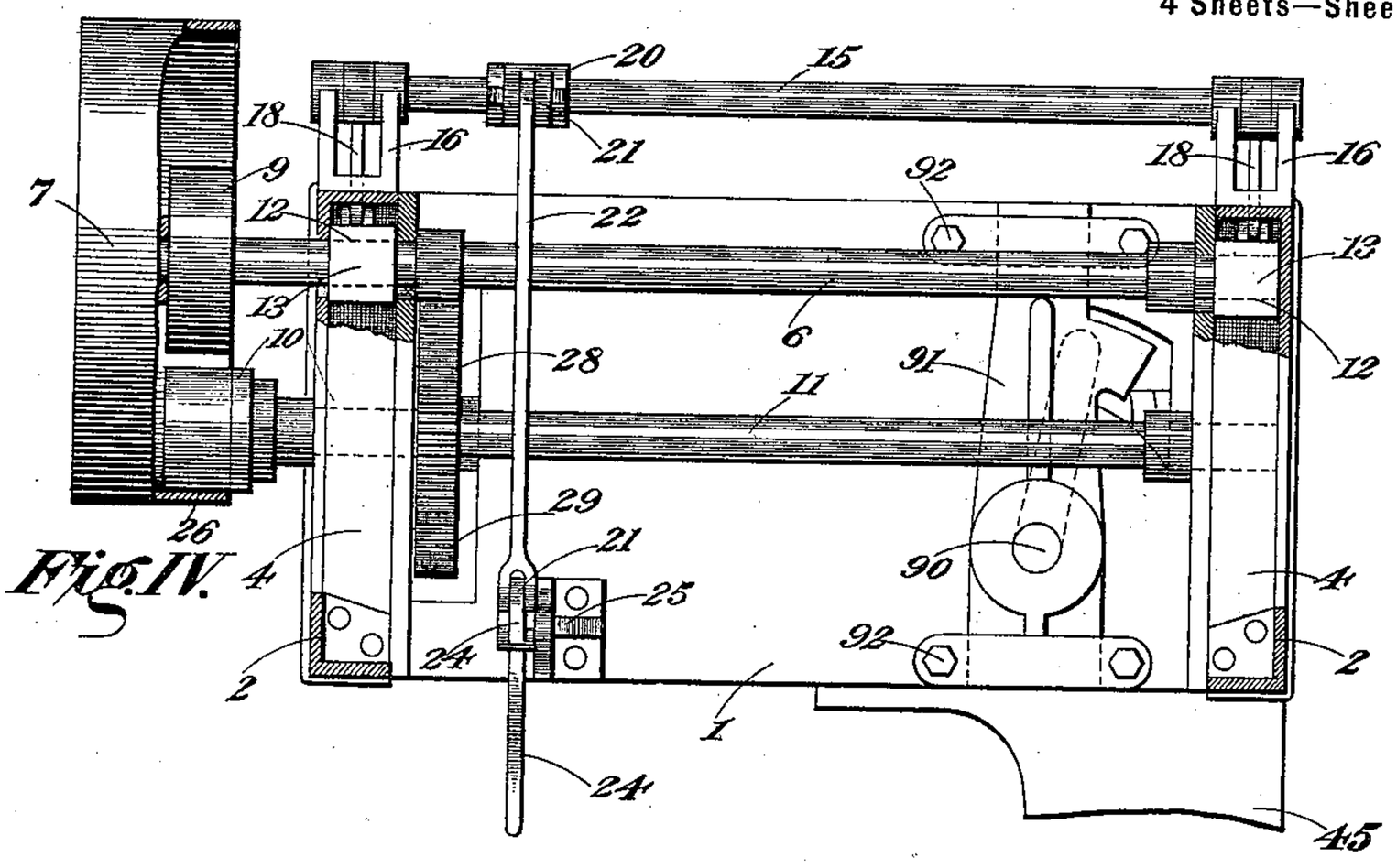


Fig. IV.

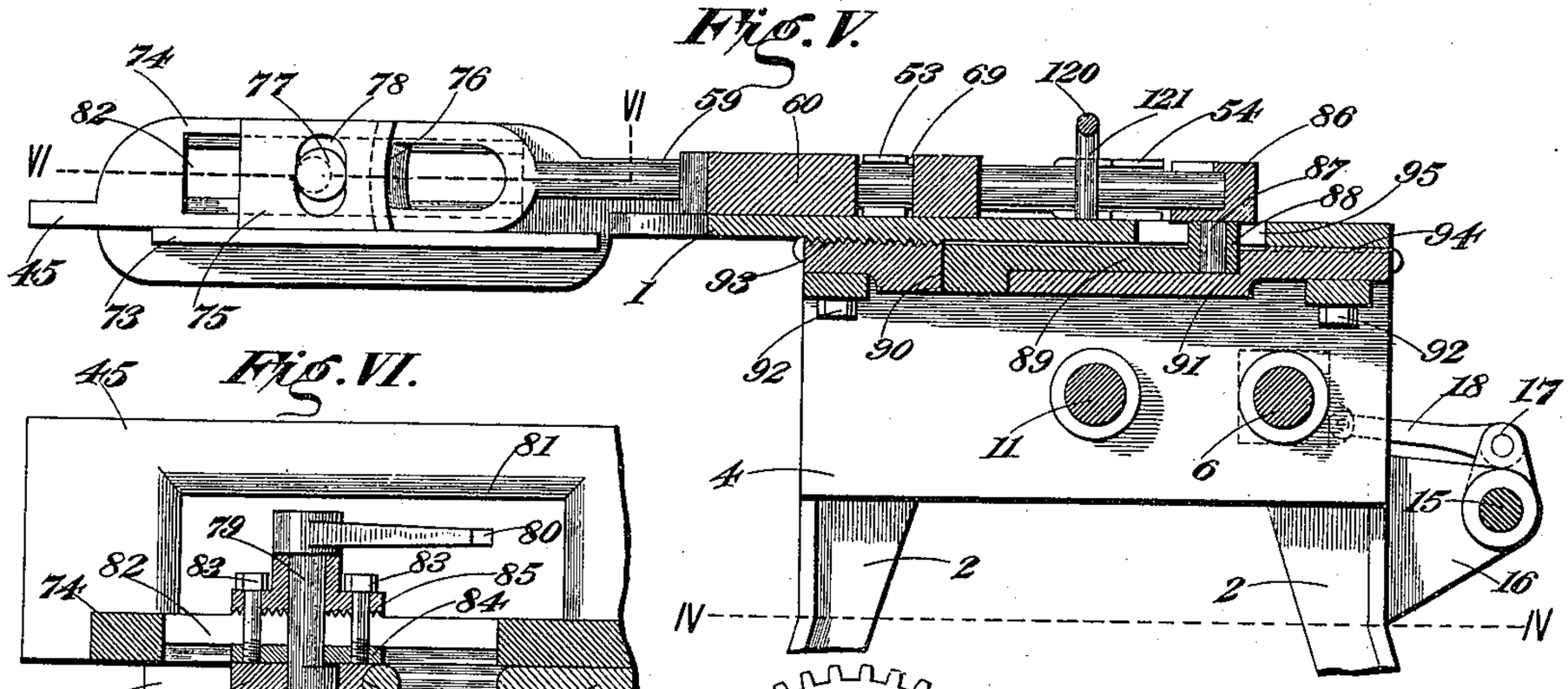
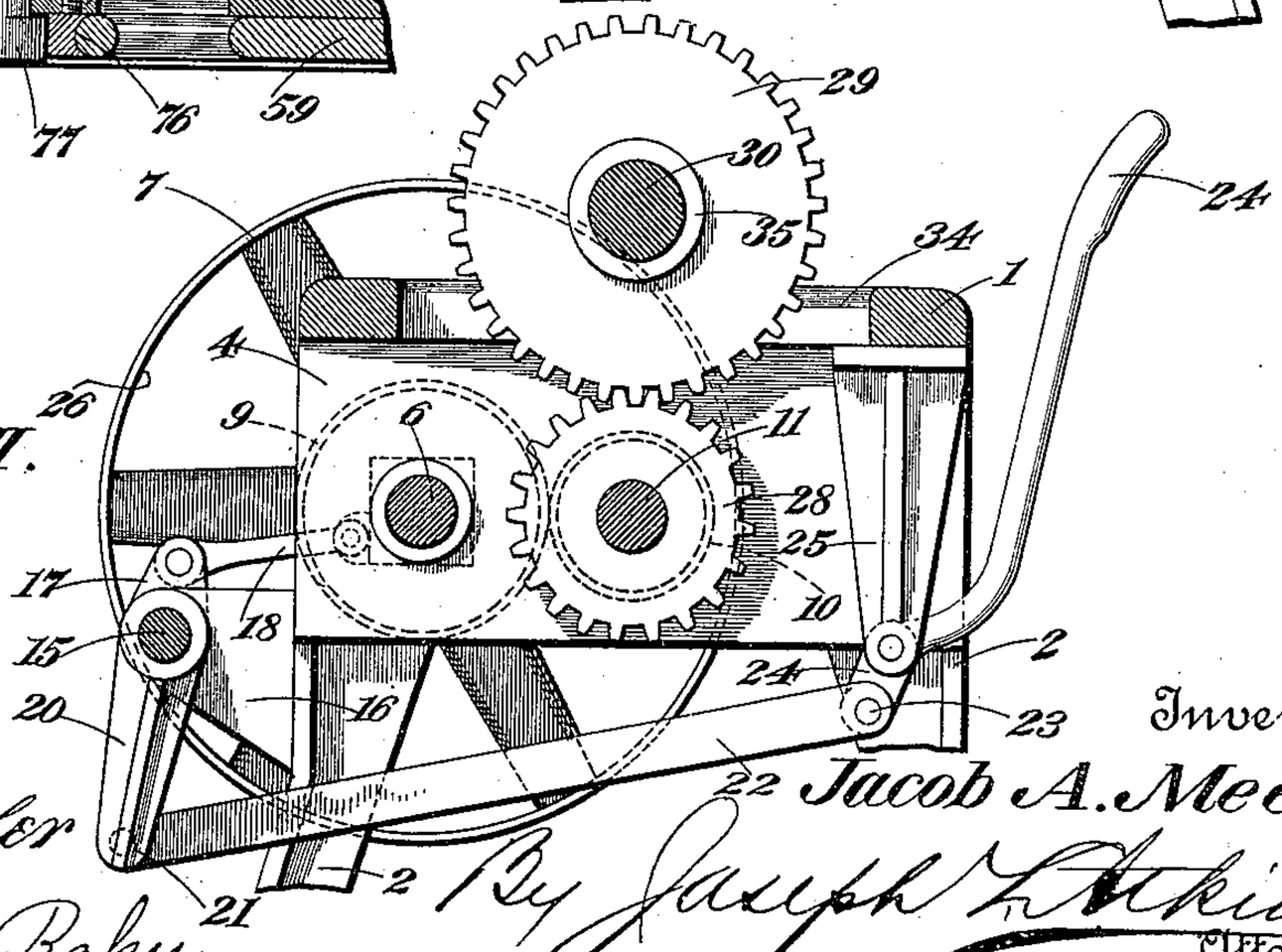


Fig. V.

Fig. VI.

Fig. VII.



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(No Model.) 4 Sheets—Sheet 3.

Fig. VIII.

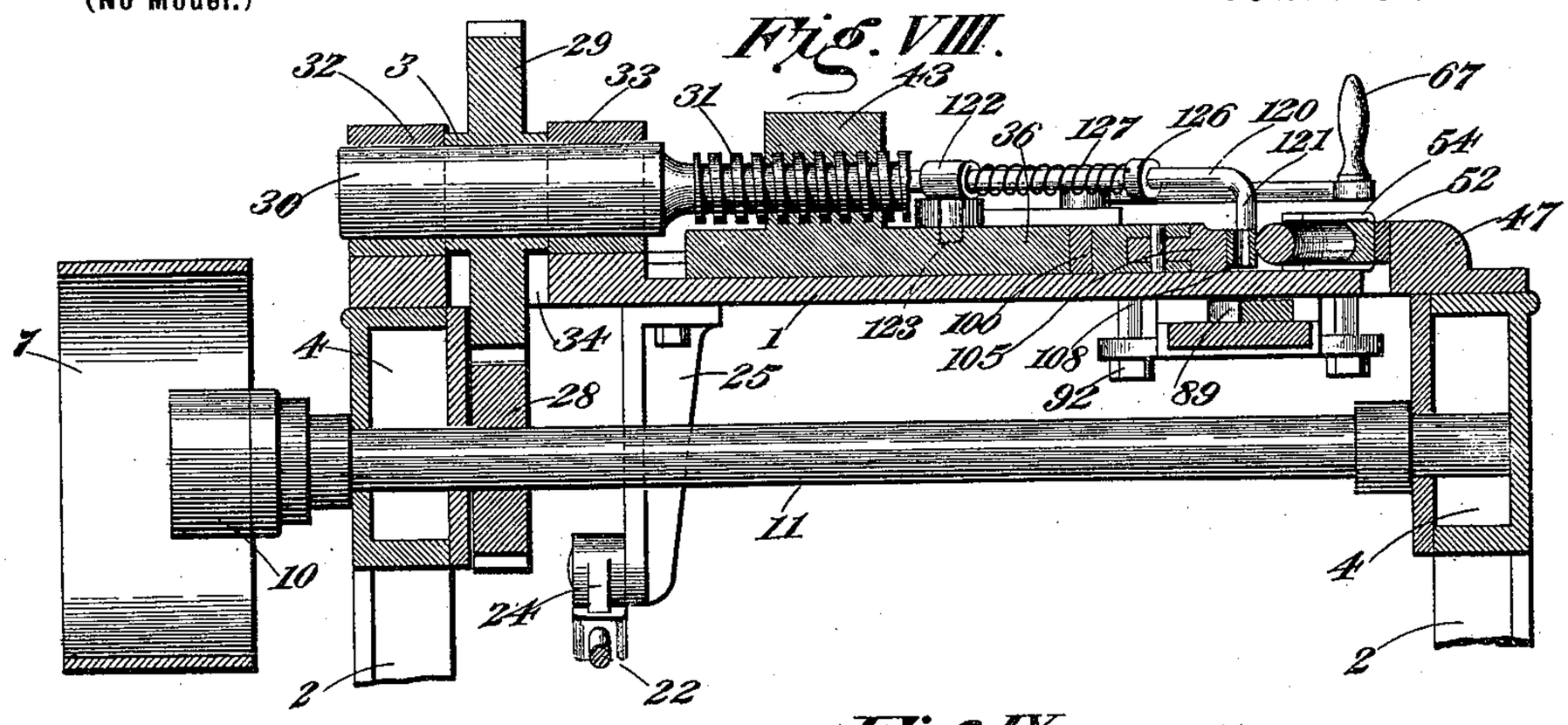


Fig. IX.

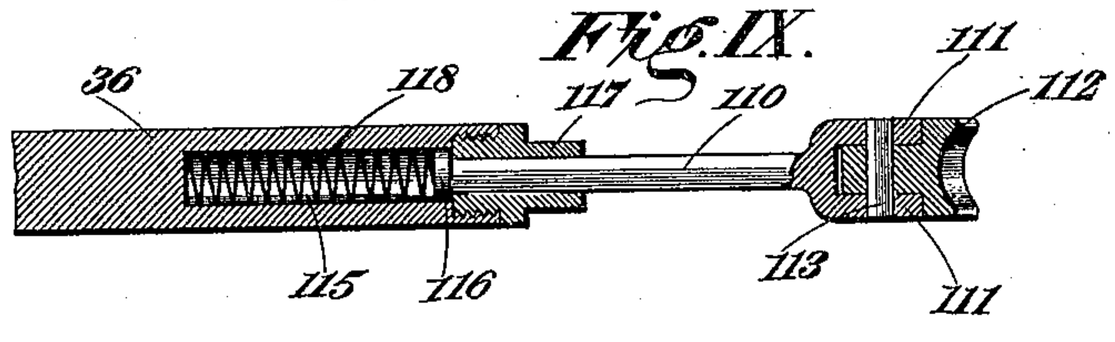


Fig. X.

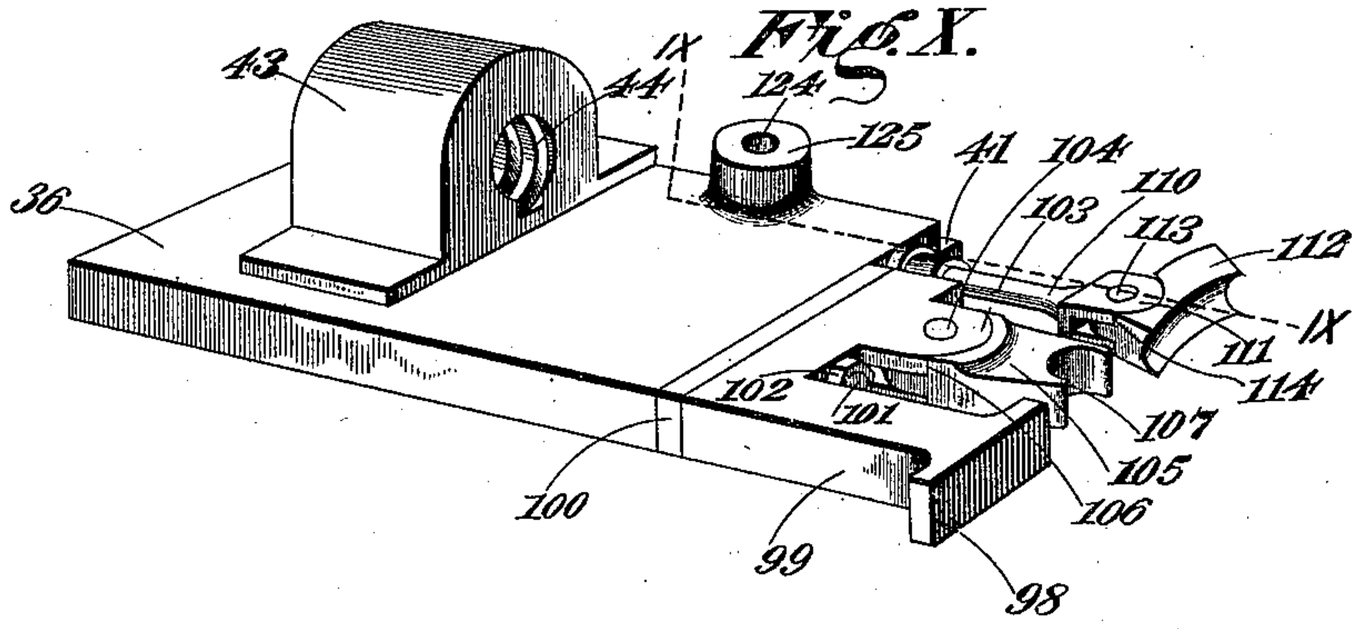
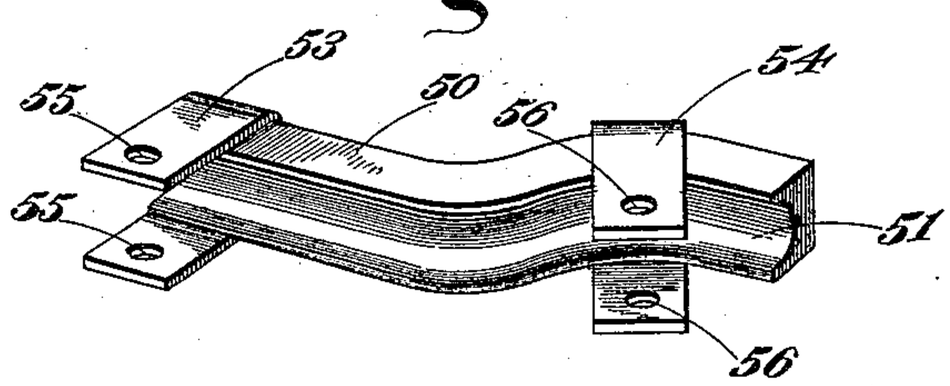


Fig. XI.



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(Application filed Apr. 5, 1897.)

(No Model.) 4 Sheets—Sheet 4.

Fig. XII.

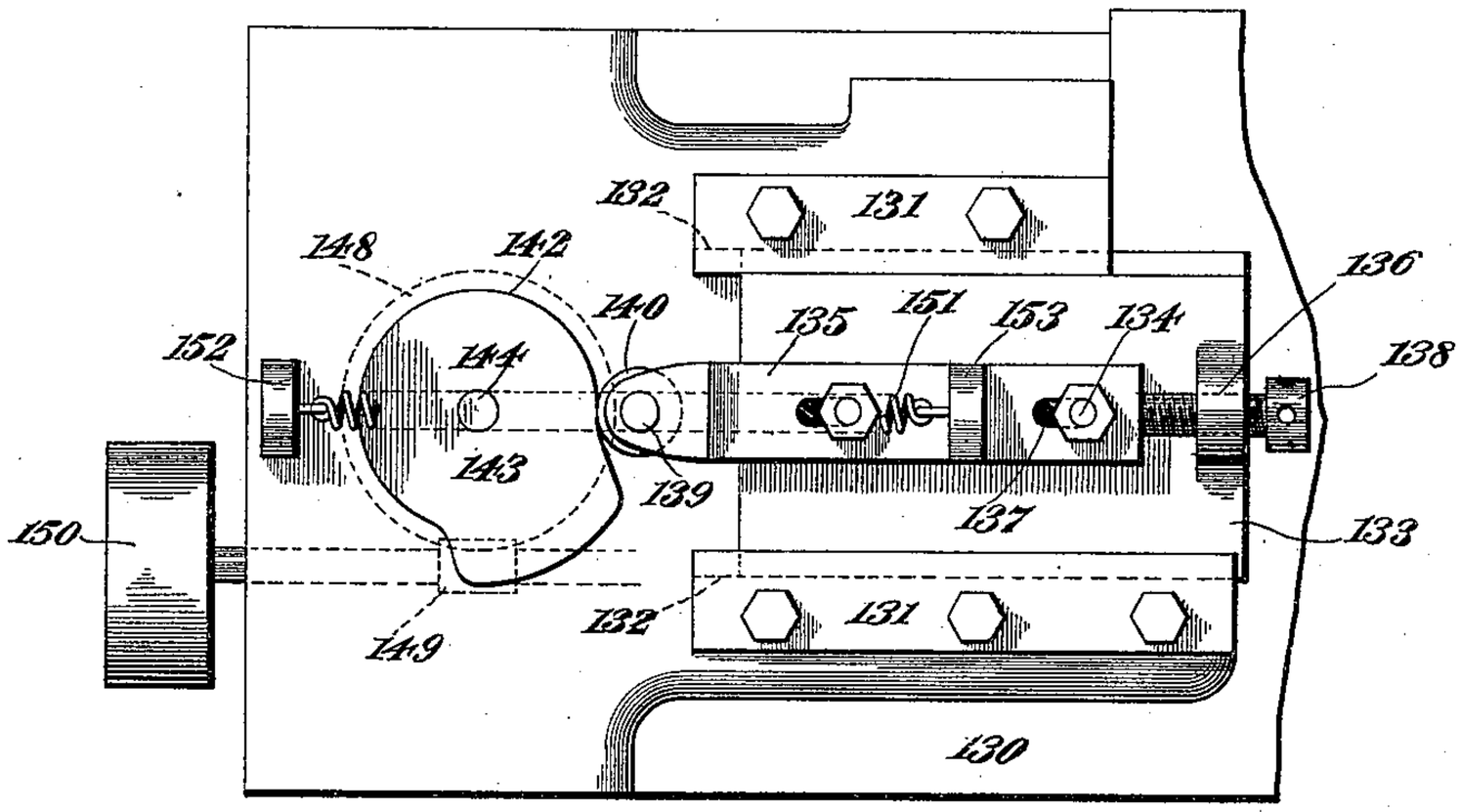
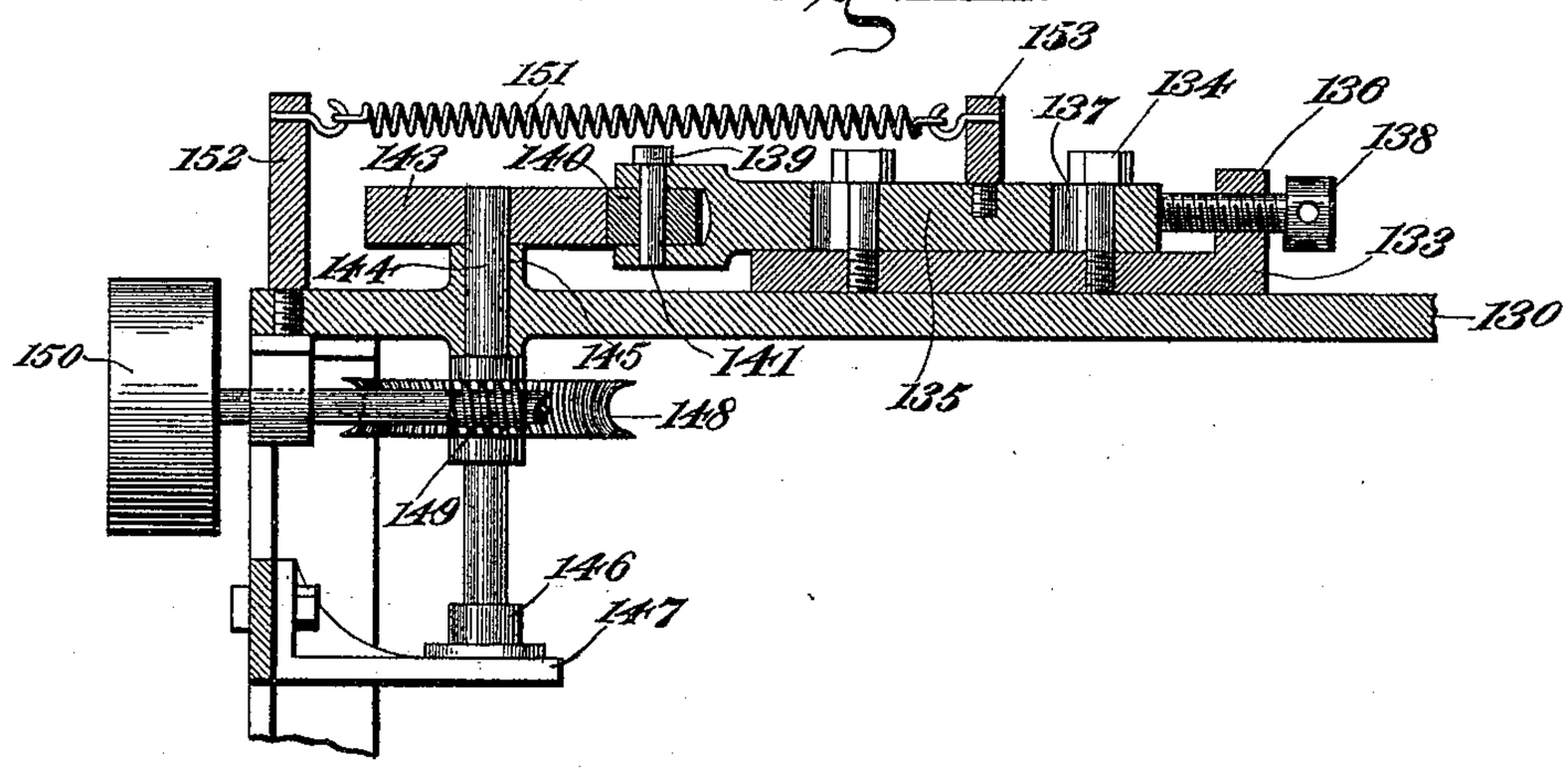


Fig. XIII.



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UNITED STATES PATENT OFFICE.

JACOB ARTHUR MEEKS, OF MUNCIE, INDIANA.

WOOD-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 617,756, dated January 17, 1899.

Application filed April 5, 1897. Serial No. 630,884. (No model.)

To all whom it may concern:

Be it known that I, JACOB ARTHUR MEEKS, of Muncie, in the county of Delaware, State of Indiana, have invented certain new and useful Improvements in Wood-Bending Machines, of which the following is a complete specification, reference being had to the accompanying drawings.

The object of my invention is to produce an improved type of machine for bending articles, particularly wooden articles—such as shovel, fork, and spade handles—into required shape.

In the accompanying drawings, Figure I is a top plan view of my complete machine, showing a handle in place to be bent and the location of the parts preparatory to the bending operation. Fig. II is a similar view of a portion of the machine, showing the position of its parts when the bending operation is complete. Fig. III is a perspective view of one of my forms with handle attached thereto. Fig. IV is a section on the line IV IV of Fig. V. Fig. V is a section on the line V V of Fig. I. Fig. VI is a section on the line VI VI of Fig. V. Fig. VII is a section on the line VII VII of Fig. I looking toward the driving-pulley. Fig. VIII is a section on the line VIII VIII of Fig. I. Fig. IX is a section on the line IX IX of Fig. X. Fig. X is a perspective view of the sliding frame with its compression members detached. Fig. XI is a view corresponding to Fig. III, showing the form with the handle removed. Fig. XII is a plan view of a portion of my machine, showing a preferred form of embodiment of compression-member-driving mechanism. Fig. XIII is a vertical section of the same, partly in elevation.

Referring to the figures on the drawings, 1 indicates a frame consisting, essentially, of a table or bed-plate provided, for example, with legs 2, illustrated as an example of suitable means of support. The legs are shown secured to cross frame-pieces 4, bolted or otherwise secured to the under side of the table or frame. (Compare Figs. IV, V, and VIII.)

Within suitable bearings in the frame-pieces 4 is revolubly-mounted a shaft 6 of the machine, that is provided at one end with a fixed pulley 7, illustrated as an example of the means of imparting rotation to the shaft.

Between the hub on the pulley 7 and the frame-piece 4 upon the shaft 6, and it may be integral with the pulley 7, I provide a fixed friction-pulley 9, that is adapted to make frictional contact with a friction-pinion 10, fixed upon a main shaft 11, in order to communicate at required intervals motion from the shaft 6 to the shaft 11.

As a means of affording transverse adjustment to the shaft 6 I provide for it suitable bearings 12, carried in boxes 13, that are movable in ways provided for them in the frame-pieces 4, respectively. A rock-shaft 15, mounted in suitable bifurcated brackets 16, secured to the frame—for example, the pieces 4 at their opposite ends—is connected, as by means of cranks 17 and links 18, to the boxes 13, respectively. The cranks 17 are preferably secured to the shaft near its opposite extremities between the sides of the respective brackets 16, and each is provided with a link 18, which is movably secured at its opposite extremities to its crank 17 and its respective box 13.

By the arrangement of the mechanism above described the rock-shaft 15 is adapted to impart equal and synchronous movements to the boxes 13, thereby securing complete contact between the entire faces of the friction-pulleys 9 and 10. For imparting motion to the shaft 15 an intermediate crank 20 may be employed, which, being fixed to the shaft 15, is loosely secured, as indicated at 21, to a link 22, that is loosely secured, as indicated at 23, to the short arm of a lever 24, movably secured to the frame 1, as by means of a pendent bracket-support 25, bolted to the under side thereof. The pulley 7 is provided with an interior frictional contact-surface 26, against which the pinion 10 may be forced by movement, as in the above-specified manner, of the shaft 6.

By means of the friction-pulley 9, the interior friction-surface 26 of the pulley 7, and the intermediate friction-pinion 10 constant motion of the shaft 6 may be utilized to drive the shaft 11 alternately in opposite directions as required. The shaft 11, as clearly shown in Fig. VIII, for example, carries a fixed gear 28, that meshes with a gear 29, fixed to the smooth or cylindrical end 30 of a power-screw 31. The cylindrical end 30 of the screw

to which the gear 29 is secured works in suitable boxes 32 and 33, located, respectively, upon opposite sides of an oblong aperture 34 in the frame 1, (compare Figs. I and II,) the endwise movement of the screw being prevented, as by the hub 35 of the gear 29, fitting snugly between the boxes.

The screw and the parts which confine it in place should be constructed of sufficient weight of metal to adapt them to the performance of the work required of them.

The power-screw 31 is designed to impart reciprocal movement to a compression or sliding frame or member 36 and is a preferred example of means for that purpose. The frame 36 is mounted in suitable guideways 37, defined as by ribs 38, that may be secured to or made integral with the frame and whose upper overlapping walls are defined by plates 39, secured, as by bolts 40, to the frame 1. One edge of the frame 36 is chamfered or rabbeted, as indicated at 41, so as to bring the top of one of the plates 39 flush with or below the top of the frame 36. This is done in order to accommodate other working parts of the machine, but is a mere detail of construction, all of which are susceptible of variation at the will of the manufacturer or designer and which are therefore comprehended within the scope of my invention.

The compression frame or member 36 is provided upon its upper side with a heavy lug or housing 43, provided with an internally-screw-threaded bore 44, adapted to receive a screw which, being fixed against endwise movement, causes, through its rotation, the frame 36 to travel in one direction or the other in accordance with the direction of movement of the screw.

The frame 36 affords a means of compressing an article to be formed by my machine and is provided upon its forward end with suitable compression members. In order, however, that their several offices may be more readily apprehended, I shall, before describing them in detail, proceed first to describe the means by which the article to be formed by compression is presented to the compression members. Accordingly, referring in the first instance to Fig. I of the drawings, 45 indicates a frame extension whose front face 46 in the machine illustrated is in a plane at right angles to the axis of the screw 31. The extremity of the face 46, adjacent to and within the frame 1, is sustained or reinforced by a wall or rib 47, that is cast with or secured to the face of the frame or table 1. This rib is recessed to constitute a form-socket 49 of a shape to correspond with the contour of the removable form 50. (See Figs. III and XI.) The form 50 in a mechanical embodiment of my invention is susceptible of great variety of changes of coutour, an appropriate form being required for each article to be shaped by my machine. The form illustrated in the drawings is a shovel-handle form, or one whose grooved body 51 is adapted to impart to a shovel-handle the required curvature. A form adapted to shape a spade-handle would vary somewhat in shape, likewise a form adapted to shape a fork-handle, and so on throughout an indefinite number of articles to the manufacture of which my machine may be adapted. In order to adapt the same socket 49 for a variety of forms 50, I provide an intermediate spacing-block 52, that, being fitted on one side to the socket, is fitted on the other to the particular form 50 which it is to support. Each of the forms is provided with two or more retaining devices or stirrups 53 and 54, that are provided, respectively, with opposite pairs of apertures 55 and 56, that are adapted to receive tapered retaining-pins 57 and 58, respectively, adapted to hold the article represented by the handle 59 after it is compressed.

60 indicates a lateral retaining-vise of any suitable shape, that shown in the drawings being a sliding member working in suitable ways 61 and movably secured to the table, as by an overlapping plate 62, bolted or otherwise secured, as indicated at 63, to the face of the table. The vise 60 is provided with a longitudinal slot or recess 64, within and against the end of which works a cam 65, carried upon a shaft 66 and actuated by a crank-handle 67. By the rotatory movement of the shaft 66 the cam may be employed to actuate the vise in both directions. The vise 60 is preferably provided with an elongated grooved clamping-foot 68, the groove of which is adapted to receive a handle, represented by the handle 59, and by pressure to confine it against the face 46 of the frame extension 45. The forward end of the vise 60 is provided with an aperture 69 of suitable dimensions to receive the stirrup 53 when the vise is advanced toward the face 46. A renewable bearing-plate 70 in the forward end of the recess 64 may be provided and secured in place, as by a bolt 71, the head of which is contained within the aperture 69.

An important feature of my invention consists in providing mechanism for subjecting the article to be bent to end pressure and for maintaining the same uniformly upon the article during the entire operation of the machine. In its present preferred form of embodiment such mechanism consists of a terminal vise carried upon the frame extension 45 and adapted to urge the handle toward a movable handle socket or cup, in which the flexible end of the handle is held during the bending operation. The terminal vise includes, preferably, as clearly illustrated in Figs. I, V, and VI, a supporting-flange 73, that extends in a plane parallel with the plane of the table and its extension 45 from the face of a flange 74, disposed at right angles to the extension 45, of which it forms a part. Upon the flange 73 rests a clamping member 75, that is adapted to engage the end of the article to be bent and in the form illustrated be-

ing adapted to clamp a D shovel-handle, is provided at its forward end with a grooved curved face 76, that fits over the D end of the handle 59. The clamping member 75, being held against rotation by the flange 73, is adjustable to and from the handle, as by an eccentric 77, working in a transverse slot 78 in the clamping member 75. The eccentric 77 is carried on a shaft 79, working in suitable bearings secured to the frame extensions 45 and adapted to be operated by a crank 80, an aperture 81 being provided in the frame extension 45 to accommodate its movement.

The bearings which support the shaft 79 are preferably adjustable upon the frame extension 45, in order that the position of the clamping member 75 may be shifted to accommodate different lengths of handles. For this purpose I provide in the upper part of the flange 74 an elongated slot 82, through which are passed bolts 83 for securing to the opposite sides of the flange bearing-plates 84 and 85, the latter being illustrated as having an internally-roughened surface for holding it in place against the surface of the flange 74.

It being the object of the cup 86 to support the flexible end of the handle with uniform resistance against the end thrust imparted to it by the terminal vise throughout the bending operation, it is requisite that the cup should travel in a predetermined direction in fixed relations to the end of the handle in its movement from the position which it occupies when straight, as shown in Fig. I, to that which it occupies when completely bent, as shown in Fig. II. I accomplish this object by providing the cup with a pivot-stud 87, that is mounted in a sleeve 88, carried upon the free end of a swinging arm 89, pivotally confined, as indicated at 90, against the bottom of the table 1, as by a plate 91, secured to the bottom of the table, as by straps and bolts 92. Oppositely-disposed roughened surfaces 93 and 94 are provided between the opposite ends of the plate and the bottom of the table for holding the plate 91 rigidly against the bottom of the table 1. The sleeve 88 projects through an aperture 95 in the table 91, so that it may swing freely between the two positions illustrated in Figs. I and II, respectively. The cup 86 is formed to receive and hold the end of a handle, (represented by the handle 59.)

It is desirable that the end pressure exerted upon the end of a handle during the operation of bending it should increase in proportion to the bending strain—in other words, that the pressure exerted by the cup 86, which is representative of a suitable retaining element adapted to hold the end of a blank during the bending operation, should be, when the blank is in the position shown in Fig. II after the bending operation, equal to or greater than it is when in the initial or starting position. (Shown in Fig. I.) As may be apprehended upon comparison of Figs. I and II, my machine is adapted for the purpose through the employment of and disposition of the arm 89, which carries the cup 86. The movement of the end of the blank confined within the cup 86 may be described by an arc struck from a point within the plane 96 as a center. (See Fig. III.) The movement of the cup 86 may be described by an arc struck from an axis of the pivot 90 as a center. The location of the axis of the pivot 90 to one side of the point previously referred to imposes the condition that the arc of movement of the cup 86 shall cross that of the movement of the end of the blank contained within the cup. For this reason and by the employment of the means described the required end pressure upon the blank during the bending operation is maintainable. By so mounting the cup that it can turn relative to the part which carries it it is possible to maintain the cup parallel with a line drawn through the main portion of the handle-blank 59 throughout all of the bending movements.

Having completed the description of the means by which the article to be formed by compression is presented to the compression members, it is now in order to describe the means employed for compressing the article.

The frame 36 affords, under the impulse of the power-screw 31, means of compression and is for that purpose provided with suitable compression members.

The handle 59 (see Fig. III) between the sectional planes indicated by the construction-lines 96 and 97 is bent in the form of a compound curve. The cup 86 envelops the end of the handle upon one side and preferably extends to or nearly to the transverse plane 97. The edge of the vise 60 toward the cup 86 is substantially in alinement with the plane 96. The portion of the handle, therefore, between the cup 86 and the above-mentioned edge of the vise 60 is the portion of the handle that is subject during the bending operation of the machine to strain. It is on that account that I prefer to employ as compression-pieces a series of movable elements adapted individually to act against the several sections of the curved portions of the handle and collectively to prevent splitting or checking of the wood at any part during the bending operation of the machine. The preferred embodiment of compression-pieces answering to this description is illustrated. As illustrated, the compression-pieces include a presser-foot 98, (see particularly Fig. X,) that is carried upon a leg 99, projecting at right angles from a base-plate 100, that is secured to the forward edge of the compression-frame 36, as by a bolt 101 and nut 102. The frame 36, driven by the power-screw 31, advances the presser-foot 98, which, impinging against the cup 86, imparts a predetermined movement to the cup 86 and swinging arm 89 and to the end of the handle 59, carried within the cup. The cup moves, as above

specified, in a direction calculated to maintain a constant end pressure upon the handle 59.

Upon the base-plate 100, adjacent to the leg 99 and projecting inwardly in like manner, is a pair of lugs 103, between which is hinged, as upon a pintle 104, a dog 105. The swinging movement of the dog upon its pintle is limited, as by shoulders 106, that overlap the opposite edges of the lugs 103. The forward end of the dog 105 is provided with a substantially semicylindrical concavity 107, that receives and securely holds a free collar or tubular bearing-face 108, which, forming the contact member between the dog and the handle against that which becomes the concave portion of the compound curve of the bent handle, permits the insertion of the pin 58 through the apertures 56 in the stirrup 54. Being separate from the dog, it becomes when the pin 58 is inserted through it, as above stated, a temporary member of the form 50. (See Fig. III.)

Upon the end of the forward edge of the frame 36 opposite that from which the leg 99 projects I provide a yielding plunger 110, that carries upon its forward bifurcated end 111 a grooved curved shoe 112, that is movably secured in place, as by a pintle 113, its oscillatory movement being limited, as by shoulders 114, which engage with the opposite edges of the bifurcated head 111. The plunger 110 is yieldingly carried upon the frame 36, as within a bore 115 in the frame, within which the head 116 works, and by a bearing-nut 117, screwing into the end of the bore. A spring 118, bearing at one end against the end of the bore 115 and at its other end against the head 116 of the plunger, serves to yieldingly urge the plunger outwardly.

The shoe 112 engages with and is shaped to fit that portion of the handle which constitutes when bent the convex portion of its compound curve. It therefore rides against the surface of the handle during the bending operation until as that operation approaches its completion it fits snugly over the handle and causes its outer surface to conform accurately to the shape of the curved body 51 of the form 50, which confines the handle upon its opposite surface.

Between the shoe 112 and the tubular bearing-face 108 the handle is subject to strain incident to the formation of the compound curve of the handle. Between the shoe and the bearing therefore I provide a yielding rider 120, which, being provided with a bent head 121 to form an engaging face, is movably secured within a T cross-head 122, whose shank 123 fits within a bore 124 of a boss 125 upon the frame 36. To the stem of the rider 120, near its head 121, is secured a collar 126, against which at one end bears a spring, preferably a coiled spring 127, surrounding the rider and which bears at its other end against the opposing face of the cross-head 122.

The yielding plunger and the spring-actuated rider exert in the manner above specified a constant resistance to any tendency upon the part of the handle to split at that portion of it most liable to that action during the bending process.

The operation of my machine as above specified may be described as follows: Assuming the parts of the machine to be in the relative positions shown in Fig. I, for instance, and that a previously-steamed or otherwise treated handle-blank has been properly secured in place between the clamping-foot 68 and the face 46, engaging its opposite sides, and the terminal vise and cup 86, engaging its opposite ends, the presser-foot 98 being in contact with the cup 86, and the remaining compression-pieces upon the forward end of the frame 36 being in their proper respective positions, the operator by movement of the lever 24 sets the machine in motion. Thereupon the power-screw 31 drives the frame 36 toward the handle-blank, the movement of the frame continuing until the handle is made to conform to the shape of the grooved body 51 of the form 50, when the operator by aid of the lever 24 arrests the movement of the machine. The screw 31 retains the frame 36 in the position to which it was advanced by the driving mechanism, and the operator is enabled to insert the pins 57 and 58 into their respective apertures 55 and 56 in the stirrups 53 and 54. The machine is then reversed by movement of the lever 24 and the frame 36 retires, whereupon the operator by means of the cranks 67 and 80, respectively, opens the lateral and terminal vises and liberating the handle is enabled to remove it, with its form attached, and to insert another form and another handle-blank in position for a repetition of the operation described. The handle is allowed to remain attached to its form until it becomes cold or set into the shape of the form, when by removing the pins 57 and 58 the form may be detached for further use and the handle is complete, ready for use.

In Figs. XII and XIII of the drawings I have illustrated a modified form of embodiment of mechanism for actuating the compression-frame of my machine, which form of embodiment for some reasons I now regard as preferable. To avoid confusion, I assign to the elements illustrated in these figures individual reference-numerals; but it should be understood that the mechanism is substantially identical to that previously specified, except as to the compression-frame-actuating member. In those figures the frame 130 corresponds with the frame 1 previously described, and plates 131, corresponding to the plates 39, define guideways 132, corresponding to the guideways 37. 133 indicates a compression member, to which, as by bolts 134, is secured an adjustable tongue 135. The tongue fits within an oblong recess 136 and is provided with longitudinal slots 137, through which the bolts 134, to reach suitable bolt-holes provided for them, respectively, in the

lower wall of the recess 136, extend. The tongue 135 is longitudinally adjustable within the recess 136, the slots 137 being provided for that purpose. An abutment-screw 138, working in the wall 136′ of the member 133 in front of the recess 136, is adapted to facilitate the adjustment of the tongue. Upon its projecting end the tongue 135 carries, as within a bifurcated head 139, an antifriction-roller 140, revolubly mounted, as upon a pin 141. The roller 140 makes contact with the actuating-periphery 142 of a cam 143. The cam is mounted as upon a vertical shaft 144, carried within a suitable box 145 in the frame 130, and stepped in a suitable bearing 146, supported as upon a bracket 147, secured to the legs of the machine. 148 indicates a worm-gear, which is illustrated as an example of means for imparting rotation to the shaft 144. 149 indicates a worm supported in mesh with the gear 148 and provided upon its extremity with a belt-pulley 150 for driving it. To hold the compression member 133 in operative engagement through its tongue 135 with the cam 143, I provide a tensile spring 151, secured at one end, as to a stud 152, projecting from the face of the frame 130, and at the other end to a stud 153, projecting from the face of the tongue 135. By the employment of the spring 151 the antifriction-roller 140 is compelled to engage with the periphery 142 of the cam and to derive from the movement of the cam double reciprocatory movement. The cam 143 is designed through the constant rotation in one direction of the shaft 144 to advance the compression member 133 at regular intervals of comparatively short duration. This is accomplished during a portion of the revolution of the shaft 144, the compression member being in the retracted position during the remaining portion of each complete revolution of the shaft. When the compression member 133 is advanced by the cam 143, the blank is compressed and the pins 57 and 58 are inserted. During the intervals when the member 133 is retracted opportunity is afforded for removal of a handle with its form and the insertion of another form and another blank to be bent.

What I claim is—

1. In a machine for bending wood to form handles and the like, the combination with a horizontal frame or table provided with a support open from above to receive a form for the blank to be bent, of a removable form located within the support and having a recess along one side for the reception of the blank, and a reciprocatory compressing device opposite the recessed side of the form for forcing a wood blank laterally against the form, substantially as specified.

2. In a wood-bending machine, the combination of a frame provided with a reinforced wall or rib in one side of which is formed a socket, a reciprocatory compressor arranged opposite to such socket, driving mechanism, and a removable form adapted to fit into the said socket, and arranged to give shape to the wood when forced into the form by the said compressor, substantially as set forth.

3. In a wood-bending machine, the combination with a frame, compression member and driving mechanism, of a frame extension provided with an edge adapted to support a blank, and a recess in the frame adjacent to the edge adapted to constitute a form-socket, substantially as set forth.

4. In a wood-bending machine, the combination with a frame, compression member, and driving mechanism, of a frame extension, a blank-supporting edge upon the extension, a recess constituting a form-socket, in the frame adjacent to the edge, and a removable form adapted to constitute a continuation of the edge, substantially as set forth.

5. In a wood-bending machine, the combination of a reciprocatory compressing member which forces the wood against a shaping-form, driving mechanism, and a supporting-frame which is provided with a wall or rib projecting above its upper surface, and arranged substantially at right angles to the movements of the said compressing member, such rib or wall being formed with a recess in its face opposite to the compressing member to constitute a socket for a form, and with a supporting edge for the wood blank adjacent to and outside of the said recess, substantially as set forth.

6. In a wood-bending machine, the combination with a frame, compression member, and driving mechanism, of a frame extension provided with a blank-retaining edge, a lateral vise coöperating with the edge, and a form for shaping an article, arranged adjacent to the retaining edge and opposite the compression member, substantially as set forth.

7. In a wood-bending machine, the combination with a frame and frame extension, of mechanism carried upon the frame adapted to bend an article to the required shape, a blank-retaining rib upon the frame extension formed along a portion of its length into a form-retaining socket, and a reciprocatory vise coöperative with the blank-retaining rib and designed to hold the blank in position to be pressed laterally into the form, substantially as specified.

8. In a wood-bending machine, the combination with a frame, and mechanism thereon adapted to bend an article to required shape, of terminal blank-retaining mechanism adapted to support one end of an article to be bent, and movable retaining mechanism adapted to support the other end of the article to be bent, mounted so that it can turn relative to the part which carries it, while in engagement with the article, substantially as set forth.

9. In a wood-bending machine, the combination with a frame and mechanism thereon adapted to bend an article to required shape, of a retaining element adapted to hold one end of the article, movable with the end of the article as it is operated upon, and means

for maintaining such element in determined relations, such as parallel with a line through the main or straight portion of the article, throughout the several bending movements, substantially as set forth.

10. The combination with a frame, compression member, and driving mechanism, of stationary blank-retaining mechanism, and a retaining element adapted to hold the end of an article to be bent, and movable within fixed limits in the direction of the travel of the end of the blank during the bending operation, substantially as set forth.

11. In a wood-bending machine, the combination with a frame, compression member, and driving mechanism, of blank-retaining mechanism, a swinging arm in the path of the compression member, and a handle-socket movably secured to the free end of the swinging arm, substantially as set forth.

12. In a wood-bending machine, the combination with a frame, compression-frame thereon, and driving mechanism, of blank-retaining mechanism, a fixed presser-foot upon the compression-frame, a hinged dog, a yielding plunger, and a swinging rider adapted independently to work against a blank during the bending operation, substantially as set forth.

13. In a wood-bending machine, the combination with a frame, a reciprocatory compression-frame, driving mechanism therefor, and means for holding the blank while being operated upon, of a form to which the blank is to be bent, independent compression-pieces carried by the compression-frame and adapted to engage with the blank, certain of such compression-pieces being separable from the compression-frame, and means for securing such separable piece to the form upon the completion of the bending operation, substantially as set forth.

14. The combination with a frame, compression member and driving mechanism, of blank-retaining mechanism, a retaining element adapted to hold the end of an article to be bent, and mechanism adapted to guide the movement of the retaining element in an arc different from the arc of movement of the end of the blank, substantially as set forth.

In testimony of all which I have hereunto subscribed my name.

JACOB ARTHUR MEEKS.

Witnesses:
E. R. TEMPLER,
JAS. N. TEMPLER.