

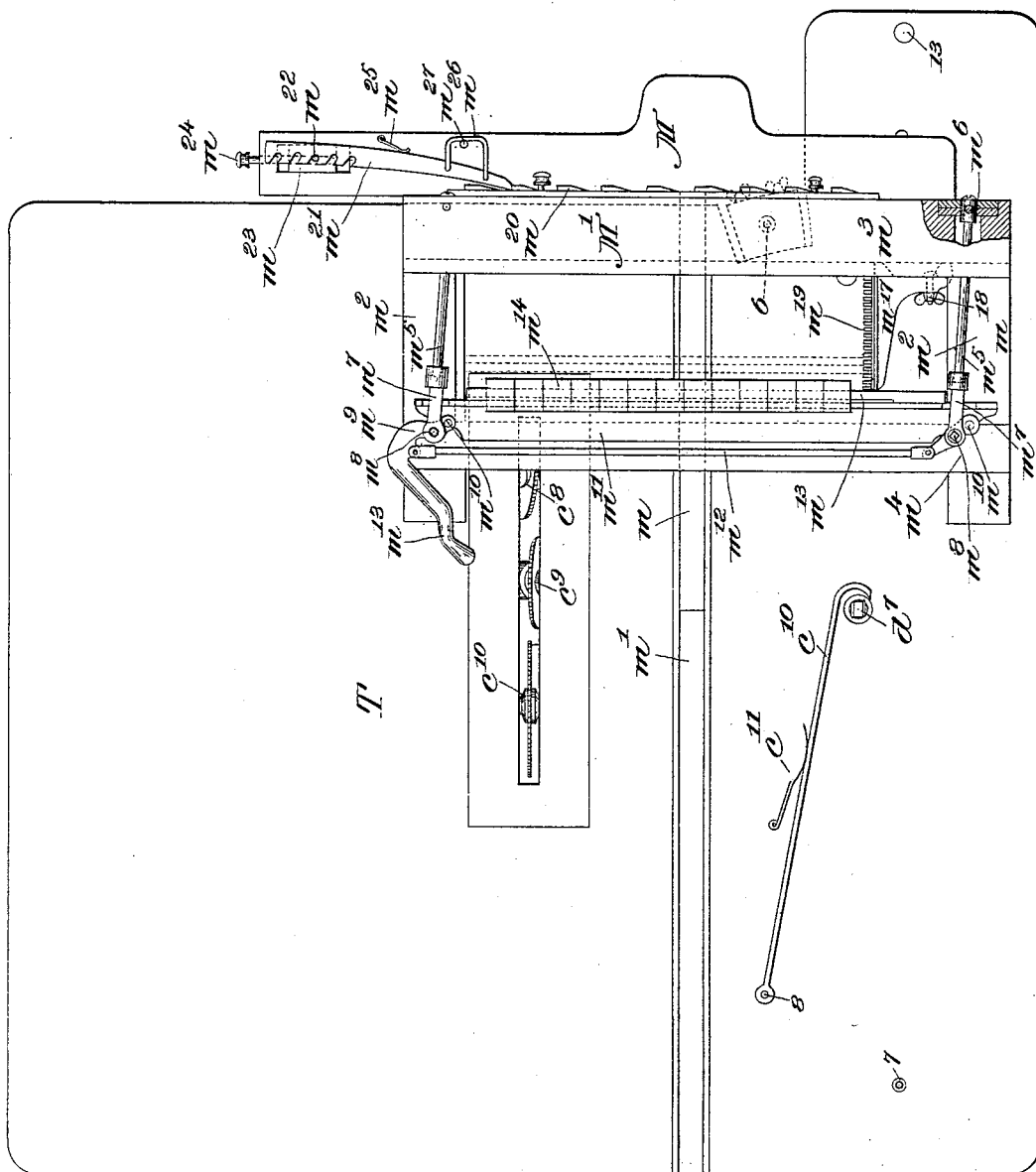
(No Model.)

6 Sheets—Sheet 1.

D. E. HUNTER.
DOVETAILING MACHINE.

No. 580,133.

Patented Apr. 6, 1897.



Witnesses.

Edward F. Allen.

Fred S. Greenleaf.

Fig. 1.

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David E. Hunter.

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(No Model.)

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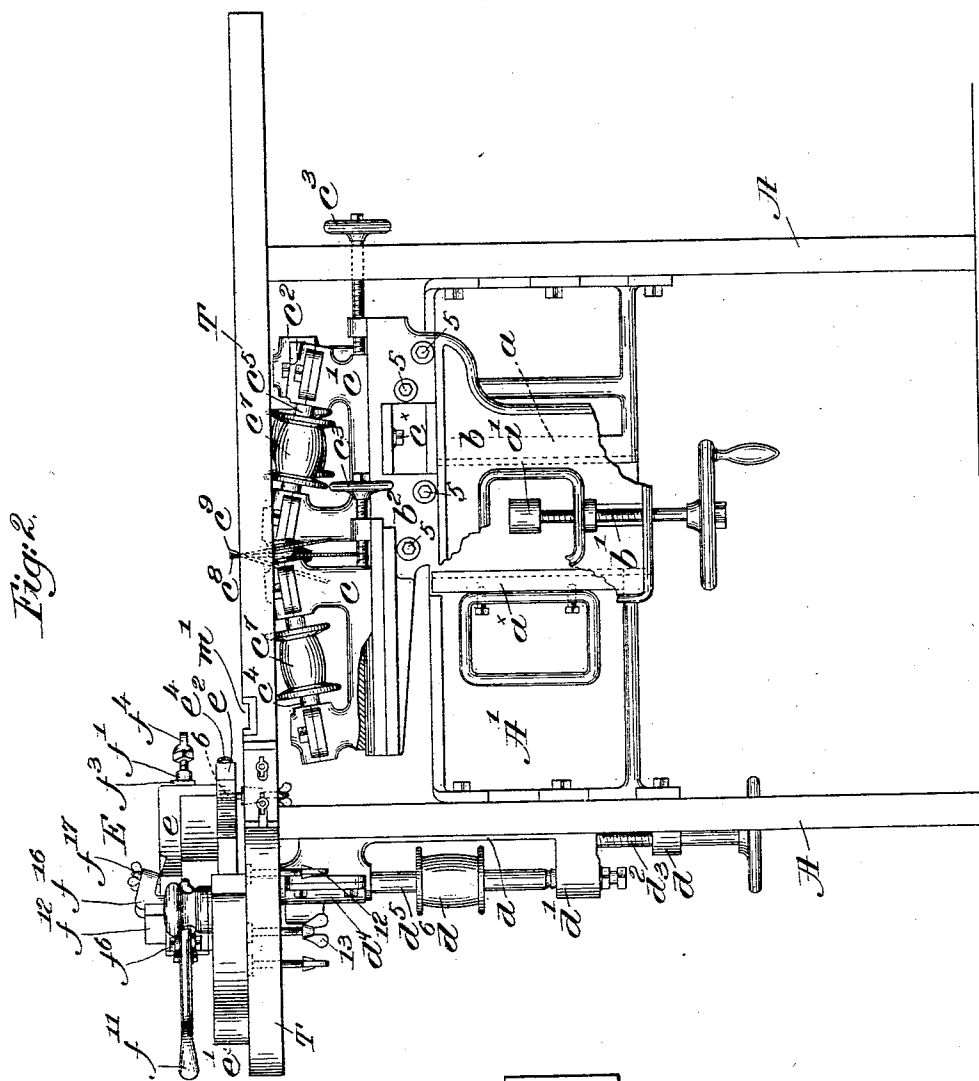
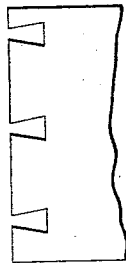


Fig. 11.



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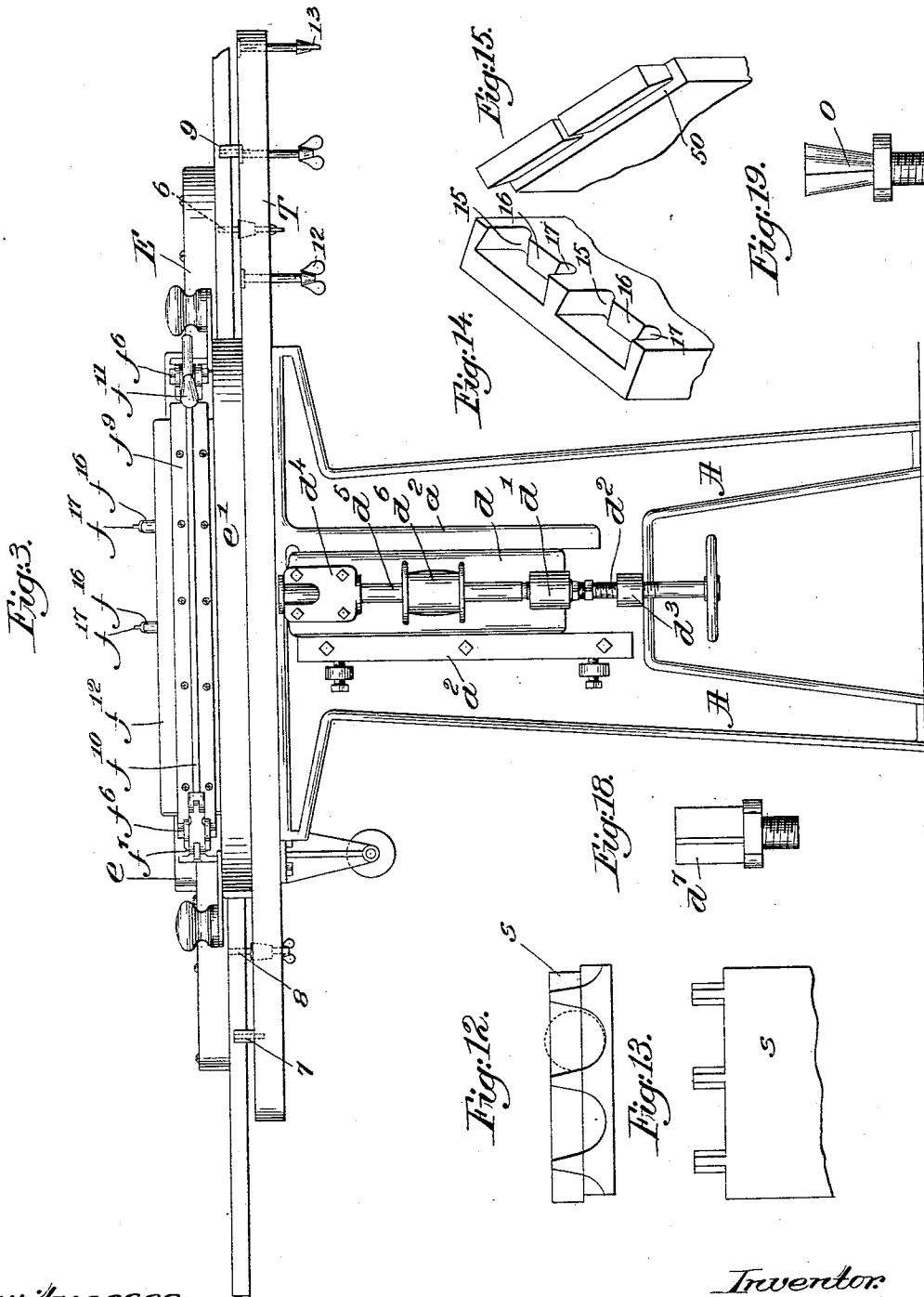
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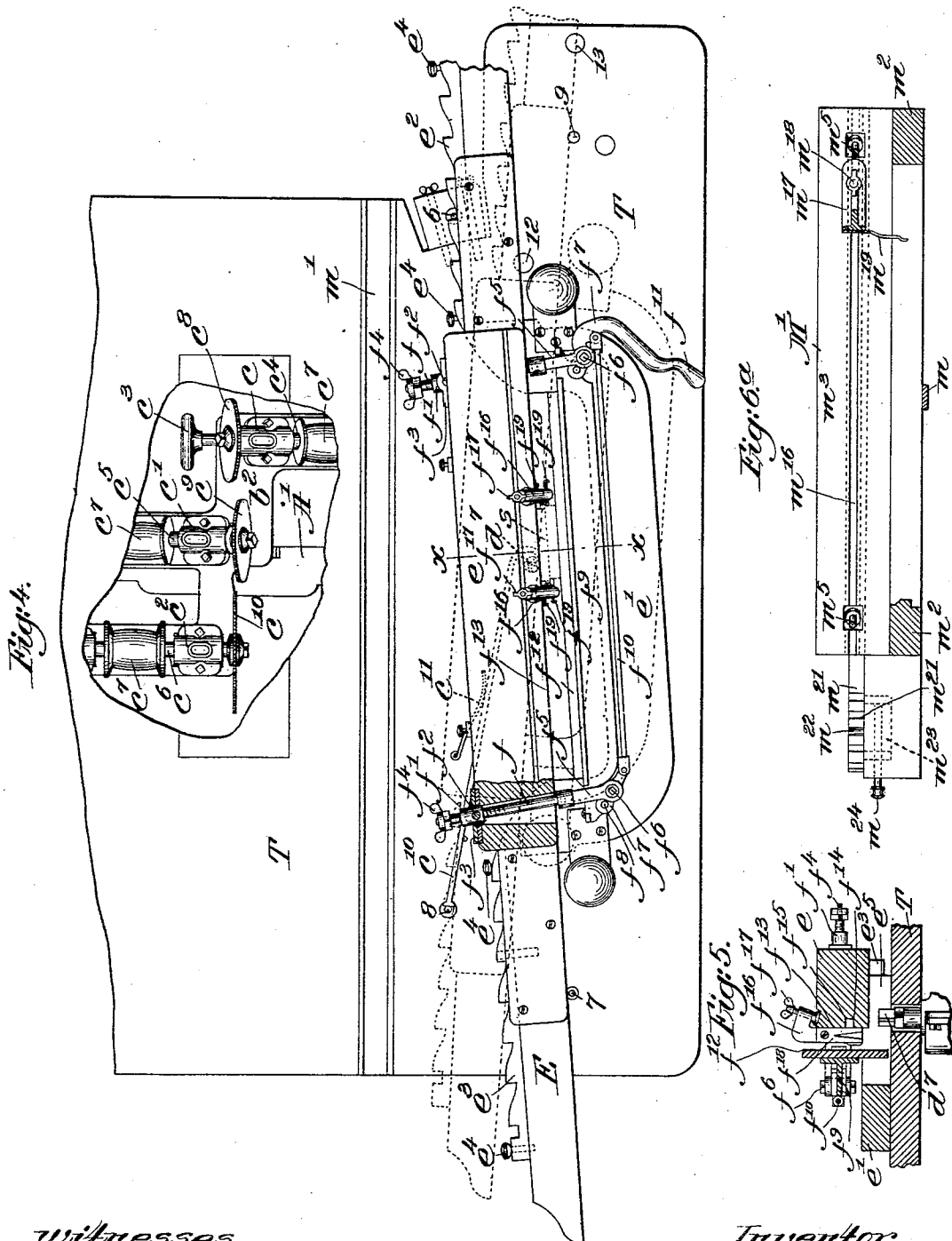
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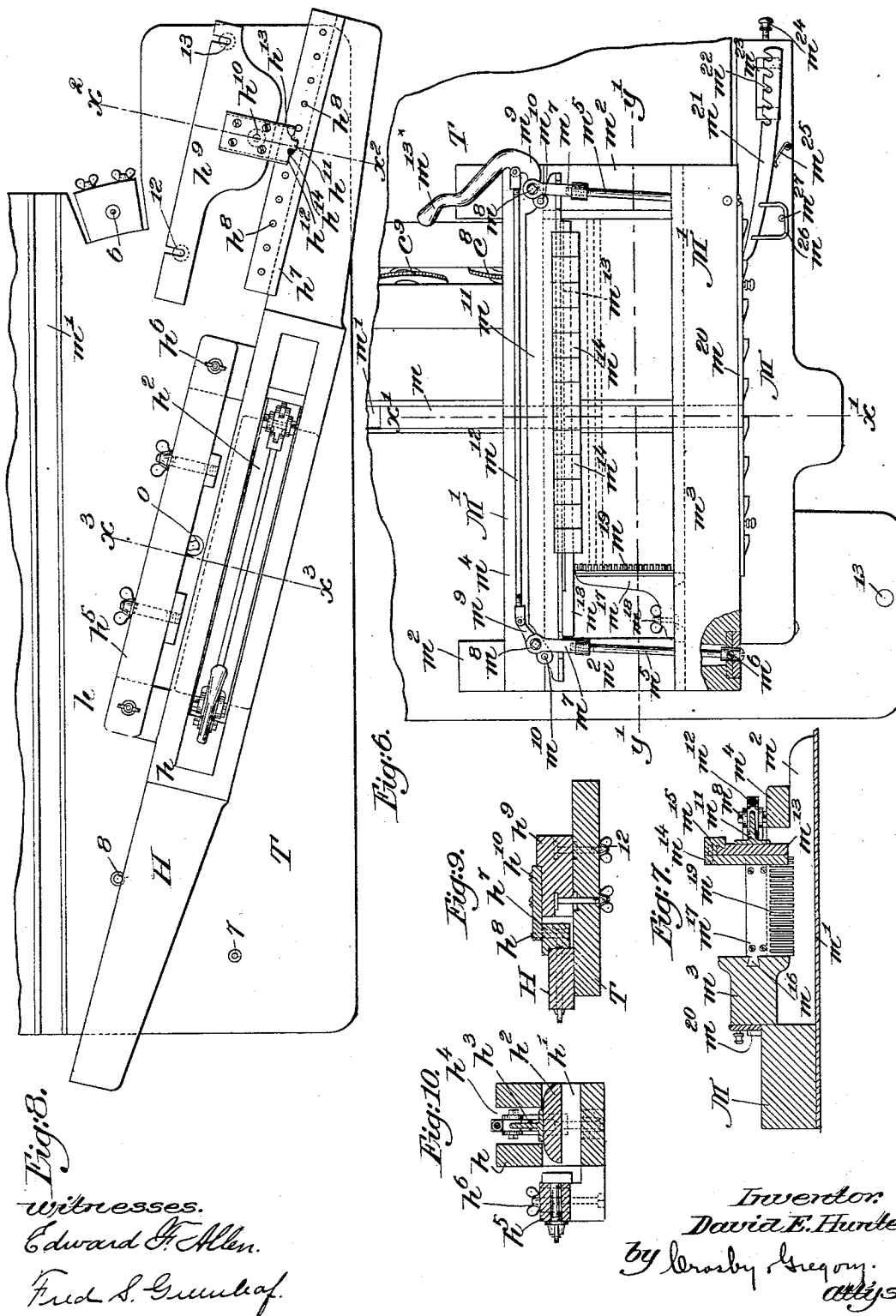
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D. E. HUNTER.
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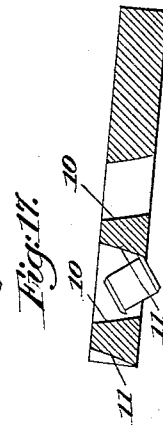
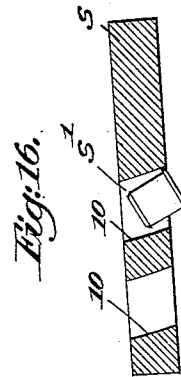
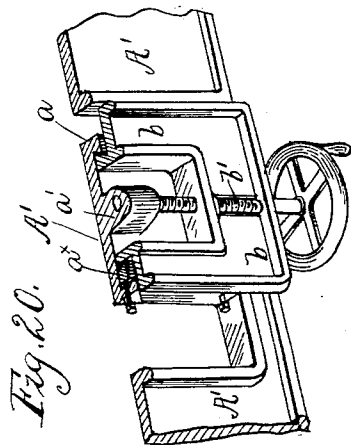
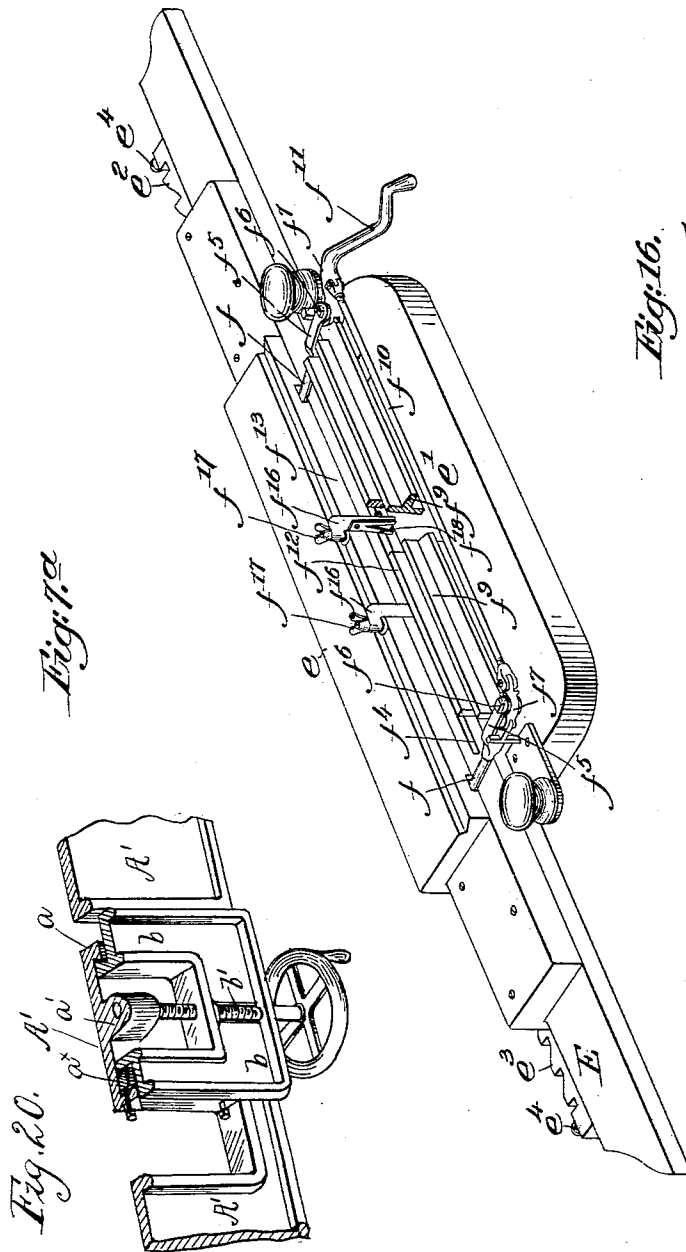
6 Sheets—Sheet 6.

D. E. HUNTER.
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Patented Apr. 6, 1897.

6+



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Witnesses.
Edward F. Allen.
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UNITED STATES PATENT OFFICE.

DAVID E. HUNTER, OF CAMBRIDGE, MASSACHUSETTS.

DOVETAILING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 580,133, dated April 6, 1897.

Application filed August 16, 1895. Serial No. 559,522. (No model.)

To all whom it may concern:

Be it known that I, DAVID E. HUNTER, of Cambridge, county of Middlesex, State of Massachusetts, have invented an Improvement in
5 Dovetailing-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

10 This invention has for its object to provide an improved process and machine for dovetailing, that is, an improved process and machine for cutting dovetail mortises and tenons in sticks or members of wood or other suitable material to enable the same to be united.

15 My improved dovetailing-machine contains suitably-arranged rotating cutters or saws for cutting the dovetailed mortises and one or more other rotating cutters for cutting the
20 dovetail tenons.

My invention has particular reference to the means for holding and moving the work relatively to the cutters and will be best understood after a description of one embodiment of my invention in a machine for practical use.

25 Figure 1 is a top or plan view of a machine embodying my invention; Fig. 2, a front elevation—that is, an elevation of the machine looking from the right, Fig. 1—with the mortising-carriage removed and the tenoning-carriage in position; Fig. 3, a side elevation of the machine as in Fig. 2—that is, a view
30 looking from the left of said figure; Fig. 4, on an enlarged scale, shows a portion of the table with the parts for forming a tenon in position thereupon, the said table being also broken away to expose the mortising-cutters; Fig. 5, a sectional detail on the dotted line
40 xx , Fig. 4, looking to the left; Fig. 6, a plan view of a portion of the table, showing the parts for cutting the mortises in position; Fig. 6^a, a section on dotted line $y'y'$, Fig. 6, looking toward the front; Fig. 7, a cross-section on the dotted line $x'x'$, Fig. 6; Fig. 7^a, a perspective view of the work-holder E. Fig. 8, in plan view, shows a portion of the table with parts thereon for making what is known as a
45 "blind tenon;" Fig. 9, a cross-section thereof on the dotted line x^2x^2 ; Fig. 10, a cross-section thereof on the dotted line x^3x^3 ; Fig. 11, a view showing the end of a drawer member

with the dovetail mortises formed therein by the mechanism of Fig. 6; Fig. 12, an end view of two pieces of wood, illustrating the
55 method of forming the dovetail tenons by the mechanisms of Figs. 2 to 4, inclusive; Fig. 13, a top or plan view of Fig. 12; Fig. 14, a perspective end view of a stick in which is formed a blind tenon; Fig. 15, a perspective end view
60 of a mating member having corresponding blind mortises; Fig. 16, a diagram showing the path of the cutter through the end of a stick; Fig. 17, a similar view showing the completion of a tenon; Figs. 18 and 19, views
65 of two of the cutters employed; Fig. 20, a detail to be referred to.

In the particular embodiment of my invention shown in the drawings to illustrate this invention, A A are two side frame members
70 shown as joined by a cross frame member A', the whole being of suitable shape and construction to sustain the various working parts, together with the table T. The cross member A' of the frame is provided with a suitable vertical guideway formed by and between
75 the fixed and adjustable plates $a a^x$ for the vertically-adjustable frame-plate b , shown as carrying a threaded adjustable screw b' , which acts against a lug a' on the cross member A' and furnishes means by which the
80 said frame-plate b may be adjusted vertically as desired.

The frame-plate b at its upper edge has secured to it by bolts 5 a horizontal bed-plate
85 b^2 , in which are formed suitable guideways for the horizontally-adjustable cutter or saw heads c, c' , and c^2 , Fig. 4, which are each provided with clamping-bolts c^x , only one of which is shown in Fig. 2, extended down-
90 wardly through slots in the said bed-plate for the purpose of clamping the said heads in adjusted position, suitable adjusting-screws c^3 being provided for and to cause horizontal movement of the said heads for adjustment.
95 In the present instance the head c^2 is supposed to be fixed, the other two being adjustable, although all may be adjustable if found desirable. These several heads referred to each contain suitable bearings for
100 the inclined shafts c^4, c^5 , and c^6 , provided at their outer ends with suitable driving-pulleys c^7 and at their inner or adjacent ends with suitable rotary cutters c^8, c^9 , and c^{10}

(shown as saws) to operate as will be described.

Referring again to Figs. 1 to 4 and 20, one of the side frames A therein—that at the left, Fig. 2—is provided (see Fig. 3) with suitable guideways a^2 for the vertically-adjustable frame d , shown as provided at its lower end with a boss d' , with which coöperates the end of the adjusting-screw d^2 , threaded in the lug d^3 on the frame A and furnishing means for vertical adjustment of said frame d . The boss d' , together with a box d^4 at the upper end of the adjustable frame d , constitute bearings for the vertical or side spindle d^5 , fitted with a suitable pulley d^6 , and at its upper end (see Figs. 1 and 4) carries a suitable side cutter d^7 , (shown separately in Fig. 18,) or it may receive a cutter like that shown in Fig. 19, the latter cutter being tapering, that is, larger at its top than bottom.

Referring now to Figs. 4 and 5, I have in the present instance provided the table with four pins 6, 7, 8, and 9, two of which, numbered 6 and 8, serve as fulcrum or pivots, the other two as back-stops, to be described. Upon the table T is arranged the work-holder E. (Shown separately in Fig. 7^a as a long bar, preferably of wood, reduced in thickness at its ends, thereby leaving a raised middle portion e , said holder also having a laterally-extended flat support e' .) To the inner edge of the holder E are secured near its ends the two racks e^2 e^3 , having preferably ratchet-shaped teeth, the teeth in the two racks facing outwardly—that is, in opposite directions. These racks are made readily removable for the substitution of others of different spacing by means of the clamping-screws e^4 .

The holder E has a portion removed at its under side, as indicated at e^5 , Figs. 5 and 7^a, to clear the cutter d^7 , protruding upwardly from the table, and the said holder at the ends of its raised middle portion E is perforated horizontally for the reception of the clamping bolts or devices f f , (see Fig. 7^a), shown as threaded in suitable sleeves or boxes f' , Fig. 4, provided, top and bottom, with trunnions f^2 , by means of which they are pivoted to swing about vertical axes in plates f^3 , suitably attached to the inner face of the holder. At their inner ends these threaded rods f are fitted with suitable thumb-nuts or heads f^4 , by which said rods may be rotated and thereby caused to have a threaded longitudinal movement in the pivotal boxes f' , for a purpose to be described. At their ends adjacent the outer edge of the table the said rods have swiveled to them in suitable manner the yokes f^5 , in which are jointed at f^6 the levers f^7 , which latter at one of their ends are jointed at f^8 to the clamping-bar f^9 , shown as T-shaped in cross-section, (see Figs. 5 and 7^a), said levers at their opposite ends—that is, at the opposite ends of the pivots f^6 —being connected by a suitable connecting-rod f^{10} . One of the levers f^7 is extended to constitute a handle f^{11} . To the head of this T-

shaped clamping-bar f^9 is secured the preferably wood face-piece f^{12} , between which and the inner vertical edge f^{13} of the raised middle portion e of the holder are clamped the piece or pieces on which the dovetail tenons are to be cut. As herein shown, the middle portion e of the holder is provided at its outer edge (see Figs. 5 and 7^a) with a horizontal guiding-groove f^{14} , which receives suitable guiding-ears f^{15} on the two sliding yoke-like clamps f^{16} , which curve up and over the upper edge of the said raised portion e and are there provided with suitable thumb-screws f^{17} , about which the said yoke-like clamps may be secured in desired longitudinally-adjusted position on the holder. To the inner adjacent faces of these clamps or yokes f^{16} are secured in the present instance forked or bifurcated spring-plates f^{18} , (see detail Fig. 7^a), and acting upon the two members of these bifurcated spring-plates are suitable screws f^{19} , Fig. 4, tapped into the yoke-like clamps from the outer sides, rotation of the screws acting to vary the positions of the members of the said bifurcated plates.

In practice the stock or board upon which the dovetail tenons are to be formed is clamped between the clamping-bar f^9 and the raised portion e of the holder and between the clamps f^{16} .

In practice the holder E, (see Fig. 4,) with the pieces to be operated upon clamped in position, as described, is placed upon the table with one of the teeth of the rack e^2 in engagement with the pin 6 on the table, said pin constituting a fulcrum about which the said holder may be swung, the normal position of the holder being in its lowermost position, Fig. 4, in contact with the stop 7, as shown. The rotating cutter now occupies a position beneath the raised portion e of the holder, as shown in Fig. 5. If now the holder be swung bodily inward, Fig. 4, about the pin 6 as a fulcrum, the stick s , Fig. 4, clamped as described, will be pushed directly over the cutter, the latter cutting its way through the lower end of the stick adjacent the table, as in the diagram Fig. 16, leaving a curved path or cut s' of a width equal to the diameter of the cutter and on a circle having its center coincident with the axis of the pin 6, about which the holder is swung. One face of this cut—viz., that marked 10—is to constitute one face of a dovetail tenon. The other face is to be removed subsequently, as will be described. With the stick clamped as before, the holder is drawn back against the stop 7 and its fulcrum end withdrawn from the fulcrum-pin 6 and the holder moved in one or the other direction—for instance, to the right—until the pin 6 engages the next tooth of the series, when the holder is again pushed forward upon a cutter, the latter making a second cut through the end of the stick and forming another face 10 for the next succeeding dovetail tenon, this operation being repeated, the holder being moved longitudi-

nally one tooth after each cut until the desired number of cuts have been made in the end of the stick, these cuts being regularly spaced according to the space of the teeth of the rack c^3 . In this manner the faces 10 of the entire series of dovetail tenons are formed, and to form the other and oppositely-inclined faces of said tenons the operator moves the entire holder to the right and reverses the position of the same, so that the teeth of the rack c^3 engage the pin 8, which now constitutes the fulcrum about which the holder is swung, the pin 9 at the opposite end of the table acting as a back-stop. The holder is now swung about the pin 8 in a manner similar to that described and the cutter again forced through the stick, this time making a cut of an opposite curvature from before and forming the other face 11 of a dovetail tenon, the holder being moved to the left one tooth and the operation repeated, this operation being followed out until all of the tenons have been correctly formed. The faces of the dovetail tenons formed in this manner are slightly concaved, which insures tight fitting of the tenons in the mortises at the corners, where tight fitting is more desired, and leaves a desirable amount of slackness between the tenon and walls of the mortises between the corners for the reception of and to insure a proper distribution of the glue.

In forming the tenons described there is danger of the rotating cutter chipping the stock as it enters or leaves the same. To obviate this, I have provided a curved chip-breaker c^{10} , which, acted upon by a spring c^{11} , partially encircles the rotating cutter d^7 and acts upon the stock close to the edge where the cutting-knives enter or leave the inner side of the stick.

To obviate chipping at the back side of the stick where the cutter penetrates the latter, I arrange back of the stick being cut a second similar stick, as shown in Fig. 12 and in dotted line, Fig. 4, offset from the former by a distance equivalent to the taper or incline of the face of the tenon, and determined by adjustment of the bifurcated plate f^{18} , adjusted by its set-screws f^{19} . When the cutter penetrates the first stick, it enters, but does not penetrate, the second stick, the latter, however, by pressing tightly against the former, preventing chipping where the cutter leaves the said former stick. By offsetting the stick, as shown, the cut partially made in the second stick is properly positioned for the beginning of the cut subsequently to be made completely through it for the formation of the tenons therein—that is, the cuts partially made in the second stick are spaced correspondingly to the cuts of the first stick, so that they may be subsequently carried completely through the stick and into a third to prevent chipping, as described. In this manner I effectually prevent chipping and also in one operation partially cut two of the sticks.

To cut the blind tenons, Figs. 14 and 15, I employ mechanism, Figs. 8 to 10, inclusive, in which is employed a holder somewhat similar in construction and shape to the holder E, Figs. 2 to 5, inclusive, except that in the present construction, Figs. 8 to 10, the holder is provided with a vertical instead of a horizontal clamp.

Referring to Figs. 8 and 10, the high middle part h of the holder H is slotted horizontally, as at h' , Fig. 10, to receive the clamping-plate fast on the under side of the T-shaped clamping-bar h^3 , which works vertically in a vertical slot h^4 in the part h of the holder. This clamping-bar h^3 is mounted in substantially the same manner as the clamping-bar in Figs. 1 to 5, inclusive, except that it works vertically instead of horizontally to cause the face-plate h^2 to clamp between it and the horizontal portion of the holder beneath the board or stick placed flatwise and horizontally between them. The back or end stop h^5 is arranged along one edge of the face-plate h^2 , it being made adjustable on and relatively to the holder by means of suitable thumb-screws h^6 , working in slots therein.

Instead of providing the holder with racks, as in Figs. 1 to 5, inclusive, in the present instance I provide the said holder at one end with interchangeable plates h^7 , provided with regular spaced pins h^8 , the pins on the plates being differently spaced for different separation of tenons.

Upon the table and held in place by suitable clamping-bolts 12 13 is a block h^9 , carrying a profile-plate h^{10} , shown as having a central projection h^{11} , with horizontal faces h^{12} at either side, there being slight cavities or depressions h^{13} h^{14} in the corners where the faces h^{12} meet the projection h^{11} .

The operation of the machine for making blind tenons is as follows, viz: The board or stick—for instance, a drawer-front in which the blind tenons are to be formed—is clamped flatwise between the face-plate h^2 and lower portion of the holder, Fig. 10, with its end on which the tenons are to be formed projecting to the left, Fig. 10, and upwardly, Fig. 8, against the end stop h^5 , all these with the holder in the lowermost dotted position, Fig. 8, the tapering cutter o , Fig. 19, being used and shown in Fig. 8. With one of the pins h^8 in the notch h^{14} the holder is now swung by the workman about the pin h^8 as a fulcrum, causing the end of the stick or drawer-front to be pushed upon the cutter, causing the latter to cut its way into the end of the said drawer-front until the holder is stopped by contact with the stop 8, which may and preferably will be a limit-stop. This forms the portion 15 of the cut, Fig. 14. With the left end of the holder still in contact with the limit-stud 8 the operator withdraws the opposite end of the holder sufficient to clear the pin h^8 from the notch h^{14} and thereafter slides the holder longitudinally to the left with the pin h^8 working along the face h^{12} at the left of the

projection h^{11} to cause the cutter to remove the portion 16, Fig. 14, until the next succeeding pin h^8 reaches and enters the groove h^{13} at the opposite or right-hand side of the central projection, when the holder again moves toward the cutter to form the depression 17 at the opposite end of the cut, after which the workman again withdraws the left end of the holder against the stop-pin 7 to draw the cutter out from the stick, leaving the recess cut, as shown in Fig. 14, and forming adjacent sides of two blind tenons. The operator, with the holder still held against the back-stop pin 7, moves the right end of the holder sufficiently to carry its pin h^8 around the projection h^{11} into the recess h^{14} , when the former operation described is repeated to form the next recess of the series in the end of the drawer-front. In this way all the blind tenons are formed, as shown in Fig. 14, they being spaced according to the spacing of the pins h^8 .

It will be noticed that by the process for forming blind tenons described the rotating cutter is first pushed into the wood to a distance beyond the desired depth of the tenon, about equal to half the diameter of the cutter, to form one side of a tenon. The cutter is then withdrawn a distance equal to about one-half its diameter, or to the base of the straight face of the tenon, is moved laterally to form the face 16, and is again pushed inwardly to form a face of a second tenon, as shown in Fig. 14.

Heretofore, so far as known to me, the use of a rotating cutter in making blind tenons has always resulted in a tenon having a rounded face, but by my novel process and machine the tenon is provided with substantially straight faces, as when cutting by hand, the semicircular pocket being beyond the base-lines proper of the tenons.

Having described the manner of forming both the ordinary and blind tenons, I will now describe the manner of forming the corresponding mortises.

Referring to Figs. 1, 6, and 7, M is a carriage shown as a bar-like head adapted to slide upon the table in a direction at right angles to the axes of the rotary cutters c^8 , c^9 , c^{10} , it having a guiding-rib m , which slides in a guiding-groove m' in the table to insure proper line of travel, said carriage-head M and its guiding-rib m much resembling a draftsman's L-square. In front of the carriage M, resting upon the table and having a forward and back movement with the said carriage M or an independent movement at right angles thereto, though not necessarily connected with said carriage M, is what I call the "auxiliary" carriage M', it, as shown, comprising the runners m^2 , Figs. 1, 6, and 6^a, which rest upon the table and which are connected by the cross-bars m^3 , m^4 . The cross-bar m^3 is provided with two horizontal holes or openings for the reception of the clamping-rods m^5 , swiveled in sleeves m^6 ,

Fig. 6, pivotally mounted upon the said cross-bar, said rods at their opposite ends being threaded in suitable yokes m^7 , which carry the pivots m^8 of the levers m^9 , jointed at m^{10} to a clamping-bar m^{11} and connected at their opposite ends by a rod m^{12} , one of said levers being extended to form a handle m^{13} . This clamp is substantially like the clamps described for holding the sticks in position for forming the tenons, the clamping-bar m^{11} being provided with a face-plate m^{13} , as in the former clamp; but in the present clamp this face-plate m^{13} is provided with other and preferably several auxiliary face-plates m^{14} , provided with laterally-extended hooked ears m^{15} , which engage the upper edge of the main face-plate m^{13} (see Figs. 6 and 7) to hold the same in position. In the horizontal dovetail groove m^{16} in the cross-bar m^3 is fitted to slide a bracket m^{17} , made adjustable by suitable thumb-screws m^{18} and provided with a series of depending spring-fingers m^{19} . The runner m^2 at the right, Fig. 6, constitutes an end stop, and in practice several drawer-sides or sticks in which the dovetail mortises are to be cut, are placed end down and face to face between the face-plates m^{14} and the cross-bar m^3 , as indicated in dotted lines, Fig. 6, and the clamp moved to clamp the same in position, the said sticks before clamping, however, being moved to the right in contact with the end stop referred to and held there by moving the bracket m^{17} against the opposite edges of said sticks, the spring-fingers acting upon the individual sticks to press them individually against the end stop, thus insuring proper positioning of the sticks notwithstanding they may vary somewhat in width. The number of auxiliary plates m^{14} employed will depend upon the width of the sticks operated upon.

The cross-bar m^3 at its lower side, Fig. 6—that is, at its outer side—is provided with a removable rack-plate m^{20} , which coöperates with the pawl m^{21} , shown as notched to engage a pin m^{22} on a block m^{23} , made adjustable on the carriage M by means of a suitable adjusting-screw m^{24} , there being a series of notches in the pawl, either of which may be engaged with the pin m^{22} for approximate adjustment, final and accurate adjustment being effected by movement of the block and its pin. A spring m^{25} presses the pawl always toward the rack, said pawl being limited in its movement by a bail m^{26} on the pawl engaging a pin m^{27} on the carriage. With the sticks clamped as described, both the main and the auxiliary carriages M and M' are moved bodily along the guideway m' toward the saws, the pawl in engagement with the rack holding the two carriages in proper relative position. This forward movement of the carriages causes the saws, arranged as shown, to successively act upon the ends of the sticks and form therein a transverse series of mortises, one such mortise in each stick. The carriages are now withdrawn,

the auxiliary carriage is moved along one tooth of the rack upon the main carriage M, and the operation repeated to cause the saws to make the next dovetail mortise in the several sticks, this operation being repeated until all the mortises are cut in the several sticks.

For forming the mortises for the blind tenons precisely the same mechanism is used, properly adjusted, and for forming the dovetail rabbet 50 at the sides of the several sticks, Fig. 15, where blind tenons are used I feed the said sticks against a suitable straight guide past the saws to cause the same to remove the rabbet shown.

My invention is not limited to the particular construction herein shown and described, for it is evident the same may be varied without departing from the spirit and scope of my invention.

I claim—

1. In a dovetailing-machine, a frame, a cutter, a work-support, a fulcrum for said work-support and away from said cutter at one side thereof and about which said work-support is free to swing, the free end of said work-support being movable transversely thereof over said cutter in the path of an arc, and means to advance said holder transversely to the path of cut step by step relatively to said fulcrum, substantially as described.

2. In a dovetailing-machine, a frame, a cutter, a work-holder free to swing over said cutter, and a plurality of fixed fulcra, about either of which as a center the work-holder is free to swing, the free end of the work-support being movable forward and back over the cutter in an arc concentric with the fixed fulcrum, substantially as described.

3. In a dovetailing-machine, a frame, a cutter, a work-holder free to swing over said cutter, a plurality of fixed fulcra for said swinging movement, and a series of stop-surfaces on said holder arranged to be respectively engaged with said fulcra as described to limit the longitudinal movement of the holder relatively thereto, substantially as described.

4. In a dovetailing-machine, a frame, a cutter, a work-holder free to swing over said cutter, a fixed fulcrum on one side of said cutter, a second fixed fulcrum on another side of said cutter, two series of stop-surfaces, one series to coöperate with each fulcrum, and means to removably secure said stop-surfaces to said holder, substantially as described.

5. In a dovetailing-machine, a frame, a cutter, a movable work-holder, a clamping device to clamp the work upon the holder, end stops movable on the holder, and means to adjust said stops independently of their movement on the holder, substantially as described.

6. In a dovetailing-machine, a frame, a cutter, a movable work-holder, a clamping device to clamp the work upon the holder, two series of end stops movable on the holder, and means to independently adjust the several stops of either series and independently of

their movement on the holder, substantially as described.

7. In a dovetailing-machine, a frame, a cutter, a movable work-holder, a clamping device to clamp the work upon the holder, spring end stops movable on the holder, and means to adjust said stops by springing out one portion thereof independently of said movement on the holder, substantially as described.

8. In a dovetailing-machine, a frame, a cutter, a work-holder, a fulcrum for one end thereof and about which the opposite end may vibrate to present the work to and withdraw the same from said cutter, and a profile to determine the movements of the said opposite or free end of the said holder, substantially as described.

9. In a dovetailing-machine, a frame, a cutter, a work-holder, a fulcrum for one end thereof, about which the opposite end may vibrate to present the work to and withdraw the same from said cutter, and a profile to determine the character of the movements of said opposite end, said profile being shaped to present a central projection, and depressions at either side thereof flanked by straight surfaces, substantially as described.

10. In a dovetailing-machine, a frame, a cutter, a work-holder, a fulcrum for one end thereof, about which the opposite end may vibrate to present the work to and withdraw the same from said cutter, a series of projections at said opposite end, and a profile co-operating with said projections to operate, substantially as described.

11. In a dovetailing-machine, a frame, mortise-cutters, a main work-supporting and an auxiliary carriage movably mounted adjacent thereto, a series of projections on one and a coöperating projection on the other of said carriages to determine the relative movement of the two, substantially as described.

12. In a dovetailing-machine, a frame, one or more mortise-cutters, and a work-support, said cutter or cutters and said work-support being movable, one relatively to the other, a series of pressers on said work-support for and to act upon independent pieces or sticks to position the same, and a clamp to confine said pieces or sticks in the positions into which they are moved by said pressers, substantially as described.

13. A blind tenon having straight side walls, a straight-faced ledge or base extending therefrom on each side in line with the base-line proper of said tenon and of the adjacent tenons, and a semicircular pocket joining said respective ledges or bases to said side walls and beyond the base-lines proper of the tenon, substantially as described.

14. A blind-tenon joint, comprising blind tenons having straight side walls, straight-faced ledges or bases extending between said tenons in line with the base-lines proper of the tenons, and semicircular pockets joining said respective ledges or bases to said side walls and beyond the said base-lines proper,

and mortises to properly fit said tenons, a rabbit being formed adjacent said mortises connecting the bases thereof to provide an overlying portion to neatly conceal said pockets
5 when the joint is made, substantially as described.

In testimony whereof I have signed my

name to this specification in the presence of two subscribing witnesses.

DAVID E. HUNTER.

Witnesses:

FREDERICK L. EMERY,
LAURA S. MANIX.