W. D. KELLY.

WOODWORKING MACHINE.

APPLICATION FILED JAN. 26, 1916.

1,245,240.

Patented Nov. 6, 1917.

7 SHEETS—SHEET 1.

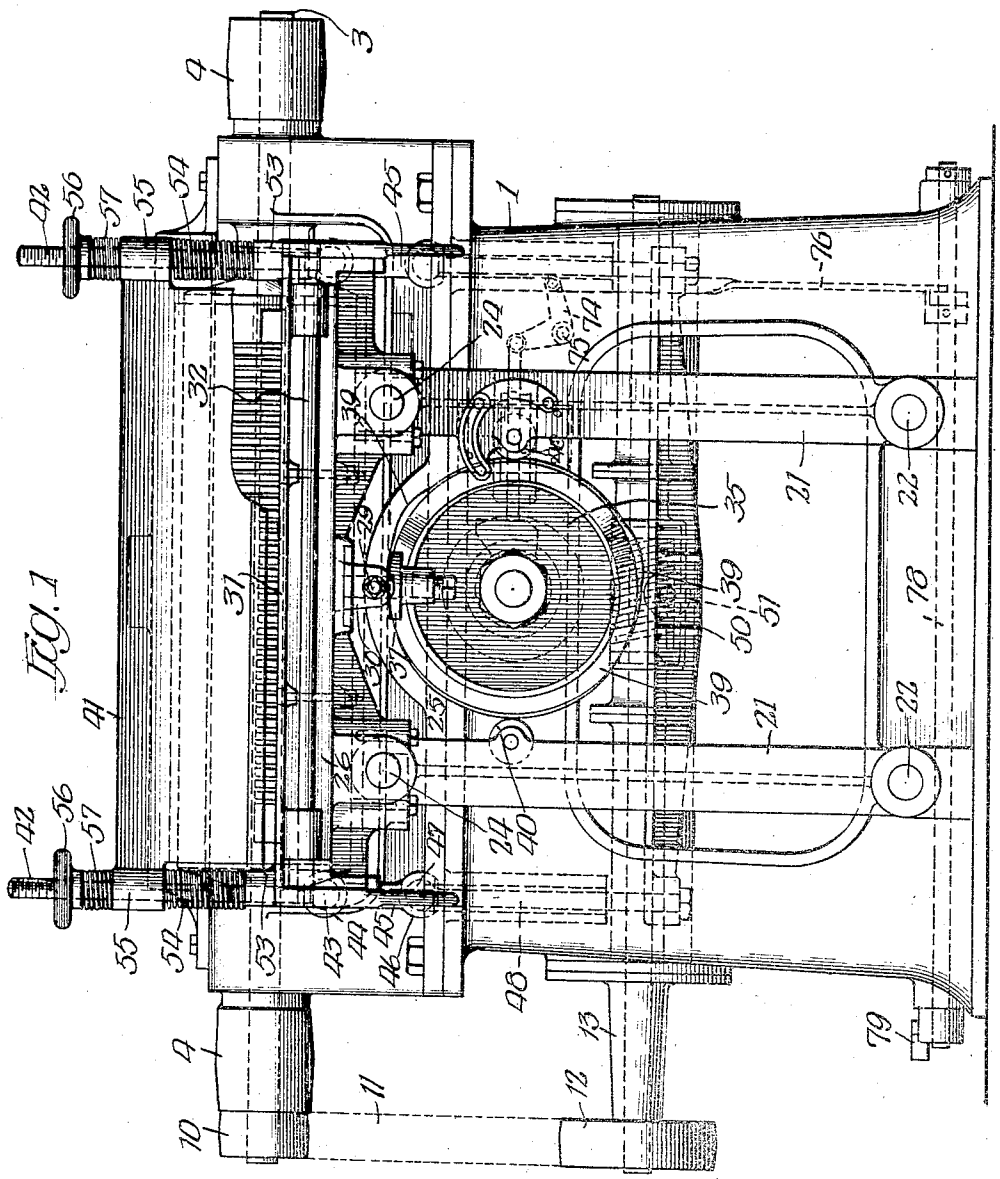


FIG. 1

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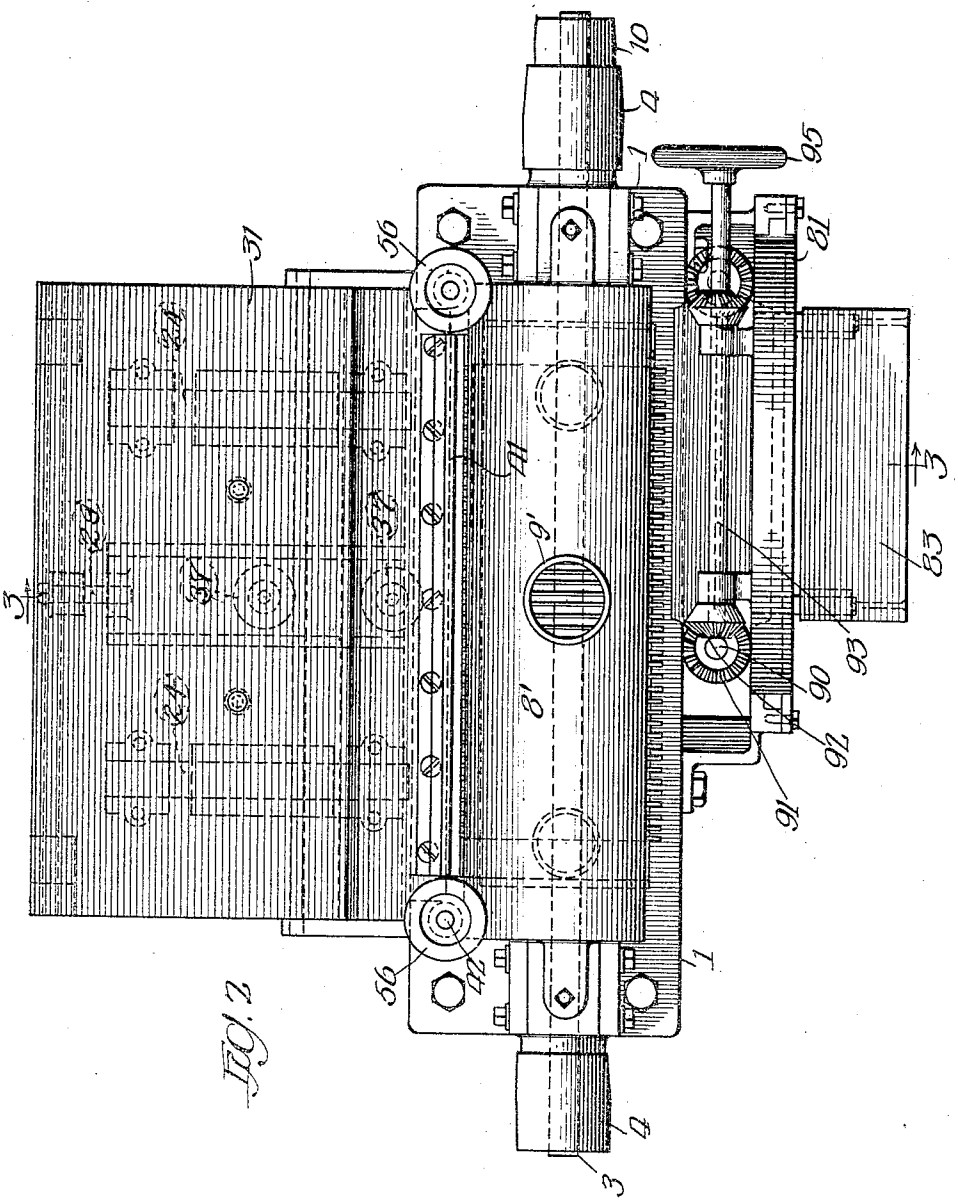


Fig. 2

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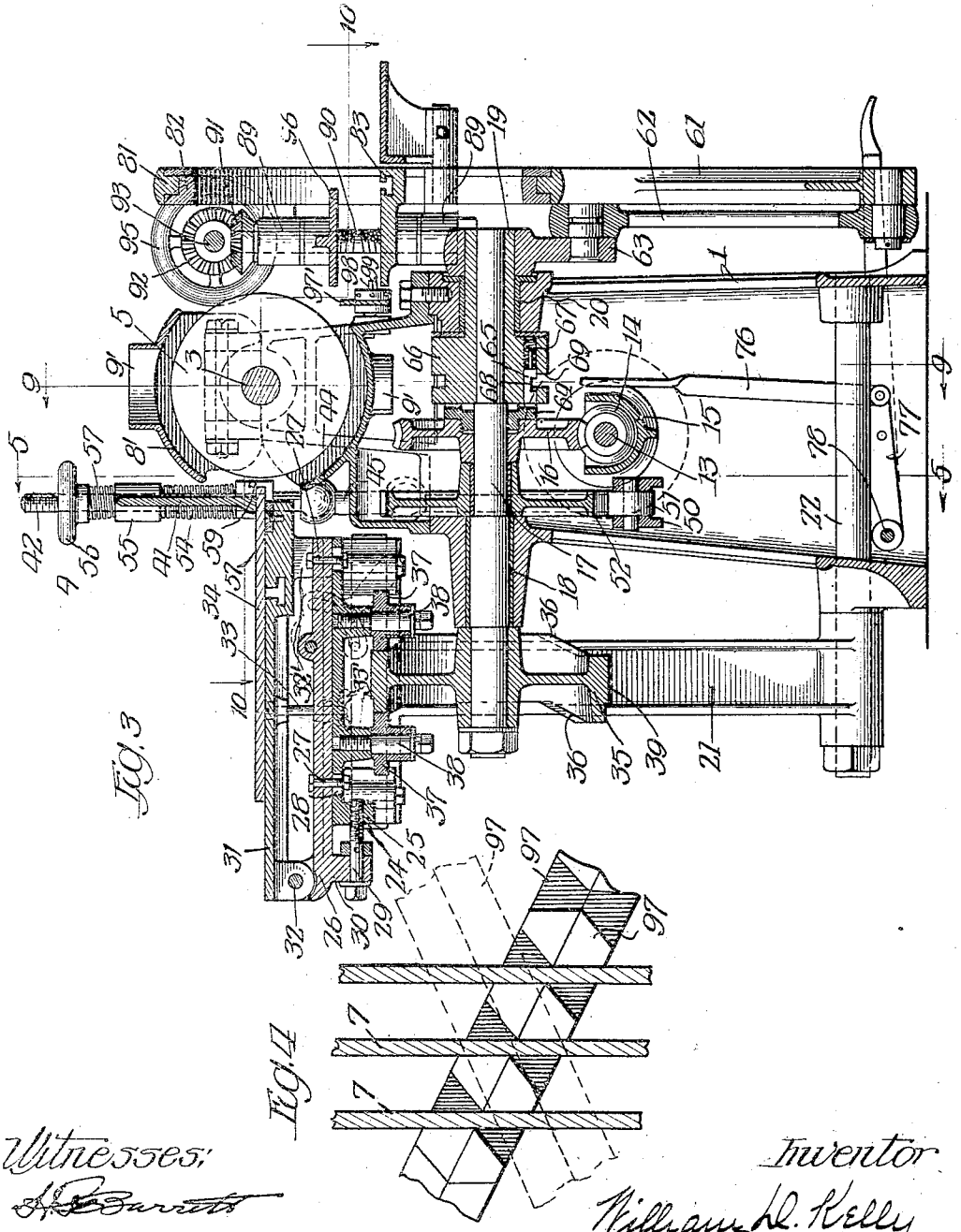


FIG. 3

FIG. 4

Witnesses:

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FIG. 6

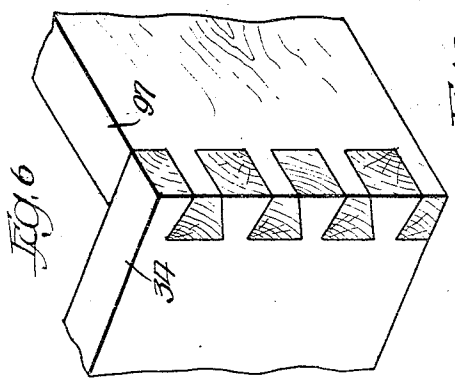


FIG. 8

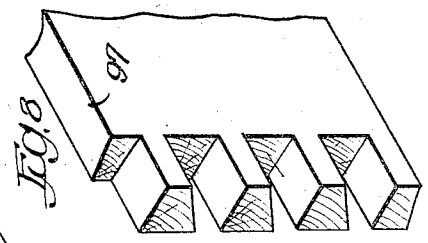


FIG. 7

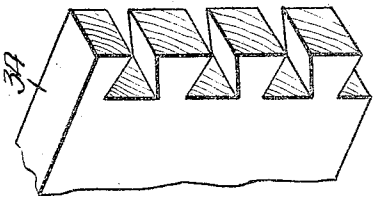
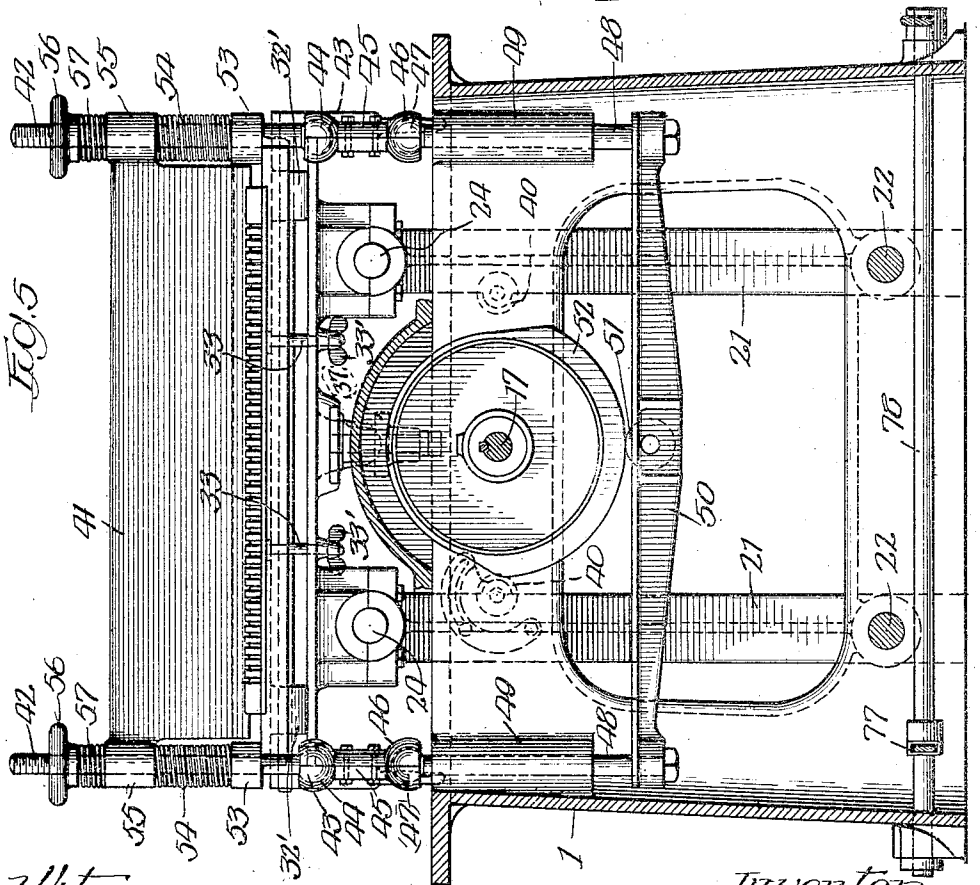


FIG. 5



Witnesses:

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7 SHEETS—SHEET 5.

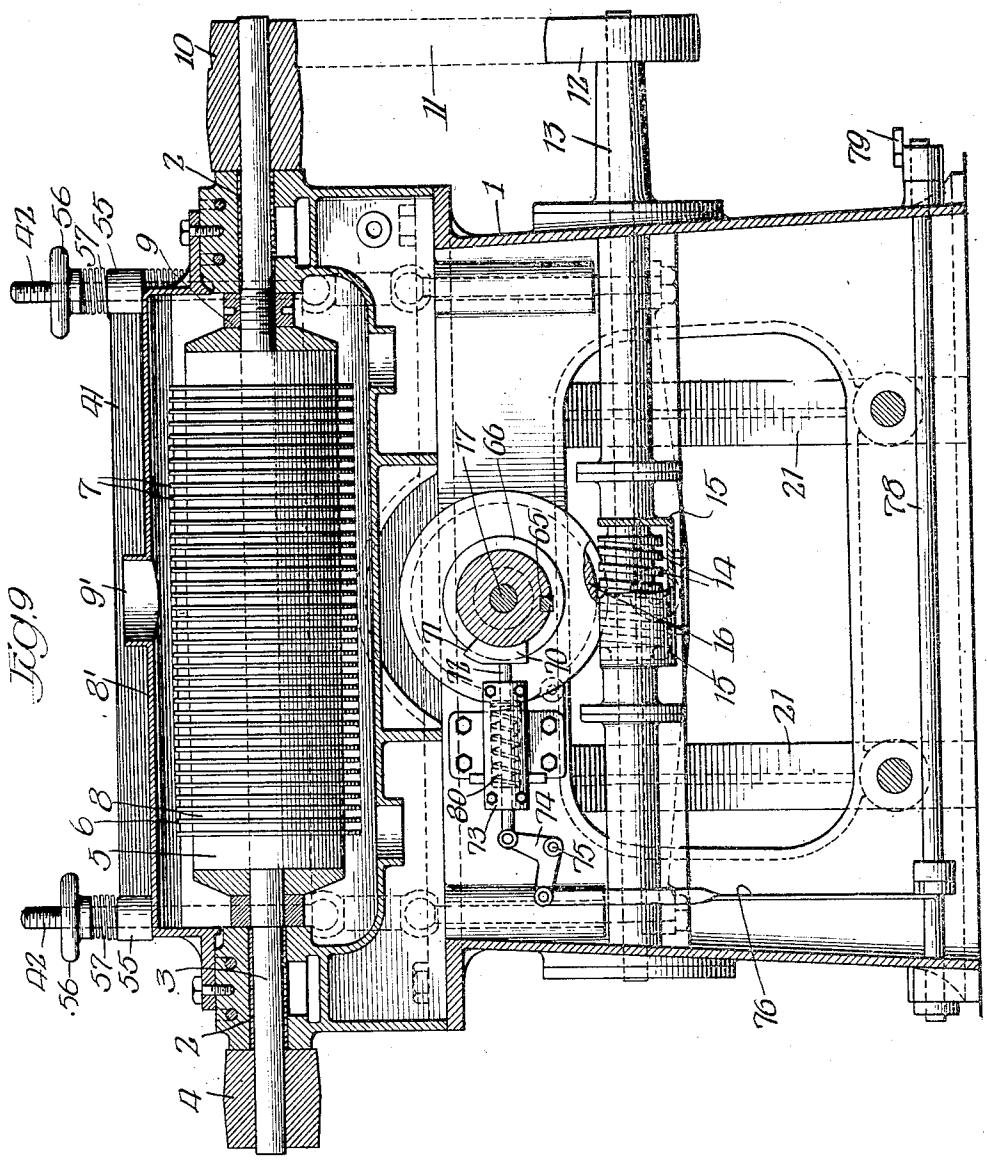


Fig. 9

Witnesses:

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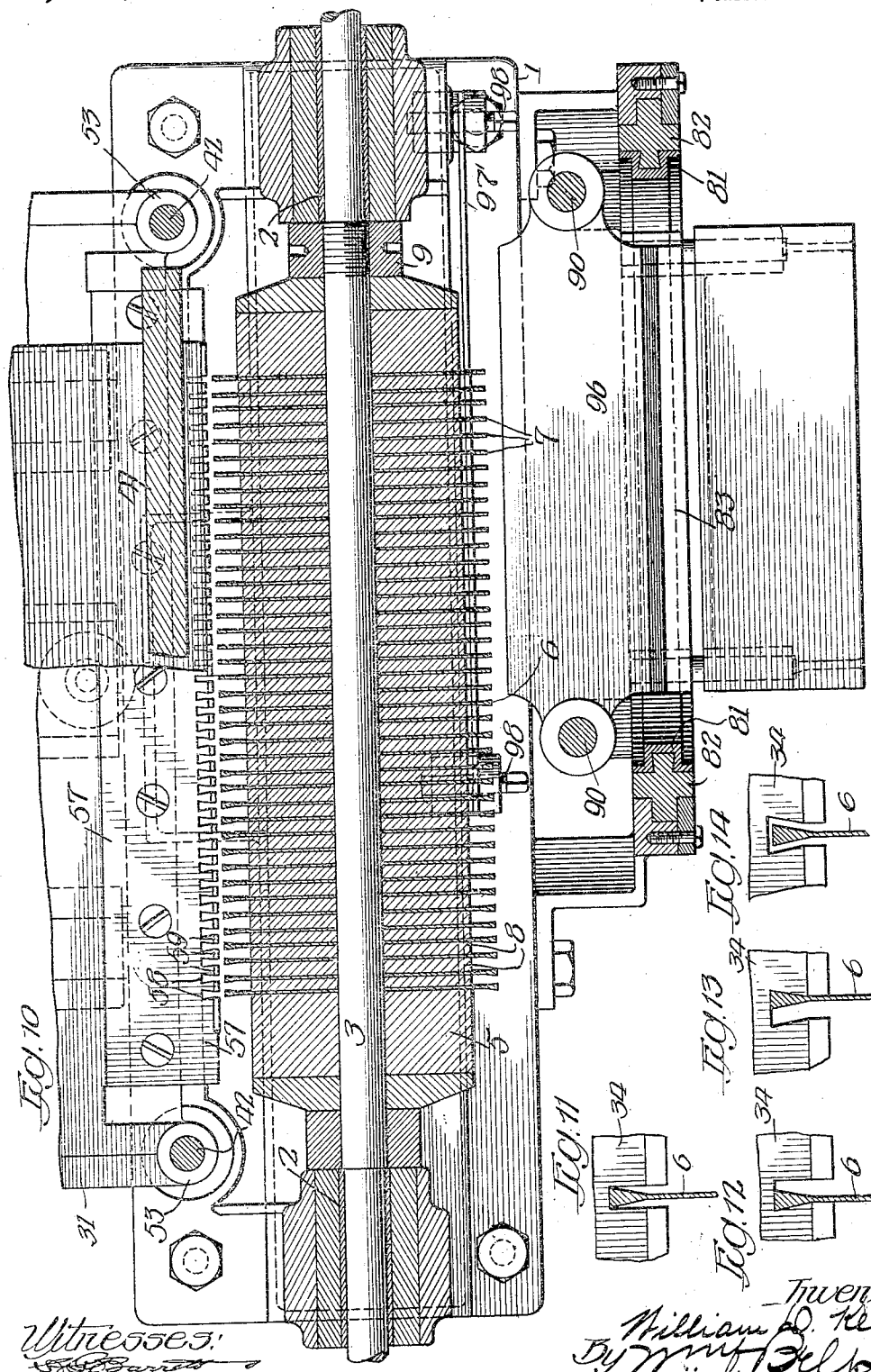
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7 SHEETS—SHEET 6.



Witnesses:

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7 SHEETS—SHEET 7.

FIG. 16

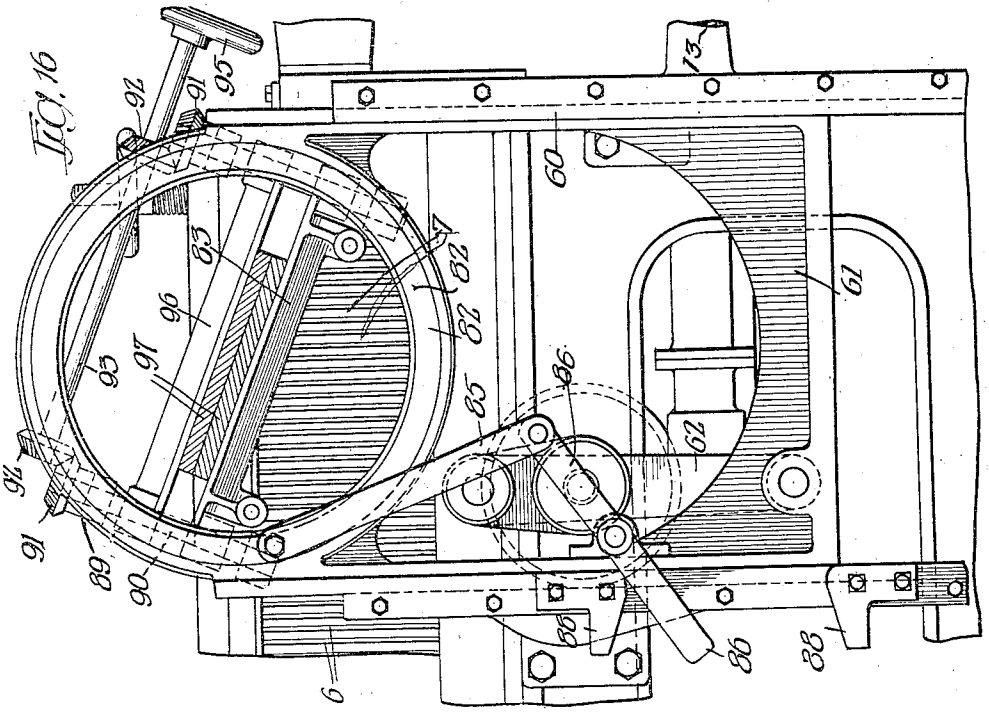
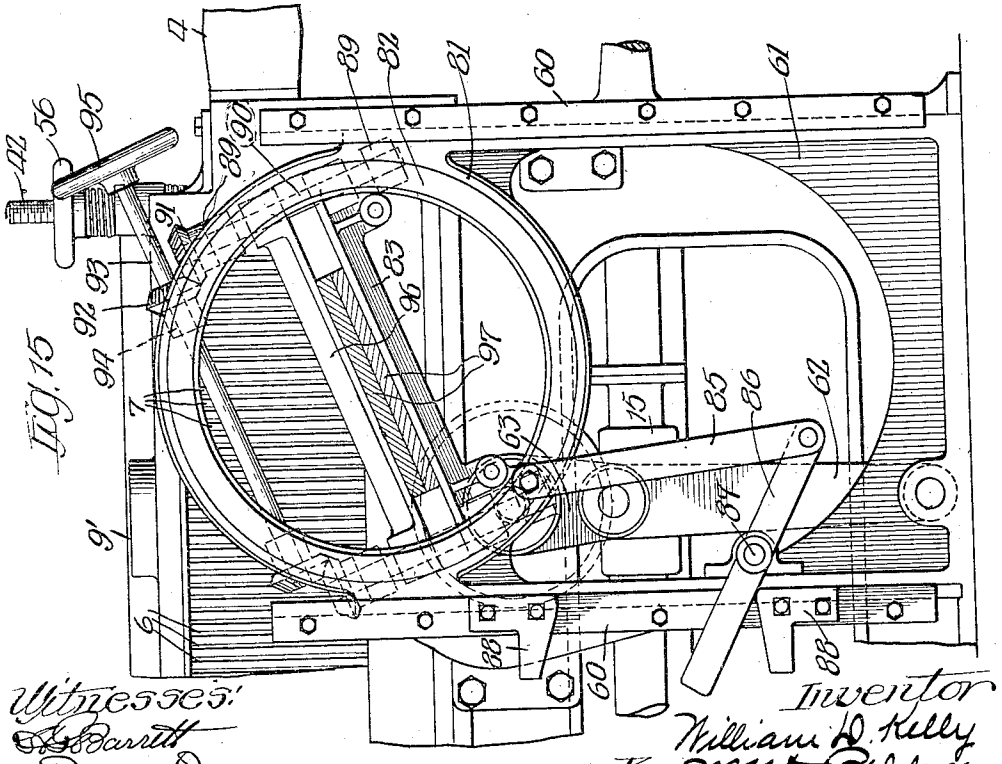


FIG. 15



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By Wm. F. Bellamy

UNITED STATES PATENT OFFICE.

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WOODWORKING-MACHINE.

1,245,240. Specification of Letters Patent. Patented Nov. 6, 1917.

Application filed January 26, 1916. Serial No. 74,349.

To all whom it may concern:

Be it known that I, WILLIAM D. KELLY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Woodworking-Machines, of which the following is a specification.

This invention relates in general to woodworking machines and more particularly to a mortising machine adapted to form a series of mortises and alternating tenons of different configuration in separate pieces of stock, the configuration of the mortises and tenons in the separate pieces of stock being such that when fitted together they can be separated only by movement in one direction.

It is an object of my invention to provide a compact and relatively simple machine wherein a single rotatable member, provided with suitable cutting elements, may be utilized to form mortises of different configuration in separate pieces of stock.

A further object of my invention is the provision of means for automatically manipulating the stock during the operation of the machine, whereby mortises and alternating tenons of desired configuration may be formed therein.

A further object of my invention is the provision of cutting means designed to first cut a series of parallel straight-walled notches in the stock being operated upon and then as a result of movement of the stock relatively to the tool to increase the width of the bases of the notches by undercutting the side walls thereof, thereby simultaneously producing a series of mortises and tenons.

A still further object of my invention is the provision of means for automatically forming wedge-shaped mortises and alternating tenons, the sloping sides of which are angularly disposed with respect to the plane surfaces of the stock, the ends of the tenons taking the form of truncated triangles.

Further objects and advantages of my invention will be apparent as it is better understood by reference to the following specification when read in connection with the accompanying drawing, illustrating the preferred embodiment thereof, in which—

Figure 1 is a front elevation of the machine;

Fig. 2 is a top plan view thereof;

Fig. 3 is a vertical section on the line 3—3 of Fig. 2;

Fig. 4 is a diagrammatic view illustrating the cutting operation as performed on the right-hand side of the machine, viewing Fig. 3;

Fig. 5 is a vertical section on line 5—5 of Fig. 3;

Fig. 6 is a perspective view illustrating the appearance of the separate pieces of stock when fitted together;

Fig. 7 is a perspective view illustrating the stock after being cut on the left-hand side of the machine, viewing Fig. 3;

Fig. 8 is a similar view illustrating the stock after being cut on the right-hand side of the machine, viewing Fig. 3;

Fig. 9 is a vertical section on the line 9—9 of Fig. 3;

Fig. 10 is an enlarged horizontal section on the line 10—10 of Fig. 3;

Figs. 11 to 14, inclusive, are diagrammatic views illustrating the cutting operation as performed on the left-hand side of the machine, viewing Fig. 3;

Fig. 15 is a rear elevation of the machine, illustrating the position of the table at one phase of the operation of the machine, and

Fig. 16 is a similar view, illustrating the position of the table at another phase of the operation of the machine.

Referring to the drawing, 1 indicates a suitable frame, preferably of cast iron, to support the various parts of the mechanism presently to be described. Journaled in bearings 2 at either end of the frame 1 is a main shaft 3 having a pulley 4 secured thereto, whereby the shaft 3 may be driven from any suitable source of power. Secured to the shaft 3 is a tool 5 comprising a plurality of cutters 6 and 7 spaced apart by plates 8 disposed therebetween and each consisting of a disk having suitable formed teeth on the periphery thereof. A clamping collar 9, threadedly mounted on the shaft 3 provides a means for maintaining the cutters 6 and 7 and the plates 8 rigidly in operative position upon the shaft 3. A housing 8′ partially surrounds the tool 5 and is provided with outlets 9′ adapted to be connected to suction means (not shown) to draw the dust and chips formed during the cutting operations from the housing 8′.

A pulley 10, secured to the shaft 3, is connected by a belt 11 to a pulley 12 on the counter-shaft 13 journaled in suitable bear-

ings in the ends of the frame 1. The shaft 13 is provided with a worm 14 disposed in a housing 15 and meshing with a worm gear 16 secured to a shaft 17 normally disposed with respect to the shaft 13. One end of the shaft 17 is journaled in a bearing 18 in one side of the frame 1, the other end being supported in a hollow shaft 19 journaled in a bearing 20 in the opposite side of the frame 1.

At the left hand side of the machine, viewing Fig. 3, a pair of arms 21 are pivotally mounted on shafts 22 secured to and projecting forwardly from the frame 1 and are provided at their upper extremities with guide rods 24 slidably supporting a frame 25 carrying the work table support 26. The work table support 26 is adjustably mounted on the frame 25 by means of bolts 27 secured to the work table support 26 and connected through slots 28 to the frame 25. A screw 29, disposed through a lug 30, depending from the work table support 26 and threadedly engaging the frame 25, allows the table support 26 to be locked in adjusted position with respect to the frame 25. The forward end of the work table 31 is pivotally mounted on the rod 32 extending transversely of the work table support 26 while the rearward end is supported by lugs 32′ depending therefrom and resting on the work table support 26. Bolts 33, provided with thumb nuts 33′, secure the work table 31 in operative position.

To move the work table 31 toward and from the cutting tools 6 I provide a cam member 35 secured to the shaft 17 and provided with cam faces 36 adapted to cooperate with the rollers 37 rotatably mounted on stub shafts 38, depending from the frame 25. As the cam member 35 rotates the frame 25 will slide backwardly and forwardly on the guide rods 24 and the work table 31 will carry the stock 34 disposed thereon into coöperative relation with the cutters 6, the stock being retained in such relation during the cutting operation. The cam member 35 is provided on its periphery with a cam face having two high positions 39 adapted to coöperate successively with rollers 40, rotatably mounted on the arms 21, and as the cam member 35 rotates the arms 21 will swing in the direction of the axis of the tool 5 first to one side and then to the other after the stock 34 has been moved into engagement with the cutters 6, carrying the stock 34 on the work table 31 laterally in both directions with respect to the cutters 6 to accomplish the under-cutting of the mortises as will be more fully explained hereafter. The rollers 40 are adjustable with respect to the arms 21 to regulate the amount of lateral movement of the work table 31.

To clamp the work 34 to the table 31 I provide a transversely extending clamping member 41, slidably mounted on uprights 42 having balls 43 at their lower extremities disposed in sockets 44 of couplers 45. The opposite ends of the couplers 45 are provided with sockets 46 in which are disposed balls 47 on the ends of the rods 48 slidably mounted in bearings 49 formed on the frame 1 and connected at their extremities by a transverse member 50 having a roller 51 rotatably mounted centrally thereof to cooperate with the cam 52 secured to the shaft 17. The members 42 pass through guide lugs 53 on the table 31 and springs 54 are disposed between the guide lugs 53 and the guide lugs 55 on the clamping member 41 through which the members 42 also pass. Hand wheels 56 are threadedly mounted on the ends of the members 42 and springs 57 are disposed between the hand wheels 56 and the guide lugs 55. By operating the hand wheels 56 the clamping member 41 may be adjusted in accordance with the thickness of the stock 34 to be treated and will resiliently grip the material when the clamping member 41 is moved downwardly under the actuation of the cam 52.

To prevent chipping of the stock during the cutting operation a chip plate 57 is secured to the work table 31 on the edge thereof adjacent the cutter 6 and with its upper surface flush with the upper surface of the work table 31. The chip plate 57 is provided with a plurality of notches 58 of a form corresponding to the desired form of the finished mortises to be cut in the stock. A plurality of upstanding fingers 59 on the edge of the chip plate 57, between the notches 58, serve to guide the edge of the stock and limit the depth of the cut, depending upon the adjustment of the work table support 26 with respect to the frame 25.

The purpose of the mechanism just described is to first cut a series of parallel straight-walled notches in the stock being operated upon and then to move the stock transversely with respect to the continuously rotating cutters to undercut the side walls of the notches and thereby simultaneously produce a series of mortises and tenons of the form illustrated in Fig. 7. This operation will be best understood by reference to Figs. 11 to 14 of the drawing which illustrate the form of the cutters 6 as well as the result of the successive operations thereof. As the shaft 17 rotates the cam faces 36 of the cam member 35 will force the frame 25, and consequently the work table 31, to the left, viewing Fig. 3, and simultaneously the clamping member 41 will be raised by the action of the springs 54 to release the stock 34. The operator removes the stock from the table and replaces it with stock to be cut. Upon continued rotation of the shaft 17 the support

25 and the work table 31 is moved to the right, viewing Fig. 3, carrying the stock 34 toward the cutters 6, the clamping member 41 being simultaneously drawn into engagement with the stock 34 by the cam 52 to clamp it securely to the work table 31. As the stock 34 engages the cutting tools 6 a plurality of notches are cut in the edge thereof in the manner illustrated in Fig. 11. When the notches have been cut to their full depth, the depth of the cut being regulated by the adjustment of the work table 31 with respect to the frame 25, the cam member 35 will have rotated to a position to cause a high portion 39 thereon to coöperate with the roller 40 on one of the arms 21 to force the frame 25 and the work table 31 to the right, viewing Fig. 1, with the result that the sides of the notches will be under-cut as indicated in Fig. 12. Subsequently a high portion 39 on the cam member 35 will engage the roller 40 on the remaining arm 21 and force the frame 25 and the work table 31 to the left, viewing Fig. 1, with the result that the opposite sides of the grooves will be under-cut as shown in Fig. 13. The continued operation will cause the arms 21 to assume a vertical position so that the cutters 6 are disposed centrally of the notches as illustrated in Fig. 14 and the cam faces 36 of the cam member 35 will cause the work table 31 to move away from the cutters 6, as previously described, and the clamping member 41 will be simultaneously released so that the stock may be removed and the operation repeated.

Inasmuch as all of the operations of this portion of the machine are automatic throughout the complete cycle thereof the machine, when once adjusted to cut notches of the desired depth, may be fed by a relatively unskilled operator with great rapidity and will form the mortises and tenons on the stock as rapidly as fresh stock can be placed upon the table by the operator. One or more pieces of stock may be cut at each operation, depending on the thickness thereof.

At the right hand side of the machine, viewing Fig. 3, I provide a separate work table to carry the stock into coöperative relation with the cutters 7, which for reasons more fully explained hereafter, are of a different shape than the cutters 6 although mounted on the same shaft and operated in unison therewith. Slidably mounted in a pair of tracks 60, secured to the frame 1, is a frame 61 adapted for vertical movement and actuated through a link 62 by a crank 63 secured to the hollow shaft 19. A clutch member 64 is secured to the worm gear 16 and a coöperating clutch element 65 is slidably mounted within an enlarged portion 66 of the hollow shaft 19 and is normally forced into engagement with the clutch member 64 by a spring 67. The clutch element 65 is provided with a notch 68 which, when the clutch element 65 is in inoperative position, registers with a peripheral groove 69 in the enlarged portion 66 of the hollow shaft 19. A shoe 70 having a cam nose 71 is disposed in the groove 69 and secured to a rod 72 slidably mounted in a bracket 73, secured to the frame 1. A bell-crank lever 74 is pivotally mounted at 75 on the frame 1, one arm being connected to the rod 72 by a link 76 to an arm 77 secured to a transverse shaft 78 journaled in the ends of the frame 1. A foot lever 79 is provided whereby the shaft 78 may be rocked and the shoe 71 thereby moved in the groove 69 diametrically of the hollow shaft 19 to release the clutch element 65. A spring 80 within the bracket 73 normally maintains the shoe 71 in the groove 69 in position to engage the notch 68 in the clutch element 65 as the hollow shaft 19 rotates. With the parts in driving position (as shown in Fig. 3) the hollow shaft 19 is locked to the clutch member 64 and is rotated with the shaft 17. At each complete rotation of the hollow shaft 19 the notch 68 in the clutch element 65 engages the cam nose 71 (Fig. 9) of the shoe 70 which wedges the clutch element 65 backwardly against its spring 67 and withdraws it from engagement with the clutch member 64, so that the hollow shaft 19 is released from the continuously rotating clutch member 64 and ceases to rotate therewith until the foot lever 79 is depressed to allow the clutch element 65 to again engage the clutch member 64.

The frame 61 is provided with a circular track 81 supporting a circular frame 82, to which the work table 83 is secured as hereafter described. The circular frame 82 is connected by a link 85 to a lever 86 pivotally mounted at 87 on the slidable frame 61, the opposite end of the lever 86 being adapted to coöperate with a pair of stops 88 fixedly mounted on one of the tracks 60. By means of the mechanism described the work table is moved upwardly and downwardly at each complete rotation of the hollow shaft 19 and as the table nears the completion of its upward or downward movement it is tilted through the coöperation of the lever 86 with one of the stops 88 to the positions illustrated in Figs. 15 and 16.

Mounted in suitable bearings 89 on the circular frame 82 at each side of the table 83 is a shaft 90 provided with a bevel gear 91 meshing with corresponding pinions 92 on a shaft 93 journaled in bearings 94 on the circular frame 82. The shaft 93 is provided with a hand wheel 95 and upon rotation thereof a clamping member 96, threadedly engaging the shafts 90, may be moved toward and from the table 83, which is also threadedly mounted on the shafts 90, to

clamp the stock firmly between the clamping member 96 and the table 83.

To limit the depth of the notches produced during the cutting operation I provide a stop plate 97′ adjustably mounted on bolts 98 secured to the frame 1 of the machine. By rotating the bolts 98 the plate 97′, which threadedly engages the bolts 98, may be adjusted toward and from the cutters 7 and may be locked in adjusted position by the collars 99.

The purpose of the mechanism just described is to cut a plurality of mortises and alternating tenons having sloping sides disposed at an angle to the plane surfaces of the stock (as shown in Fig. 8), the mortises and tenons being adapted to interlock with the mortises and tenons (shown in Fig. 7) formed by the mechanism at the opposite side of the machine to provide a structure such as that illustrated in Fig. 6. In order to rapidly and economically accomplish this result the cutters 7 are provided with straight parallel sides and two pieces of stock 97 are preferably treated at the same time. The two pieces of stock 97 are disposed upon the table 83 by the operator and the hand wheel 96 is actuated to cause the clamping member 96 to descend and hold the stock in proper position upon the table 83. The position of the parts is that indicated in Fig. 15 and upon depression of the foot pedal 79 by the operator the clutch element 65 is released and engages the clutch member 64, causing the hollow shaft 19 to rotate and the frame 61 to move upwardly past the cutters 7.

The operation will be more clearly understood by reference to Fig. 4 in which the full line position of the stock 97 is that which it assumes during the first phase of the operation in which a plurality of cuts are made in the edges of the stock 97 diagonally with respect to the plane faces thereof. When the sliding frame 61 nears the upward limit of its travel and after the stock has cleared the cutters 7 the lever 86 engages the upper stop 88 and turns the frame 82 to the position indicated in Fig. 16, after which, owing to the continued rotation of the hollow shaft 19, the sliding frame 61 descends again, moving the stock 97 past the cutters 7 in the position indicated in dotted lines in Fig. 4, with the result that a second series of diagonal cuts is made in the ends of the stock 97 and the mortises and tenons are completely formed. As the sliding frame 61 nears the completion of its downward movement the lever 86 engages the lower stop 88 and the frame 82 is turned to the position indicated in Fig. 15, after which the clutch element 65 is automatically withdrawn from engagement with the clutch member 64 in the manner previously described and the stock 97 may be withdrawn after releasing the clamping member 96 and the complete cycle of operation is repeated, using fresh stock.

The operation of this portion of the machine is automatic throughout the cycle thereof except for the clamping movement and the releasing of the clutch mechanism. The clamping of the stock is, however, accomplished by a slight turn of the hand wheel 95 and when the operator has acquired a slight amount of skill the clutch pedal 79 may be held in releasing position and the machine operated continuously.

From the foregoing description it will be readily understood that I have perfected a machine which is compact and relatively simple in construction and operation, whereby mortises and tenons of different configuration and adapted to interlock so that they can be separated by movement in a single direction only are simultaneously, rapidly and economically produced.

It will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing any of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a woodworking machine, the combination of a work support, a tool comprising a plurality of cutters arranged to cut in parallel planes and held against movement relative to their respective planes, means for bringing the work and tool into coöperative relation, whereby notches having parallel side walls are produced in the work by said cutters, and automatic means for causing said work support to move laterally with respect to said cutters to bring the inclined side edges of the cutters and the side walls of the notches into coöperative relation whereby said side walls are under-cut.

2. In a woodworking machine, the combination of a work support, a tool comprising a plurality of cutters having inclined sides, arranged to cut in parallel planes normally to the axis of rotation of the tool and held against movement relatively to their respective planes, means for bringing the work and tool into coöperative relation to produce a plurality of parallel notches in the work, and means for automatically moving said work support longitudinally of said tool during the cutting operation to bring the inclined sides of the cutters into contact with the side walls of the notches, whereby said side walls are under-cut.

3. In a woodworking machine, the combination of a work support, a circular cutting tool provided upon its periphery with a plurality of cutters having diverging edges, said tool being restrained from movement in the direction of its axis of rotation, means for moving said work support to-

ward the axis of rotation of said tool to subject the work to the action of the ends of the cutters, and automatic means for subsequently moving said work support in both directions longitudinally of the axis of rotation of said tool, whereby the diverging edges of the cutters are caused to under-cut the work.

4. In a woodworking machine, the combination of a work support, a rotatable tool provided with a plurality of circumferential alined cutters having inclined side edges and mounted to rotate in a plane normal to the axis of rotation of the tool, said tool being restrained from movement in the direction of its axis of rotation, means for bringing the work and the tool into coöperative relation, whereby notches having parallel side walls are cut in the work by said cutters, and automatic means for subsequently moving said work support longitudinally of the tool axis, whereby the inclinded side edges of the cutters are caused to under-cut the side walls of said notches to produce an under-cut mortise.

5. In a woodworking machine, the combination of a work support, a rotatable tool provided with circumferentially alined cutting elements having diverging cutting edges, said alined elements being arranged to travel in a plane normal to the axis of rotation of the tool, said tool being restrained from movement in the direction of its axis of rotation, means for feeding the work toward the tool to produce straight walled notches therein to a predetermined depth, means for moving the work laterally with respect to said cutting elements in directions parallel to the axis of rotation of said tool, whereby the diverging cutting edges of said cutting elements are caused to under-cut the side walls of said notches, and means for subsequently withdrawing the work from engagement with the tool.

6. In a woodworking machine, the combination of a work support, a tool presenting a plurality of cutters arranged to cut in parallel planes and held against movement relative to their respective planes, means for bringing the work and the tool into coöperative relation to produce a plurality of notches of predetermined depth in the work, means for moving said work support transversely of the cutting planes in both directions from the central cutting position and returning it to central position, and means subsequently causing a relative movement between the work and tool to withdraw the work from the tool.

7. In a woodworking machine, the combination of a work support, a rotatable shaft, a cutting tool provided with a plurality of cutters fixedly mounted on said shaft arranged to cut in parallel planes and held against movement relative to their respective planes, means for rotating said shaft, and means for moving said work support toward and from said tool and in both directions longitudinally of said shaft, whereby a plurality of notches having straight sides are first produced in the work and the sides of the notches are subsequently under-cut to provide a plurality of under-cut mortises.

8. In a woodworking machine, the combination of a frame, a work support and a rotatable cutting tool provided with a plurality of alined cutters mounted on said frame, a shaft mounted in the frame, a cam mounted on the shaft and provided with a plurality of cam faces, means operated by said cam for moving said work support toward and from the tool, and means also actuated by said cam for moving said work support laterally with respect to said alined cutters, whereby the side walls of the notches formed by said alined cutters are under-cut.

9. In a woodworking machine, the combination of a work support, a rotatably mounted cutting tool having diverging cutting edges adjacent its periphery, said tool being restrained from movement in the direction of its axis of rotation, means for holding stock in position on said support, mechanism for bringing the stock and the cutting tool into coöperative relation to produce a series of straight-walled notches, and means for subsequently moving the stock along the plane thereof, whereby said diverging cutting edges are caused to increase the width of the notches at the bottom thereof.

10. In a woodworking machine, the combination of a work support, means for holding stock thereon, a rotatable cutting tool provided with a series of peripheral cutters having diverging cutting edges, said tool being restrained from movement in the direction of its axis of rotation, means for automatically feeding the stock a predetermined distance toward said tool to cause notches of predetermined depth to be cut therein by said cutters, and means for subsequently moving said stock relatively to said tool transversely of the cutting plane of said cutters, whereby the width of the bases of said notches is increased by said diverging cutting edges without increasing the width of the mouths thereof.

11. In a woodworking machine, the combination of a work support, a rotatable cutting tool provided with a series of parallel cutters with inclined side edges adapted to simultaneously cut a series of parallel notches, said tool being restrained from movement in the direction of its axis of rotation, a reciprocatory work support, means for reciprocating said support toward and from said tool, means for holding stock fixedly on said support when said support is in proximity to said tool, and means for causing movement of said stock in directions

transversely of the reciprocatory movement of said support when said support is at the limit of its travel toward said tool to cause the side walls of the parallel notches to be under-cut by said inclined side edges of said tool.

12. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters arranged to cut in parallel planes, a swinging support for said work table bodily movable transversely to the planes of said cutters, and means for swinging said support, whereby said work table is moved laterally with respect to said cutters.

13. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters arranged to cut in parallel planes, a swinging support for said work table bodily movable transversely to the planes of said cutters, means for moving said work table relatively to said support toward and from said cutters, and means for swinging said support whereby said work table is moved laterally with respect to said cutters.

14. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters arranged to cut in parallel planes, a pair of swinging arms having means connected thereto to slidably support said work table, means for moving said work table relatively to said arms toward and from said cutters, and means for swinging said arms whereby said work table is moved laterally with respect to said cutters.

15. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters arranged to cut in parallel planes, means for rotating said tool, a swinging support for said work table bodily movable transversely to the planes of said cutters, a shaft, a cam on said shaft, and means coöperating with said cam to swing said support, whereby said work table is moved laterally with respect to said cutters.

16. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, means for rotating said tool, a swinging support for said work table, a shaft, a cam on said shaft, and means coöperating with said cam to move said work table toward and from said cutters and to swing said support, whereby said work table is moved laterally with respect to said cutters.

17. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters, arranged to cut in parallel planes, means for rotating said tool, a swinging support for said work table bodily movable transversely to the planes of said cutters, a shaft, a cam on said shaft, means coöperating with said cam to move said work table toward and from said cutters and to swing said support, whereby said work table is moved laterally with respect to said cutters, and means for clamping the stock to be cut on said work table.

18. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters arranged to cut in parallel planes, means for rotating said tool, a swinging support for said work table bodily movable transversely to the planes of said cutters, a shaft, a cam on said shaft, means coöperating with said cam to move said work table toward and from said cutters and to swing said support, whereby said work table is moved laterally with respect to said cutters, a clamp adapted to coöperate with said work table to hold the stock to be cut thereon, and means for automatically actuating said clamp.

19. In a woodworking-machine, the combination of a work table, a tool comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, means for rotating said tool, a swinging support for said work table, a shaft, a cam on said shaft, means coöperating with said cam to move said work table toward and from said cutters and to swing said support, whereby said work table is moved laterally with respect to said cutters, a clamp adapted to coöperate with said work table to hold the stock to be cut thereon, a second cam on said shaft, and means coöperating therewith to automatically actuate said clamp.

20. In a woodworking machine, the combination of a work table, a rotatable tool comprising a plurality of cutters arranged to cut in parallel planes, means for relatively reciprocating said work table and tool in a direction tangential to said cutters, and means automatically controlled by the relative movements of said work table and tool causing said work table to assume positions in which it is angularly disposed with respect to the direction of relative movement of said work table and tool.

21. In a woodworking machine, the combination of a work table, a rotatable tool comprising a plurality of cutters arranged to cut in parallel planes, means for bodily reciprocating said table in a direction tangential to said cutters, and means automatically controlled by the movement of said table for tilting said table, whereby it is caused to assume positions in which it is angularly disposed with respect to the direction of its bodily movement.

22. In a woodworking machine, the combination of a work table, a rotatable tool comprising a plurality of cutters arranged to cut in parallel planes, means for rotating said tool, means for bodily reciprocating

said work table in a direction tangential to said cutters, means automatically controlled by the movement of said table for tilting said work table, whereby it is caused to assume positions in which it is angularly disposed with respect to the direction of its bodily movement, and means for clamping stock to be cut on said work table.

23. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, means for rotating said tool, means for bodily reciprocating said work table in a direction tangential to said cutters, and means operating on said work table at the end of its movement in either direction to cause said work table to assume positions in which it is angularly disposed with respect to the direction of its bodily movement.

24. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, means for rotating said tool, a sliding frame provided with a circular track, a second frame slidably supported in said circular track, to which said work table is secured, means for reciprocating said first-mentioned frame in a direction tangential to said cutters, and means for actuating said second-mentioned frame near the end of the movement of said first-mentioned frame in either direction to cause said work table to assume positions in which it is angularly disposed with respect to the axis of said tool.

25. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, means for rotating said tool, a sliding frame provided with a circular track, a second frame slidably supported in said circular track, to which said work table is secured, means for reciprocating said first-mentioned frame in a direction tangential to said cutters, means for actuating said second mentioned frame near the end of the movement of said first-mentioned frame in either direction to cause said work table to assume positions in which it is angularly disposed with respect to the axis of said tool, and means for clamping stock to be cut on said work table.

26. In a woodworking machine, the combination of a work table, a tool comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, means for rotating said tool, a sliding frame provided with a circular track, a second frame slidably supported in said circular track, to which said work table is secured, means for reciprocating said first-mentioned frame in a direction tangential to said cutters, means for actuating said second-mentioned frame near the end of the movement of said first-mentioned frame in either direction to cause said work table to assume positions in which it is angularly disposed with respect to the axis of said tool, means for driving said reciprocating means, and means for releasing said reciprocating means from said driving means after each reciprocation of said first-mentioned frame.

27. In a woodworking machine, the combination of a tool, comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, the cutters adjacent one end of said tool having flaring edges and the cutters adjacent the other end of said tool having straight edges, means for rotating said tool, a work table at each side of said tool, means for moving one of said work tables toward the flaring edged cutters and then laterally with respect thereto to undercut the grooves formed thereby, and means for moving the other work table bodily past said straight edged cutters and for tilting said table, whereby it is caused to assume positions in which it is angularly disposed with respect to the direction of its bodily movement.

28. In a woodworking machine, the combination of a tool comprising a plurality of cutters having a common motion but arranged to cut in parallel planes, the cutters adjacent one end of said tool having flaring edges and the cutters adjacent the other end of said tool having straight edges, means for rotating said tool, a work table at each side of said tool, means for moving one of said work tables toward the flaring edged cutters and then laterally with respect thereto to undercut the grooves formed thereby, means for moving the other work table bodily past said straight edged cutters and for tilting said table, whereby it is caused to assume positions in which it is angularly disposed with respect to the direction of its bodily movement, and means for clamping stock to be cut on said work table.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."