

H. L. STALEY.
 DUPLEX TENON FORMING MACHINE.

APPLICATION FILED NOV. 30, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

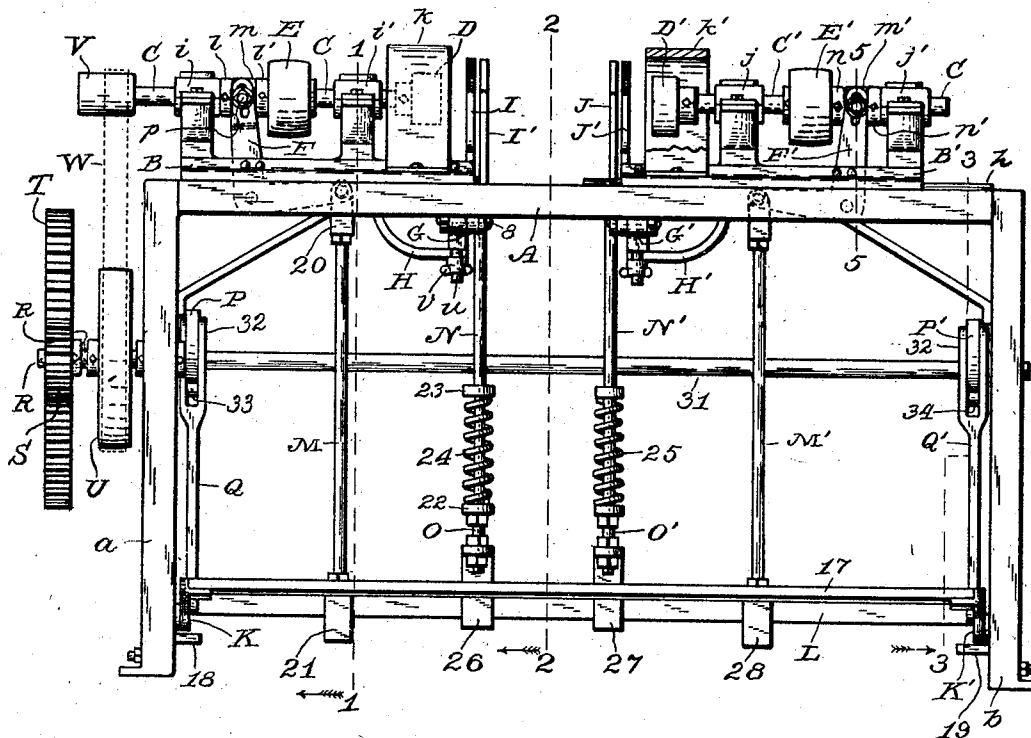
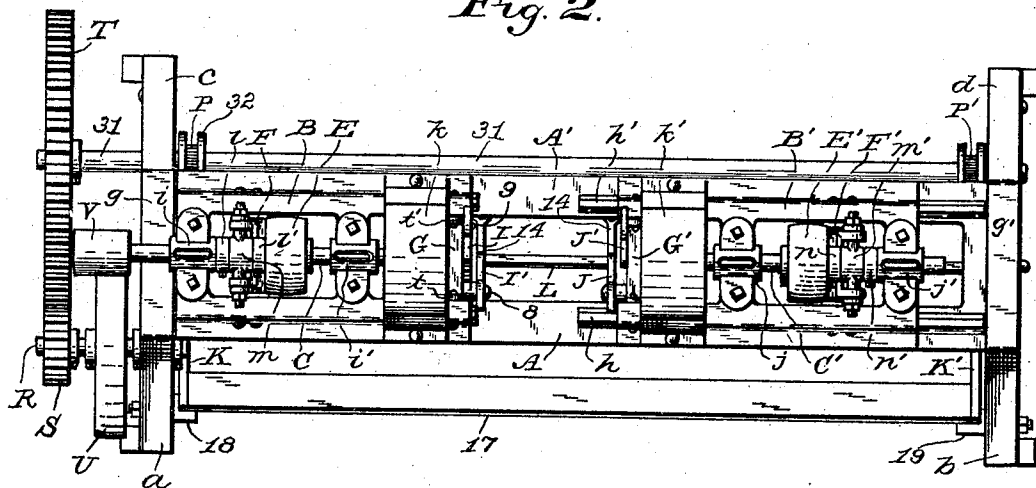


Fig. 2.



Inventor:

Harrison L. Staley.

by

C. J. Silvers.

Attorney.

Witnesses:

E. Kellartine
 Stella Snider

No. 800,412.

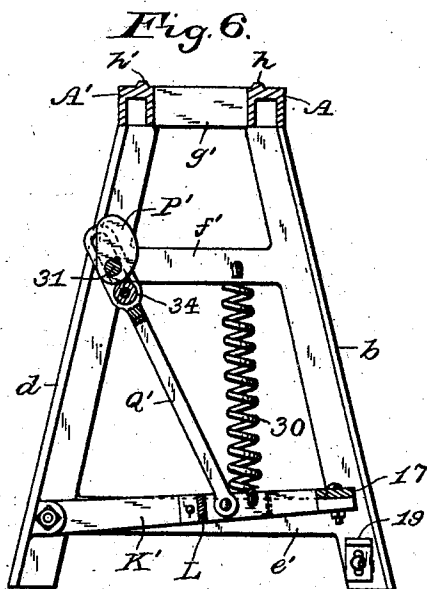
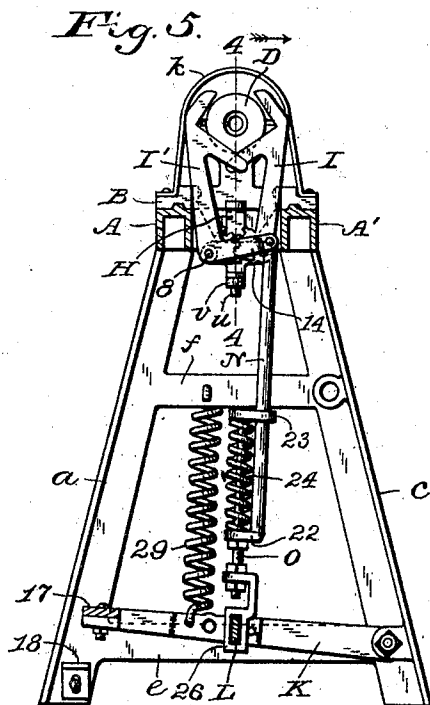
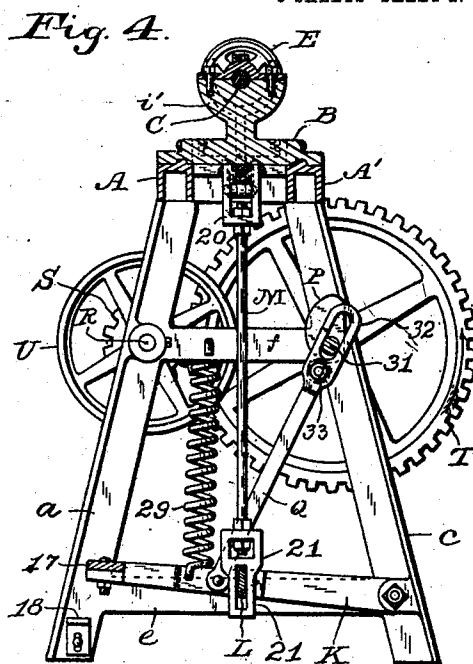
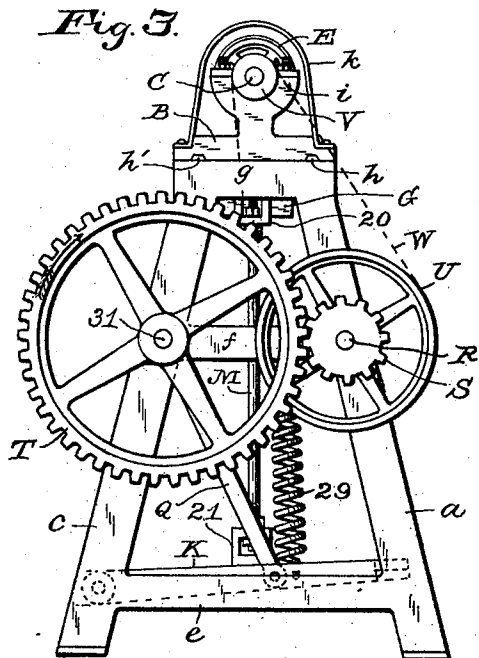
PATENTED SEPT. 26, 1905.

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3 SHEETS—SHEET 2.



Witnesses:

E. P. Martin.
Stella Snider

Inventor:

Harrison L. Staley.

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E. T. Silvers

Attorney.

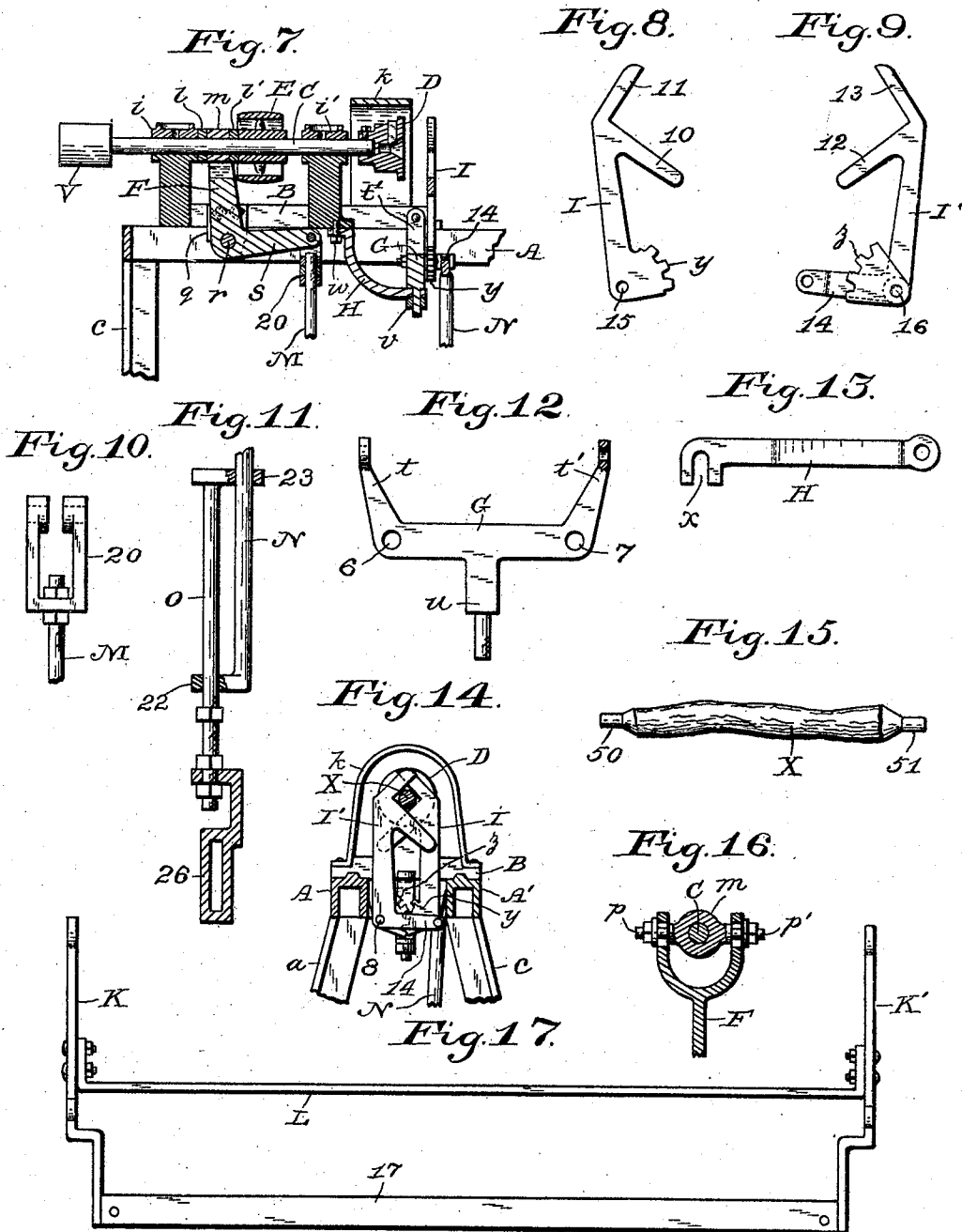
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3 SHEETS—SHEET 3.



Witnesses.

E. E. Martin.
 Stella Snider.

Inventor:
 Harrison L. Staley.
 by
 E. J. Silvers.
 Attorney.

UNITED STATES PATENT OFFICE.

HARRISON L. STALEY, OF MARTINSVILLE, INDIANA, ASSIGNOR TO THE
OLD HICKORY CHAIR COMPANY, OF MARTINSVILLE, INDIANA, A
CORPORATION OF INDIANA.

DUPLEX TENON-FORMING MACHINE.

No. 800,412.

Specification of Letters Patent.

Patented Sept. 26, 1905.

Application filed November 30, 1904. Serial No. 234,855.

To all whom it may concern:

Be it known that I, HARRISON L. STALEY, a citizen of the United States, residing at Martinsville, in the county of Morgan and State of Indiana, have invented new and useful Improvements in Duplex Tenon-Forming Machines; and I do declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to machines that are designed to cut or form circular tenons on the ends of pieces of wood which may be used in the manufacture of furniture and other articles, and the invention has reference particularly to machines in which two tenons may be formed simultaneously and especially in alignment at the two ends of a crooked piece of wood.

Objects of the invention are to provide inexpensive machines capable of forming tenons at both ends of pieces of wood that may be crooked and have uneven surfaces, such as natural undressed wood in its bark, the tenons to be true in cylindrical form and in alignment one with another, to provide tenon-machines that may be operated rapidly and economically by unskilled operators and which may be equally adapted to form tenons on true or straight pieces.

The invention consists of a machine having a plurality of oppositely-disposed movable tool-heads, a plurality of novel chucks for holding the work mounted between the heads, and apparatus for successively operating the chucks and the heads automatically and also manually; and the invention consists, further, in the novel parts and the combinations and arrangements of parts, as hereinafter particularly described, and pointed out in the appended claims.

Referring to the drawings, Figure 1 represents a front elevation of the machine; Fig. 2, a top plan thereof; Fig. 3, an elevation of an end of the machine; Fig. 4, a transverse sectional view on the line 1 1 in Fig. 1; Fig. 5, a transverse sectional view on the line 2 2 in Fig. 1; Fig. 6, a fragmentary transverse sectional view approximately on the line 3 3 in Fig. 1; Fig. 7, a fragmentary longitudinal sectional view vertically, as at the plane of

the line 4 4 in Fig. 5; Figs. 8 and 9, elevations of the two principal parts of one of the chucks; Figs. 10, 11, 12, and 13, detail views of parts embodied in the machine detached therefrom; Fig. 14, a fragmentary transverse sectional view on the line 2 2 in Fig. 1, showing a chuck closed on a piece of wood; Fig. 15, a side view of a piece of wood having tenons formed at its ends, illustrating the character of work performed by the machine; Fig. 16, a transverse sectional detail view of the device for moving a tool-head to and from its work on the line 5 5 in Fig. 1, and Fig. 17 is a plan of the foot-lever for controlling the chucks and the movements of the tool-heads with respect to the articles to be worked on.

Similar reference characters in the several figures of the drawings designate corresponding parts or features.

In construction a suitable frame is provided embracing posts *a*, *b*, *c*, and *d*, serving as legs, and horizontal rails *e*, *e'*, *f*, *f'*, *g*, and *g'* and longitudinal bars *A* and *A'*, attached to the rails *g* and *g'* at the tops of the posts, the bars having guides *h* and *h'* on their tops, on which are mounted head-stocks *B* and *B'*, which are adapted to be moved toward or from one another, and each stock may be fastened by any suitable means to the frame.

The head-stock *B* is provided with a pair of journal-bearings *i* and *i'*, in which a spindle *C* is mounted, and the stock *B'* has a pair of bearings *j* and *j'*, in which is mounted a spindle *C'*. A suitable tool-head *D* is attached to the spindle *C*, and a similar head *D'* is attached to the spindle *C'*, one spindle being provided with a pulley *E* and the other with a like pulley *E'*. One tool-head is covered by a guard *k* and the other by a like guard *k'* to prevent the chips from flying into the operator's face and also to prevent the operator from accidental injury through contact with the tool-head, the guards being attached to the head-stocks.

In order to move the tool-heads toward each other, the spindle *C* has a pair of collars *l* and *l'* secured thereto, and a sleeve *m* is arranged between the two collars loosely on the spindle, and on the spindle *C'* a pair of collars *n* and *n'* are secured, there being between the two collars a loose sleeve *m'*. Each sleeve (see Fig. 16) has lugs *p* and *p'*, that are engaged by the forked end of a lever *F* or *F'*,

that is connected to a bracket *g* by means of a pivot *r*, each lever being provided with an arm *s* at right angles thereto. A yoke *G*, having arms *t* and *t'* and pivot-holes 6 and 7, is pivoted by the arms to the head-stock *B* and the end thereof near the tool-head *D*. A similar yoke *G'* is supported in a similar manner by the stock *B'*. Each yoke has a stem *u*, whereby it is normally prevented from swinging on its pivots by means of a brace *H* or *H'*, that is connected to a head-stock by a pivot *w*, the brace having a slot *x* receiving the stem *u*, which is provided with a nut *v*.

The two chucks required are mounted on the yokes *G* and *G'*, one chuck comprising an arm *I* and an opposing arm *I'* and the other comprising identical arms *J* and *J'*. One arm of each pair, as *I*, has two jaw-fingers 10 and 11, and the other arm, as *I'*, has similar fingers 12 and 13. The arms have pivot-holes 15 and 16, by which they are connected to a yoke by pivots 8 and 9. The arm *I* has a toothed segment *y*, and the arm *I'* has a toothed segment *z*, the two segments being in engagement, and the arms *J* and *J'* are similarly connected together. The arms *I'* and *J* are provided each with a lever 14, by which to open and close the chucks. The fingers 10 and 12 serve as guide-fingers.

In order to manually operate both of the chucks and also adjust the tool-heads in harmony, a foot-lever is provided, which comprises two arms *K* and *K'*, that are pivoted to the lower rear parts of the frame, and also a connecting-bar *L* and a footboard 17, both of which are secured to the arms, the footboard being at the free ends of the arms. Stops 18 and 19 for the foot-lever are adjustably attached to the posts *a* and *b* of the frame. A connecting-rod *M* has a jaw 20 connected to the arm *s*, and it also has a loop 21 adapted to be engaged by the bar *L*, the loop having clearance so that the bar *L* may move vertically to some extent in the loop.

A link *N* is pivoted to the lever 14 of the chuck-arm, and it has a guide 22, through which extends a link *O*, that has a guide 23, through which the link *N* extends, and a spring 24 is arranged on the link *O* between the guides 22 and 23, so that the two links *N* and *O* together provide an elongating or extensible link, with the spring tending to contract or shorten the link, the lower end of which is provided with a loop 26, that extends closely about the bar *L*, but may be moved along the bar when desired. The other chuck is provided with an identically-constructed extensible link comprising link parts *N'* and *O'*, a spring 25, and a loop 27, connected also to the bar *L* in the same manner as the loop 26. For operating the lever *F'* a connecting-rod *M'*, having a loop 28 coöperating with the bar *L*, is provided. A pair of springs 29 and 30 are connected to the foot-lever arms and to the frame for normally holding the foot-

lever in an elevated position and by means of the rods *M* and *M'* holding the tool-heads apart. The rods *M* and *M'* and also the link parts *O* and *O'* are adapted to be adjusted as to their lengths.

In order to render the machine automatic in its operations, a rotative shaft 31 is journaled in the rear parts of the frame, and on the shaft is secured a pair of cams *P* and *P'*. A pair of push-bars *Q* and *Q'* are pivoted to the foot-lever arms *K* and *K'* and have each a guide 32 engaging the shaft 31, the bars being provided with bearing-rollers 33 and 34 in engagement with the cams for depressing the foot-lever. A rotative shaft *R* is journaled in the post *u*, and a pinion *S* is secured to the shaft and meshes with a gear-wheel *T*, that is secured to the shaft 31. A crowning-pulley *U* is also secured to the shaft *R* and is driven by a straight-face pulley *V*, that is secured to the spindle *C* by means of a belt *W*, that is indicated by broken lines in Figs. 1 and 3.

A chair-rung *X* in Fig. 15 has tenons 50 and 51 at its ends, that are in alinement irrespective of irregularities of the surface of the body of the piece, and illustrates the character of work that may be done by the machine.

When it is desired to manually operate the foot-lever, the belt *W* may be removed and the push-bars *Q* and *Q'* disconnected from the foot-levers.

In connecting the driving-belts to the machine-pulleys *E* and *E'* one belt is to be open or straight and the other crossed, so that the spindles *C* and *C'* may be driven in opposite directions, the cutters in the tool-heads *D* and *D'* being properly arranged to cut when running oppositely, thus requiring the least amount of power for the clutches in holding the work.

In practical use after starting the machine a piece of wood of proper length is to be placed upon the guide-fingers 10 and 12 of the clutch-arms and then the foot-lever is to be depressed, (either manually or automatically,) thus closing the clutches, and if the piece has a greater diameter at one end than at the other the springs 24 and 25 will compensate for the difference and permit both clutches to grasp the piece with nearly the same degree of pressure. While the clutches are being closed the rotating tool-heads are being moved toward the piece of wood by reason of the weight of the rods *M* and *M'* and their connections, and the head that may first engage the piece will push it over to the opposite head before the clutches have clamped the piece. After pressure has been applied to the clutches the bar *L* will engage the loops 21 and 28 and force the tool-heads to cut the tenons, the springs 24 and 25 yielding sufficiently for the required movements of the tool-heads along the piece of wood. When the foot-lever rises, the bar *L*

will push up the rods M and M', causing the tool-heads to be retracted, after which the clutches will release the work, so that it may be removed from the guide-fingers and another piece operated on as before, the work being done expeditiously and accurately, each tenon being of the same length.

The braces H and H' may be disconnected from the yokes G and G' by loosening the retaining-nuts v, permitting the chucks to swing away from the fronts of the tool-heads when the operator desires to have ready access to the tool-heads or to the cutting-tools.

Having thus described the invention, what I claim as new is—

1. A tenon-machine including two opposing rotative tool-heads mounted on spindles movable longitudinally, two centering and holding chucks supported between the two tool-heads, and means for either closing or opening the chucks simultaneously provided with automatically-operating yielding means permitting either one of the two chucks to close to a lesser diameter than the other.

2. A tenon-machine including a rotative spindle carrying a tool-head and movable endwise, a chuck supported near the tool-head and comprising opposing cooperating pivoted arms having each a guide-finger and a jaw, a foot-lever, a rod cooperating with the foot-lever and controlling the endwise movements of the spindle, and a spring-contracted extensible link connected to the foot-lever and cooperating to close and open the chuck.

3. A tenon-machine including a frame, a head-stock on the frame, a rotative longitudinally-movable spindle mounted on the head-stock and carrying a tool-head, a chuck comprising opposing cooperating pivoted arms having each a guide-finger and a jaw, a yoke pivoted to the tool-head and supporting the chuck, a foot-lever, a rod cooperating with the foot-lever and controlling the longitudinal movements of the spindle, and a spring-contracted extensible link connected to the foot-lever and cooperating to close and open the chuck.

4. A tenon-machine including a frame, a head-stock on the frame supporting a chuck and also a rotative spindle movable endwise and carrying a tool-head toward and from the chuck, and operative connections between the spindle and the chuck controlling the endwise movements of the spindle and the opening and closing of the chuck in harmony, the connections being automatically adjustable and cooperating to close the chuck in advance of the operation of the tool-head and to withdraw the tool-head in advance of the opening of the chuck.

5. A tenon-machine including a frame, a head-stock on the frame and supporting a chuck having an operating-lever, a spindle mounted rotatively and movable longitudinally on the head-stock, a tool-head attached

to the spindle, a lever controlling the longitudinal movements of the spindle and provided with a connecting-rod having a loop at the lower end thereof, a foot-lever pivoted in the frame and having a slip connection with the loop of the connecting-rod, and an automatically-extensible link connected to the operating-lever of the chuck and also to the foot-lever.

6. A tenon-machine including a rotative and longitudinally-movable spindle carrying a tool-head, a chuck supported near the tool-head and comprising a pair of pivoted arms having cooperating gear-segments and provided with jaws, one of the arms being provided with an operating-lever, a foot-lever, a rod cooperating with the foot-lever and controlling the longitudinal movements of the spindle, and a spring-contracted extensible link connected to the foot-lever and also to the operating-lever of the chuck-arm.

7. A duplex machine including a plurality of rotative and longitudinally-movable spindles carrying tool-heads, a plurality of centering and holding chucks supported between a pair of opposing tool-heads and provided with yielding means adapted to compensate for diametrical inequalities of sticks held thereby to be operated on by the tool-heads, a plurality of levers cooperating to move the spindles longitudinally, a plurality of operating-rods connected to the levers, a plurality of links connected operatively with the plurality of chucks, and operating mechanism connecting together the plurality of operating-rods and the plurality of links.

8. A duplex tenon-machine including a frame, a spring-pressed foot-lever pivoted in the frame, a plurality of head-stocks on the frame, a plurality of spindles on the head-stocks, tool-heads attached to the spindles, a plurality of chucks each supported by a head-stock near a tool-head and provided with an operating-lever, a plurality of controlling-levers mounted on the head-stocks and operatively connected with the spindles and also with the foot-lever, a plurality of elastic links connected to the operating-levers of the chucks and also with the foot-lever, a rotative shaft provided with a plurality of cams, a plurality of push-bars connected with the foot-lever and cooperating with the cams, and operative connections between the rotative shaft and one of the plurality of spindles.

9. A duplex tenon-machine including a pair of rotative tool-heads movable toward each other, a plurality of chucks arranged between the tool-heads and comprising each a pair of pivoted arms having cooperating gear-segments and provided with jaws and guide-fingers, a plurality of levers cooperating to simultaneously move the tool-heads, a plurality of connecting-rods connected to the levers, a plurality of extensible links controlling the chucks, mechanism connecting together the

plurality of connecting-rods and the plurality of extensible links, and means connecting the mechanism operatively with one of the pair of rotative tool-heads.

5 10. In a tenon-machine, the combination of a head-stock provided with a swinging yoke, a brace for the yoke normally preventing its swinging, a chuck mounted on the yoke and having an operating-lever, a spindle rotative
10 on the head-stock and movable longitudinally, a tool-head attached to the spindle, a lever pivoted near the spindle and having operative connection therewith for the control of the longitudinal movements thereof, and opera-
15 tive elastic connections between the lever and the operating-lever of the chuck.

11. In a tenon-machine, the combination of a head-stock, a spindle mounted rotatively and movable longitudinally on the head-stock, a
20 controlling-lever operatively connected with the spindle, a tool-head attached to the spindle, a plurality of chucks, mechanism operatively connecting the plurality of chucks with the controlling-lever, and driving means con-
25 nected with the mechanism and also with the spindle coöperating to intermittently operate the plurality of chucks and move the spindle longitudinally.

12. In a tenon-machine, the combination
30 with a head-stock and a tool-head operatively mounted thereon, of a yoke having arms pivoted to the head-stock and also having a stem extending from the body thereof, a brace pivoted to the head-stock and detachably con-
35 nected to the stem of the yoke, a chuck comprising a pair of arms pivoted to the yoke and extending nearly to the tool-head, the arms having each a gear-segment attached thereto in engagement one with the other,
40 jaws and guide-fingers attached to the arms,

and an operating-lever attached to one of the arms.

13. In a tenon-machine, the combination with a pair of longitudinally-movable rotative
spindles carrying each a tool-head and in 45 alinement, of a plurality of controlling-levers each operatively connected with a spindle, a plurality of connecting-rods each operatively connected with a controlling-lever and pro-
50 vided with a loop, a plurality of chucks mounted between the tool-heads, a plurality of links each operatively connected with a chuck, a foot-lever having a connecting-bar extending through the loops of the connecting-rods and having a limited degree of movement therein
55 in vertical directions, and a plurality of loops each connected to a link and also to the connecting-bar and adjustable thereon.

14. In a tenon-machine, the combination of a frame, a plurality of head-stocks adjustable
60 on the frame, longitudinally-movable rotative spindles on the head-stocks, tool-heads on the spindles, chucks mounted on the head-stocks, a foot-lever pivoted in the frame, connections
65 between the spindles and the foot-lever, connections between the chucks and the foot-lever, a push-bar connected to the foot-lever, a shaft journaled in the frame, a cam attached to the shaft and operating the push-bar, a
70 gear-wheel secured to the shaft, a spring connected to the foot-lever and drawing the push-bar against the cam, and driving-gearing between the gear-wheel and one of the spindles.

In testimony whereof I affix my signature in presence of two witnesses.

HARRISON L. STALEY.

Witnesses:

HENRY S. LEWIS,
BLANCHE L. KEENER.