2 Sheets--Sheet 1.

W. H. ELLIOT.

Tenoning-Machines.

No. 147,554. Patented Feb. 17, 1874.

Fig. 1.

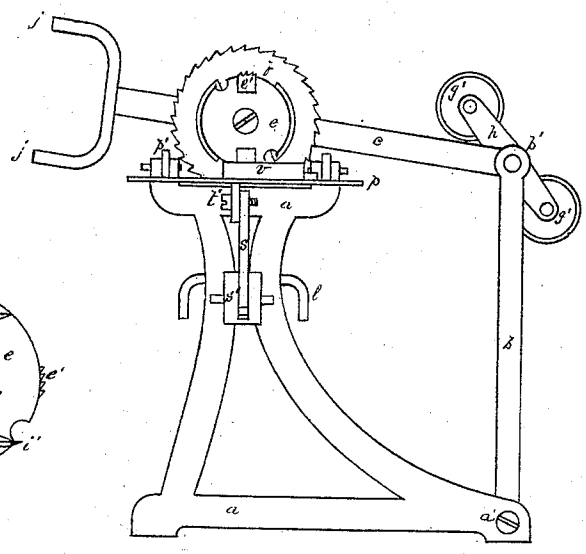

Fig. 3.

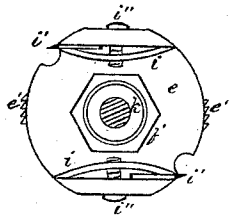

Fig. 4.

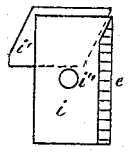

Fig. 2.

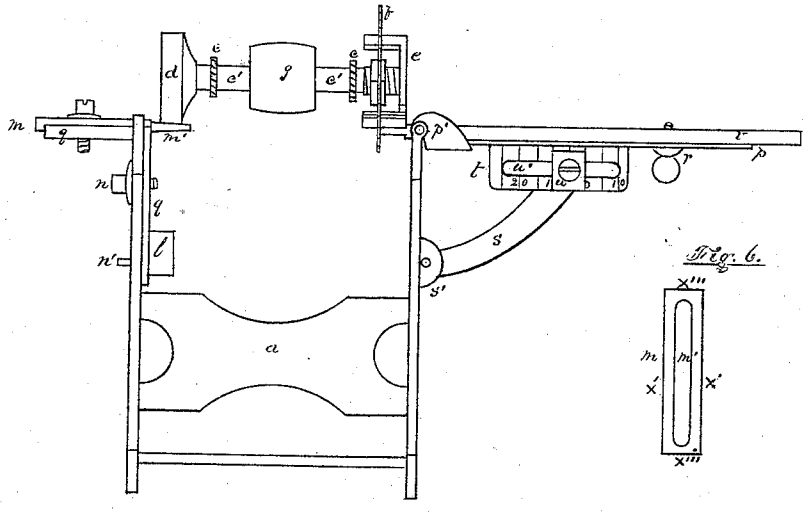

Fig. 5.

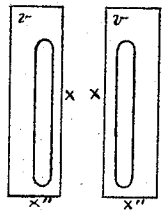

Fig. 6.

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2 Sheets--Sheet 2.

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Fig. 7.

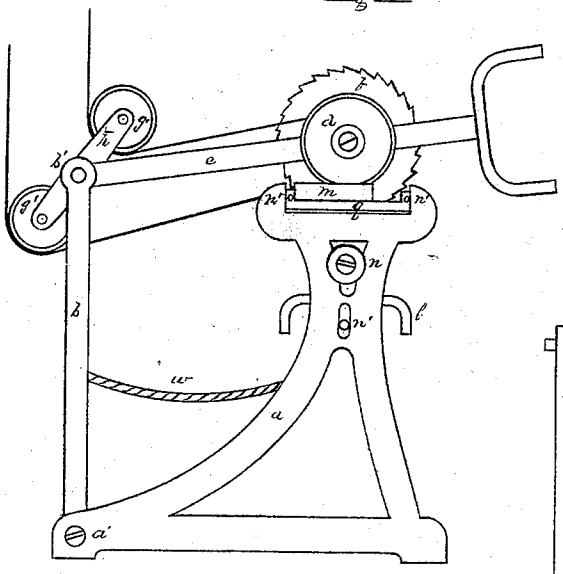


Fig. 8.

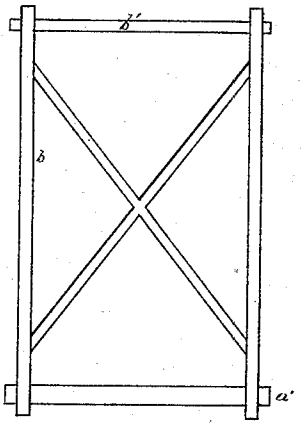
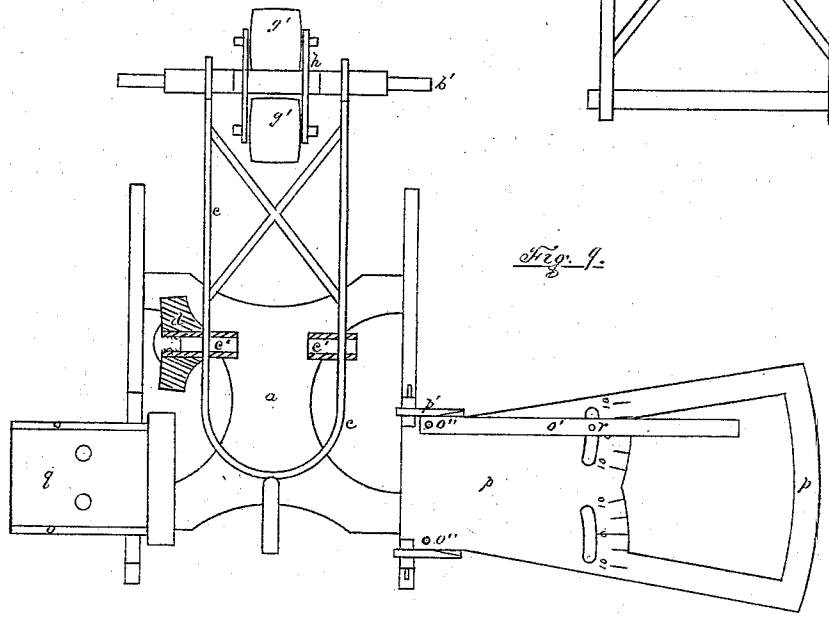


Fig. 9.



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UNITED STATES PATENT OFFICE.

WILLIAM H. ELLIOT, OF NEW YORK, N. Y.

IMPROVEMENT IN TENONING-MACHINES.

Specification forming part of Letters Patent No. **147,554**, dated February 17, 1874; application filed November 4, 1873.

To all whom it may concern:

Be it known that I, WM. H. ELLIOT, of the city, county, and State of New York, have invented a new and Improved Tenon-Machine; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon.

Similar letters of reference indicate the same devices in all the figures.

To enable others skilled in the arts to comprehend, make, and use my invention, I will proceed to describe its nature, construction, and operation.

The nature of my invention consists in the combination of parts which will be more fully hereinafter described and set forth in the claims.

Figure 1 is a right-side elevation of my universal tenon-machine. Fig. 2 is a front elevation of the same. Fig. 3 is an inside view of the cutter-head. Fig. 4 is an inside view of a part of the same. Fig. 5 is a view of both ends of a rail with tenons thereon. Fig. 6 is an end view of the pattern. Fig. 7 is a left-side elevation of my tenon-machine. Fig. 8 is an elevation of the vertical swinging frame. Fig. 9 is a top view of the machine.

a, frame of the machine; *b*, vertical swinging frame, hinged to frame *a* at *a'*; *c*, horizontal, traversing, and swinging frame, hinged to the frame *b* at *b'*; *d*, pattern-roller, supported upon hollow bearing *c'*; *e*, cutter-head; *e'*, spurs for making the shoulder of the tenon; *f*, saw; *g*, driven pulley on the cutter-head shaft; *g'*, guiding-pulleys; *h*, frame of guiding-pulleys; *i*, jaws for holding tools *i'*; *i''*, screws for same; *j*, handles of frame *c*; *k*, screw-nuts which screw onto the hub of the cutter-head, and hold the saw between them; *l*, guard; *m*, pattern; *m'*, tenon portion of the same; *n*, screw for holding the bed-pattern *q*; *n'*, guides for the same; *o*, ledges on the pattern-bed, against which the pattern rests; *o'*, ledge on rail-bed, against which the rail rests; *o''*, pivot of adjustable ledge *o'*; *p*, rail-bed; *p'*, hinge, which joins the rail-bed to the frame *a*; *r*, screw, which holds ledge *o'* in position; *s*, brace, which supports bed *p*; *s'*, hinge of brace *s*; *t*, flange on bed *p*, to which brace *s* is fastened by screw and washer *u*; *u'*, slot through flange *t*, along which the screw and washer travel in changing the position of the bed *p*; *v*, right-and-left hand ends of a rail; *w*, stop for limiting the movements of the frame *b*; *x*, working sides of the rail; *x'*, working sides of the pattern; *x''*, working edge of the rail; *x'''*, working edges of the pattern.

My invention refers particularly to machines for cutting tenons, and my purpose is to produce a machine which, with a single cutter-head, will cut tenons of every desirable shape and length, and also at any required angle, at one operation.

In the construction of my universal tenon-machine, I place the cutter-head, with its shaft and driven pulley, and also the pattern-roller, on a traversing and swinging frame, *c*. This frame is hinged at *b'* to the vertical swinging frame *b*, which, in its turn, is pivoted to the frame *a* at *a'*. By this means the cutter-head is held rigidly so far as to prevent any movement parallel with its axis, but allowed to move freely in all directions in a plane parallel with its revolution. The cutter-head or frame *c* may slide upon ways, or they may be suspended upon the swinging frame *b*, from a point above, by extending the frame *a* up high enough, and attaching the swinging frame *b* thereto.

I also construct my tenon-machine with two beds, one for the rail upon which the tenon is cut, and one for the pattern. These beds, when arranged for straight tenons, are in one plane, and the ledges *o* and *o'* are in one line, and these two beds, with their ledges, are exactly parallel with the axes of the cutter-head and roller, and exactly at right angles to all the movements of the cutter-head. By separating the two beds, and placing the cutter-head and pattern-roller between them, I am able to pass the cutter-head and pattern-roller entirely around the ends of the rail and pattern, and also to introduce another feature—that of representing the working side and edge of the rail in the pattern, and cutting the tenon correctly in relation to them.

The diameter of the pattern-roller at the largest point is exactly the same as the diameter of the circle described by the points of the tools on the cutter-head, so that as the roller passes around upon the pattern, the cutter-

head leaves just as much of the end of the rail untouched as will represent the pattern-tenon, and the tenon left upon the end of the rail must occupy just the same position in relation to the working side and edge of the rail as the pattern-tenon does to the working side and edge of the pattern.

By the peculiar construction and operation of my tenon-machine, a relative rotatory movement is produced between the cutter-head and tenon, and also between the pattern-roller and pattern, and it matters not whether the cutter-head, with its corresponding pattern-roller, be attached to the frame *c*, and the two beds fixed upon the frame *a*, as represented in the drawings, or whether the cutter-head and its pattern-roller run in bearings fixed upon frame *a*, and the two beds supported upon frame *c*. In either modification the same mechanical principles are exhibited, and the same result is obtained.

The vertical frame *b*, being pivoted to the frame *a* at *a'*, and supporting on its upper end the rear end of frame *c*, permits the latter to have a free forward and back or traversing movement, in combination with its swinging movement in a vertical plane, at the same time holding the axis of the cutter-head exactly parallel with the axes *a'* and *b'*.

The pattern-bed *q* extends down upon the inside of the frame *a*, and supports on its lower end the guard *l*, and for the purpose of maintaining the exact adjustment between the two beds, and also for the purpose of varying the distance of the tenon from the working side of the rail, as occasion may require, I make the pattern-bed adjustable vertically, sliding between the guides *n'*, and fastened by screw *n*. This bed may be raised and lowered by a screw or cam.

For the purpose of cutting the tenon at an angle in relation to the working side of the rail, I make the rail-bed *p* adjustable vertically, swinging upon hinges *p'*, and supported in position by brace *s;* and for the purpose of cutting the tenon at an angle in relation to the working edge of the rail, I make the ledge *o'* adjustable horizontally, swinging upon hinges *o''*, and held in position by screw *r*. In either or both cases the position of the pattern-bed with its ledges remains unchanged.

By this means I am able to cut a tenon at any required angle from a straight pattern.

As the patterns of all the tenons are straight it is necessary to have some means of knowing how to adjust the machine for an angular tenon. To facilitate this operation I graduate the sliding joint between the brace *s* and bed *p*, and also the sweep of the ledge *o'* on the top of bed *p*, and by marking these angles on the pattern in figures the machine may be quickly and accurately adjusted. These last-described features render my tenon-machine very valuable for carriage and sleigh work.

The traversing-frame *c* should be balanced either by the action of the driving-belt and tightening-pulley or by a weight in any practical way, so as to relieve the operator of some, if not all, of the labor of holding it up.

For the purpose of conducting the driving-belt to and from the driven pulley, I employ conducting-pulleys *g'* on swinging frame *h*. By leaving this frame free to move on pivot *b'* it adjusts itself to the varying angles of the belt. The counter-shaft, with a suitable tightening-pulley, should be placed directly over the frame *b*, so that the strain of the belt will tend to hold that frame in a vertical position. By placing frame *h* with its pulleys *g'* upon the frame *c*, about half-way between the pivot *b'* and the axis of the cutter-head, the upward strain of the driving-belt would then tend to balance frame *c* and at the same time hold frame *b* in an upright position.

There are many practical ways by which power may be carried to the driven pulley *g*. A tight and loose pulley may be put on axis *a'*, and then a short belt to axis *b'*, and another short belt from axis *b'* to the driven pulley on the cutter-head shaft. In that case the two frames would require to be balanced by a weight drawing upward from about the middle of the frame *c*. To save the operator the labor of stooping or of raising his hands too high, I place on the forward end of frame *c* two handles, one over the other, so that when the cutter-head is running on the under side of the tenon he uses the upper handle, but as it comes to the upper side he changes to the lower handle. I place the tools *i'* on an inside surface in the cutter-head, so that the strain of the cut will be against a solid portion of the cutter-head instead of against the head of the screw, and by using a strong jaw for holding the tool I am able to construct the tool of thin steel plate at less expense and much less liability to get out of balance.

In cutting tenons at an angle with the rail I employ a saw, *f*, in combination with the cutter-head, to square the end of the tenon while it is being cut, and I adjust the saw for tenons of different lengths by holding it between two nuts, *k*, which screw onto the hub of the cutter-head. For very short tenons both nuts may be above the saw, and washers only under it. Two holes have to be cut through the saw to allow the projections on the cutter-head, and the jaws and tools attached thereto, to pass through it, as seen in Figs. 1 and 2.

To prevent the saw and cutter-head from coming in contact with any part of frame *a*, and being injured thereby, I employ guard *l*, so placed that roller *d* will touch it before the saw touches the frame. The roller *d* need not necessarily revolve. It may be better in some cases to make it stationary, so as to produce a little friction to steady the forward movement of the cutter-head.

In use, a pattern-tenon is selected and placed upon the pattern-bed with its working side down, and one edge resting against one of the ledges *o*. The ledge *o'* is then placed on the

bed *p* in a position corresponding with the ledge against which the pattern rests, and if a straight tenon is required the ledge *o'* is adjusted at *o°*, the rail is then fastened upon the bed with its working side down, and its working edge resting against the ledge *o'*, the machine put in motion, and the roller *d* passed around the pattern. When the rails have all been cut at one end the pattern has to be moved over against the other ledge on the pattern-bed, and the ledge *o'* changed to the other side of the rail-bed and arranged as before, when the tenons on the other ends of the rails may be cut.

The adjustability of either of the beds, or the ledges thereon, is not indispensably essential to the working of my tenon-machine for straight tenons; nor do I intend to include that feature in any part of the claims, except in those sections which especially mention their adjustability.

I make no claim to the arrangement of the cutting-tool and guide upon opposite ends of the same arbor in connection with pattern and work-supporting tables.

Having described my invention, what I desire to have secured to me by Letters Patent of the United States is—

1. In a tenon-machine, the combination of frame *c*, supported as described, cutter-head *e*, pattern roller or guide *d*, with a pattern, pattern-bed, and rail-bed, constructed and operating substantially as described, whereby a relative rotatory or revolving movement is obtained, as specified.

2. The combination, in a tenon-machine of the kind described, of a pattern-bed and a rail-bed provided with ledges, and a pattern which represents both the working side and edge of the rail, as specified.

3. The combination, with the pattern, pattern-bed, and rail-bed herein described, of a movable cutter-head and pattern roller or guide having a common axis, which is parallel with the pattern-bed and its ledges, all as set forth.

4. The combination, in a tenon-machine, of separate pattern and rail-beds, which are stationary while in operation, a movable cutter-head and pattern-roller or guide, as herein set forth, whereby the cutter-head and pattern-roller are adapted to operate between the beds and around the end of the rail, as specified.

5. In a tenon-machine, the combination, with the pattern, of a pattern-bed having a vertical adjustment, and a rail-bed, as and for the purpose specified.

6. In a tenon-machine, a rail-bed adapted to be angularly adjusted to the axis of the cutter-head, pattern-bed, and pattern, and arranged to operate in relation to them, as and for the purpose specified.

7. In a tenon-machine, the combination, with the rail-bed, of ledge *o'*, pivoted at its inner end in a line with ledge *o*, and adapted to be angularly adjusted to the axis of the cutter-head, pattern-ledge *o*, and pattern, as herein specified.

8. In a tenon-machine, the combination, with the pattern-bed, having the two ledges, as described, of a pattern adapted to be adjusted with relation to the rail-bed and its ledges, whereby right and left hand tenons may be cut by the use of the same pattern, as set forth.

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