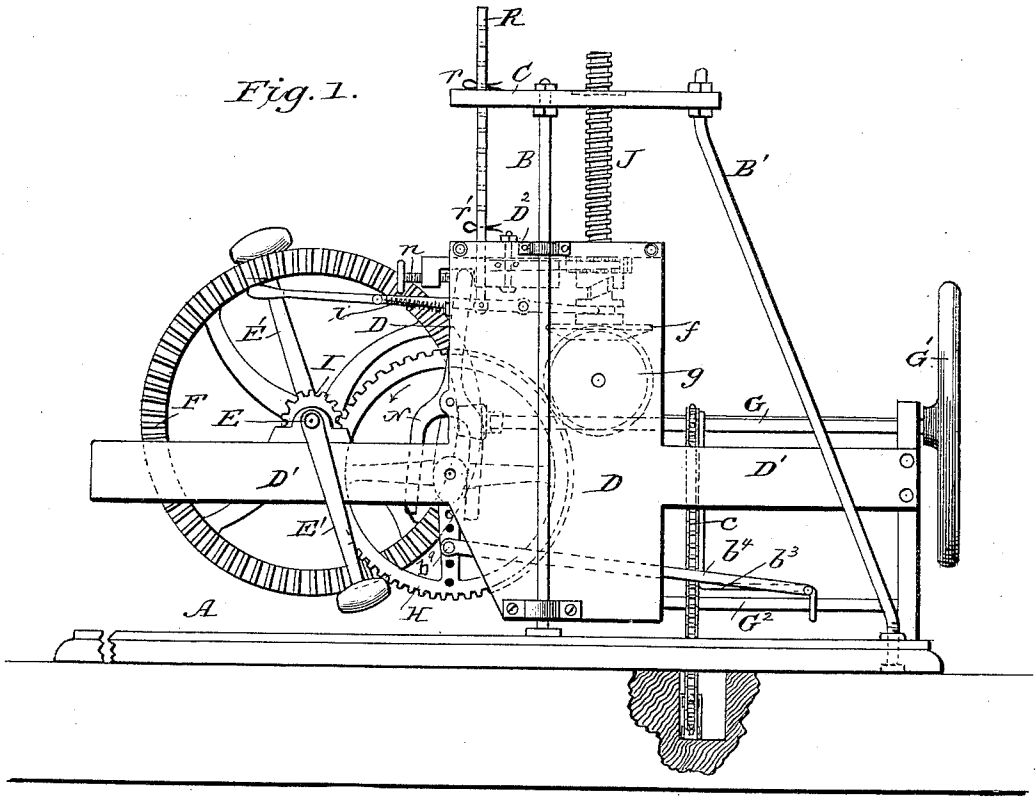
(No Model.) 4 Sheets—Sheet 1.

T. N. WILSON.

MORTISING MACHINE.

No. 452,820. Patented May 26, 1891.

Fig. 1.



WITNESSES:
Fred G. Dieterich
Edw. W. Byrn.

INVENTOR:
Thomas N. Wilson
BY Munn & Co
ATTORNEYS

(No Model.) 4 Sheets—Sheet 2.

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MORTISING MACHINE.

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Fig. 2.

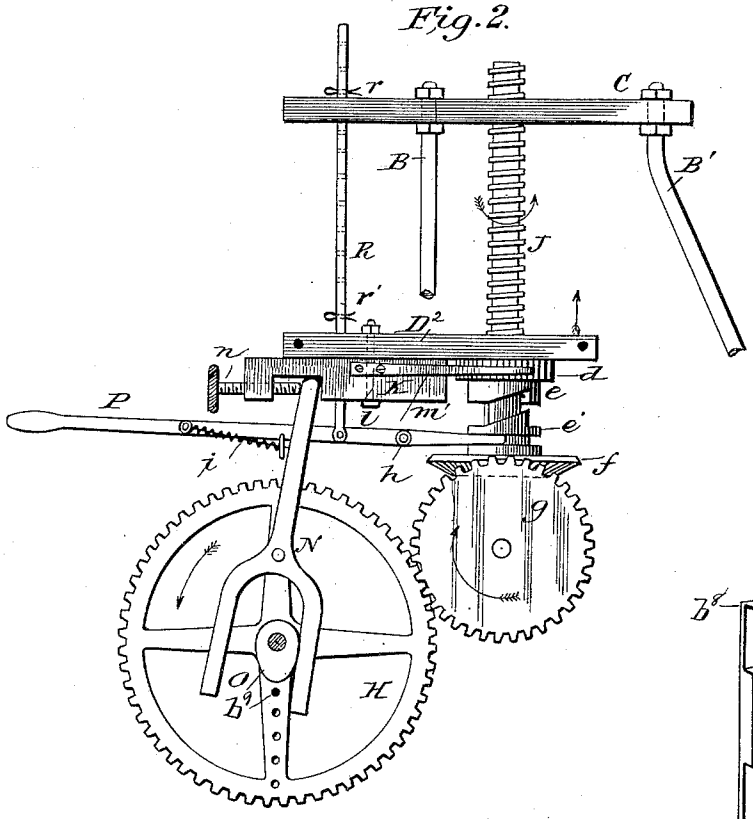


Fig. 5.

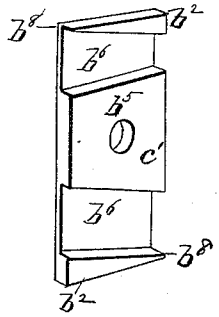
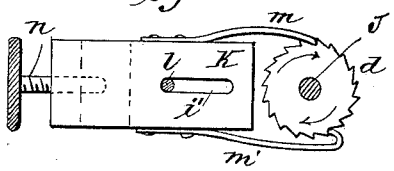


Fig. 6.



WITNESSES:

Fred G. Dieterich

Edw. W. Byrn.

INVENTOR:

Thomas N. Wilson

BY Munn & Co

ATTORNEYS

(No Model.) 4 Sheets—Sheet 3.

T. N. WILSON.

MORTISING MACHINE.

No. 452,820. Patented May 26, 1891.

Fig. 3.

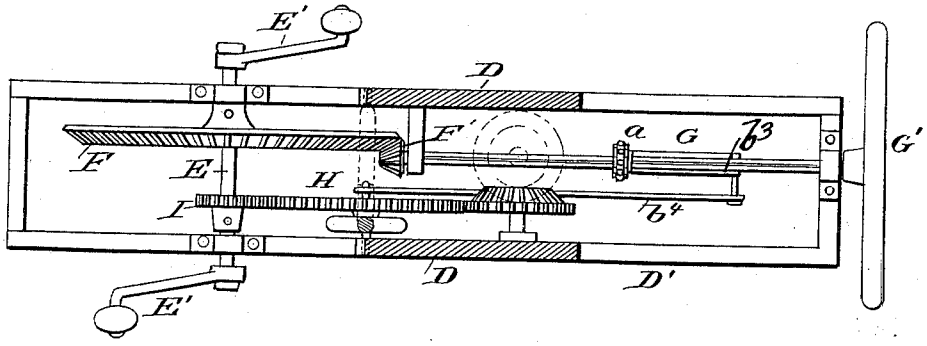


Fig. 7.

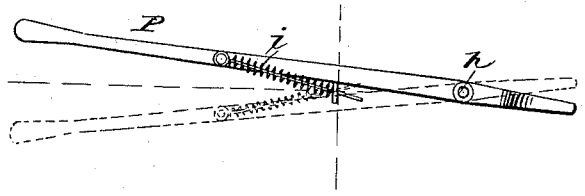
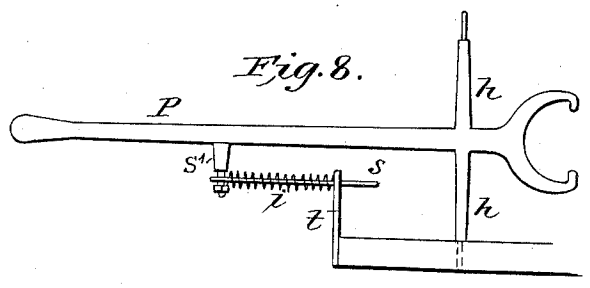


Fig. 8.



WITNESSES:
Fred G. Dieterich
Edw. W. Byrn.

INVENTOR:
Thomas N. Wilson
BY Munn & Co
ATTORNEYS

(No Model.) 4 Sheets—Sheet 4.

T. N. WILSON.

MORTISING MACHINE.

No. 452,820. Patented May 26, 1891.

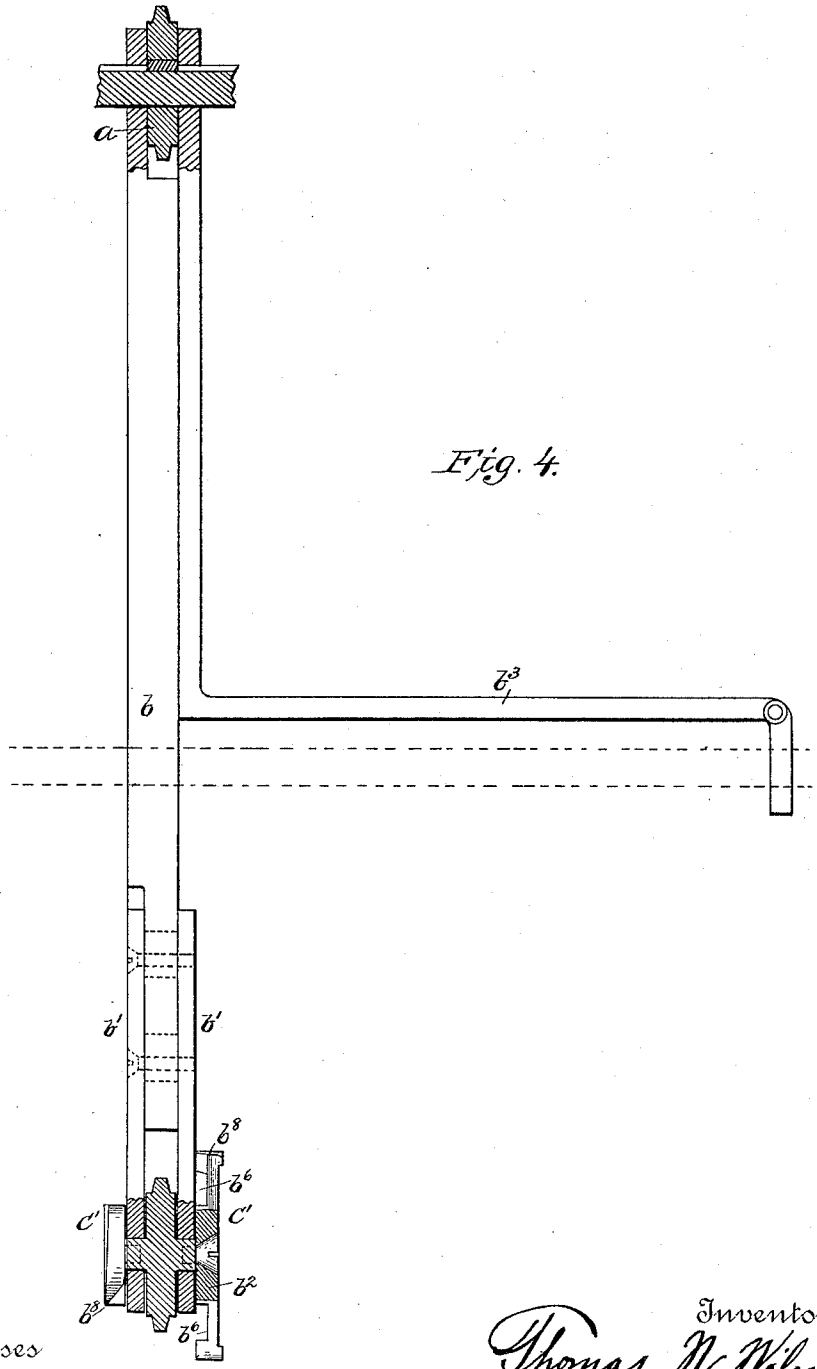


Fig. 4.

Witnesses
Jos. H. Blackwood
H. E. Johnson

Inventor
Thomas N. Wilson
by Wm. H. Doolittle
Attorney

UNITED STATES PATENT OFFICE.

THOMAS N. WILSON, OF HICKMAN, ASSIGNOR OF ONE-HALF TO ALONZO J. HALL, OF MILFORD, ILLINOIS.

MORTISING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 452,820, dated May 26, 1891.

Application filed January 16, 1890. Serial No. 337,149. (No model.)

To all whom it may concern:

Be it known that I, THOMAS N. WILSON, of Hickman, in the county of Iroquois and State of Illinois, have invented a new and useful Improvement in Mortising-Machines, of which the following is a specification.

My invention consists of an improved mortising-machine, as hereinafter described and claimed.

The principal objects of my invention are to quickly and accurately cut a square or oblong hole to any desired depth, width, and length by cutting-blades; to automatically reciprocate the cutters when at work in order to cut the entire length of the mortise while cutting its depth and width; to automatically reverse and withdraw the cutters when a given depth, width, and length of mortise have been attained; to provide simple means for setting and feeding the machine to cut given depths and lengths of mortises; to increase or diminish the speed of the cutters; to give the cutters a positive cutting action with ample clearance, and to remove the chips from the mortise as fast as they are cut.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the machine, showing the apparatus as applied to work on a piece of lumber. Fig. 2 is a side view of the working parts removed from the main frame. Fig. 3 is a plan view partly in section. Fig. 4 is a detail side view of the chain cutter-frame. Fig. 5 is a perspective detail of one of the cutter-knives. Fig. 6 is a detail of the feed mechanism, and Figs. 7 and 8 are respectively a side and top view of the shifting-lever and its attachments.

Referring to the drawings, A is the base-board of a stationary frame, which is otherwise constructed of upright rods or standards B B′ and a cross top plate C, the rods being bolted at their respective ends to said base-board and top plate.

D D′ D^3 are the parts of a vertically-moving frame within the stationary frame, and which is mounted and slides on the rods B.

E, Figs. 1 and 3, is the main drive-shaft, journaled on the movable frame D′ and provided at its opposite ends with crank-handles and knobs E′, by which it is rotated. This drive-shaft has a large bevel-gear F, which meshes with a small bevel-pinion F′ on a horizontal shaft G, also journaled on the movable frame and running at right angles to the drive-shaft. On the horizontal shaft is a small chain-wheel *a*, which slides longitudinally along the shaft and also revolves with it, the shaft being provided with a groove and the wheel with a feather or spline for the latter purpose. G′ is a fly-wheel arranged upon the end of this shaft.

Hung on the horizontal shaft G is a vertical bar *b*, Fig. 4, and passing through the middle portion of the bar and directly below the upper shaft is another horizontal guide-shaft G^2, journaled at its opposite ends in the movable frame. A bent guide-arm b^3 is bolted or cast to the bar *b*, the upper shaft G′ passing through said arm and the lower shaft G^2 passing through a lug on the lower outer end of said arm.

The lower end of the bar *b* is provided with adjustable bearing-plates *b′ b′*, to and between which is mounted another chain-wheel *a′*, and over this wheel and the upper one *a* is passed an endless chain *c*. Rotary motion is imparted through this chain from the upper shaft G′ to these wheels.

Cutting-blades *c′ c′*, Fig. 5, are secured to the ends of the axis of the lower chain-wheel outside of the bearing-plates *b′ b′*, and are revolved by said wheel. These blades are each made of a single plate of metal. The inner face of the blade, which faces the bar *b* presents a central raised bearing-surface b^5, with a cut-away space or groove b^6 on each side thereof, which grooves have outer raised edges or walls b^2, the same height as the central portion. The raised portions have each one end sharpened to form a cutting-edge b^8. The cutting edges or ends b^8 on the respective ends of the plate point in opposite directions, so that when the blade is revolved both ends will follow each other in the cutting action. The grooves b^6 permit the escape of the shaving out of the hole cut and are beveled down to an edge toward the cutting end, so as to permit the free passage of the shaving into and out of the groove. The opposite outer face of the blade is made smooth and level, except at its cutting ends, which

are raised slightly at one end and beveled back slightly from that end in order that the knife may feed in a diagonal direction when the cutters are reciprocated to cut the mortise lengthwise.

The movable frame is given an up-and-down motion only; but the cutters are given both an up-and-down and a reciprocating motion. The mechanism for giving these motions will now be described.

The downward motion of the movable frame and attached cutter mechanism is not a continuous one, but is intermittent, the intervals of rest being had to permit the cutters to be given a horizontal movement for cutting lengthwise the mortise, as hereinafter described. To produce this intermittent downward motion the following means are employed: J is a vertical screw-shaft, which engages and passes through an internally-screw-threaded nut fixed on the top cross-piece C of the stationary frame, and which also passes through the top cross-piece D^2 of the movable frame.

K is a slide-plate secured onto and directly beneath the cross-piece D^2. The slot i' and bolt l are the means shown for this purpose. Beneath the plate K is loosely swiveled on the screw-shaft a ratchet-wheel d, and which carries on its lower end a part e of a double clutch e e'. The clutch e revolves on the screw-shaft, but not with it. This upper clutch and the ratchet-wheel are held up in position by a pin passing through and projecting at both ends from the screw-shaft. The screw-shaft carries at its lower end a bevel-wheel f, which has on its upper face the clutch e'. This wheel and clutch slide up and down on the shaft and are grooved, so as to engage with a spline in the shaft, and are thereby revolved with it.

P is a crank-lever, pivoted at h to the inside of the vertical side pieces of the movable frame and having a forked end embracing the neck of the lower clutch e' and arranged and adapted to throw that clutch and bevel-wheel f into and out of engagement with the upper clutch e. A wire rod s is secured at one end to a stud s' on one side of the handle or long arm of the lever, while its other end is passed through a slot in an offset t on a side of the movable frame. On this rod is placed a stiff spiral spring i. The function of this spring is to hold the lever in position when the latter is raised or lowered to connect or disconnect the clutches and the gearing for the purpose of raising or lowering the movable frame and cutter mechanism. When the crank-lever is raised above its dead-center, the spring acts to force and hold it up, and the clutches are disconnected, so that the downward movement cannot take place, and when the lever is pushed above its dead-center the spring acts to force and hold it down, and thus holds in engagement the clutches and gearing for feeding the frame and shaft down. The function of the ratchet-wheel d is to rotate the screw-shaft when the clutches and gearing are engaged.

To operate the ratchet, spring-pawls m m' are used, which are secured to the slide-plate K, which pawls embrace the ratchet. The points of the pawls project in opposite directions, engage the ratchet, and alternately operate, as the slide-plate reciprocates, to continuously move the ratchet in the same direction. The plate K is forced back and forth by the following means: H is a toothed wheel mounted on a bolt-rod extending through one side of the movable frame and is in gear with and receives motion from a small gear-wheel I on the main drive-shaft E. The wheel H is provided with a cam or stud O, and a vibrating lever N, hung on the side piece of the movable frame, has its lower end forked and embraces O. The upper end of this lever plays between a projection on the slide-plate K and the end of a set-screw n, extending through an internally-screw-threaded boss on said slide. Now when the machine is started and wheel H is revolving lever N is vibrated by the cam O, and slide K is moved back or forward, and the teeth of one of the pawls catch in the teeth of ratchet-wheel d, and when moved in the opposite direction the teeth of the other pawl catch the teeth of the ratchet, which causes the ratchet to move in the same direction for both movements of the slide-plate. If the clutch-section e' be raised and engaged with e, the rotation of the ratchet-wheel turns the screw-shaft J in the direction opposite to that indicated by the arrow and feeds the movable frame down; but if the clutches e' and wheel f are down the rotation of the ratchet has no effect upon the shaft. In such position, when clutch e' is forced down by the lever, wheel f engages with a small spur and bevel wheel g, which meshes with wheel H. Then the action of the main shaft serves to turn the lower wheel on screw-shaft in the opposite direction, and being keyed to that shaft turns it, raising the same, and consequently the frame also, thus lifting the cutting devices out of the mortise.

To cause the machine to reverse automatically—for instance, when the cutter has been fed down—so as to raise the cutters when the proper depth of the mortise has been attained, a gage-bar R is employed, which is joined to the lever P and extends up through plates D^2 and C. It is provided with a series of holes and has above plate C a stop-pin r in one of these holes and below plate C another stop-pin r' in another of these holes. As shown, the depth of the mortise has been attained and the stop-pin r has struck the top of plate C and by an upward pull on rod R and lever P has thrown down the clutch e' and gear f, starting into action the reversing devices for raising the cutting mechanism. Then when the movable frame and the cutting devices have risen to near their highest adjustment and the cutting devices leave the

mortise pin r' strikes against the lower side of plate C, and, the movable frame continuing to rise, the handle of the lever P is forced part way down to just above its dead-center and raises clutch e', so as to break connection between gears g and f and to hold the clutch-sections apart until the lever P is forced all the way down by hand to again engage said clutches and produce the downward movement. Thus without discontinuing the motion of the handles E' E' the cutting-tool is made to descend and rise, and at the same time is fed horizontally along the timber to give the length to the mortise.

To increase or diminish the speed of the downfeed of the cutters, the play of the lever N on slide K is made adjustable by means of the set-screw n, so that a greater or less motion is imparted to the slide K, carrying the pawls. For instance, the greater the space in which the lever N thus vibrates the slower the speed.

To give the cutters their reciprocating movement, so as to cut lengthwise while cutting at the same time in depth and width, the driving-chain and cutter-bar b are moved along the guide-shafts G and G^2 by the following means: The bar b is provided with an arm b^3, as before stated, which embraces guide-shaft G^2, and a pitman or connecting-rod b^4 connects arm b^3 with a radial shouldered pin, screw-threaded at its end on the wheel H. The wheel H is provided with a series of holes, which are screw-threaded and vary in distance from the center of the wheel. The purpose of these holes is to permit the pin to be set therein to vary the length of the mortise, as when the wheel H engages with the small wheel I on the main shaft the farther the pin to which the pitman is connected is set from the center of the wheel the greater the throw of the sliding bar to which the cutter-bar is attached.

I am aware that a mortising-machine has heretofore been constructed with a series of blades fixed on the links of a chain; but in this construction the looseness of the jointed links prevents the blades from having a positive cutting action.

I am also aware that revolving saw-shaped cutters have been operated at the lower end of a rotary shaft through bevel-gears. In this construction the bevel-gears are liable to become obstructed by chips, and a special provision for removing the chips must be provided.

In my construction the mounting of the cutters upon the axis of the lower pulley, about which the chain revolves, and outside of the plane of the chain serves to give the cutters a positive cutting action with ample clearance, while the chain, in addition to driving the cutters in a manner consistent with a horizontal adjustment, also serves as a conveyer to remove the chips from the mortise.

What I claim is—

1. In a mortising-machine, the combination, with a vertically-movable frame, of a screw-rod to which said frame is attached, a ratchet-wheel secured to said rod, a reciprocating double spring-pawl for alternately engaging the sides of said ratchet, means for reciprocating said pawl, a double clutch mounted on said rod, and a spring-lever secured to said frame for connecting and holding in engagement said clutch, whereby said frame is given its downward movement, substantially as described.

2. In a mortising-machine, the combination, with a vertically-movable frame, of a screw-rod to which said frame is attached, a bevel-wheel on said rod, bevel-gearing mounted on the said frame and engaging with the said wheel on the rod, a spring-lever for forcing the bevels together, and means for actuating the bevel-gearing, whereby said frame is given its upward movement, substantially as described.

3. In a mortising-machine, the combination, with a vertical bar provided with cutters and a horizontal shaft on which said vertical bar is mounted and on which said cutter-bar is reciprocated, of means for reciprocating said bar on said shaft and means for operating said cutters, whereby the cutters are reciprocated while cutting, substantially as described.

4. In a mortising-machine, the combination of a vertical drive-chain, pulleys at top and bottom of the same, a bar for the chain, having bearings for the lower pulley, cutters arranged upon the axis of the lower pulley outside of the plane of the chain and upon both sides thereof, and means for feeding the chain vertically and horizontally, substantially as shown and described.

5. In a mortising-machine, a vertical bar, in combination with adjustable plates secured to the bar at its lower end and cutters secured to said plates, whereby the cutters are adjusted and set at the desired height, substantially as described.

6. In a mortising-machine, a cutting-blade provided on one face with a central raised bearing-surface, a groove on each side of said surface, a raised portion on the outer side of said groove having one end sharpened to form a cutting-edge, said grooves beveled down to the cutting end, and with an opposite face having the cutting ends raised slightly thereon and beveled slightly back, substantially as and for the purpose described.

7. In a mortising-machine, the combination, with the bar carrying the cutters, of the horizontal shaft carrying said bar, a guide-arm connected to said shaft and reciprocating thereon and to which said bar is connected, a pitman connecting said bar, and a drive-wheel, said drive-wheel provided with an adjustable radial arm to which said pitman is connected, said wheel also provided with holes at varying distances from its center, in which said adjustable arm may be placed, whereby the cutters are set to cut a longer or shorter hole, substantially as described.

8. The combination, with the screw-shaft, of

the ratchet-wheel for rotating it, a slide having double pawls embracing the ratchet, a rocking lever forked at its lower end and having an arm at its upper end to engage said slide to move it to and fro, a set-screw for limiting the stroke of said lever, and an actuating-gear provided with a projection to extend within the forks of said lever to rock the same, whereby the feed of the cutter mechanism is given and its speed regulated, substantially as described.

9. In a mortising-machine, a gage-bar provided with holes and pins, in combination with a stationary and a movable frame and a spring-lever for actuating said movable frame, whereby the up-and-down movement of the movable frame is controlled, substantially as described.

10. The cutters *c c'*, combined with and hung upon the shaft G by a feather or spline connection, so as to be adjustable horizontally thereon and partake of its rotary motion, the bevel-gear F', drive-shaft E, with bevel-gear F and crank-handles E', and a guide-shaft G^2 for the lower portion of the cutter, substantially as described.

11. The combination, with the horizontal shaft G G^2, of the cutters *c c'*, hung thereon, pitman b^4, connected to the cutter for imparting horizontal motion, gear-wheel H, having an adjustable connection with the pitman, and the main drive-shaft, with pinion I, meshing with gear H, and provided with crank-handles, substantially as shown and described.

12. The combination, with the stationary plate C of the stationary frame and the movable plate D^2, of the vertically-movable frame carrying the mortising devices, the perforated gage-bar R, with pins *r r'*, clutch devices for reversing the movement of the vertically-movable frame, and the lever P, connected to the clutch devices, and also to the gage-bar, for the automatical reversal of the mortising devices at any adjustment, substantially as described.

13. The combination of the stationary frame A B B' C, the movable frame D D' D^2, carrying mortising devices, the cutters *c c'*, and endless vertical chain, two pulleys over which the chain passes, the lower one of which is provided with knives fixed to its axis and the upper one of which is hung upon and geared to and rotated with its supporting-shaft, means for moving said upper pulley on said shaft, and an automatic device for alternately raising and lowering the mortising devices, substantially as described.

14. In combination with a movable frame and vertical cutter-bar, a cog carried in the lower end of said bar and cutting-blades mounted on the opposite ends of the axis of said cog, each of said blades having cutting-edges at its opposite ends and clearing-spaces between said edges for the escape of chips or shavings through said spaces, substantially as described.

THOMAS N. WILSON.

Witnesses:
ALONZO J. HALL,
EDGAR A. DEWITT.