3 Sheets—Sheet 1

W. H. DOANE & G. W. BUGBEE.

Machine for Boring and Mortising Blind Stiles.

No. 201,506. Patented March 19, 1878.

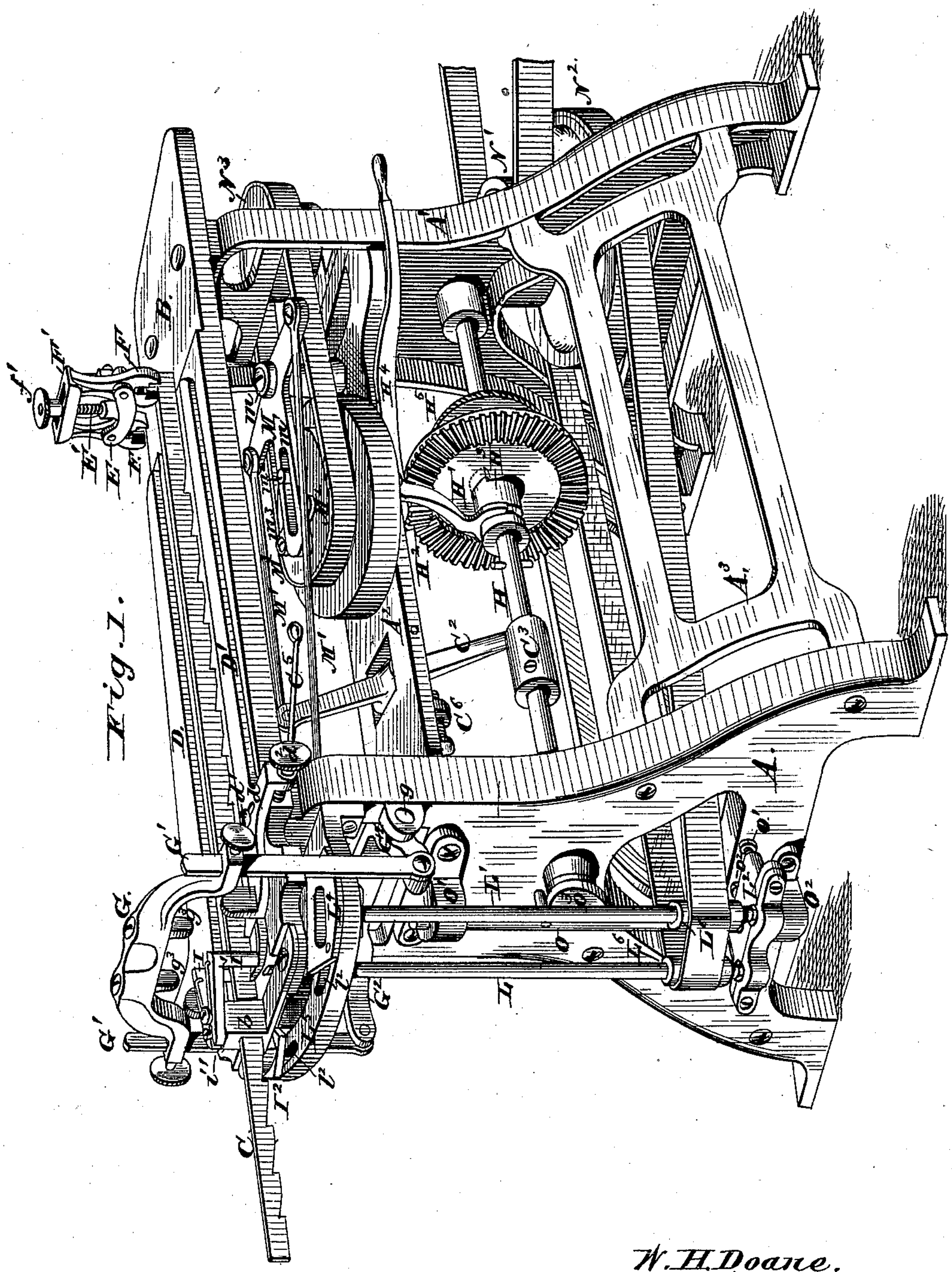

Fig. 1.

Attest
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W. H. Doane.
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Inventors.
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N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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Fig. 2.

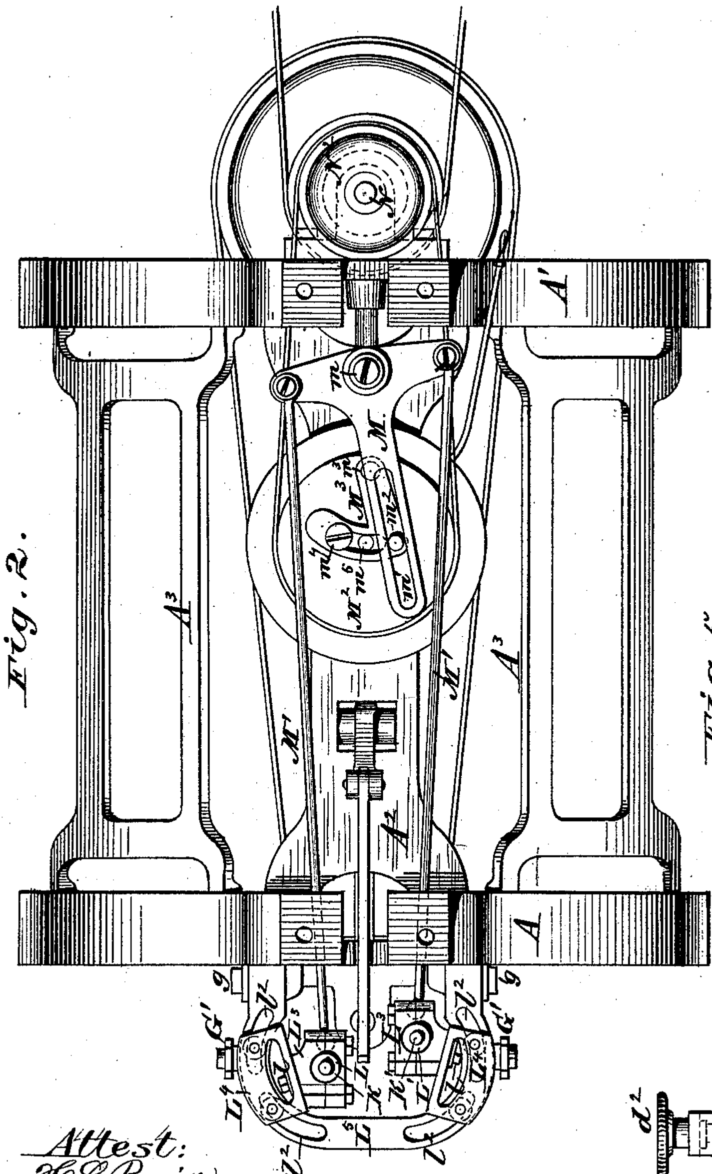

Fig. 5.

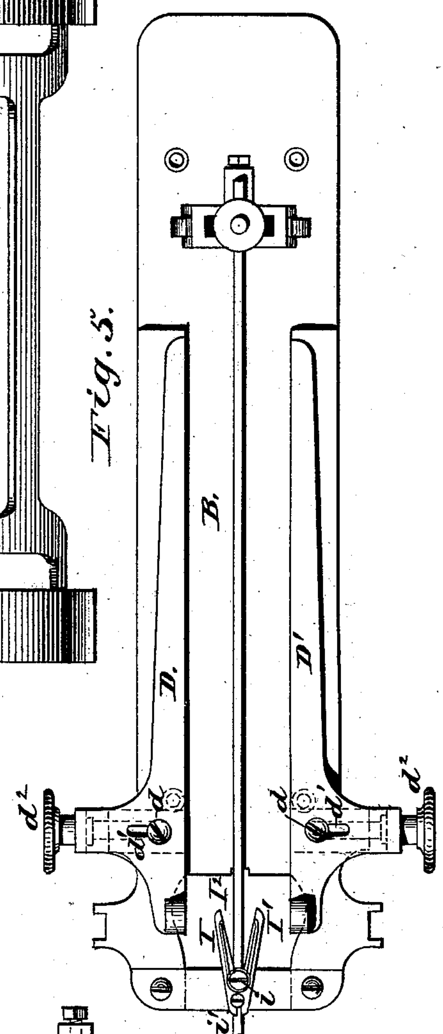

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Fig. 6.

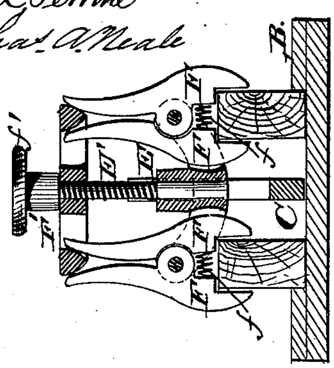
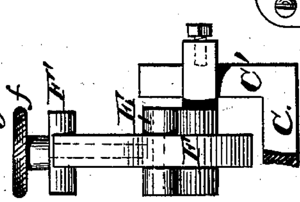


Fig. 7.



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Atty.

3 Sheets—Sheet 3.

W. H. DOANE & G. W. BUGBEE.
Machine for Boring and Mortising Blind Stiles.

No. 201,506. **Patented March 19, 1878.**

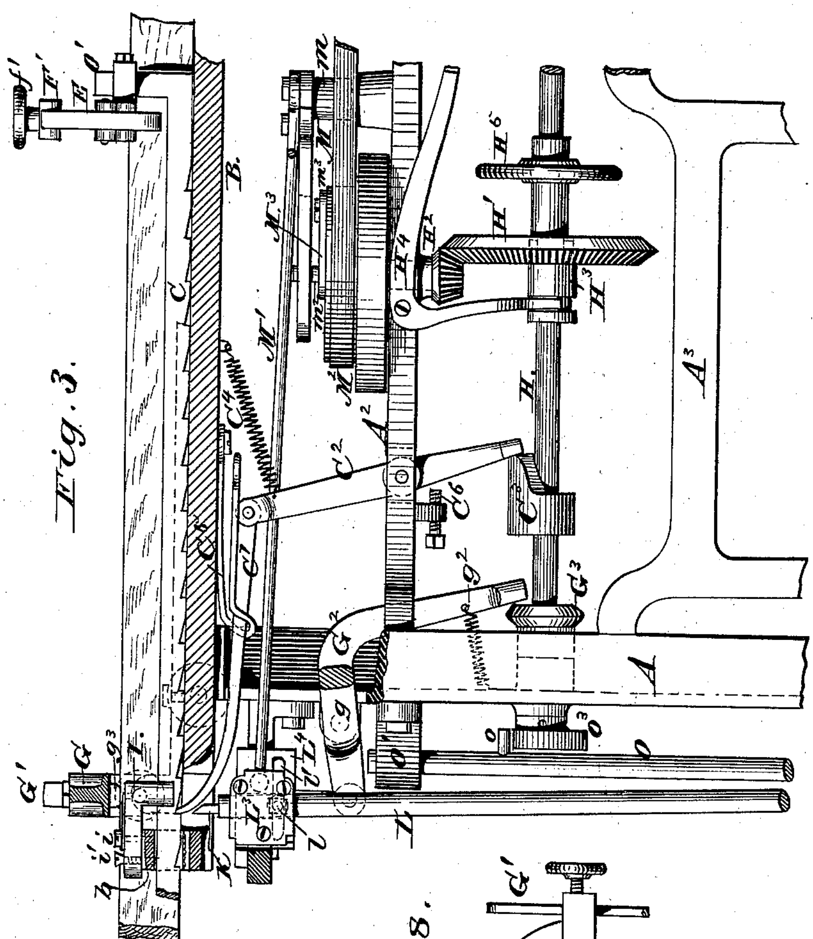

Fig. 3.

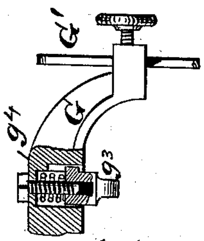

Fig. 8.

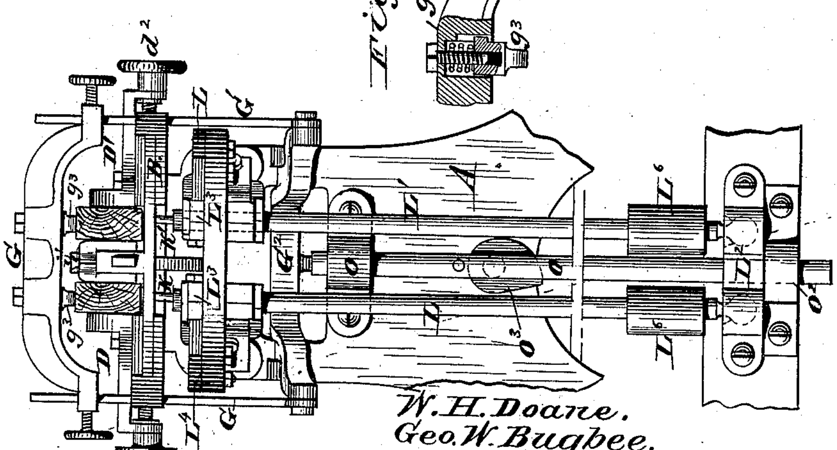

Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM H. DOANE AND GEORGE W. BUGBEE, OF CINCINNATI, OHIO, ASSIGNORS TO J. A. FAY & CO., OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR BORING AND MORTISING BLIND-STILES.

Specification forming part of Letters Patent No. **201,506**, dated March 19, 1878; application filed December 3, 1877.

To all whom it may concern:

Be it known that we, WILLIAM H. DOANE and GEORGE W. BUGBEE, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a certain new and useful Improvement in Machines for Boring and Mortising Blind-Stiles, of which the following is a full, clear, and exact description.

This invention consists in organizing a machine for boring and mortising blind-stiles with one or more cutter-spindles, which are moved endwise, to bore or cut into the stiles to the proper depth, and, being pivoted at one end, are also adapted to be vibrated, in order to move the cutters at the other end to and fro, for the purpose of cutting mortises.

It further consists in novel mechanisms for imparting the endwise and vibrating motions to the cutter-spindles.

It further consists in the combination of a pair of cutter-spindles with appropriate mechanism to vibrate them in opposite directions in mortising, whereby they neutralize each other as regards the tendency to move the stiles endwise.

It further consists of a novel mechanism for actuating the presser-bar.

It further consists of a duplex clamp, of peculiar construction, especially adapted to the duplex form of machine, which we prefer, for securing the pair of stiles to the feed-bar.

It further consists in the application of a friction device, to bear forcibly on the stile or stiles, to counteract the momentum of the feed.

In the annexed drawings, Figure 1 is a perspective view of my improved machine. Fig. 2 is a plan view thereof, the platen and parts supported thereon having been removed to show the mechanism underneath. Fig. 3 is a longitudinal sectional elevation. Fig. 4 is a front elevation. Figs. 5 to 8 are detail views of detached parts.

The same letters of reference indicate identical parts in all the figures.

The machine chosen to illustrate our invention is adapted to operate on two stiles at a time. While this is the style which we prefer, it should be understood that our invention is not limited to a duplex machine.

The housings or stands A A^1, together with the bar or stringer A^2 and the stays A^3, constitute the frame-work of the machine. The bed B rests upon and is secured to the top of the housings, overhanging the same at both ends. A large opening is formed in the overhanging portion of the forward end of the bed, through which the cutting-tools operate upon the bottom edges of the stiles supported on the bed, and through which the feed-pawl projects from below, to act upon the feed-bar C, also supported on the top of the bed. The stiles to be bored or mortised are placed two at a time, and one on either side of the centrally disposed feed-bar, between the guide-bars D and D′ upon the bed. The guide-bars are laterally adjustable, to provide for guiding stiles of different thickness centrally over the cutting-tools. To this end each guide-bar has a transverse tongue formed upon its bottom side, which tongue is seated in a transverse way in the bed, in line with the set-screw *d* and the slot d^1. The adjustment is effected by unscrewing set-screw *d*, and then turning screw d^2, which turns in a tap in the bed and operates on a lug in the guide-bar. After proper adjustment the set-screws *d* are screwed down tight to firmly secure the guide-bars.

The rear end of the feed-bar C terminates in an upwardly-projecting knee, C^1, which supports a duplex clamp, for securing the stiles to said feed-bar. This clamp has two pairs of tongs, which are, respectively, pivoted on opposite sides of the feed-bar, between the bifurcated ends of the yoke E, adjustably secured by a sleeve and set-screw to the knee of the feed-bar. The tongs are hung with their jaws F downward, to gripe the stiles from above. Springs *f* are placed between their jaws to open them, and the extreme ends of their shanks diverge a little to admit the wedge-shaped cross-bars of the wedge-frame F′, which, on being forced between their shanks, simultaneously closes both pairs of tongs. A screw, E′, projects upward from yoke E, and passes through an aperture in the center bar of the wedge-frame F′. The projecting upper end of the screw carries a nut, *f′*, which operates on the wedge-frame in forcing it down.

This duplex clamp is made vertically-adjustable on the knee of the feed-bar, to accommodate it to stiles of different width.

At the forward end of the machine the stiles pass under a presser-bar, G, the socketed ends of which are adjustably secured by set-screws g to the slide-bars G^1 G^1, respectively, seated in vertical ways formed on the opposite edges of the bed. These slide-bars are pivoted at their lower ends to the respective forks of the horizontal arm of an elbow-lever, G^2, pivoted on the housing A at g^1. The downwardly-projecting arm of elbow-lever G^2 is drawn upon by a spring, g^2, which tends to so turn said lever as to push up the slide-bars, and so elevate the presser-bar. Spring g^2 acts in opposition to a cam, G^3, on the feed-shaft H, by which cam the elbow-lever is turned in the opposite direction, so as to force down the presser-bar. This cam is formed and timed to force the presser-bar down on the stiles between the feed-motions, while spring g^2 elevates the presser-bar to release the stiles therefrom during the feed-motions. The presser-bar is made vertically-adjustable on the slide-bars G^1, to adapt it to stiles of different width. It acts upon the stiles through fingers g^3 g^3, respectively seated in sockets, and suspended from headed stems passed through the top of the presser-bar and encircled by stiff springs g^4, which give a yielding character to the fingers, so that they can adapt themselves to slight differences in the width and to surface inequalities of the stiles, and thus enable the presser-bar to act properly under all circumstances without subjecting other parts of the machine to undue strain.

The stiles are pressed laterally against the guide-bars D and D′ by the long arms of the levers I and I^1, which are pivoted at i upon a central lug, b, on a cross-bar at the front end of the bed, and are provided to create sufficient friction on the stiles to counteract the tendency of the feed-bar, with the stiles, to move at each feed beyond the point to which the pawl is intended to advance them.

The long arms of the levers are spread apart by a spring, I^2, and a screw, i', with a wedge-shaped or tapering head, is inserted between their short arms. By adjusting the screw the short arms of these friction-levers may be spread apart more or less by the tapering head, and the pressure of the long arms on the stiles properly regulated.

The cutting-tools K and K′ are, respectively, secured to the upper ends of the upright spindles L and L^1, the lower ends of which are made spherical, as shown by dotted lines in Fig. 4, and stepped in ball-sockets in the bearing-block L^2. Each spindle is, near its upper end, supported by a journal-box, L^3, adapted to reciprocate on a guide-block, L^4, to which the box is connected by a headed stud-pin, l, passing through a horizontal slot, l', of the guide-block into a tap in the box. This arrangement allows the box to swivel on its guide-block, so that it may accommodate itself to oblique positions assumed by the spindle. The guide-blocks of these journal-boxes are supported on a horseshoe-bracket, L^5, secured with its heels to the front side of housing A. The bracket has curved slots l^2, through which screws are passed into the guide-blocks to secure them. The slots are in the arcs of circles struck, respectively, from points vertically over the center of the balls on the lower ends of the respective cutter-spindles. These curved slots l^2 provide for an adjustment of the guide-blocks from a parallel to more or less diverging positions, so as to cause the journal-boxes, when reciprocated, to move in parallel or in diverging directions, as the case may be.

The journal-boxes L^3 are connected by rods M^1 to the respective limbs of a T-lever, M, which is fulcrumed on a stud, m, projecting upward from the stringer A^2 of the framework. The pivot of the T-lever is directly in rear of the cone-pulley M^2, and is so located that a line drawn through said pivot and the axis of said cone-pulley will pass midway between the journal-boxes.

The center stem of the T-lever, projecting over the cone-pulley M^2, contains a long slot, m^1, which is engaged by a stud-pin, m^2, on an angle-bar, M^3, pivoted at m^3 on the upper face of the said cone-pulley, and adapted to be fixed thereto by a headed screw, m^4, which passes through a curved slot, m^5, of the lateral arm of the angle-bar into a tap in the face of said pulley.

The center of stud-pin m^2 and the axis of the said cone-pulley are equidistant from the pivot m^3, so that the angle-bar may be adjusted to bring the stud-pin m^2 directly over the axis of the said pulley, in which case the rotation of the latter will have no effect on T-lever M; but when the stud-pin is set more or less to one side of the axis of the said pulley the T-lever will be vibrated, and will impart reciprocating motions to the journal-boxes L^3 through the connecting-rods M^1, which are connected to said journal-boxes by ball-and-socket joint, as indicated by dotted lines in Fig. 2, to provide for the oblique and angular movements of the parts. The cone-pulley M^2 is driven by a belt from the reversed cone-pulleys N^3 on the driving-shaft N.

The pulleys L^6 on the spindles L and L^1 are directly opposite to each other, and are both driven by a single belt from the pulley N^2 on driving-shaft N, whose pulley N^1 is driven by a belt from a suitable counter-shaft.

To the bearing-block L^2 of the spindles L and L^1 is adjustably secured, by a set-screw, o^2, a vertical lifting shaft or bar, O, which passes through, and is guided by lugs O^1 and O^2 fixed on the front side of housing A, lug O^1 being located below the bearing-block, which rests upon it in its lowest position. Lifting-bar O has a rearwardly-projecting stud-pin, o, which is acted upon by a cam, O^3, on the feed-shaft H to lift the lifting-bar, and with it the bearing-block L^2 and spindles L

and L^1, once during each revolution of the feed-shaft, so as to force the cutting-tools K and K′ gradually into the stiles to bore or cut to the proper depth. The lifting-bar being cylindrical in this instance, the bearing-block is provided with a couple of screws, o^1, which bear against a cross-bar of housing A, and prevent the turning of the bearing-block and twisting of the spindles.

By adjusting the lifting-bar up or down in the bearing-block its upward throw can be regulated, so that the cutting-tools may enter the stiles to a greater or less depth. As the swell of cam O^3 passes from under the stud *o* the spindles and their adjuncts fall by gravity to their normal position, withdrawing the cutting-tools entirely from the stiles. While the cutting-tools are in this depressed position the toothed feed-bar C is fed forward by the feed-pawl C^7, which is pivoted to a lever, C^2, through which it is moved forward by a cam, C^3, on feed-shaft H, and retracted by a spring, C^4. The feed-pawl is supported and held up against the teeth of the feed-bar C by a spring-yoke, C^5, by depressing which the pawl may be thrown out of gear at any time. The throw of the lever C^2 is governed by a set-screw, C^6, the position of which determines the extent of forward motion of the feed-bar at each feed.

The three cams C^3, G^3, and O^3 on the feed-shaft are timed to operate as follows: The presser-cam G^3 begins its action a little in advance of lifting-cam O^3, and releases the presser-bar by the time that the lifting-cam has wholly released the lifting-bar. Directly after that the feed-cam comes into action, and completes the feed before the other cams again become active.

The feed-shaft carries a loose bevel-wheel, H^1, which is driven by a pinion, H^2, on the shaft of the cone-pulley M^2. The feed-shaft is also provided with a shifter-clutch, H^3, connected thereto by groove and spline, and adapted to engage bevel-wheel H^1.

The clutch is controlled by a lever, H^4, whereby it may be readily shifted to couple or uncouple the feed-shaft and bevel-wheel H^1. The feed-shaft also carries a fixed hand-wheel, H^5, by which it may be turned when uncoupled from the bevel-wheel H^1.

To adapt the machine for boring purposes, the angle-bar M^3 on cam-pulley M^2 must be so adjusted that the center of its stud-pin m^2 will be coincident with the axis of the cam-pulley. By this adjustment the stud-pin squares T-lever M, and then holds it steady, with its limbs in the center of their arcs of oscillation, so that the journal-boxes L^3 of the cutter-spindles will stand face to face midway on their rectilinear course. In this position the axes of the spindle-bearings of these journal-boxes are always vertically, or very nearly so, over the balls on the lower ends of the spindles, so that the latter then stand in vertical lines, or so nearly so that the deviation will be wholly inappreciable in a length equal to the depth of the holes to be bored in the stiles.

After the stiles have been secured to the duplex clamp of the feed-bar in the manner heretofore explained, arranged in proper position over the cutter-spindles for boring the first holes, and the feed-shaft has been turned to the point where the presser-cam G^3 begins to act, the machine is ready to start. As the cutter-spindles rotate, they are gradually lifted by lifting-cam O^3, forcing the cutting-tools up into the stiles to the desired depth. The first holes having been bored, the lifting-cam releases the cutter-spindles, which fall to their original position, wholly withdrawing the cutting-tools from the stiles. The presser-cam at the same time releases the presser-bar, which at once rises slightly and releases the stiles, which are then fed forward the proper distance by the feed mechanism, ready to have the next holes bored by the time the lifting-cam comes again into action. Thus the operation proceeds automatically until all of the holes have been bored.

In mortising, the arrangement of the machine is precisely the same, except that then the angle-bar on the cone-pulley M^2 is adjusted to place its stud-pin m^2 more or less out of center, so as to impart a vibrating motion to the T-lever M, and through it and its connecting-rods a reciprocating motion of greater or less extent to the upper journal-boxes of the cutter-spindles. To cut the straight-end mortises in the stiles, the guide-blocks of the journal-boxes must be adjusted parallel to each other; while they must be adjusted to diverge at the proper angle to cut the intermediate oblique mortises.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. A machine for boring and mortising blind-stiles, organized with an endwise-moving cutter-spindle, which is pivoted at one end, in order that it may also be vibrated to move the cutters at its other end to and fro in mortising.

2. In a machine for boring and mortising blind-stiles, the combination, substantially as specified, of the pivoted cutter-spindle, the vertically-moving bearing-block for the lower pivoted end thereof, and the journal-box near its upper end, adapted to be reciprocated horizontally.

3. In a machine for boring and mortising blind-stiles, the combination, substantially as specified, of the cutter-spindle, the vertically-moving bearing-block for the lower end thereof, the journal-box near its upper end, adapted to be reciprocated horizontally, and the guide-block which determines the line of motion of the said journal-box when reciprocated.

4. In a machine for boring and mortising blind-stiles, the combination, substantially as specified, of the cutter-spindle, the vertically-moving bearing-block for the lower end thereof, the journal-box near its upper end, the guide-block which determines the line of mo-

tion of the said journal-box when reciprocated, and a mechanism of the character described adapted to either hold the said journal in a fixed position or to reciprocate it, according as it is desired to bore or mortise the stile.

5. In a machine for boring and mortising blind-stiles, the combination, substantially as specified, of the cutter-spindle, the vertically-moving bearing-block for the lower end thereof, the journal-box near its upper end, the guide-block which determines the line of motion of the said journal-box when reciprocated, the lever operated upon by an adjustable crank-pin, adapted to either hold said lever in a fixed position or to vibrate it, and a connecting-rod which connects said lever to the said journal-box.

6. The combination, substantially as specified, of the pair of cutter-spindles, the journal-boxes for the tool-carrying ends thereof, the T-lever, whose center stem is operated upon by an adjustable crank-pin, adapted to either hold said lever in a fixed position or to vibrate it, and the rods which connect the limbs of the T-lever to the said journal-boxes and move the latter in opposite directions when the T-lever is vibrated.

7. The combination, substantially as specified, of the bed, the presser-bar, the lever and slide-bars for supporting the presser-bar, and the cam and spring acting adversely on said lever.

8. The duplex clamp, composed of a yoke carrying two pairs of spring-tongs, and an adjustable wedge-frame for simultaneously closing said pairs of tongs, substantially as and for the purpose specified.

9. The combination, substantially as specified, of the feed-bar and the duplex clamp.

10. The combination, substantially as specified, of the feed-bar, a clamp for securing the stile thereto, the side guide for the stile, and the friction-lever for pressing on the stile.

11. The combination, substantially as specified, of the cutter-spindle, the bearing-block for the lower end thereof, the adjustable lifter-rod, and the lifting-cam.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

W. H. DOANE.
G. W. BUGBEE.

Witnesses:
ALBERT A. NEARE,
W. R. HYDE.