(No Model.) 5 Sheets—Sheet 1.

J. HARRIS.

HOLLOW CHISEL MORTISING MACHINE.

No. 494,140. Patented Mar. 28, 1893.

Fig. 1.

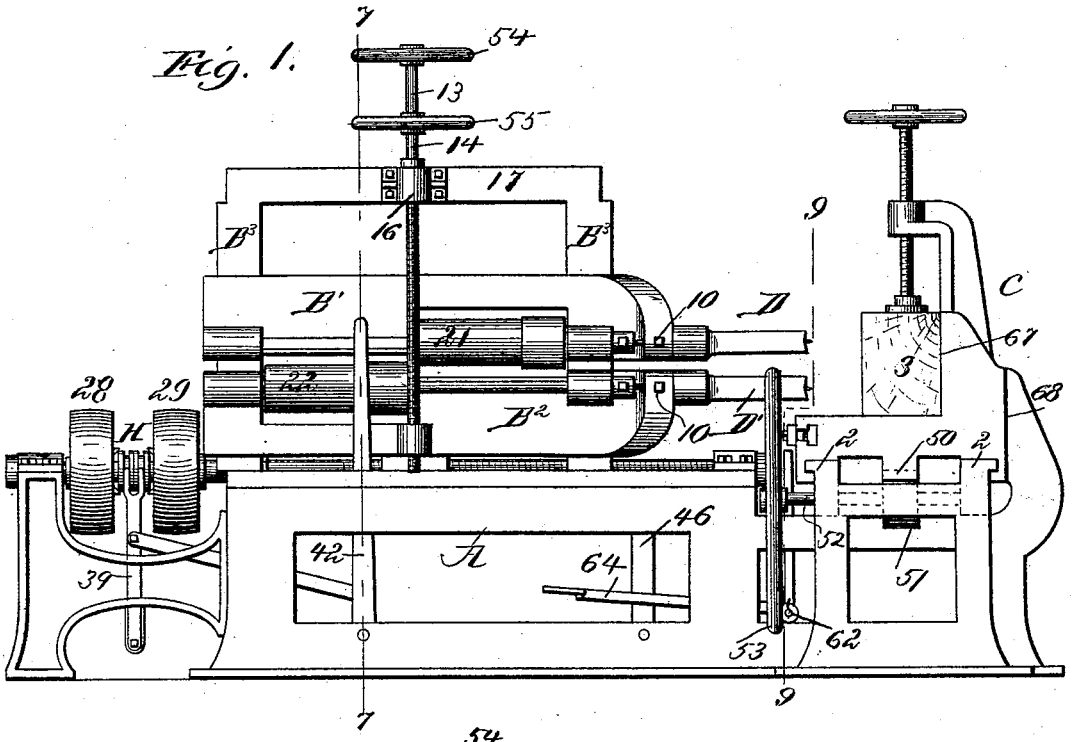
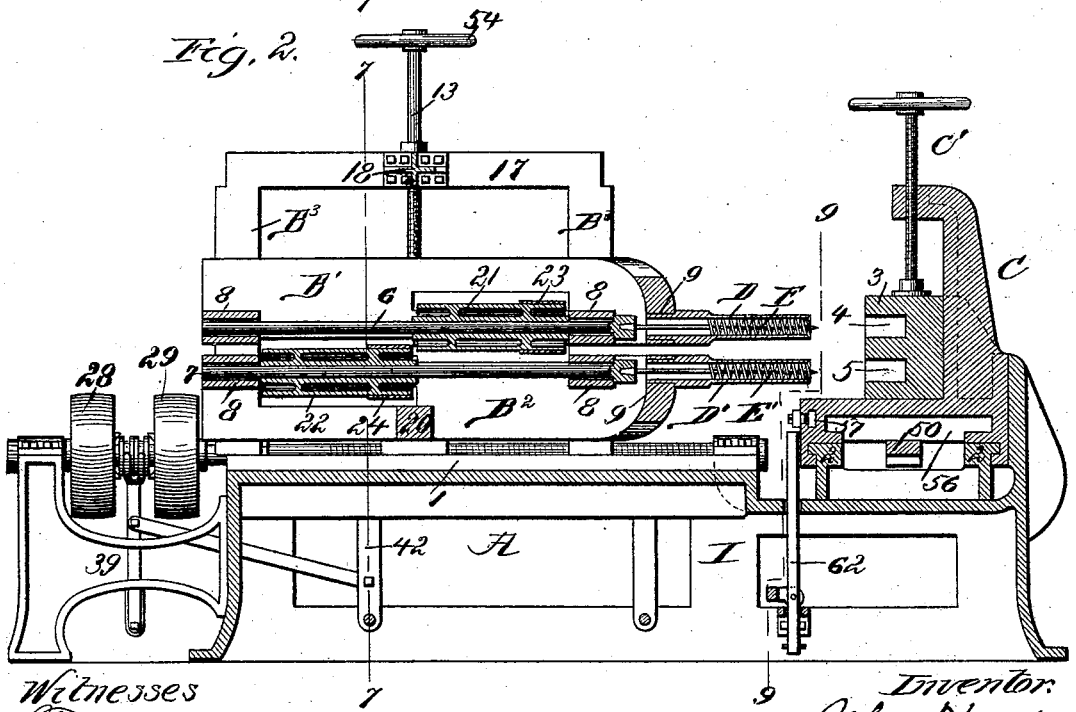


Fig. 2.



Witnesses
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(No Model.) 5 Sheets—Sheet 2.

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HOLLOW CHISEL MORTISING MACHINE.

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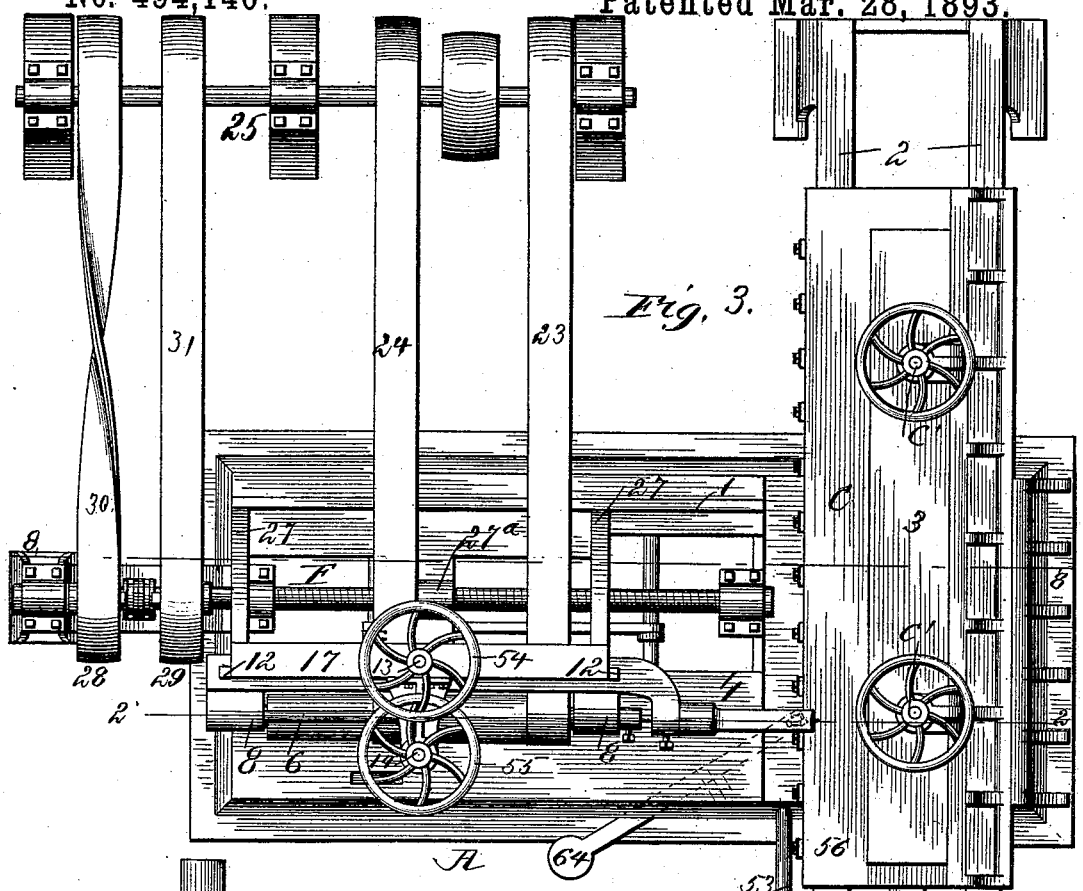

Fig. 3.

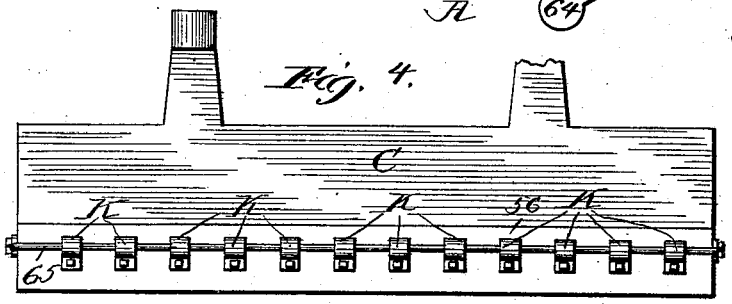

Fig. 4.

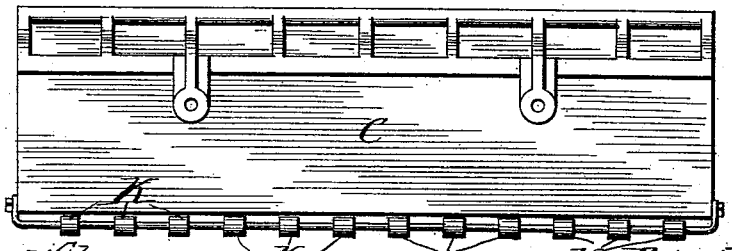

Fig. 5

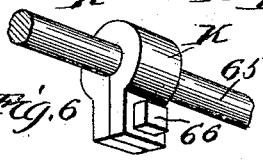

Fig. 6

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HOLLOW CHISEL MORTISING MACHINE.

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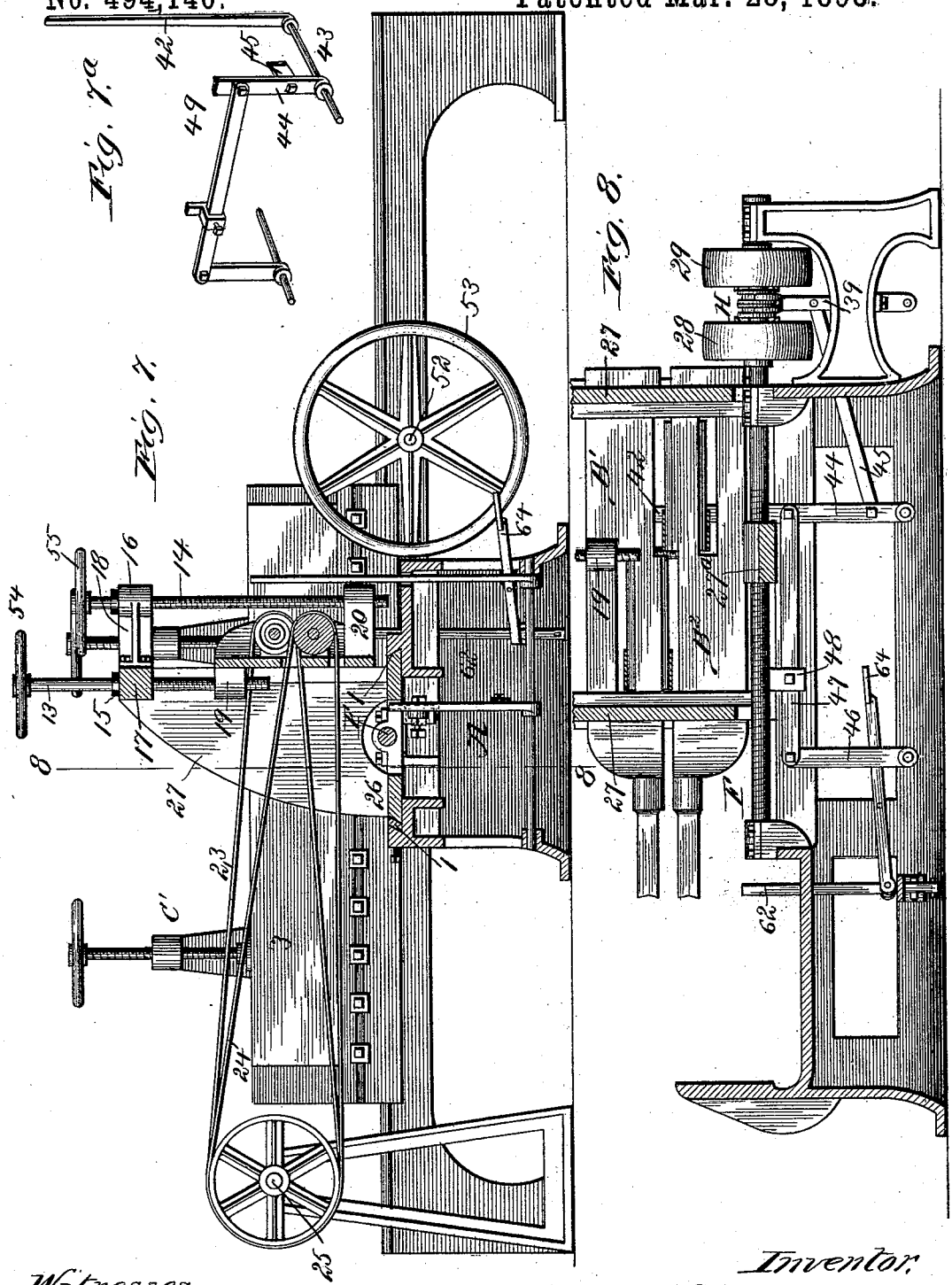

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(No Model.) 5 Sheets—Sheet 4.

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HOLLOW CHISEL MORTISING MACHINE.

No. 494,140. Patented Mar. 28, 1893.

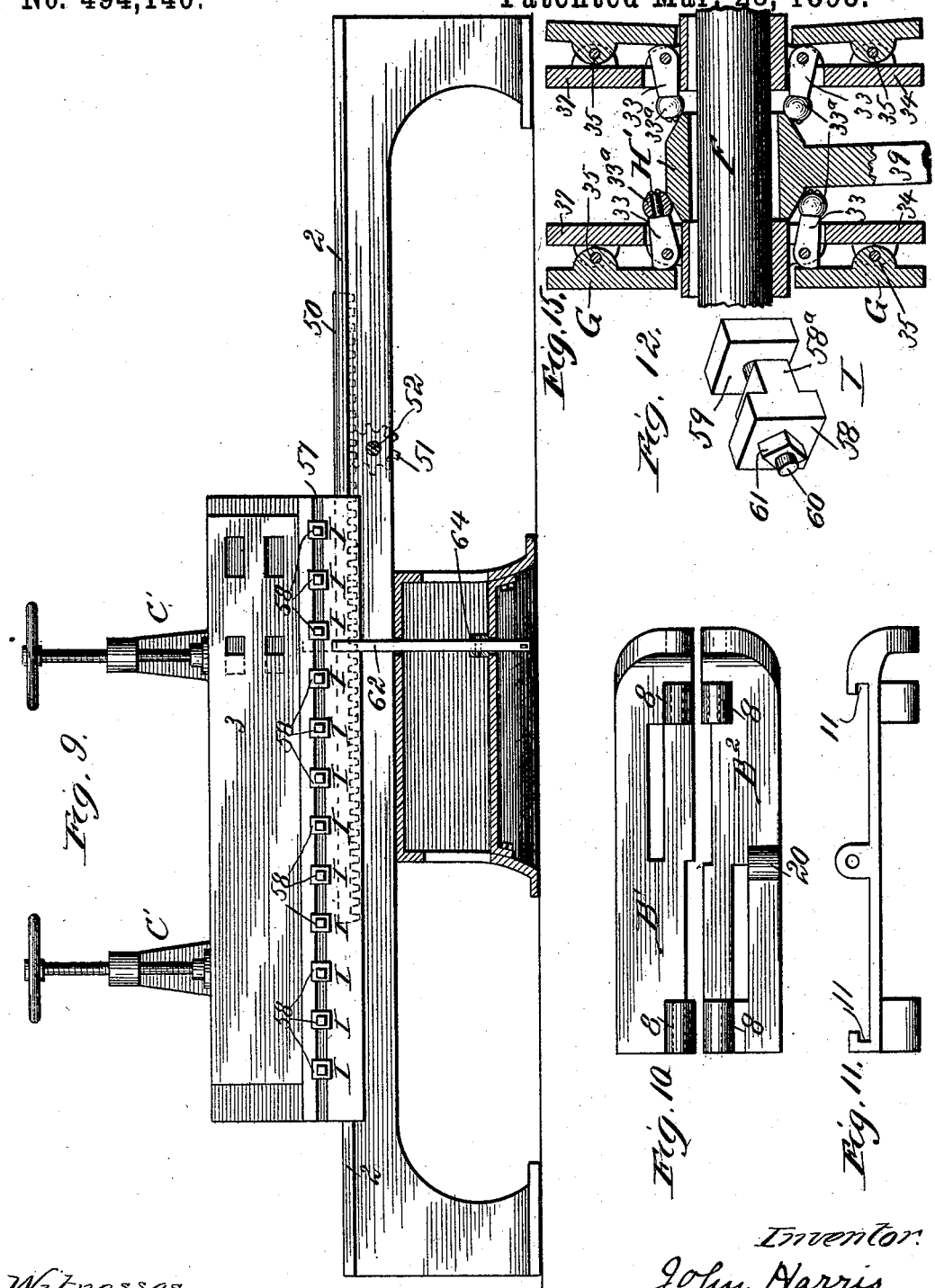

Fig. 9.

Fig. 15.

Fig. 12.

Fig. 10.

Fig. 11.

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HOLLOW CHISEL MORTISING MACHINE.

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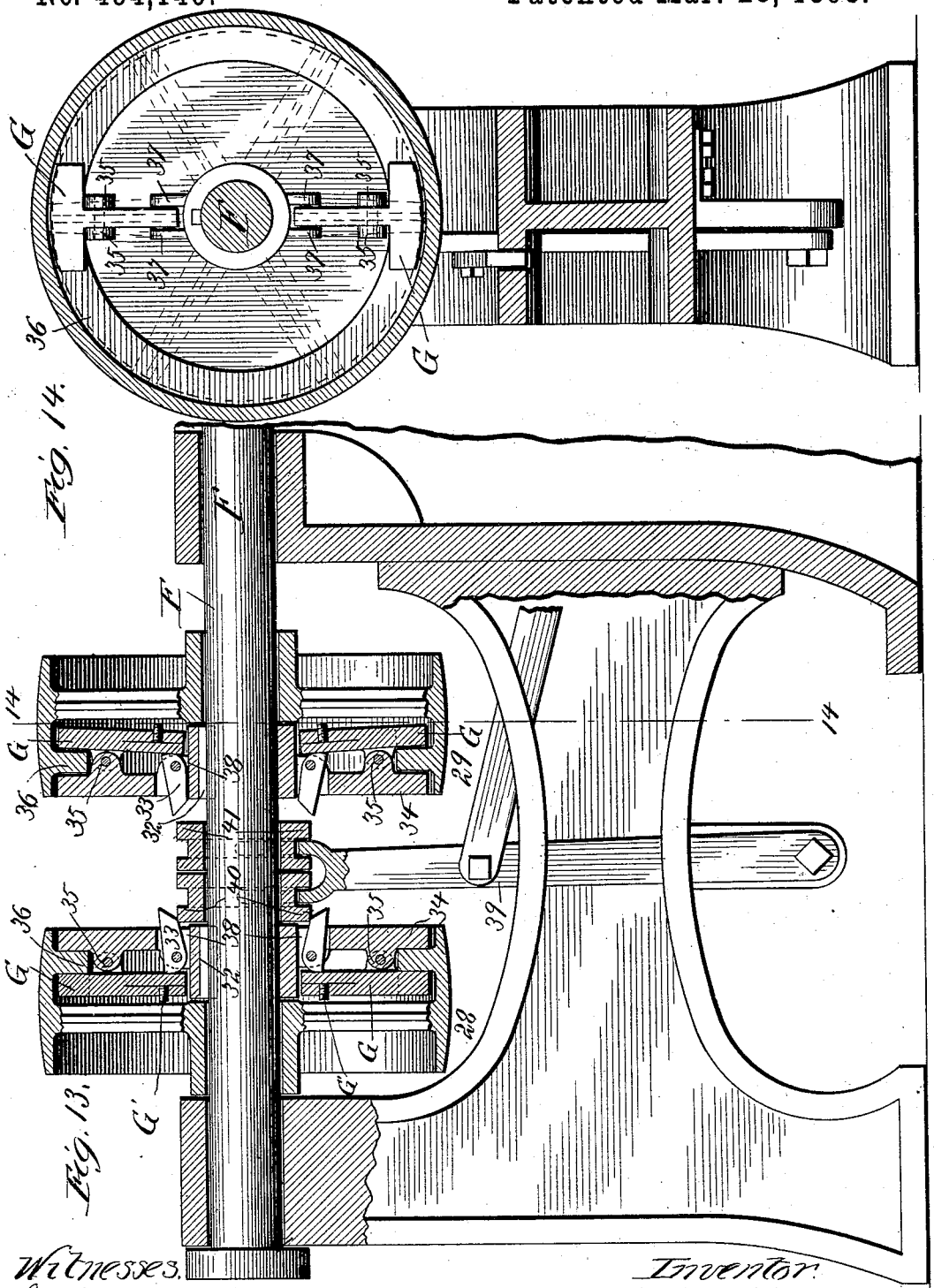

Witnesses.
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A. D. Wells

Inventor.
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By Chas. G. Page Atty.

UNITED STATES PATENT OFFICE.

JOHN HARRIS, OF CHICAGO, ILLINOIS.

HOLLOW-CHISEL MORTISING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 494,140, dated March 28, 1893.

Application filed March 28, 1891. Serial No. 386,780. (No model.)

To all whom it may concern:

Be it known that I, JOHN HARRIS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Hollow-Chisel Mortising-Machines, of which the following is a specification.

My invention relates to mortising machines in which the mortise is formed by a bit, which serves to bore a hole in the work or timber, and a hollow chisel which follows up the action of the bit and serves to square the hole, it being customary to extend the bit through the hollow chisel so that while the bit may bore slightly in advance of the chisel, the latter can follow up the action of the bit.

Prominent objects of my invention are, to provide a highly efficient and quick acting hollow mortising machine; to provide a simple and compact construction; to avoid a multiplicity of parts or members; to form a couple of lines of mortises along the work without necessitating separate operations for the two series; to readily vary the distance between the two lines of mortises, and to permit the formation of a series of mortises on any desired line along the timber; to avoid marking the timber at points where the mortises are to be made and to provide means for gaging the adjustment of the work carriage or table with reference to the length and distance apart of the mortises; to automatically determine the depth of the mortise to be made; to readily adjust the bits and chisels with reference to the required mortises; to effectively advance and retract the bits and chisels regardless of their adjustments; to provide highly efficient means for effecting the advancement and retraction of the bits and chisels; to resist the thrust of the chisel or chisels on the work, and to provide various novel and improved details and combinations all serving to increase the general efficiency and serviceability of hollow chisel mortising machines.

To the attainment of the foregoing and other useful ends my invention consists in matters hereinafter set forth.

In a hollow chisel mortising machine characterized by the several features of my invention, I provide a reciprocating bit and chisel carriage and a movable work carriage which is arranged for movement transversely to the line of movement of the bit and chisel carriage and which can be reciprocated or moved forward for the purpose of advancing the work so as to permit it be mortised at intervals along its length, and retracted so as to place it in readiness for the next piece. The bit and chisel carriage is advanced toward the work so as to permit the same to be mortised, and is automatically arrested when a mortise of desired depth has been made. The carriage is then retracted so as to free the mortising devices from the work and permit the work carriage to be advanced for the next mortising operation.

I provide the bit and chisel with two or more but preferably with a couple of bits and hollow mortising chisels, and support the same for vertical independent adjustment, in which way, while two mortises, one above the other, can be formed in the work or timber during the advancement of the bit and chisel carriage, said two mortises can be formed at a distance apart determined by the relative adjustment of the chisels and their respectively allotted bits.

In connection with the work-carriage, I provide a stop or gage device which preparatory to the mortising operation can be adjusted with reference to the number, positions and lengths of mortises to be formed along a piece of timber, and hence I do away with all necessity for marking out the mortises on the timber and also set the machine for similarly mortising any desired number of pieces of timber. I also removably hold the bits and chisels on the carriage, whereby either chisel and its allotted bit can when desired be detached. The push or thrust of the chisel or chisels on the work is necessarily excessive, and to steady the timber and avoid breakage, I back the work carriage by an abutment adapted to withstand all such strain.

In connection with the bit and chisel carriage I provide a reversible propelling mechanism, and in conjunction with such propelling mechanism, I provide an adjustable stop device suitable for automatically arresting the forward movement of the bit and chisel carriage the instant a mortise of desired depth

has been made; I also adapt the stop mechanism to arrest the back movement of the bit and chisel carriage at the proper moment.

Various other important matters are hereinafter more fully set forth.

While I prefer to reciprocate the bit and chisel carriage as a means for advancing and retracting the bits and chisels, various features of improvement herein involved could be applied to a stationary bit and chisel carriage employed in connection with a work carriage having an end movement for advancing the work in the direction of its length and a lateral movement for moving the work up to and away from the chisels.

In the accompanying drawings,—Figure 1 is a side elevation of a hollow chisel mortising machine embodying my invention. Fig. 2 is a section on line 2—2 in Fig. 3. Fig. 3 is a top plan of the machine. Fig. 4 is a front elevation of the work-carriage with a set of adjustable stops constructed and supported somewhat differently from the stops in preceding figures. Fig. 5 is a top plan of the work carriage and stops shown in Fig. 4. Fig. 6 represents in perspective one of the stops and a portion of the rod involved in Figs. 4 and 5. Fig. 7 is a section on line 7—7 in Figs. 1 and 2. Fig. 7ª represents a perspective of the power shifting device. Fig. 8 is a section on line 8—8 in Fig. 3. Fig. 9 is a section on line 9—9 in Fig. 1, the work carriage being shown in elevation. Fig. 10 represents in side elevation the two bit and chisel supporting frames or carriers. Fig. 11 is a top plan of one of the holders or carriers of Fig. 10. Fig. 12 illustrates one of the stops employed in several of the figures, for example in Fig. 9. Fig. 13 is a central longitudinal section on a vertical plane through the belt pulleys and clutch devices for automatically reciprocating the chisels. Fig. 14 is a section on line 14—14 in Fig. 13. Fig. 15 illustrates the clutch shown in Figs. 13 and 14, with a different construction of shifting clutch-member.

The bed or main supporting frame A of the machine is constructed with reference to several members which it supports, and is provided with suitable boxes or bearings at points where the same are required.

The bed-frame is provided with a suitably arranged track or guide-way 1 for a reciprocating carriage or carrier B for the bits and hollow mortising chisels, and it is further provided with a suitable way or guide-track 2 for the work-carriage or carrier C.

The track or guide-way for the work-carriage is arranged transversely to and opposite one end of the track or guide-way for the bit and chisel carriage, so that by adjusting the former along its track or guide-way, the timber which it carries can be moved endwise so as to permit the formation of mortises at desired points along its length.

The reciprocating carriage B carries at its forward end a couple of hollow mortising chisels D, D′, which are detachably secured upon the carriage, one above the other, and arranged to project forwardly from the same as best illustrated in Figs. 1 and 2. The bits E and E′ are arranged respectively within one and the other of the hollow mortising chisels and during operation bore into the work somewhat in advance of the chisels which in following up the cuts of the bits serve to square the holes. By thus arranging the hollow mortising chisels, I can mortise the work at desired points along two parallel longitudinal lines, a couple of such mortises being illustrated in Fig. 2 wherein the timber 3 shown, held upon the work carriage has a couple of mortises 4 and 5 understood to have been formed by the upper and lower mortising chisels respectively. By removably securing the hollow chisels upon the carriage, one or the other of said chisels can be removed in case a single line of mortises is desired, it being understood that the bits which practically constitute component parts or members of the hollow mortising chisels are also removably held upon the carriage so that when a chisel is removed, its accompanying bit can likewise be detached.

In order to permit the mortises to be formed on different lines along the timber, the hollow mortising chisels and their accompanying bits are vertically adjustable upon the reciprocating carriage, the adjustment of one being independent of the other in order that the mortises can be made along any desired lines. The two hollow mortising chisels can therefore be adjusted independently of one another so as to form two sets of mortises along two lines at any desired distance apart, and again, either chisel can be removed and the remaining chisel adjusted in height with reference to the formation of one set or line of mortises in the work.

As a means for removably and adjustably holding the bits and chisels upon the reciprocating carriage B, I provide said carriage with a couple of members B′ and B² which are adjustable vertically and independently of one another upon the upright body-portion B³ of the carriage and which constitute adjustable brackets or supports for the bits and hollow chisels.

The adjustable bit and chisel supports B′ and B² can be formed or constructed in various ways so long as they are adapted for adjustment on the frame-portion B³ and provide bearings for the hollow mortising chisels and the rotary shafts or spindles 6 and 7 which are arranged for operating the bits. As a simple and efficient construction however, each adjustable holder is herein formed by a frame or plate provided with journal-bearings 8 for its allotted bit driving shaft or spindle, and having at one end a socket 9 in which its allotted hollow chisel can be removably held by any suitable locking device—for example by a set screw 10, Fig. 1.

The adjustable bit and chisel supports B′ and B² are arranged to slide up and down

upon the upright body-frame or frame portion B^3 of the reciprocating carriage, and can be guided thereon by suitably arranged guides, as for example, each adjustable support may have its back provided with vertical grooves or ways 11 (see Fig. 11) in which case the upright frame portion of the carriage will be provided with vertical splines or guides 12 (Fig. 3) arranged to engage in the guide ways 11 of the adjustable supports.

As a means for adjusting the bit and chisel supports independently of one another, I provide the upright portion B^3 of the carriage with a couple of adjusting screws 13 and 14 respectively engaging threaded bearings on one and the other of the adjustable bit and chisel supports B′ and B^2. As herein shown, the upright frame portion of the carriage is provided with bearings 15 and 16 for the adjusting screws, the bearing 15 being conveniently formed in the top bar 17 of said frame portion, while the bearing 16 is conveniently formed in an arm or bracket 18 (Fig. 7) on said top bar. The adjusting screw 13 engages in a threaded bearing 19 (Fig. 7) on the upper bit and chisel support B′, and the adjusting screw 14 engages in a like bearing 20 on the lower bit and chisel support B^2, by which arrangement said adjustable supports B′ and B^2 can be adjusted independently of one another so as to permit the bits and chisels to mortise along lines at different distances apart. The bits are detachably secured to the shafts or spindles 6 and 7, and said shafts or spindles respectively provided with long belt-pulleys 21 and 22 in order that they can be operated by the driving belts 23 and 24 respectively. The belt-pulleys on the driving shafts or spindles 6 and 7 are made long with reference to the extent of movement on the part of the reciprocating carriage, the belting being permitted to slip on said pulleys when the carriage is moved. The belts 23 and 24 are operated by pulleys on a driving shaft 25 arranged alongside the machine and operated from any convenient source of power.

While I do not confine myself to any particular form or construction of carriage B, it may be observed for the purpose of understanding the construction herein illustrated that the base 26 of the carriage works in a guide-way 1 in or on the bed A (Fig. 7) and that the carriage is provided with upright ends 27 which support the top bar 17 and provide the guides 12 for the adjustable bit and chisel supports. The frames or plates which constitute said bit and chisel supports are conveniently provided with openings for the belts 23 and 24 as illustrated in Figs. 7 and 10, since it is preferable to support the bit spindles on the front of said supports and to arrange the driving shaft 25 in rear of the same, although of course the adjustable supports for the bit spindles could be arranged on the rear side of frame B and the journal bearings 8 be disposed accordingly. The adjusting screws 13 and 14 can be operated by suitable levers or handles it being preferable to provide them with hand-wheels for such purpose. The carriage B is advanced for the purpose of advancing the rotating bits and the hollow chisels, and retracted for the purpose of withdrawing the bits and chisels from the work.

As a simple and efficient means for operating the bit and chisel carrying carriage, I provide a reversibly rotative driving screw F which is supported by suitable bearings on the bed frame A and arranged to engage a nut 27^a (one or more) rigid on the reciprocating carriage B as in Fig. 8. The screw F can be driven by any suitable reversing gear or driving mechanism, but as a matter of further improvement I have herein provided a special construction of reversing clutch device in connection with a couple of belt pulleys 28 and 29 respectively driven in opposite directions by belts 30 and 31. The belt-pulleys 28 and 29 are arranged loosely upon an unthreaded portion of the rotary screw shaft F, as best shown in Fig. 14, and within each pulley I arrange a hub collar 32 which is independent of the pulley but keyed upon the shaft. These hubs or collars serve as bearings for dogs or cams 33 which are pivoted upon said bearings and arranged to project from the ends of the pulleys substantially as shown. The hubs or collars 32 are provided with flange portions 34 having bearings 35 for pivots by which one or more vibratory clutch glands or jaws G are attached to the inner side of each flange 34. Each pulley is also provided with an internally arranged annular flange 36 which can be clamped between the flange 34 and the jaws G allotted to it. The jaws G are pivotally held between their ends upon the flange-portions of the hubs 32 which together with their said flanges may be regarded as bearings on the shaft. The outer short end portions of the jaws are arranged to engage and hold by frictional contact the inner flange portions 36 of the pulleys while the inner long end portions of said jaws are arranged to lie against the inner cam-faces of the dogs or cams 33. The dogs or cams 33 are pivoted between bearings 37 in the flange portions 34 of the hubs or bearings 32, and said flange portions are provided with openings 38 through which the long outer arms or end portions of the dogs or cams can extend.

As a means for operating the dogs or cams 33, I arrange upon the shaft F a sliding abutment H which can be shifted along the shaft so as to engage either of the two sets of dogs or cams. Thus, when the shifting abutment H is thrown to the left, as in Fig. 13, it will engage and throw the long arms or end portions of the dogs or cams outwardly and thereby cause the inner ends of the dogs or cams to act upon the inner ends or long arms of the jaws G in a way to move the jaws about their pivots and force their outer ends against the

pulley flanges 36, in which way, the pulley flange can be clamped between the jaws G and a stop or abutment rigid on the shaft and formed by the annular flange portion of the hub 32, and thereby hold the pulley fast upon the shaft. In like manner, the shifting abutment can be moved to the right so as to engage the dogs of the opposite pulley, for a like purpose.

The shifting abutment is operated by a vibratory lever 39 which engages in grooves in the shifting abutment, and as a means for adapting the shifting abutment to the oppositely rotating pulleys, I form it of a couple of sections 40 and 41 which are independent of one another but both engaged by the forked end of the lever 39, the said sections being free to both slide endwise and rotate upon the shaft so that when one section is placed in engagement with a set of dogs or cams it can partake of the general revolution of the pulley and shaft. The vibratory lever is connected with a hand lever 42 and an automatic stop movement, the latter being arranged for arresting the movement of the carriage at each end of its stroke. The hand lever 42 is fixed on a rock-shaft 43 which is mounted on the bed-frame A and provided with an upwardly extending arm 44. The arm 44 is connected with the lever 39 by a link 45, so that by operating the hand-lever, the movable abutment H which may hereinafter be termed the shifting clutch member can be thrown into engagement with one and the other set of cams or dogs. The vibratory arm 44 connects with a like vibratory arm 46 by means of a rod or link 47, and said rod or link 47 is provided with an adjustable stop 48 arranged forward of the nut 27 or any suitable lug or trip on the carriage, and in such position that during the advancement of the bit and chisel carriage toward the work the trip will engage the stop 48 and thereby so operate the lever 39 through the medium of the vibratory stop mechanism comprising the levers 46 and 44 and the links 45 and 47, as to free the shifting clutch member H from the dogs or stops and hence disconnect the screw shaft F from the driving power.

In order to start up the machine the attendant can by operating the hand-lever 42 throw the shifting clutch member H into engagement with one set of cams or dogs of the reversing clutch, so as to permit the driving power to rotate the screw shaft F in a direction to move the bit and chisel carriage toward the work. When the trip upon the advancing bit and chisel carriage strikes the adjustable stop or abutment on the stop mechanism, it will operate said mechanism in a way to free the shifting clutch member from the cams or dogs and hence terminate the forward movement of the bit and chisel carriage. The point at which the bit and chisel carriage terminates its forward movement will determine the depth of the mortise, and hence by adjusting the stop or abutment 48, the depth of the mortise can be predetermined.

While the arrangement of stop mechanism herein shown is a simple and efficient one, I do not limit myself to the precise details illustrated, it being obvious that various forms and constructions of adjustable swinging or sliding stop devices connected with the shifting clutch member H could be provided, and that for the broader purpose of this application, various constructions of reversing mechanisms and adjustable stop devices can be employed.

In order to cause the bit and chisel carriage to make its back stroke, the attendant can by properly operating the hand lever 42 throw the shifting clutch-member H into engagement with the set of dogs or cams opposite the set previously engaged by said member for the purpose of advancing the carriage. When the carriage reaches the desired termination of its back stroke, its trip can engage the stop mechanism and operate the same so as to free the shifting clutch from the cams or dogs, as for example the nut 27^a or other trip on the carriage can at a certain moment during the back stroke of the carriage engage a stop or abutment 49 conveniently formed on the stop mechanism by the upper end of the lever 44, although of course the stop 49 could be arranged on the rod or link 47 or on any other suitable portion of the stop mechanism.

To each of the belt pulleys 28 and 29, I may allot two or more jaws G and pivotally support said jaws upon any desired bearing fixed on the shaft, it being however, a convenient and compact arrangement to pivot them on the flanges 34. These flanges 34 which latter constitute jaws which are rigid on the shaft, and hence when the jaws G are adjusted by the dogs or cams, the flanges 36 of the pulleys will be clamped between the movable jaws G which are pivotally supported on the shaft and the jaws 34 which are fixed on the shaft.

Various means can be provided for taking up wear, as for example the inner end portion of each jaw can be split and a set screw G′ arranged in the division farthest from the cam with one end arranged to bear against the division next to the cam. This in effect provides an adjustable wearing face for the cam since by adjusting the screw the two divisions can be sprung somewhat apart.

The work-carriage C is provided with a clamp C′ for holding the work, and is guided by the track or ways 2 which are arranged transversely to the line of reciprocating movement of the bit and chisel carriage.

While I may employ as a means for adjusting the work-carriage along its allotted track or guide-way, a nut and screw or other suitable propelling device, I prefer to provide a rack and pinion, the rack 50 being arranged on the carriage and engaged by a pinion 51 on a hand-wheel shaft 52. The rack is conveniently provided along the underside of

the work-carriage, and the hand-wheel shaft is conveniently mounted in the main or bed-frame and arranged transversely to the length of the carriage at a point to permit its hand-wheel 53 to be within convenient reach of an attendant standing in front of the machine, and in this connection it will be observed that the hand-wheels 54 and 55 for the screws 13 and 14, and the clutch lever 42, will also be within convenient reach of the attendant thus standing in front of the machine.

In connection with the adjustable work carriage I provide an adjustable gage or stop device for determining both the length of each mortise, and the positions of the mortises along the work.

In certain figures of the drawings, I have provided the bed or table 56 of the work carriage with a T-groove 57 formed along its front side, and arranged within said groove the inner end portions of a set of stops I which are adjustable along said groove so as to vary the widths of the spaces between them. One of said stops is illustrated in perspective in Fig. 12, wherein it is seen that the stop comprises a couple of sections 58 and 59, a bolt 60 extending through a bore in the outer section 58 and rigid with the inner section 59, and a nut 61 applied to the outer threaded end of the bolt and arranged to tighten up against the outer end of the outer section 58. The inner section 59 of the stop is arranged within the vertically enlarged back portion of the groove 57, and the reduced back portion 58^a of the outer section 58 is arranged within the narrower forward portion of said groove, in which way the shoulders formed by the rear of the larger front end portion of said section 58 can bear against the front side of the work-carriage. By tightening up the nut the stop can be held rigid with the work-carriage, and by loosening the nut the stop can be loosened so that it can be adjusted along the carriage.

In connection with the adjustable gage stops, or abutments I on the work-carriage, I provide a movable stop or check device consisting of a vibratory arm 62 on the rock-shaft 63 which can be operated by a foot-treadle 64 within reach of an attendant standing in front of the machine. Assuming the gage-stop I to be arranged with reference to the length of mortise to be made and the positions of the mortises along the work, the space between the first two stops may for example determine the length and position of the first mortise. The space between the first and second pair of gage stops may then represent the space between the first and second mortise, while the space between the two stops of said second pair will determine the length of the second mortise, and so on. When therefore the movable stop 62 is between a couple of gage stops, it will determine the extent to which the work-carriage can be moved. In forming for example the first mortise, the attendant will place stop 62 between the first two gage-stops and adjust the work carriage so as to bring stop 62 against the second one in order of said gage stops. The bit and chisel carriage can then be started up and a square mortise made in the timber. If now the mortise is to be made twice the length of its width, the attendant will adjust the work carriage forward until the stop 62 abuts against the first in order of said stops and thereby arrests further advancement of the work carriage, whereupon the bit and chisel carriage can be again started up so as to repeat the previous mortising operation at a point suitable for elongating the mortise first made. The foregoing operation can be repeated until the mortises are all formed, and as a matter of course the gage stops can be set for mortises each formed by a single operation, or for long mortises formed by two or more operations of a bit and chisel.

If the mortises were all of equal width, and at uniform distances apart, the stop 62 could be worked automatically, but I prefer to place it subject to the control of an attendant so that without the necessity of complicated adjusting mechanism, it can be readily operated with reference to the formation of mortises at varying distances apart. I do not however, confine myself to the form and construction of gage or stop device hereinbefore described, since the same can be varied and the end herein sought attained by various constructions. As an illustration of such fact, I have in Figs. 4, 5 and 6 shown a simpler construction involving a rod 65 secured upon the front side of the work carriage, and a set of split stops K adjustably clamped upon said rod by screw-bolts 66.

The stop 62 can be employed in conjunction with the gage-stops K, and obviously in place of forming said stop 62 by a vibratory arm, it could be formed by a longitudinally movable catch or other analogous device.

In forming a mortise in a piece of timber upon the work-carriage, the timber sustains an enormous lateral thrust or pressure as a result of the operation of the hollow chisel, and in order to meet and take up such thrust, I provide the work carriage with a longitudinally arranged wall or abutment 67 against which the rear longitudinal side of the work abuts, and I back this rear wall portion of the carriage by a longitudinally arranged guide wall or abutment 68 on the bed-frame.

In Fig. 15, wherein parts corresponding with Figs. 13 and 14 are correspondingly lettered, I provide upon the vibratory lever 39 as a preferred construction an abutment or shifting clutch-member H′ in place of the two-part shifting clutch-member H. The said member H′ is preferably in one piece and may be either integral with or secured to the lever 39. Said member H′ is in the nature of a sleeve having beveled ends, and as a matter of further improvement I provide each dog or cam 33 of the two sets of cams with an anti-friction roll 33^a, so that the beveled ends

of the member H′ may engage one or the other sets of rolls 33^a according to the direction in which said shifting clutch-member is moved.

What I claim as my invention is—

1. The combination substantially as hereinbefore set forth, in a hollow chisel mortising machine, of a reciprocating carriage provided with one or more bits and hollow chisels, a reversibly operating power driven propelling screw applied for reciprocating the said carriage, suitable power operated driving means operating the propelling screw alternately in opposite directions, and a movable work carriage arranged for adjusting the work relatively to the mortising devices.

2. The combination in a hollow chisel mortising machine of a reciprocating carriage for the bits and chisels, a work carriage arranged for movement transversely to the line of movement of the reciprocating bit and chisel carriage, a couple of vertically adjustable bit and hollow chisel supports arranged one above the other and adjustable upon the bit and chisel carriage independently of one another, and a couple of horizontally arranged bits and hollow mortising chisels carried by said supports so as to operate at different points in height along a piece of work carried by the work carriage, substantially as described.

3. The combination in a hollow chisel mortising machine, of a carriage provided with a couple of vertically and independently adjustable bit and chisel supports B′ and B^2 each carrying a bit and chisel, and a movable work carriage.

4. In a hollow chisel mortising machine, the reciprocating bit and chisel carrying carriage provided with an upright B^3, the independently adjustable bit and chisel supports B′ and B^2 arranged for vertical adjustment upon said upright independently of one another, adjusting screws 13 and 14 respectively engaging said bit and chisel supports, and bit spindles and chisels carried by said supports, substantially as described.

5. The reciprocating carriage provided with an upright frame portion B^3, the bit and chisel supports B′ and B^2 arranged for vertical adjustment upon said upright frame portion independently of one another and carrying bits and chisels substantially as set forth, means for separately adjusting the bit and chisel supports, the large belt pulleys 21 and 22 on the bit spindles, driving belts 23, and 24 applied to said pulleys and passing through openings in the bit and chisel supports whereon the bit-spindles are at the front while the belting passes back from the same to the rear, substantially as described.

6. The combination of the reciprocating carriage provided with one or more hollow chisels and bit-spindles, the reversibly rotative power driven propelling screw engaging a threaded bearing on the carriage and arranged for reciprocating the same, and an automatic stop device for disconnecting the propelling screw from the power at the end of each stroke on the part of the carriage, substantially as described.

7. The combination of the reciprocating carriage provided with one or more hollow chisels and bit-spindles, the reversibly rotative propelling screw engaging a nut on the carriage and arranged for reciprocating the same, and suitable reversing mechanism for changing the direction of rotation of the propelling screw, substantially as set forth.

8. The combination as hereinbefore set forth in a hollow chisel mortising machine of a reciprocating bit and chisel carriage carrying one or more bits and hollow chisels, a reversibly rotative screw shaft engaging a nut on the carriage as a means for advancing and retracting the same, a couple of pulleys for operating said shaft alternately in opposite directions, and a clutch device for connecting the pulleys alternately with the shaft.

9. The combination in a hollow chisel mortising machine of a reciprocating bit and chisel carriage, a work carriage movable transversely to the line of reciprocation of the bit and chisel carriage, a set of adjustable stops arranged for adjustment independently of one another along the work carriage, and a movable stop device arranged for engaging and releasing the said adjustable stops on the work carriage and subject to the control of an attendant, substantially as described.

10. In a hollow chisel mortising machine the combination of the movable work carriage, a set of stops or gages set in a slot thereon and capable of being adjusted and a stop for engaging the gages consisting of a vibratory lever which can be raised to engage the stops or lowered to release them substantially as set forth.

11. The combination in a hollow chisel mortising machine of a movable work carriage, a set of gages or abutments supported for adjustment thereon, the sliding arm 62 for engaging the same and a lever 64 for raising the arm to engage the abutments and lowering the same to release them.

12. The combination with the reciprocating bit and chisel carriage of the vibratory arms or levers 44 and 46 connected by a link 47 which carries a stop 48, a stop on the carriage arranged for engaging the stop 48 and the lever 44 respectively at opposite ends of the movement of the carriage, and a reversing mechanism connected with the lever 44 and applied for reversing the power by which the carriage is propelled, substantially as described.

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Witnesses:
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