G. E. NORRIS.

MORTISING MACHINE.

APPLICATION FILED AUG. 28, 1913.

1,155,160.

Patented Sept. 28, 1915.

5 SHEETS—SHEET 1.

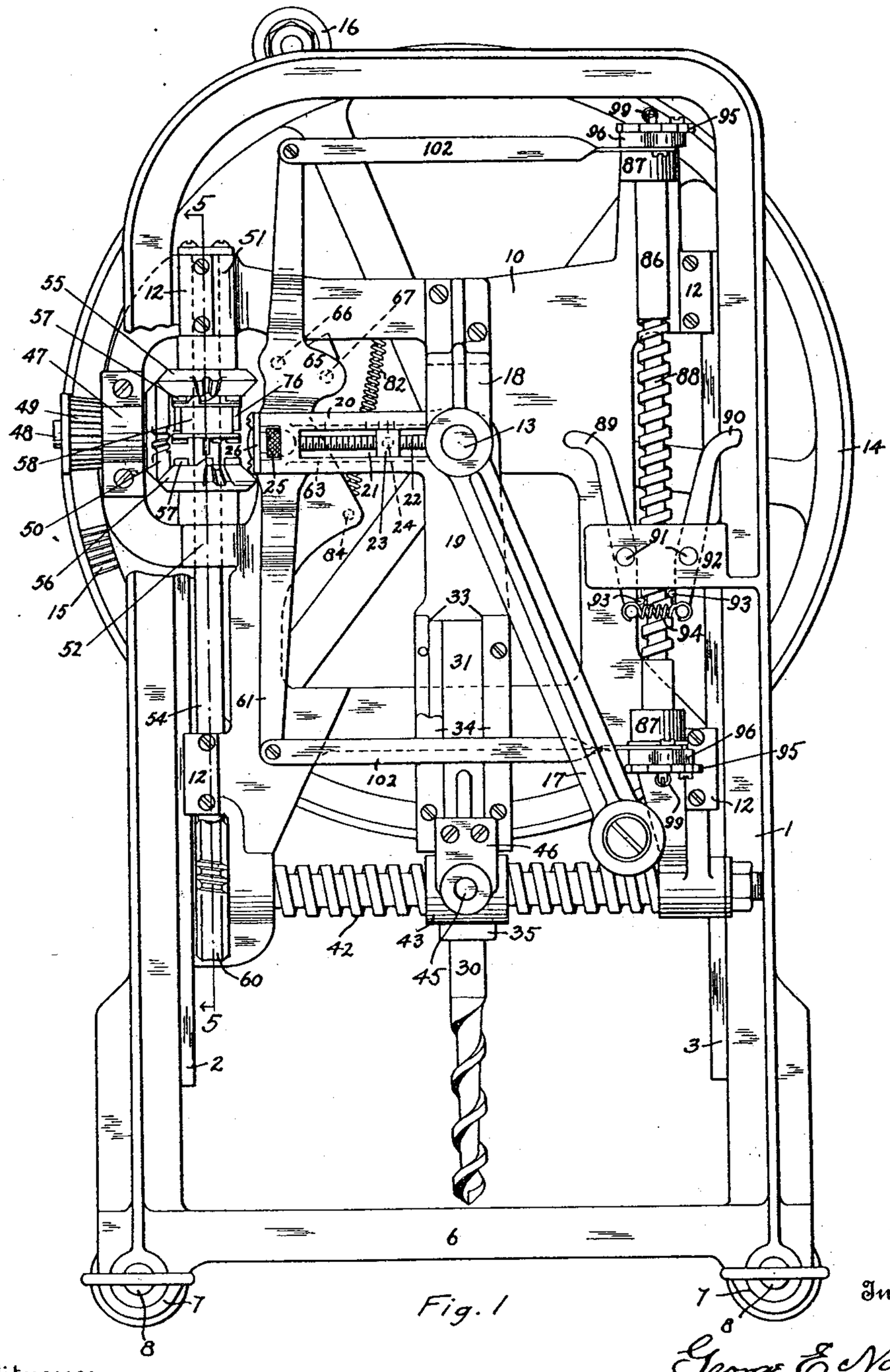

Fig. 1

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Witnesses

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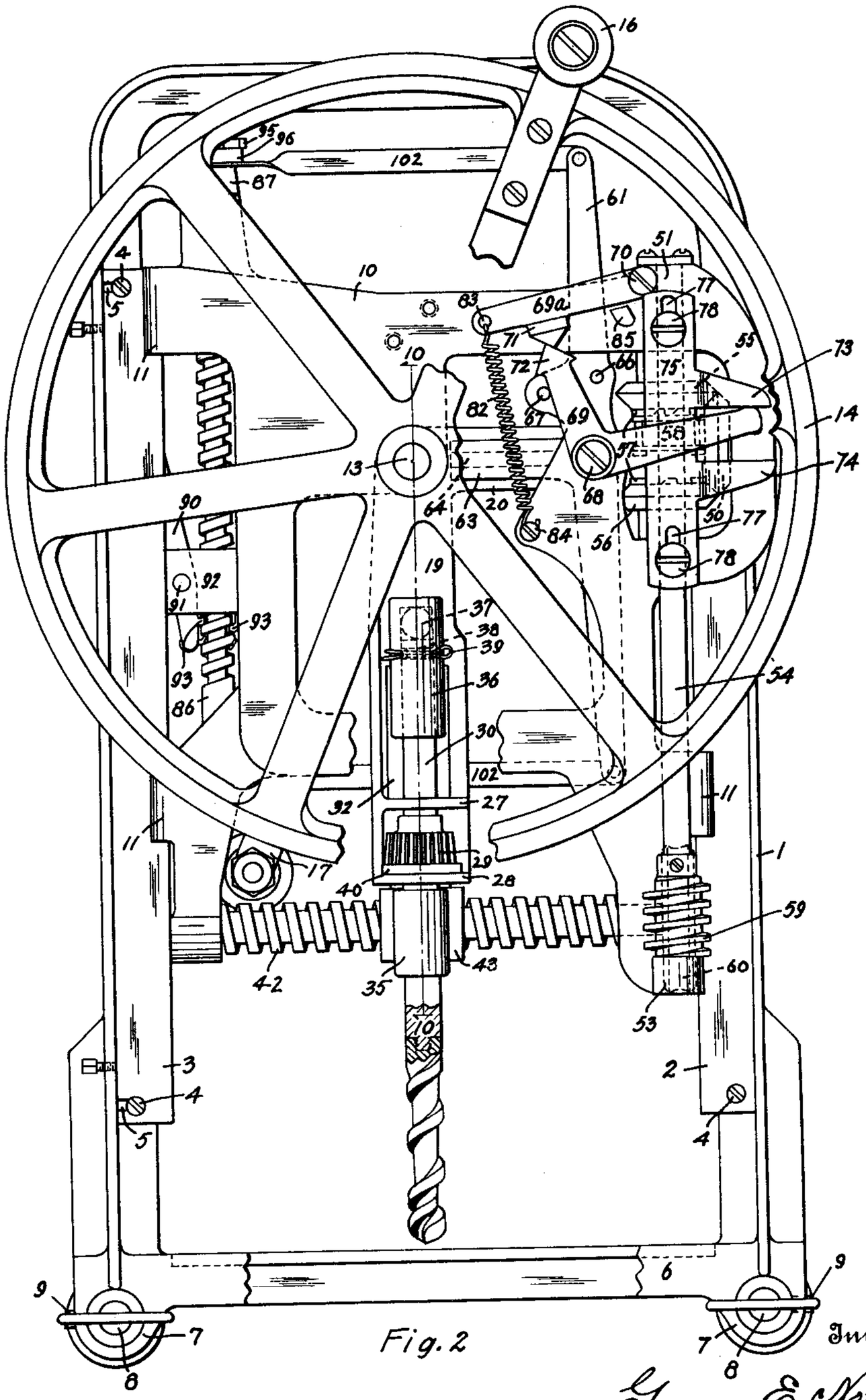

Fig. 2

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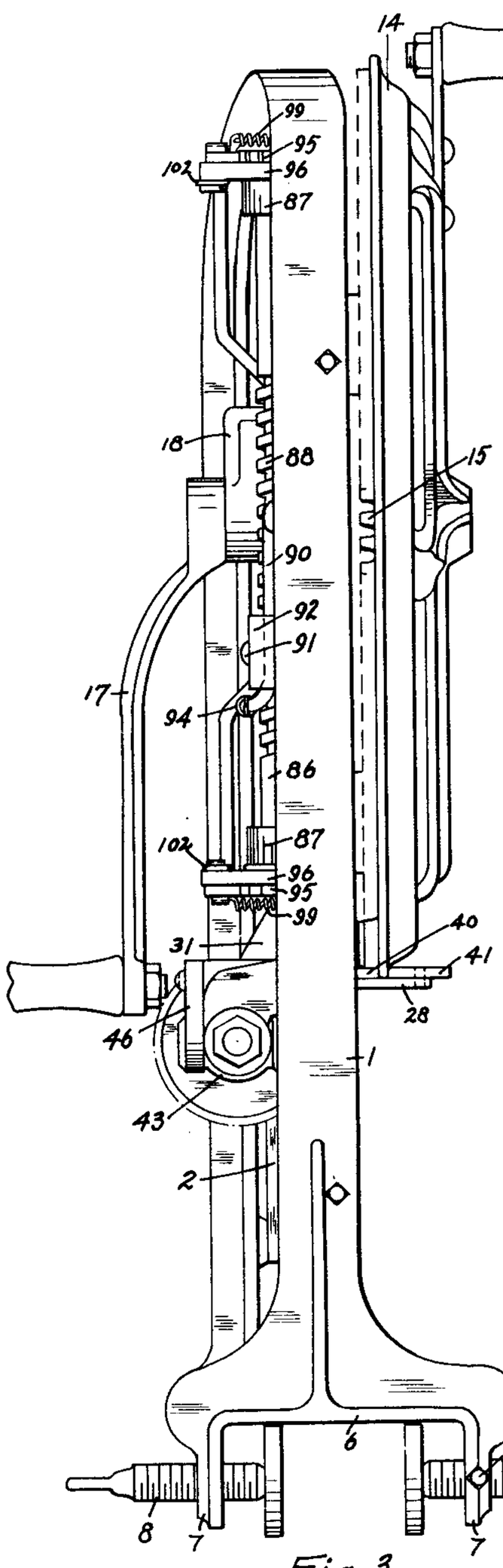

Fig. 3

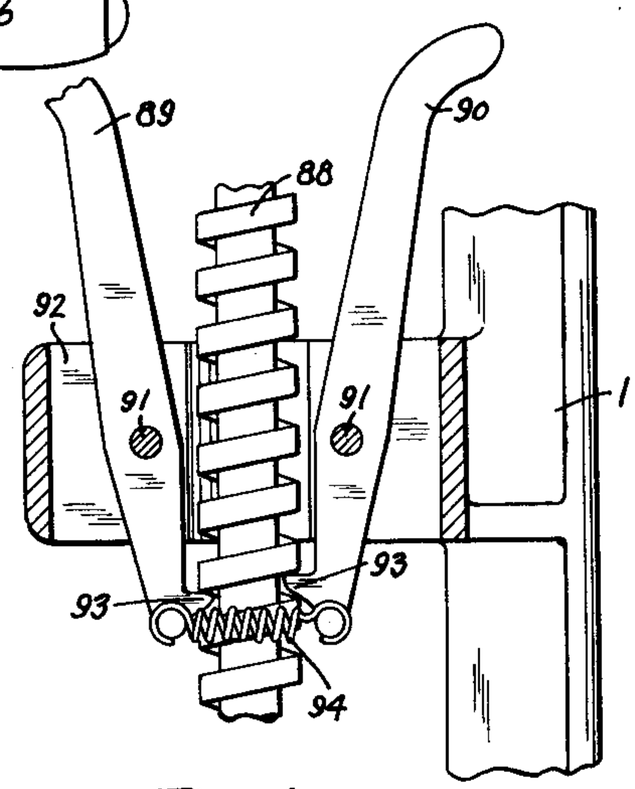

Fig. 4

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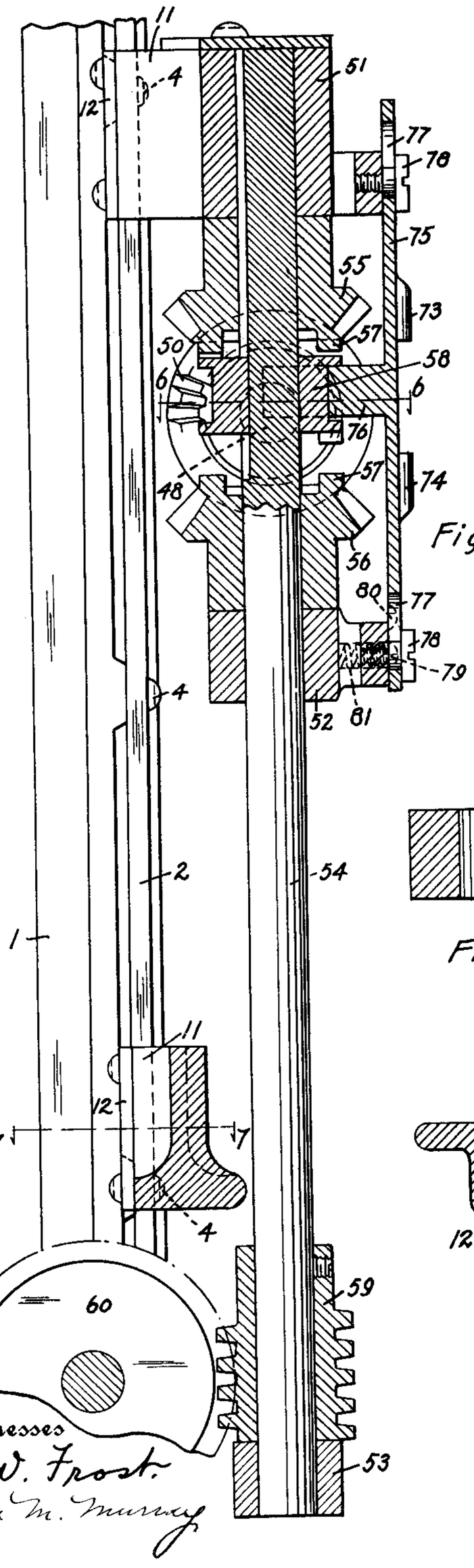

Fig. 5

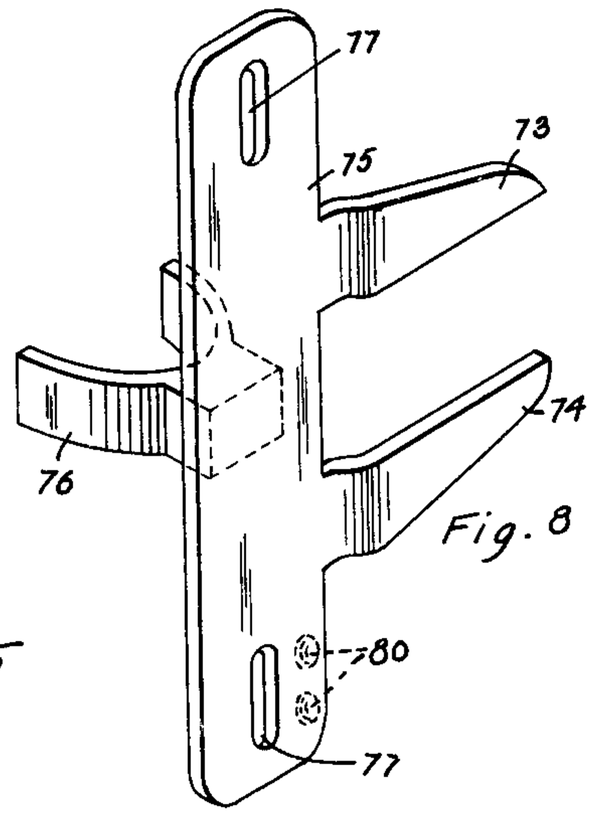

Fig. 8

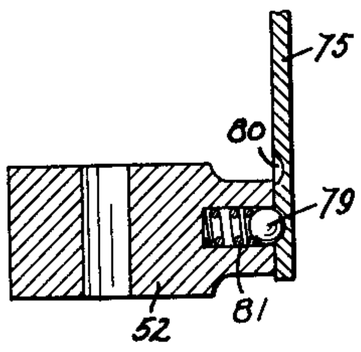

Fig. 9

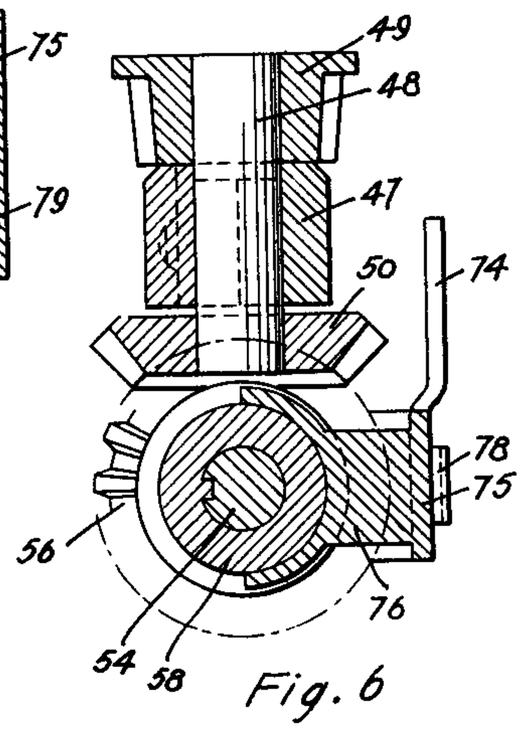

Fig. 6

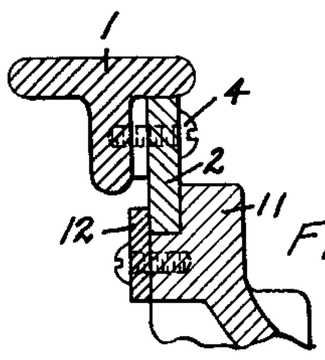

Fig. 7

Witnesses

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5 SHEETS—SHEET 5.

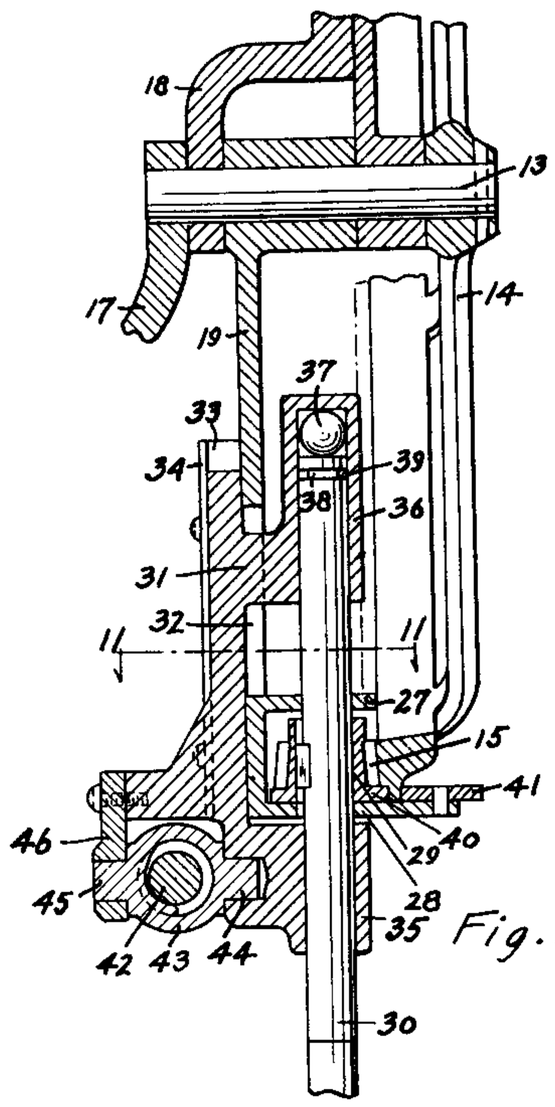

Fig. 10

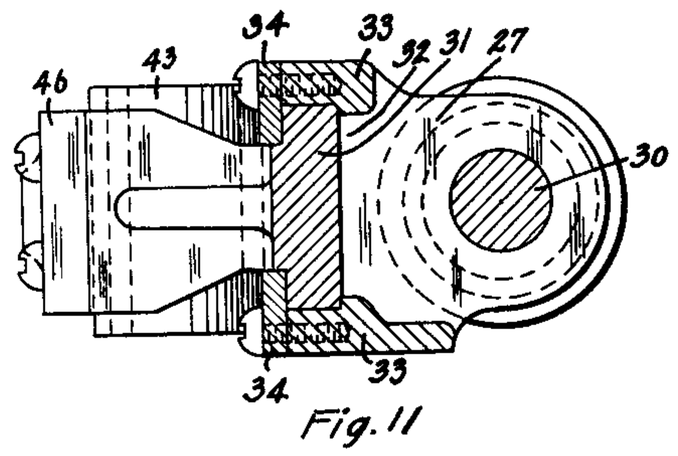

Fig. 11

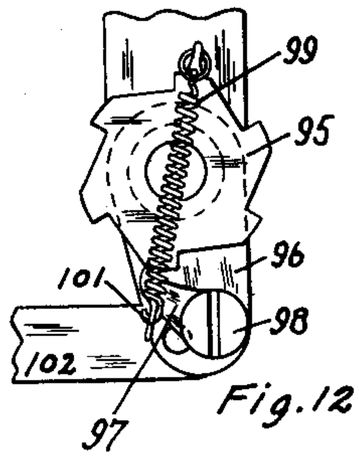

Fig. 12

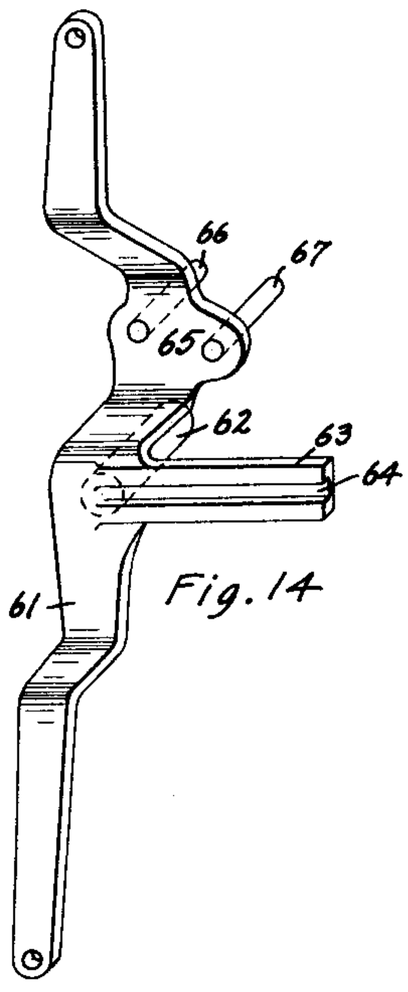

Fig. 14

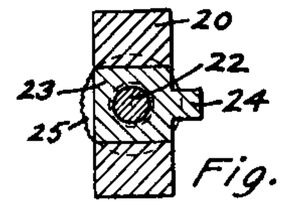

Fig. 16

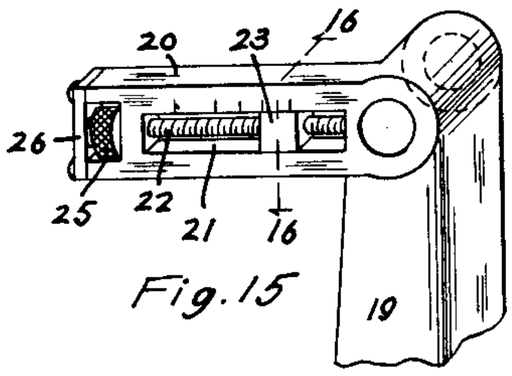

Fig. 15

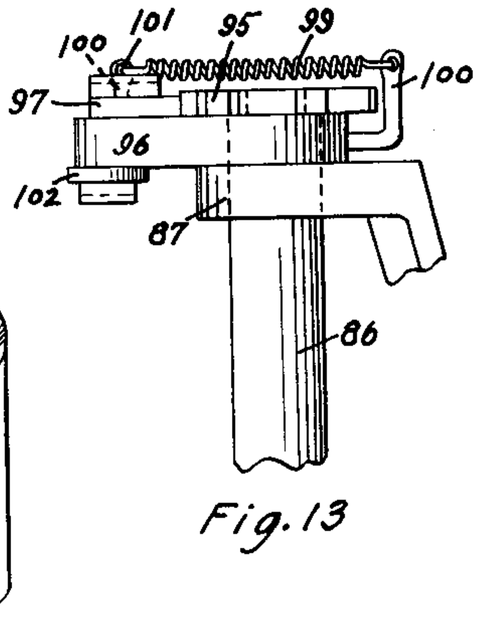

Fig. 13

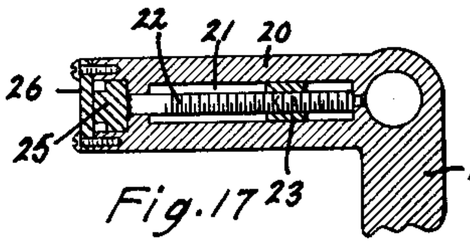

Fig. 17

Witnesses

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UNITED STATES PATENT OFFICE.

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MORTISING-MACHINE.

1,155,160. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed August 28, 1913. Serial No. 787,232.

To all whom it may concern:

Be it known that I, GEORGE E. NORRIS, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Mortising-Machines, of which the following is a specification.

My invention relates to mortising machines of the rotary cutter type and particularly the rotary and oscillating cutter type. There are in existence a number of mortising machines of this type, but these machines all require the same length of time for completing a mortise one inch long as a mortise six inches long.

One of the objects of my invention is to decrease the time required in completing a mortise in approximately the same ratio as the size of the mortise. One way of accomplishing this is by maintaining the same rate of travel of the bit in its oscillating movement for a small mortise as a large mortise, the cutting down of the time resulting in changing the time of reversal of the bit in its oscillating movement.

Another object of my invention resides in the provision of a structure for automatically feeding the bit downward by the continuous manipulation of the machine, this downward feed being continuous and uniform during the entire time the machine is being operated. In other words, the down feed of the bit is not accomplished intermittently by a series of stops, but is a continuous and very slow feed.

Another object of my invention resides in providing a structure in which the bit is made to move at a uniform rate of travel while oscillating. This uniform rate of travel applies to both the forward and backward stroke of each oscillation. By having the bit move in a uniform lineal speed, the strain placed upon the operating mechanism will be constant throughout the operation of the machine and in this manner jerks and sharp cuts must necessarily be avoided.

Still a further object of my invention is the specific structure used in imparting a uniform rate of travel linearly to the bit, and also in the specific structure used for reversing the direction of rotation of the cross feed screw, as will be hereinafter described.

Other objects of my invention will become more apparent after a detailed description of the accompanying drawings, in which similar characters of reference designate corresponding parts, and in which:

Figure 1 is a side elevation of my assembled machine, Fig. 2 is a side elevation of my machine taken from the side opposite to that shown in Fig. 1, Fig. 3 is an end elevation looking toward the right of Fig. 2, Fig. 4 is an enlarged detail view of the clamp arrangement for controlling the retractile movement of the carriage, Fig. 5 is an enlarged detail section taken on line 5—5 of Fig. 1, looking in the direction of the arrows, Fig. 6 is a section taken on line 6—6 of Fig. 5 and looking in the direction of the arrows, Fig. 7 is a section taken on line 7—7 of Fig. 5 and looking in the direction of the arrows, Fig. 8 is a view in perspective of the clutch shifting mechanism used by me, Fig. 9 is a fragmentary section showing the means for holding the clutch shifting mechanism in its adjusted position, Fig. 10 is a section taken on line 10—10 of Fig. 2, Fig. 11 is an enlarged section taken on line 11—11 of Fig. 10, Fig. 12 is a top plan view of one of the ratchet controls for the inward feed mechanism, Fig. 13 is a side view of the structure shown in Fig. 12 and looking toward the left, Fig. 14 is a view in perspective of the rocker arm used by me, Fig. 15 is a fragmentary perspective of the upper extremity of the pivoting portion of the bit structure, Fig. 16 is a section on line 16—16 of Fig. 15 and Fig. 17 is a longitudinal vertical section of the structure shown in Fig. 15.

In the drawings, there is provided a main framework 1 equipped with removable trackways 2 and 3, both being held in position by screws 4. The trackway 3 is preferably adjustable within small limits by the provision of slots 5 coöperating with the removable screws 4. The lower portion of the main framework is integrally provided with a bed plate 6, the latter carrying downwardly depending ears 7 into which are

threaded adjusting and attaching bolts 8 of a well known form. Certain of the ears 7 are also provided with set screws 9 to form means for holding their respective screws 8 in certain adjusted positions, if this is desired.

Slidably mounted upon the trackways 2 and 3 is the carriage 10 upon which practically all of the operating mechanism is mounted. This carriage 10 is held on the trackways 3 and 4 by integrally formed projecting shoulders 11 suitably mounted and carrying removable plates 12 upon their opposite sides and upon the opposite sides of the trackways.

Journaled at about the central point of the carriage 10 is a stub shaft 13, the latter carrying a main drive wheel 14 provided with teeth 15 to form a bevel gear in the manner to be hereinafter referred to and also carrying an operating handle 16. Reference to Fig 10 will show the shaft 13 as also rigidly carrying an operating handle 17 disposed in diametrically opposite relation to the handle 16, this shaft being also supported by a bracket arm 18 attached to the main portion of the carriage 10. About the shaft 13 is designed to be pivotally mounted the entire bit supporting structure. This bit supporting structure is in the nature of a depending arm 19 directly mounted upon the shaft 13 and carrying an outwardly projecting right angular extension 20 at its pivoted end, this extension being slotted as at 21 and provided with an adjusting screw 22 carrying a sliding block 23. These latter details are shown more clearly in Figs. 15, 16 and 17, from which it will be seen that the sliding block 23 carries upon its rear surface a projecting lug 24, the purpose of which will be hereinafter stated. The adjusting screw 22 is also provided with a knurled operating nut 25 held in position on the screw 22 by the removable end cap plate 26. Referring particularly to Figs. 2 and 10, it will be noted that the lower end of the arm 19 is provided with webs 27 and 28 adapted to form a housing for the small bevel pinion 29 adapted to mesh with the teeth upon the driving wheel 14. This bevel pinion is keyed to the body of the bit 30 passing upwardly through apertures suitably formed in the webs 27 and 28 and being rotatably journaled in the bit carrying member 31. It will be noted that the front of the depending arm 19 is provided with a cut-out portion 32 having outwardly projecting trackways 33 formed therein, these trackways being completed by the provision of the removable plates 34. These trackways and the cut-out portion 32 are provided to permit a slight relative longitudinal movement of the arm 19 and the bit carrying member 31, as will be more clearly pointed out. It will be noted that the bit carrying member is provided with two bearings 35 and 36, the latter being in the nature of a socket within which is placed a steel ball 37 to form a thrust bearing for the end of the bit. The upper end of the bit itself is provided with a circular groove 38, which groove is adapted to be in a position to accommodate the cotter 39 whereby the bit itself is securely held in position. By referring to Fig. 10, it will be seen that the pinion 29 carries at its lower end an enlargement 40 adapted to operate on a smooth finished surface of the driving wheel 14 to prevent too close meshing of the teeth and that the lower flange 28 is somewhat extended to permit of the rotatable mounting of a complemental roller 41 to prevent separation of the drive wheel 14 from its intermeshing pinion 29.

From the description thus far given, it will be apparent that rotary movement is given the bit by means of the drive wheel 14 and pinion 29. Transverse or oscillatory movement is given by the provision of a cross feed screw 42 journaled upon opposite sides in the lower portion of the carriage 10. Referring again to Fig. 10, it will be noted that the feed screw controls this transverse movement of the bit by the pivotal mounting of the collar 43 complementally threaded to the feed screw 42, upon the bit carrying member. This pivotal mounting is effected through the diametrically opposed lugs 44 and 45 being journaled in the bearing portion 35 of the bit carrying member 31 and the bearing plate 46 respectively, the bearing plate 46 being suitably held in position upon the bit carrying member, as shown. Therefore, it will be apparent that as the bit is caused to move from one end of the cross feed screw to the other, it will be necessary that there be a relative separation between the depending arm 19, about which the bit pivots, and the bit carrying member 31. This is accomplished by the provision of the trackways 33 and the cut-out portion 32 formed upon the depending arm 19. It will, therefore, be apparent that an extensible and retractile movement of the bit itself is permitted.

By referring to Fig. 1, it will be seen that the upper left hand corner of the carriage 10 is provided with an overhanging bearing 47, within which is journaled a shaft 48. This shaft 48 carries a bevel pinion 49 upon one end and a bevel gear 50 upon its opposite end. The bevel gear 49 is adapted to cooperate with the teeth upon the main drive wheel 14, whereby rotary motion is given the bevel gear 50. The carriage 10 is also provided, as shown toward the left of Fig. 1, with bearings 51, 52 and 53, the latter being shown at the bottom of the right hand side of Fig. 2. Rotatably mounted within these bearings is a shaft 54 carrying oppos-

ing bevel pinions 55 and 56 adjacent its upper end. Both the pinions 55 and 56 are adapted to at all times be in mesh with the bevel gear 50 and both pinions are provided upon their opposing faces with clutch teeth 57 adapted for coöperation with a clutch member 58. Both the bevel pinions 55 and 56 are loosely mounted upon the shaft 54, while the clutch member 58 is keyed thereto, the key being such that movement of the clutch member itself between the opposing pinions is permitted. It will, therefore, be apparent that engagement of the clutch 58 with the pinion 55 will cause rotation of the shaft 54 in one direction, while its engagement with the pinion 56 will cause rotation of this shaft in the opposite direction, whereby rotary motion of the desired type is imparted to the cross feed screw 42 through the medium of the worm 59 carried upon the lower end of the shaft 54 and the intermeshing worm wheel 60 rigidly carried by one end of the cross feed screw 42 itself.

The position of the clutch member 58 is controlled by the following structure. A rocking arm 61, shown in detail in Fig. 14, is pivotally mounted upon the carriage 10 at a point in substantially horizontal alinement with the shaft 13 by means of the integral rearwardly extending projection 62. It will be noted that this projection 62 provides a pivotal mounting for the rocker arm at a point intermediate its ends. This rocker arm is also provided with a right-angular extension 63 having a slot 64 therein, designed for coöperation with the projecting pin 24 carried by the sliding block 23. It will, therefore, be apparent that whatever position the sliding block 23 may be in, the rearwardly extending pin 24 will always form a means of connection between the angular arm 20 upon the upper portion of the depending arm 19 and the angular extension 63 of the rocker arm 61. Therefore, the oscillating movement of the bit supporting structure about its pivot 13 will cause an oscillation of the rocker arm 61 by means of this connection and by virtue of the pivotal mounting of the rocker arm itself. The rocker arm 61 is further provided with a vertically offset portion 65 which offset portion carries horizontally projecting pins 66 and 67. Further, the projection 62 is drilled and tapped for the cap screw 68 shown in Fig. 2. This cap screw is designed to hold in position a bell crank 69 loosely mounted upon the projection 62, this loose mounting being provided so that the oscillation of the rocker arm itself will not affect the position of the bell crank. Referring to Fig. 2, the upper portion of the carriage 10 is shown as carrying an arm 69ª pivoted about an attaching screw 70 and carrying a downwardly extending double inclined track cam 71. This track cam 71 is designed to coöperate with a double inclined structure 72 of a similar nature carried upon the upper end of the short arm of the bell crank 69, while the long arm of this same bell crank is designed to play between stops 73 and 74 carried upon the clutch shifting member 75, shown in detail in Fig. 8. This clutch shifting member 75 carries an embracing yoke 76 at its rear side, which embracing yoke is adapted to engage the clutch 58 carried by the shaft 54 and operating between the pinions 55 and 56. This clutch shifting member is also carried by the carriage 10 by means of the slots 77 cooperating with screws 78. Further, this clutch shifting member is resiliently held in either its extreme upper position or its extreme lower position by means of the ball 79 engaging either one of the sockets 80 formed in the lower portion of the clutch shifting member, this ball 79 being impelled outward by means of the confined spring 81.

The operation of this cross feed reversing mechanism is as follows: It being assumed that the entire structure is in the position shown in Fig. 2, clockwise movement of the drive wheel 14 will cause movement of the bit itself toward the right through the various gear connections. Movement toward the right of this bit supporting structure will cause the angular extension 20 carried at its upper end to swing upward about the pivot shaft 13. This extension 20, as heretofore related, carries the sliding block 23 and the pin extension 24, which latter slides in the slot 64 of the angular extension 63 carried by the rocker arm 61. Therefore, upward movement of the extension 20 will also cause upward movement of the angular extension 63 and cause the rocker arm to slightly oscillate about its pivot point 62. This would cause the upper portion of the rocker arm to move toward the right carrying the pins 66 and 67 with it. This movement toward the right of the pin 67 will cause an engagement thereof with the short arm of the bell crank 69 and gradually cause it to swing about its pivotal mounting and also cause one of the inclines of the cam trackway 72 of the pivoted member 69 to ride its complemental incline on the similar formation 71. This naturally causes an elevation of the arm 69ª against the tension of the spring 82 mounted at 83 upon one end of the arm 69ª and at 84 upon the carriage 10. As the bell crank 69 is caused to move in this manner, its long arm passes out of engagement with the projection 73 on the clutch shifting member 75 and moves toward the opposite projection 74, the clutch shifting member being in the meantime held in position by the ball 79 engaging the lower socket 80. When the bit supporting structure has moved a distance to cause the rocker arm to have moved the bell crank 69

far enough that the two inclined surfaces previously in engagement are disengaged, the opposite two surfaces of the cam trackways will engage each other and the spring 82 will exert a pressure to instantly throw the arm 69ª downward to its limit of movement, which is governed by the stop 85 also upon the carriage. Forcing of the arm 69ª down, will, of course, throw the bell crank to a position where its long arm will have engaged the projection 74 on the clutch shifting member and move the entire clutch shifting member to its lowermost position, whereby the clutch 58 is caused to disengage itself from the bevel pinion 55 and engage itself with the bevel pinion 56 through the medium of the embracing yoke 76. Therefore, the direction of rotation of the shaft 54 will be immediately reversed and the drill carrying structure caused to move in the opposite direction. It is, of course, understood that the time of reversing the rotation of the cross feed 42 governs the size of the mortise and the angular projection 20 of the bit supporting structure may, therefore, be graduated to indicate the various sizes of mortises, thereby simplifying very greatly the positioning of the sliding block 23 to obtain the desired size of mortise.

In order to govern the position of the carriage and consequently the bit supporting structure upon the main framework, I have provided a down feed screw 86 journaled at its upper and lower ends in outwardly projecting bearings 87 formed upon the carriage 10. Coöperating with the threads 88 of this down feed screw, are two follower fingers 89 and 90 pivotally mounted intermediate their ends at 91 upon ears 92 projecting laterally from the main frame structure 1. These fingers are provided with inwardly projecting lugs 93 as clearly shown in Fig. 4, these lugs being forced and held into the threads 88 by a coiled spring 94 carried at the bottoms of these fingers. Whenever it is desired to manually change the position of the carriage upon the main frame, the followers 89 and 90 are grasped in a manner to withdraw the lugs 93 from the down feed screw, in which case the carriage may be slid up or down as desired upon the trackways 2 and 3 of the main frame. However, it is essential that a structure be provided for automatically feeding the carriage and bit supporting structure inwardly automatically with the operation of the main drive wheel 14. This is accomplished by providing the down feed screw 86 with a ratchet and pawl arrangement. I preferably provide both ends of this in feed screw with such ratchet and pawl structure, a detail of one being shown in Figs. 12 and 13, in which the feed shaft 86 is shown as being provided at its upper end with a ratchet wheel 95. Between the ratchet wheels 95 and the bearings 87, I have interposed arms 96 loosely mounted upon the shaft 86 and carrying pawls 97 pivoted at their forward ends as at 98. These pawls are further pressed against the ratchet wheels 95 by the springs 99 mounted at their rear upon upwardly projecting arms 100 formed upon the elements 96 and being attached in any desired manner at 101 to the front portion of each of the pawls. These ratchet and pawl structures are operated automatically by the action of the rocker arm 61 previously described. The two ends of this rocker arm are connected by means of links 102 to the pivoted arms 96. It will be noted that this rocker arm is pivoted approximately midway between its ends and as the upper arm is moved in a direction toward the right, the lower arm is moved in a direction toward the left, whereby the lower ratchet and pawl structure is given a partial turn, while the upper structure is moved backward to a position to also move the shaft 86 on its return stroke. It will be remembered that the rocker arm 61 is given its motion by means of the pin connection 24 upon the rear of the sliding block 23. When the two angular extensions 20 and 63 upon the drill structure and rocker arm respectively, are connected in this manner, the down feed screw is necessarily operated. It will, therefore, be apparent that during the entire time the bit supporting structure is in lineal motion, its angular extension 20 will cause a movement of the rocker arm 61, which will in turn render either the upper or lower ratchet and pawl structure effective to turn the in feed screw. In this manner, the drill structure itself is given a continuous and uniform inward feed. It will, therefore, be apparent that not only is the in feed screw in operation during the entire time of lineal movement of the bit supporting structure, but also this inward feed is the same for all sizes of cuts, that is, the in feed for a six inch mortise would be the same as the in feed for a one inch mortise. It will also be apparent that by the apparatus described, the cross feed or lineal movement of the bit supporting structure must be uniform throughout and is further automatically reversed by a peculiarly novel structure.

What I claim, is:

1. A mortising machine comprising a framework, a bit, means for rotating said bit, means for oscillating said bit during the rotation, and means for varying the length of such oscillation, said last means being such that the number of oscillations is increased correspondingly with each reduction in length of oscillation and vice-versa.

2. A mortising machine comprising a framework, a bit, means for rotating said bit, means for oscillating said bit during its

rotation, means for varying the length of the oscillations, and means for maintaining a uniform rate of oscillatory movement of said bit for all lengths of oscillatory movement.

3. A mortising machine comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure pivotally mounted on said carriage, a rotatable cross feed screw for said bit supporting structure, means for imparting rotation to said bit, said bit supporting structure having a part slidable toward and from the pivot thereof and having threaded connection with said cross feed screw.

4. A mortising machine comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure, means for moving said structure back and forth, in-feed mechanism for the bit, and connecting means between said structure and said mechanism adapted to actuate said mechanism to give a continuous in-feed as long as said structure moves in its backward and forward path.

5. A mortising machine comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure, means for moving said structure back and forth, a pivotally mounted rocker arm, in-feed mechanism, connecting means between said arm and said mechanism, and connecting means between said arm and said structure, said two named connecting means being arranged to operate said mechanism continuously inward by the movement of said structure.

6. A mortising machine comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure, means for oscillating said structure, a rocker arm pivoted to said carriage, connecting means between said rocker arm and said structure, an in-feed screw, a ratchet and pawl structure controlling the movement of said in-feed screw, and a connection between said ratchet and pawl structure and said rocker arm, said connection operating said mechanism continuously inward by the movement of said structure.

7. A mortising machine comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure, means for oscillating said structure, a rocker arm pivoted intermediate its ends to said carriage, a connection between said arm and said structure, an in-feed screw, a ratchet and pawl structure on opposite ends of said screw, and a connecting link attached to each end of said arm, said links connecting said arm with said ratchet and pawl structures whereby said bit is given a continuous in-feed as long as said bit is being oscillated.

8. A mortising machine, comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure pivoted to said carriage, means for oscillating said bit supporting structure, an extension forming a portion of said bit supporting structure, a rocker arm pivoted to said carriage, an extension on said rocker arm, a connection between said two extensions, an in feed screw, a ratchet and pawl structure controlling the movement of said in feed screw, and a connection between said rachet and pawl structure and the end of said rocker arm.

9. A mortising machine comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure pivoted to said carriage, means for oscillating said bit supporting structure, an extension forming a portion of said bit supporting structure at its pivoted end, a rocker arm pivoted intermediate its ends to said carriage, an extension on said rocker arm projecting outward from its pivotal connection, an adjustable connection between said two extensions, an in feed screw, ratchet and pawl structures controlling the movement of said in feed screw, and connections between said ratchet and pawl structures and the ends of said rocker arm.

10. A mortising machine comprising a framework, a carriage slidable on said framework, a bit, a bit supporting structure pivotally mounted on said carriage, a cross-feed screw journaled in said carriage, means for rotating said cross feed screw, an extensible connection between said cross feed screw and said bit supporting structure, means for changing the direction of rotation of said cross feed screw, an extension forming a portion of said bit supporting structure at its pivoted end, a rocker arm pivoted intermediate its ends to said carriage, an extension on said rocker arm projecting outward from its pivotal connection, an adjustable connection between said two extensions, an in feed screw, ratchet and pawl structures controlling the movement of said in feed screw, and connections between said ratchet and pawl structures and the ends of said rocker arm.

11. A mortising machine comprising a framework, a carriage slidably mounted on said framework, a bit, a cross feed screw journaled in said carriage, a bit supporting structure adapted to move back and forth by rotation of said screw, a drive wheel, a drive shaft journaled in said carriage and geared to said drive wheel and said screw, a bevel gear forming a portion of the gear connection between said drive wheel and said drive shaft, two bevel pinions mounted on said drive shaft and meshing with said bevel gear, a clutch element on said drive shaft normally in engagement with one of said

pinions, but movable to a position of engagement with the other, and means for instantaneously shifting said clutch from engagement with one of said pinions to engagement with the other by the continuous rotation of said drive wheel.

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

GEORGE E. NORRIS.

Witnesses:
C. C. SHEPHERD,
L. W. FROST.