July 19, 1960 K. W. GRUBB 2,945,520

DOOR AND JAMB MORTISING MACHINE

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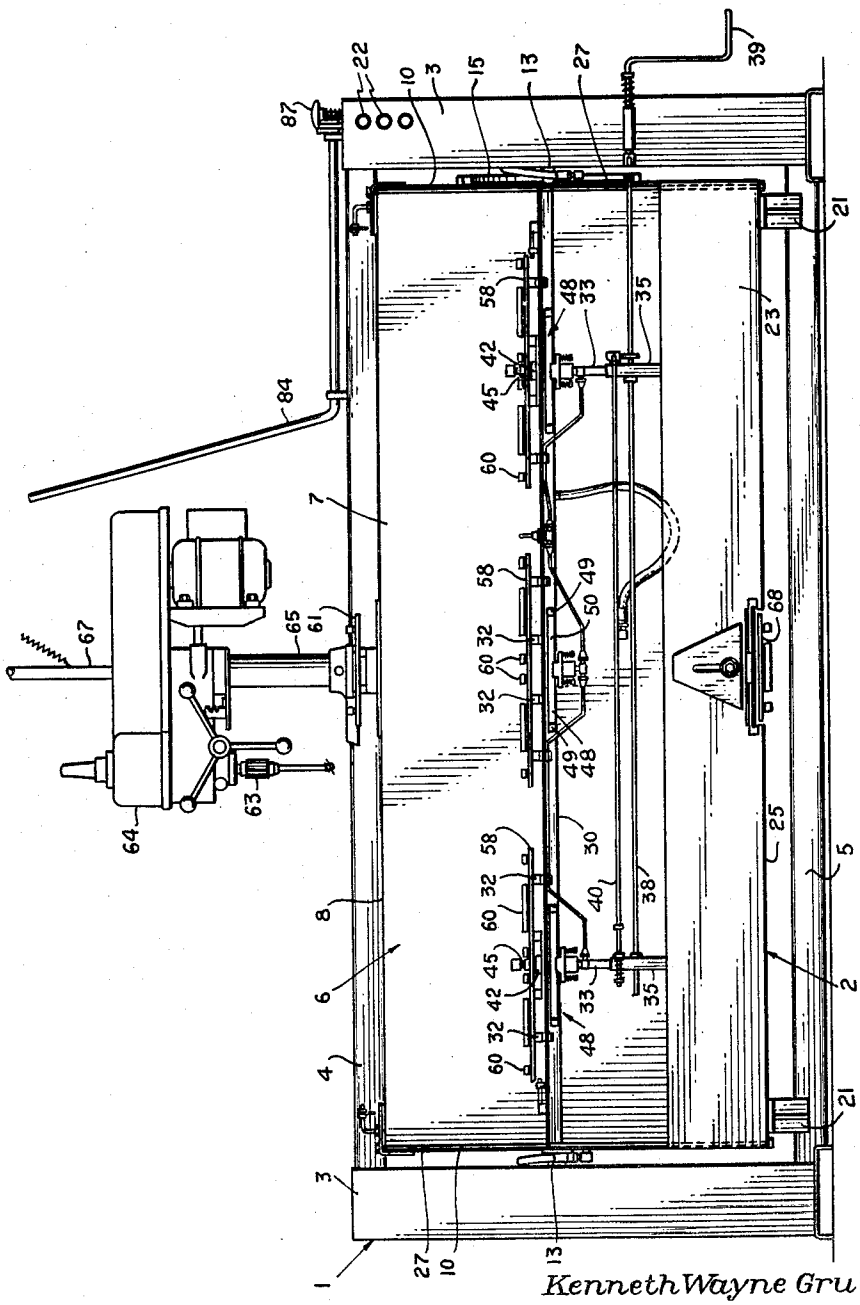


Fig. 1.

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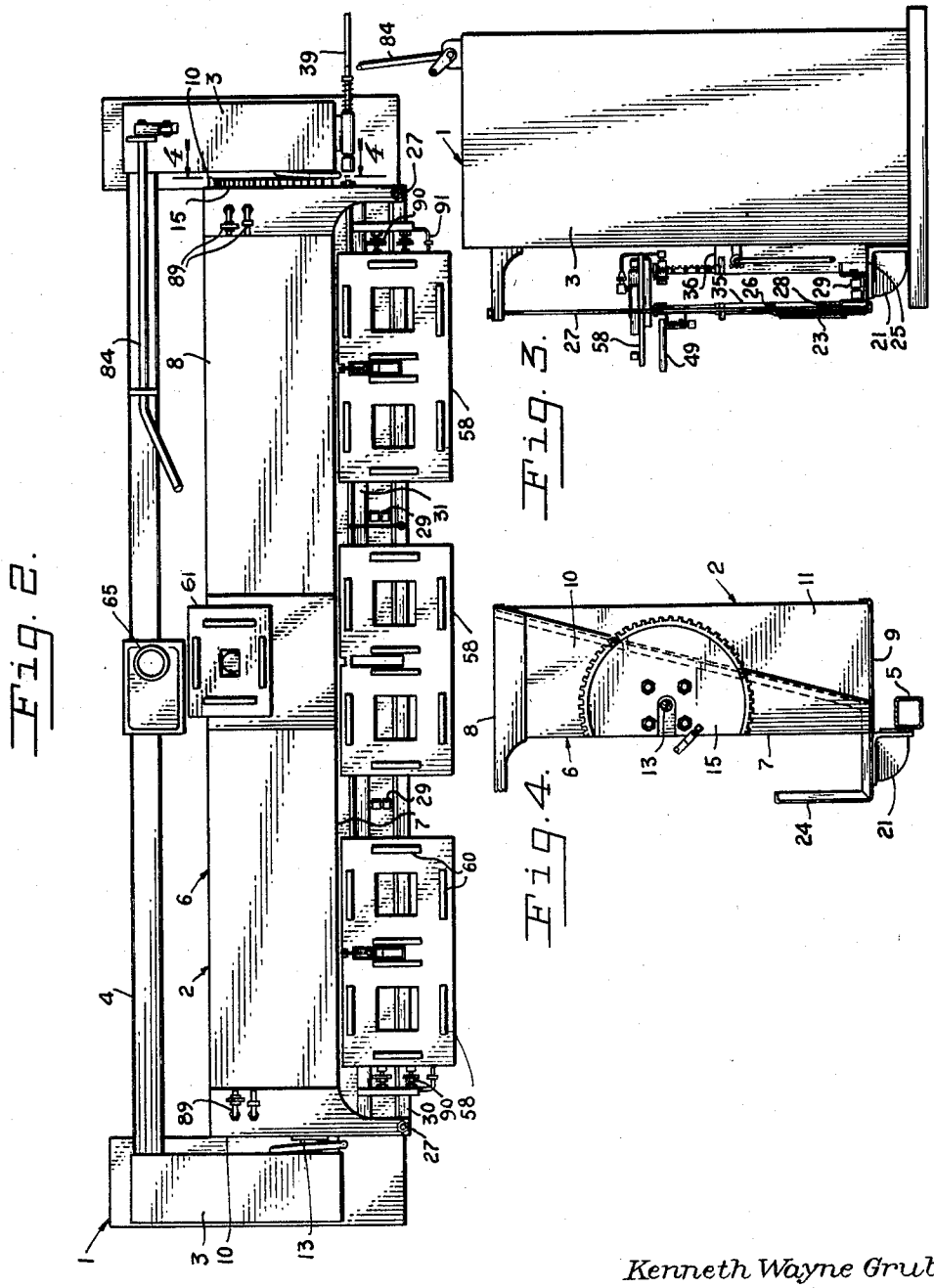


Fig. 2.

Fig. 3.

Fig. 4.

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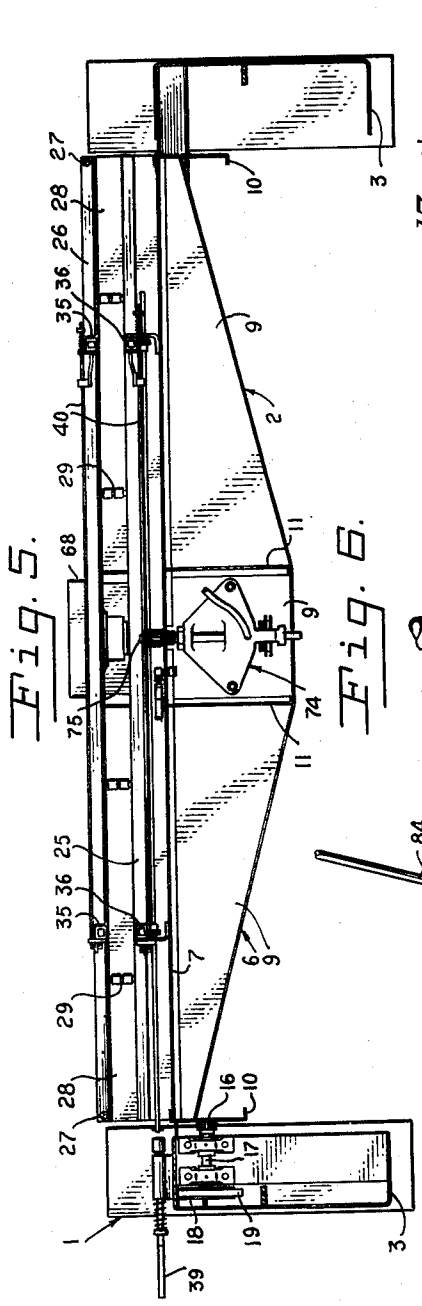


Fig. 5.

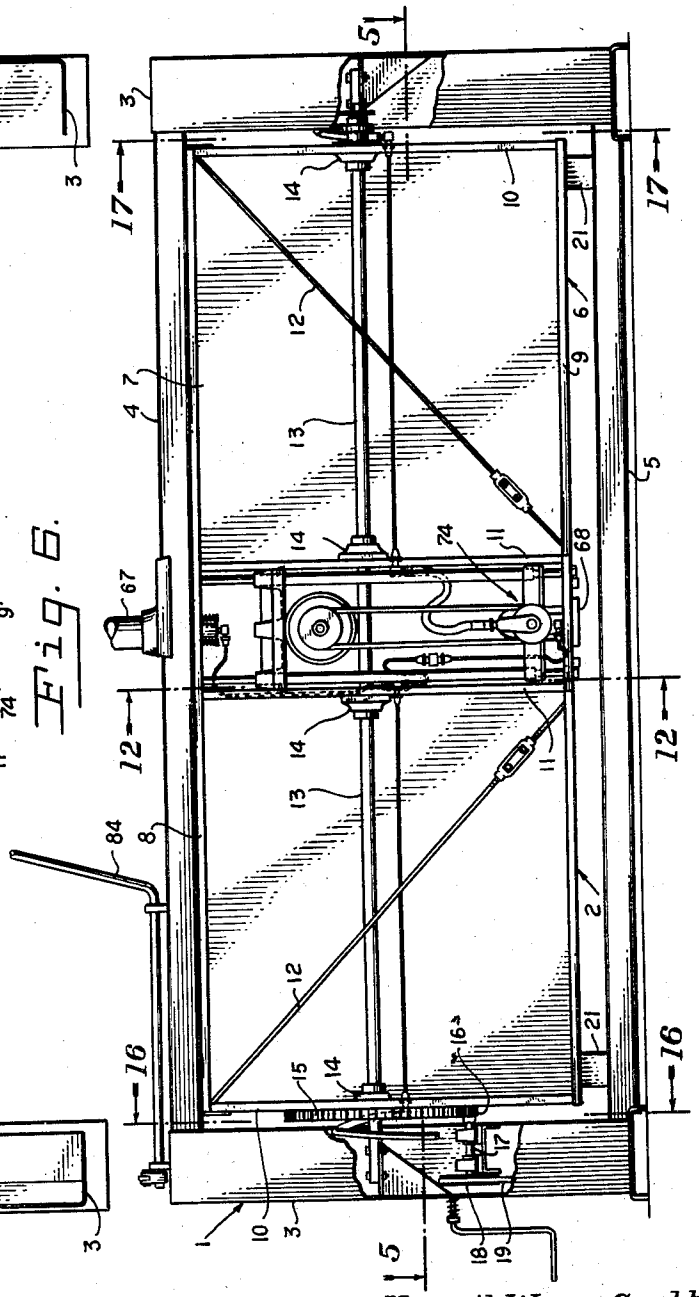


Fig. 6.

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DOOR AND JAMB MORTISING MACHINE

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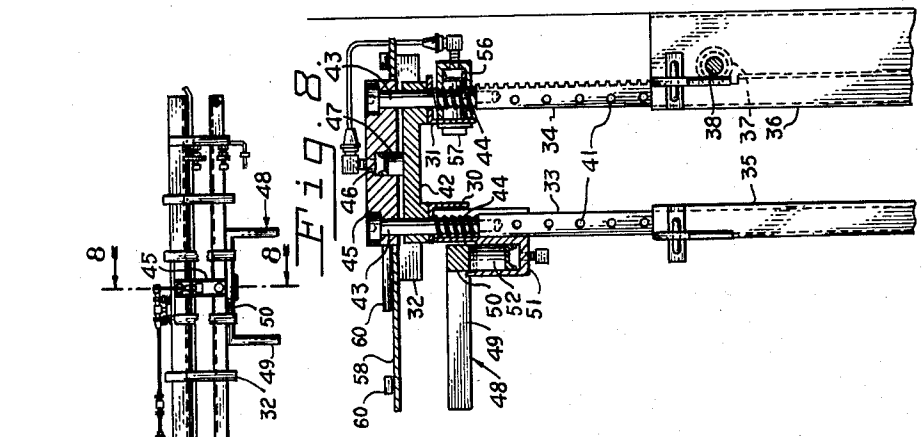


Fig. 8.

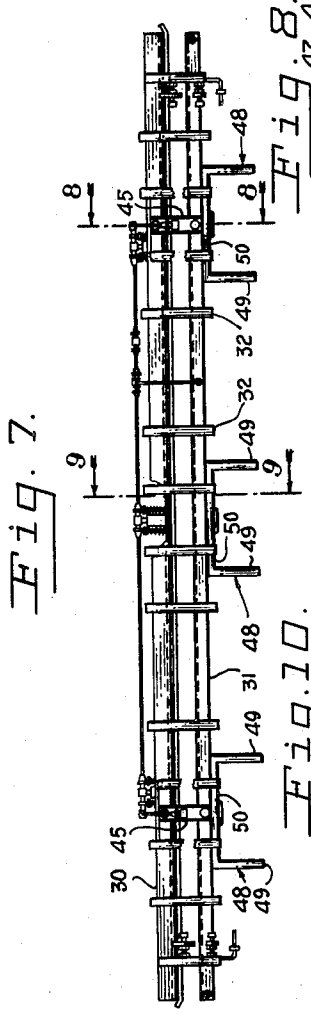


Fig. 7.

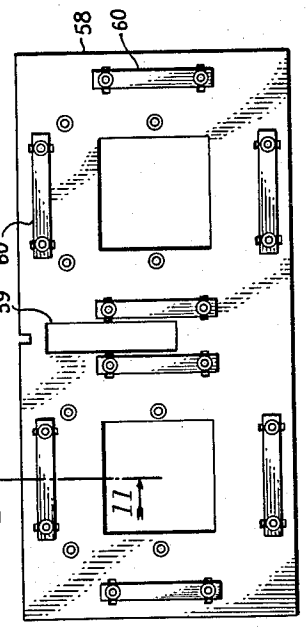


Fig. 10.

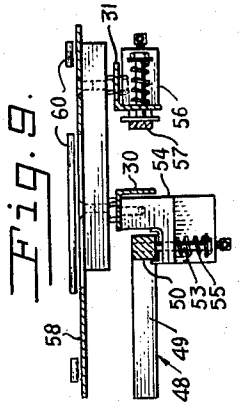


Fig. 9.

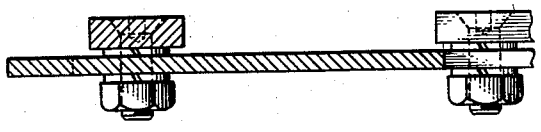


Fig. 11.

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Fig. 12.

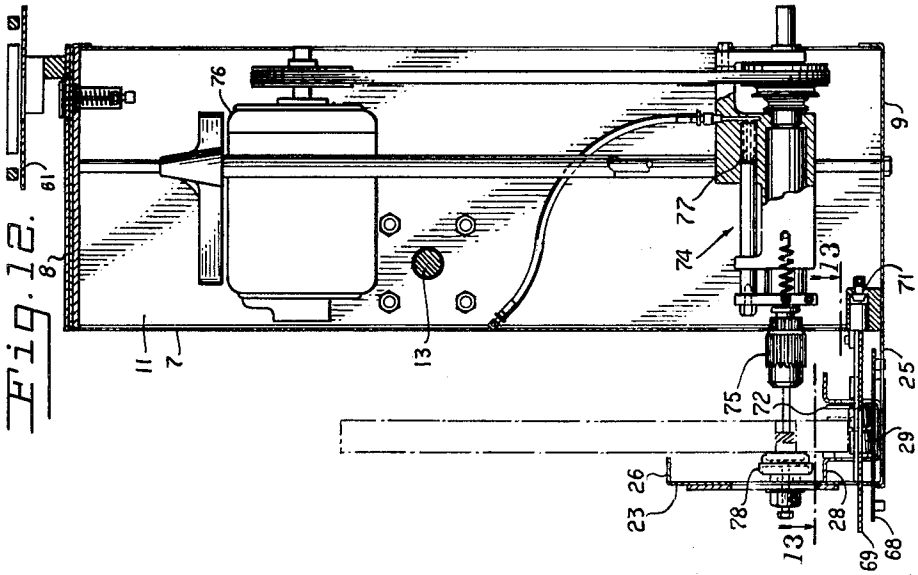


Fig. 14.

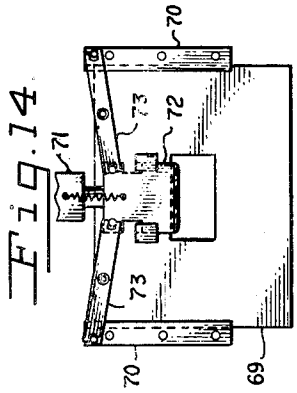


Fig. 15.

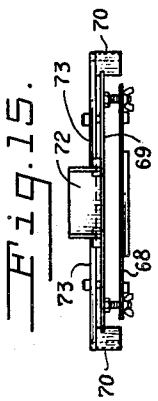
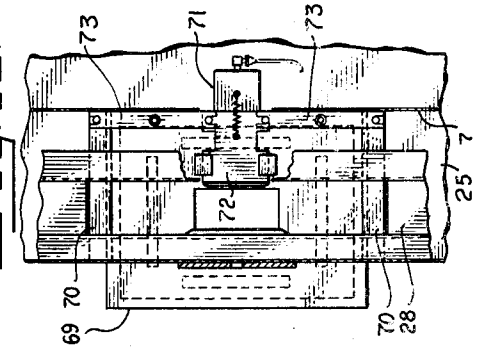


Fig. 13.



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Fig. 16.

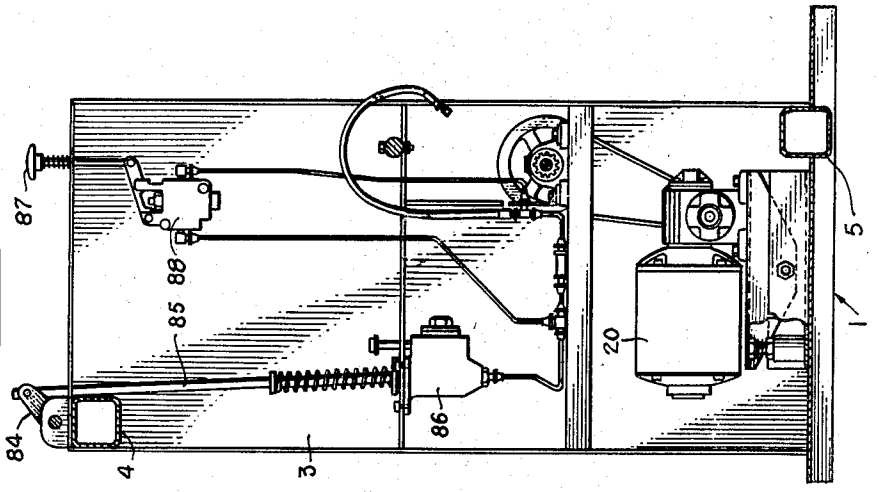


Fig. 17.

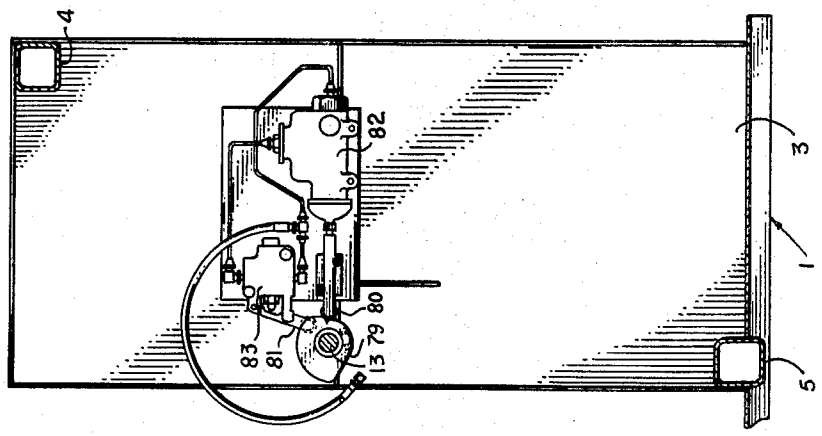
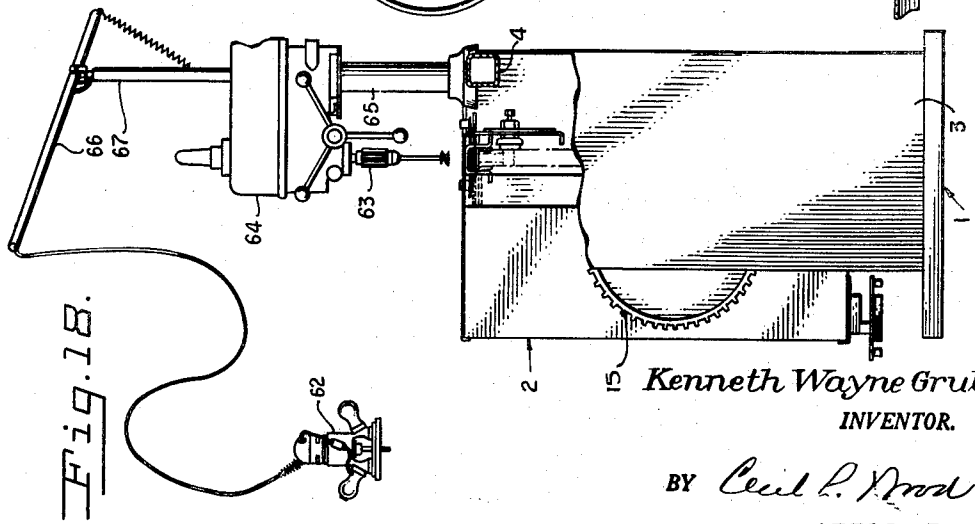


Fig. 18.



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United States Patent Office 2,945,520 Patented July 19, 1960

2,945,520

DOOR AND JAMB MORTISING MACHINE

Kenneth Wayne Grubb, Fort Worth, Tex., assignor to Turn-A-Bore Equipment Company, a corporation of Texas

Filed June 30, 1958, Ser. No. 745,707

6 Claims. (Cl. 144—27)

This invention relates to automatic apparatus for mortising and preparing swinging doors, and the framing therefor, for installation, by which both doors and frames can be machined for the purpose of securing the hinges, locks and lock keeper members, and it has particular reference to a mechanism by which both door and jambs can be properly and accurately machined in a single operation by which the frame assembly and mounting of the door can be expedited, and the door may be more accurately installed than is possible by conventional processes.

The principal object of the invention resides in the provision of an integrated mechanism, capable of automatic operation by electrical and hydraulic power, actuated by simple control mediums and operable by persons of ordinary skill, by which hinge and lock fittings can be applied to conventional doors and their frames with a minimum of effort and expense, and more rapidly than with the generally accepted manual operations, which are slow, tedious and expensive.

The invention has for a prime object the provision of a unit which embodies a mechanism by which a door of conventional design, accompanied by its paired jambs, can be mortised and prepared for mounting in a matter of seconds, eliminating much effort and unnecessary labor in spacing the mortising operations, allowing for clearances, and other factors which affect the free swinging and proper locking of doors in both residential and commercial structures, avoiding the uncertainty usually attendant upon human agency, regardless of skill, and affording a degree of mechanized accuracy which permits uniformity when a plurality of such units are required.

It is an object of the invention to provide a mechanism by which the operations involving the properly spaced mortising of the hinges and locks may be performed in such manner as to insure absolute accuracy and uniformity in location and securement, on each side of the door and frame, where the coacting members properly coincide in operation, and fully cooperate, with a minimum of skilled labor required for installation, thus providing an economical arrangement by which both residential and commercial structures can be equipped with precision actuated doors with as little expense and time as possible.

An object of the invention is that of providing a mechanism which is capable of receiving a door and aligning the same to be mortised, in one position, for a plurality of hinge butts, properly spaced, while also mortising the opposing jamb member of the frame, and affording automatic means for reversing the door while simultaneously drilling a hole therein for the lock spindle, and providing also the necessary drilling of the door and the opposing jam for the lock bolt, the mortising of the door for the front plate of the lock, and the mortising of the opposing jamb for the lock catch or detent. It is contemplated that the mechanism be caple of registering the door with its respective parts, i.e., the hinge jamb and the front

plate jamb, regardless of the type of hinge or lock employed.

Another important object of the invention is to provide, among other features of the device, guide means for the routing or mortising tools which may be adjusted in accordance with the type or size of operation required, and including templates which are capable of being changed or substituted as necessary.

It is a purpose of the invention to provide a door and jamb mortising machine by which both door and jamb can be accurately fitted to any particular requirement, regardless of whether the same is to be used for residential or commercial installation, and without regard to size or special installation, it being adapted to a swinging door of either right or left hand inclination. Such arrangement also refers to the frame members, which can be formed with the "hand" of swing desired, either left or right hand.

Another object of the invention resides in the provision of fully automatic means for reversing the position of the door.

Another object of the invention is to provide, in combination with a carriage which supports the door during rotation thereof, whereby the position of the door is reversed, automatic means carried by the carriage and operable while the carriage is in motion, during rotation thereof, to drill a hole in the door for the lock spindle.

Broadly, the invention contemplates the provision of a mechanism by which any type of swinging door can be prepared for installation while its frame members are being provided with the corresponding cut-outs and mortised recesses so that the door and frame are perfactly matched and completely operative when the necessary fittings are applied.

While the foregoing objects are paramount, other and lesser objects will become manifest as the description proceeds, taken in connection with the appended drawings wherein:

Fig. 1 is an overall front elevational view of the invention, showing the reversible carriage, the crank which controls the holding mechanisms, the width adjusting crank, the templates for mortising the door and the jamb for the hinges and for mortising the jamb for the lock catch or detent, and the drill press used to bore holes in the door and the jamb for the lock bolt;

Fig. 2 is a top plan view of the machine illustrating the above mentioned templates, the holding mechanism control crank, and the door width adjusting crank;

Fig. 3 is an end view of the invention as shown in Figs. 1 and 2;

Fig. 4 is a vertical sectional view on lines 4—4 of Fig. 2, illustrating the stop devices and the large driving gear;

Fig. 5 is a longitudinal sectional view on line 5—5 of Fig. 6, illustrating the lower assembly of the machine, showing the door channel and the quill and motor assembly used to bore a hole in the door for the lock spindle;

Fig. 6 is a rear view of the invention, in elevation, showing the quill and motor assembly, the rotative carriage, the width adjusting crank, and the lever controlling the holding mechanism;

Fig. 7 is a plan view showing the door channel, the jamb shelf, and the holding means whereby the door and the jamb are supported in spaced relation to each other while mortising them for the hinges;

Fig. 8 is a fragmentary vertical sectional view on lines 8—8 of Fig. 7, showing the door channel and jamb shelf and illustrating the vertical width adjustment assembly;

Fig. 9 is a fragmentary sectional view on lines 9—9 of Fig. 7, illustrating the hydraulically operable door and jamb holding devices;

Fig. 10 is a plan view of one of the router templates,

which have adjustable router stops for controlling the position and size of mortised recesses;

Fig. 11 is a sectional view on line 11—11 of Fig. 10, illustrating the adjustability of the router stops on the template;

Fig. 12 is a vertical sectional view on line 12—12 of Fig. 6, illustrating the quill and motor assembly used to bore a hole in the door for the lock spindle;

Fig. 13 is a fragmentary sectional plan view on lines 13—13 of Fig. 12, showing in inverted position the under side of the template, and supporting means therefor, for mortising the door for the front plate of the lock, and showing the hydraulic holding means for engagement with the adjacent surface of the door;

Fig. 14 is a fragmentary plan view of a portion of the apparatus shown in Fig. 13, showing the hydraulic holding means in another of its operating positions;

Fig. 15 is an edge elevational view of the apparatus shown in Fig. 14;

Fig. 16 is a vertical sectional view of the invention on line 16—16 of Fig. 6, showing the lever and push button controlled hydraulic means for operating the clamping mechanism for the door and jamb;

Fig. 17 is a vertical sectional view of the invention on line 17—17 of Fig. 6, showing the cam controlled hydraulic means for operating the quill and motor assembly used to bore a hole in the door for the lock spindle; and

Fig. 18 is an end view of the invention, showing a portion cut away to illustrate the door in position for mortising it for the front plate of the lock, and for drilling a hole in it for the lock bolt, and showing the router and the drill press used to perform these operations, respectively.

The invention is designed to provide facilities for volume production in equipping doors and frames for installation, and to avoid expensive delays and manual labor in preparing both doors and frames for proper operation of the hinged door.

Referring to the drawings, the door and jamb mortising machine of the invention includes a cradle-like structure having a supporting frame 1 and a carriage 2, each as hereinafter described. The carriage 2 is rotatably mounted on the frame 1 whereby it may be rotated in the vertical plane, and has automatic driving and control means, as hereinafter described, whereby it may be selectively rotated to and from either of two operating positions which are spaced circumferentially 180 degrees apart from each other.

The frame 1 has a pair of end members 3, each of which consists of a box-like structure which advantageously may be formed of steel plates. The end members 3 are connected at their upper ends by an elongated tubular member 4 and at their lower ends by an elongated tubular member 5.

The carriage 2 includes a box-like structure 6 having a front wall 7, a shelf-like top wall 8, a shelf-like bottom wall 9, and a pair of end walls 10. The positions of the top wall 8 and the bottom wall 9 are reversible upon rotation of the carriage 2, as hereinafter described. The box-like structure 6 is reenforced by a pair of transverse partitions 11, which are positioned intermediate the ends thereof, in spaced relation to each other, and are connected at their ends to the top wall 8 and the bottom wall 9, respectively. The box-like structure 6 is additionally reenforced by a pair of tie rods 12.

The box-like structure 6 is journaled on an elongated shaft 13, which extends longitudinally through the box-like structure 6 and is connected at its ends to the end members 3. The shaft 13 is positioned adjacent the front wall 7 of the box-like structure 6, in alignment with the center line thereof, and is passed through a plurality of bearings 14, which are attached to the end walls 10 and the transverse partitions 11, respectively, and surround openings formed therein for engagement by the shaft 13.

A gear 15, which is capable of rotating the carriage 2 180 degrees, is attached to one of the end walls 10 of the box-like structure 6. The gear fragment 15 meshes with and is acted upon by a gear 16. The gear 16 is connected to one end of a shaft 17, which has a pulley wheel 18 connected to its opposite end. The pulley wheel 18 is connected by a belt 19 to a corresponding pulley wheel driven by an electric motor 20, which is mounted in one of the end members 3.

A pair of stops 21 are connected to the carriage 2 and extend downwardly below the bottom wall 9 for engagement with the elongated tubular members to limit rotation of the carriage 2 in either rihection. Rotation of the carriage 2 is controlled by a pair of mercury switches (not shown) which are attached to one of the end walls 10 of the box-like structure 6, the arrangement being such that the supply of electricity to the motor 20 is interrupted, and the carriage 2 is stopped, before the heavy stops 21 actually engage the tubular member 4 or 5. The direction of rotation of the carriage 2, and the starting thereof, is controlled by a selector switch 22.

An elongated panel 23, the length of which corresponds to that of the front wall 7 and which is relatively narrow as compared to the front wall 7, is arranged parallel to the front wall 7 and spaced forwardly with respect thereto, the lower edge of the panel 23 being aligned with the lower edge of the front wall 7. The panel 23 is connected in spaced relation to the front wall 7 by a plurality of brackets 24, each of which consists of an elongated piece of angle iron having end portions which are positioned at right angles to each other, one of the end portions being connected to the box-like structure 6 and extending outwardly therefrom and the other end portion extending upwardly, parallel to the front wall 7, for engagement with one side of the panel 23. A panel 25, which comprises a forward extension of the bottom wall 9, and which advantageously may be a continuation of the panel 23, is supported upon the brackets 24 and connects the lower edges of the front wall 7 and the panel 23. The upper edge of the panel 23 is turned inwardly, as at 26, and the structure is reenforced by a pair of vertically disposed tie rods 27, each of which is passed through openings provided therefor in the panel 25, the upper edge 26 of the panel 23, and one of a pair of brackets which extend forwardly from the box-like structure 6 adjacent the top wall 8.

A channel member 28, which carries a plurality of longitudinally spaced rollers 29 for engagement by one of the longitudinal edges of a door, is arranged longitudinally with respect to the box-like structure 6 and supported upon the panel 25, to which it is connected.

When the machine is in the position shown in Fig. 1, a door to be operated on by the machine may be loaded on and off the machine by providing a pair of tracks (not shown), each corresponding to the track formed by the channel member 28 and the rollers 29 and aligned therewith, adjacent opposite ends of the machine, one of the tracks acting as a loading track and the other track serving as an unloading track.

A shelf-like structure comprising a pair of elongated members, numbered 30 and 31, which advantageously may be formed of angle iron, is arranged longitudinally with respect to the box-like structure 6. The elongated members 30 and 31 lie in the same horizontal plane, and are connected in spaced, parallel relation to each other by a plurality of longitudinally spaced, elongated transverse members 32.

The shelf-like structure comprising the elongated members 30 and 31 is positioned forwardly with respect to the front wall 7, at an elevation which is below that of the top wall 8 and above that of the upper edge 26 of the panel 23, and is connected as hereinafter described to the upper ends of two pairs of elongated, vertically disposed supporting members, numbered 33 and 34. The elongated, vertically disposed supporting members 33

and 34 are positioned below the elongated horizontal members 30 and 31, respectively, and are positioned on opposite sides of the channel member 28. The vertical members 33 are each received telescopically in one of two sleeve-like members 35, which are positioned adjacent the panel 23 and spaced longitudinally with respect thereto. The vertical members 34 are each received telescopically in one of two sleeve-like members 36, which are positioned adjacent the front wall 7 and spaced longitudinally with respect thereto.

The vertical members 34 each has gear teeth formed along one edge thereof whereby they are capable of functioning as racks, for engagement with gears 37, each of which is connected to a shaft 38 and is capable of being turned therewith. The shaft 38 is passed through openings provided therefor in the sleeve-like members 36 and is capable of being rotated, upon engagement thereof by a detachable crank 39, which is mounted on one of the end members 3, whereby the vertical members 33 and 34 may be raised and lowered with respect to the sleeve-like members 35 and 36.

The vertical members 33 and 34 are capable of being positively locked in any desired position with respect to the sleeve-like members 35 and 36, respectively, by selective engagement of locking members 40, carried by the sleeve-like members 35 and 36, with corresponding openings 41 provided therefor in the vertical members 33 and 34.

The elongated horizontal members 30 and 31 are additionally connected by a pair of transverse members 42, which are spaced longitudinally with respect to the elongated members 30 and 31. Aligned openings are formed in the elongated members 30 and 31, and in the transverse members 42, for engagement by two pairs of bolts 43, which are secured at one end to the upper ends of the vertical members 33 and 34, respectively, and extend upwardly therefrom. Two pairs of compression springs 44, which surround the respective bolts 43, are positioned between the elongated horizontal members 30 and 31 and the upper ends of the vertical members 33 and 34, respectively, whereby the elongated horizontal members 30 and 31 are yieldably supported upon the vertical members 33 and 34. A pair of transverse connecting members 45, which are engaged by the heads of the bolts 43, each have a hydraulic cylinder 46 formed therein for engagement by a piston 47 acting upon the upper surface of one of the transverse members 42 whereby the transverse members 42, and the elongated horizontal members 30 and 31, may be urged downwardly by hydraulic action against the resistance of the springs 44.

A pair of shelf-like members 48, for engagement with the under side of a door jamb, each have a pair of elongated side portions 49 which are connected at one end by an elongated rearward portion 50, the portion 50 being arranged parallel to the elongated horizontal member 30, in closely spaced relation thereto. A pair of hydraulic cylinders 51, each of which has a piston 52 connected to the under side of one of the elongated rearward portions 50, each have a rearward and upward extension which slidably engages one of the vertical members 33 and is connected to the elongated horizontal member 30 and depends therefrom, whereby the shelf-like members 48 may be urged upwardly to clamp the door jamb between them and the adjacent transverse members 32.

As shown in Fig. 9, a shelf-like member 48, which is spaced longitudinally between the shelf-like members 48 above referred to, has its elongated rearward portion 50 connected to one end of a bolt 53. The bolt 53 is passed downwardly through an opening provided therefor in a block 54. The block 54 is bolted to the under side of the elongated horizontal member 30 and depends therefrom. A compression spring 55, which surrounds the bolt 53, is positioned between the block 54 and the head of the bolt 53 whereby the shelf-like member 48 is capable of yieldably engaging the under side of the door jamb.

The under sides of the transverse members 42 are capable of engaging the uppermost longitudinal edge of a door. Three hydraulic cylinders 56, which are connected to the elongated horizontal member 31 opposite the shelf-like members 48, each have a piston 57 for engagement with the adjacent side of the door to clamp the door between it and the elongated horizontal member 30. Three templates 58, one of which is shown in Figs. 10 and 11, are supported upon the shelf-like structure above described with one of the transverse connecting members 45 received in an opening 59 provided therefor in each of the templates 58. The templates 58 overlie the corresponding surfaces of both the door and the jamb, and are intended for use, in conjunction with a routing tool, for preparing the door and the jamb to receive the hinges. The template shown is for two hinges. Adjustable stops 60 are provided in the templates 58 to limit the movement of the router. The templates 58 are attached by screws to the adjacent transverse members 32.

A template 61, which is similar to the templates 58, is mounted on the top wall 8 for use in operating on the opposite jamb, with both the routing tool 62 and the drill press 63, to mortise the jamb for the lock catch or detent and also to drill a hole in it to receive the lock bolt. As shown in Fig. 18, the drill press 63 is rotatably mounted on a swinging arm 64 carried by a standard 65 which extends upwardly from the center of the elongated tubular member 4. The routing tool 62 has its electric cord suspended from a swinging arm 66 which is connected to an upward extension 67 of the standard 65.

A template 68 is mounted on the bottom wall 9 of the box-like structure 6, as hereinafter described, for use in mortising the door for the front plate of the lock, and in drilling a hole in it for the lock bolt, as shown in Fig. 18. A template supporting plate 69 slidably engages slots formed in the adjacent edges of a pair of elongated members 70, which are each connected to the bottom wall 9. The template 68 is adjustably connected in spaced relation to the supporting plate 69, the distance between the template 68 and the supporting plate 69 determining the depth of cut. The supporting plate 69 is capable of being adjusted laterally as necessary to center it with respect to the door, regardless of the thickness of the door.

A hydraulic cylinder 71, which is mounted within the box-like structure 6 adjacent the bottom wall 9, has a piston capable of acting upon a flanged plate 72, which comprises an outward extension thereof, for clamping engagement with the adjacent surface of the door, to hold the door while it is being operated on as above described. The flanged plate 72 is aligned with the template supporting plate 69, and is connected by linkage 73 to the elongated members 70.

As shown in Figs. 6 and 12, a quill and motor assembly, as hereinafter described, which is designated generally by the numeral 74, and which is positioned within the box-like structure 6 between the transverse partitions 11, is capable of drilling a hole in the door for the lock spindle while the door is being rotated from the position shown in Fig. 1 to the position shown in Fig. 18. The quill and motor assembly 74 includes a rotary cutter 75, which is driven by an electric motor 76 and is provided with hydraulic means 77 whereby the cutter 75 may be advanced and retracted with respect to the door.

A roller 78, which is adjustably mounted on the panel 23 opposite the cutter 75 for engagement by the adjacent side of the door, is capable of opposing pressure applied to the opposite side of the door by the flanged plate 72 and the cutter 75.

As shown in Fig. 17, a cam 79, which is connected

to the shaft **13**, is capable of acting upon cam followers **80** and **81** whereby hydraulic fluid is forced from a master cylinder **82** to the hydraulic means **77** which, when actuated, advances the cutter **75** with respect to the door, and thereafter the applied pressure is released by the operation of a Schrader valve **83**.

As shown in Fig. 16, a crank **84**, which is pivotally connected to one of the end members **3**, is capable of acting upon a link **85** whereby hydraulic fluid is forced from a master cylinder **86** to each of the several hydraulic devices which, when actuated, clamp the door and the jamb in place as above described. The applied pressure may be released, upon depressing a button **87**, by the operation of a Schrader valve **88**.

Stops **89** are provided to limit the longitudinal movement of the door, and stops **90** and **91** are provided to limit the longitudinal and lateral movement, respectively, of the jamb.

The invention may be modified in various ways without departing from the spirit and scope thereof.

What is claimed is:

1. A door and jamb mortising machine comprising a cradle-like structure consisting of a supporting frame and a carriage rotatably mounted on the frame whereby it may be rotated in the vertical plane, drive means capable of acting upon the carriage whereby it may be selectively rotated to and from either of two operating positions which are spaced circumferentially 180 degrees apart from each other, and door and jamb supporting means carried by the carriage and capable of supporting a door and a jamb in fixed positions relative to each other, for mortising the corresponding edges thereof to receive the hinges, while the carriage is in one of its operating positions, and for mortising the opposite edge of the door and to receive the front plate of the lock, and for drilling a hole therein for the lock bolt, when the carriage is in the other of its operating positions.

2. The structure of claim 1, and hydraulically operable clamping means capable of clamping a door and a jamb to the carriage whereby the door and the jamb may be rotated with the carriage to and from each of its operating positions.

3. The structure of claim 2, and template supporting means carried by the carriage and capable of supporting a plurality of templates, for use in mortising a door and a jamb to receive the hinges, and for mortising the opposite edge of the door and to receive the front plate of the lock, and for drilling a hole therein for the lock bolt, in fixed positions relative to the door and the jamb.

4. The structure of claim 3, and means for supporting a jamb and a template in fixed positions relative to each other, for mortising the jamb to receive the lock keeper and for drilling a hole therein for the lock bolt, while the carriage is in one of its operating positions.

5. The structure of claim 4, and a drill press mounted on the frame and positioned for use in drilling a hole in a jamb for the lock bolt, while the jamb is supported upon the carriage in one of its operating positions, and for drilling a corresponding hole in a door while the door is supported upon the carriage in the other of its operating positions.

6. The structure of claim 5, and a quill motor assembly mounted on the carriage and operable to drill a hole in a door for the lock spindle while the carriage is being rotated from one of its operating positions to the other.

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