June 27, 1950 A. H. BOWLZER 2,512,787

SWING JIG

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Fig. 1

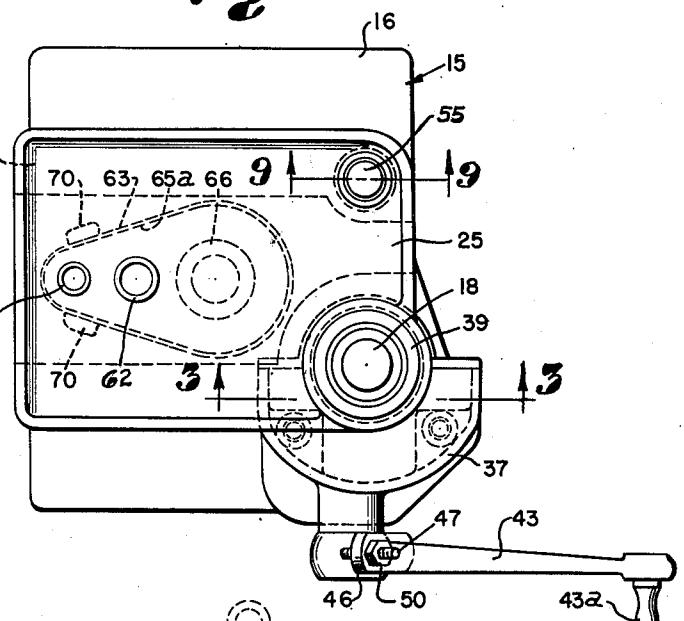


Fig. 3

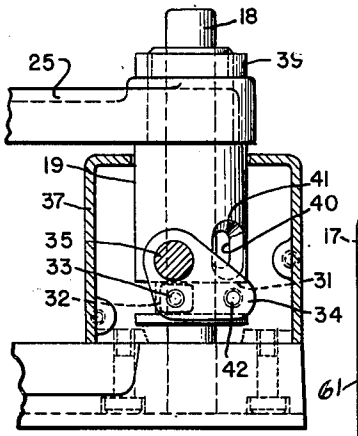


Fig. 2

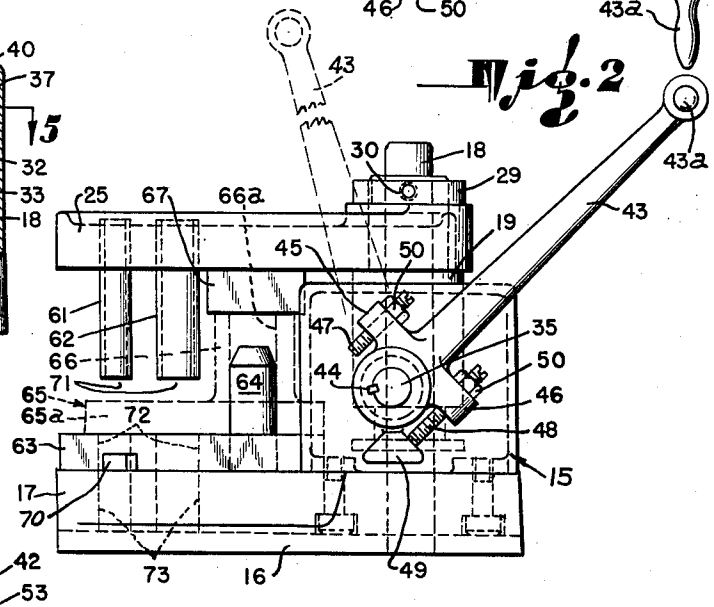


Fig. 4

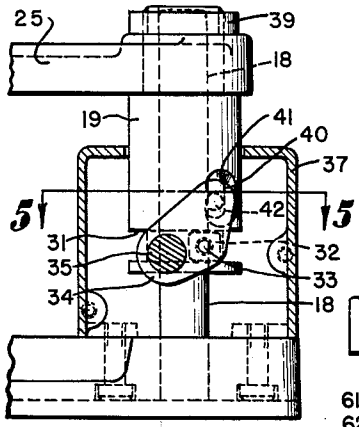
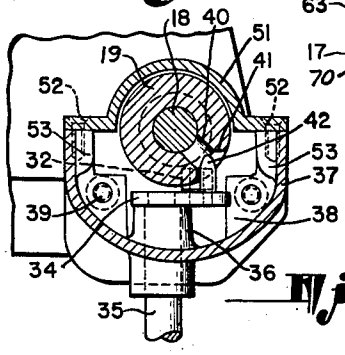


Fig. 5



INVENTOR.
ALFRED H. BOWLZER

BY

ATTORNEY

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Fig. 6

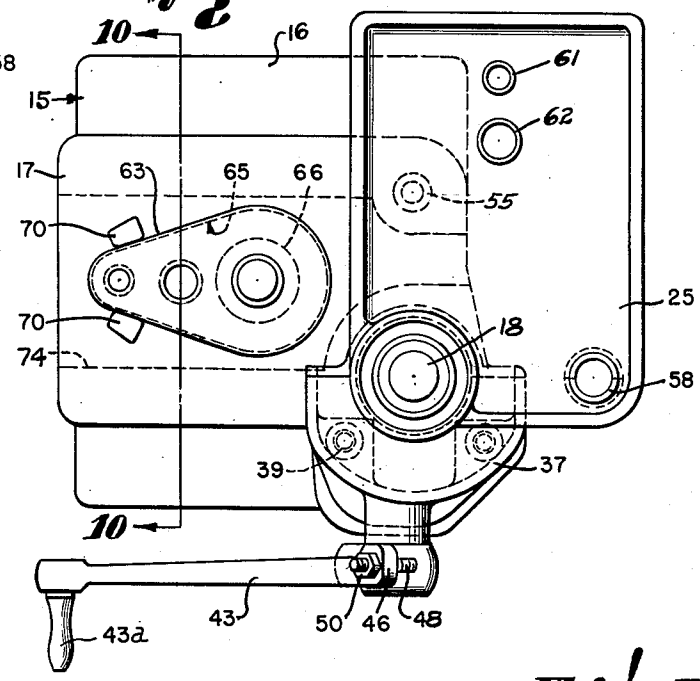


Fig. 9

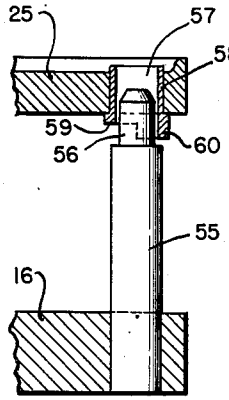


Fig. 7

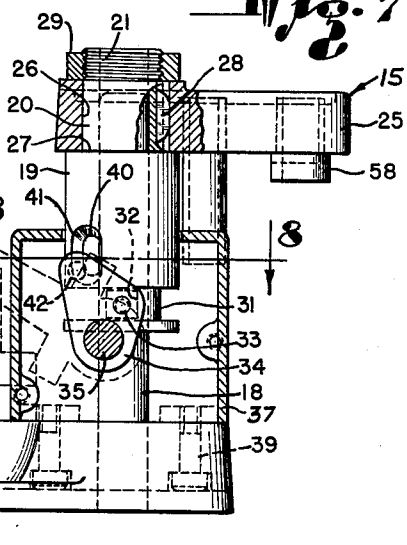


Fig. 8

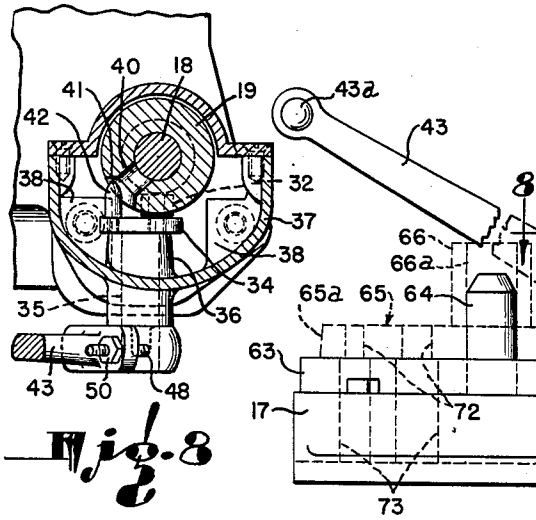
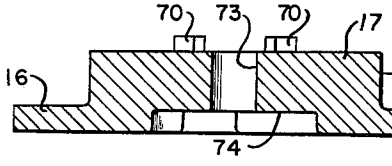


Fig. 10



INVENTOR.
ALFRED H. BOWLZER
BY
ATTORNEY

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Fig. 11

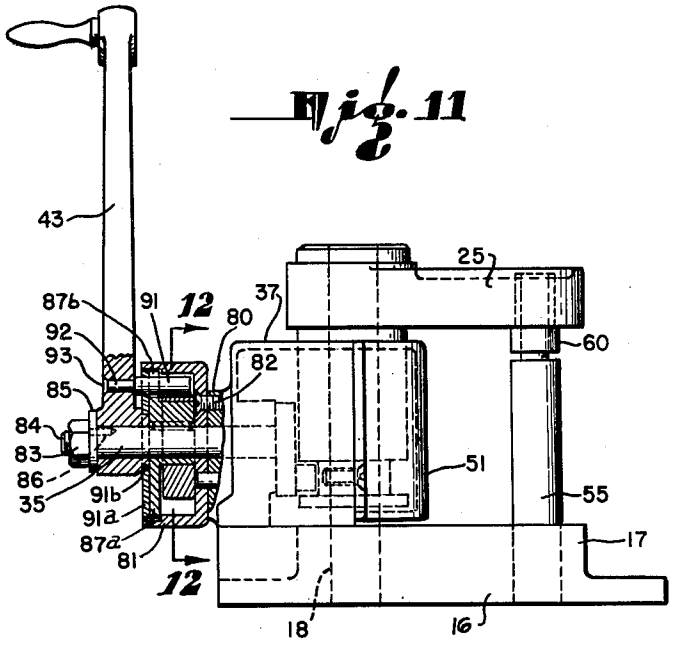
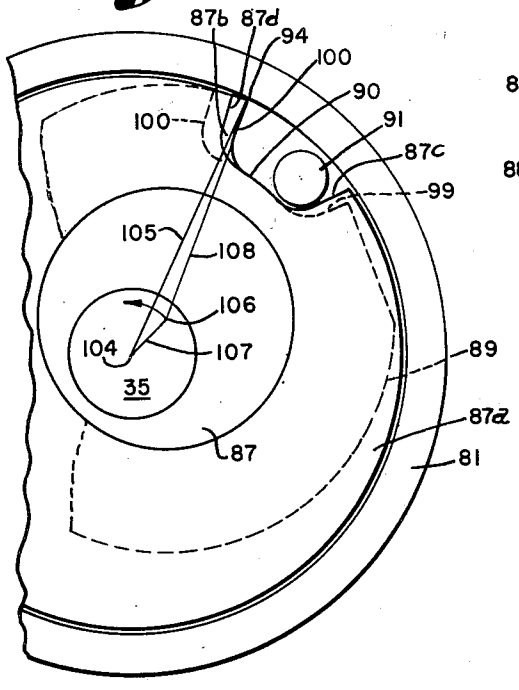


Fig. 13



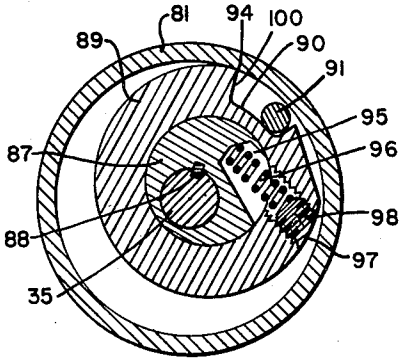


Fig. 12

INVENTOR.
ALFRED H. BOWLZER
BY
ATTORNEY

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UNITED STATES PATENT OFFICE

2,512,787

SWING JIG

Alfred H. Bowlzer, South Gate, Calif.

Application June 16, 1947, Serial No. 754,948

3 Claims. (Cl. 77—63)

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This invention relates generally to tools, and relates more particularly to quick clamping jigs for drill presses and the like.

Generally, it is customary to build a special jig for each individual drilling job, which is ordinarily an expensive matter. It is therefore an object of the present invention to provide a quick clamping or acting jig which may be made in standard sizes and readily adapted to handle various types of work by simple operations thereof.

Another object of the invention is to provide a device of this character wherein various sizes and shapes of working plates may be used therein, depending on the type of work to be done.

In many types of jigs heretofore used, and of which I am aware, it is difficult to place pieces to be worked on therein, and also difficult to remove same after they have been drilled or operated upon. Moreover, such placing and removing of the work pieces consumes a substantial amount of time and tires the operator unduly, and it is therefore a further object of the present invention to provide a quick clamping or acting jig of such character that the time for placing the work piece in and removal thereof from the jig is greatly reduced, and such operations are much easier to perform than in said jigs heretofore used.

In the present invention this is accomplished by providing a jig having a work base or base plate, for supporting the work piece, and a top plate which is adapted to clamp said work piece to the base plate, and which is adapted to be moved to a position whereat it is out of the way of the operator, so that such work piece may be quickly positioned or loaded on the base and quickly removed after the drilling and/or other operations have been performed on said work piece. More particularly, the top plate is adapted to move toward and away from the base for clamping and releasing the work piece and to further be swung out of the way of the operator for removal of the piece work upon and reloading of the jig.

A further object of the invention is to provide a device of this character wherein the top plate may be quickly moved from its out of the way position to its clamping position, or vice versa, by the simple movement of an actuating member or lever.

A still further object of this invention is to provide a device of this character having means for locking the top plate in its clamping position.

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Other objects of the invention are to provide a device of this character which is relatively simple in construction and operation and relatively simple to manufacture.

Further objects and advantages of the invention will be brought out in the following part of the specification.

Referring to the drawings which are for illustrative purposes only,

Fig. 1 is a plan view of a tool embodying the present invention showing the top plate positioned over the base, as when a work piece is clamped between said parts;

Fig. 2 is a side elevation of the same;

Fig. 3 is a fragmentary side view, partially in section, taken on the line 3—3 of Fig. 1, showing the position of various parts when the top plate is in the lowered or clamping position;

Fig. 4 is a partial section, similar to that shown in Fig. 3, showing the position of said parts when the top plate is in an elevated position;

Fig. 5 is a partial section taken on line 5—5 of Fig. 4;

Fig. 6 is a plan view of the device with the top plate swung to its out-of-the-way position;

Fig. 7 is a side view of the same, partially in section;

Fig. 8 is a sectional view taken on line 8—8 of Fig. 7;

Fig. 9 is a fragmentary view taken on line 9—9 of Fig. 1;

Fig. 10 is a sectional view of the base plate taken on line 10—10 of Fig. 6;

Fig. 11 is an end elevation, partially in section showing a locking arrangement of the invention, whereby work pieces of various thicknesses may be accommodated;

Fig. 12 is a sectional view, taken on line 12—12 of Fig. 11 with the mechanism slightly rotated in a clockwise direction; and

Fig. 13 is an enlarged diagrammatic view to show the various parts of the locking mechanism and the action of said arrangement of Figs. 11 and 12.

Referring more particularly to the drawings, there is shown a jig, indicated generally at 15, having a work base or base plate 16 which is adapted to be secured to a drill press or the like, in any well known manner. This base may be designed in any suitable shape and/or size, depending upon the character of the work to be done. Formed integrally with the base is a raised portion 17 which serves to support the pallet, which is described more fully hereinafter.

Adjacent one corner of the base plate 16 there

is a kingpin 18 having its lower end press fitted into an opening provided therefor in the base 16, and upon which a quill 19 is slidably and rotatably mounted. The upper end of the quill has a reduced portion 20 which has threads 21 adjacent its upper or free end. A top plate 25 is attached to the quill for movement therewith, said top plate having an opening 26 adjacent one corner thereof for reception of the reduced portion 20 of the quill. The plate 25 rests on a shoulder 27 at the lower end of the reduced portion 20 and said reduced portion and plate 25 have respective slots for reception of a key 28 to prevent rotation of the plate relative to said quill. A quill nut 29 is screwed onto the threaded end 21 of the quill for securing said top plate and quill together, there being peripheral openings 30 on diametrical sides of the quill nut, for reception of a tool for tightening or loosening said nut.

The quill is provided with an annular groove 31 adjacent its lower end, in which is slidably received a block 32 pivotally mounted on a pin 33 secured in a plate or crank arm 34. The plate 34 is attached to a shaft 35 journaled in a bearing 36, formed integrally with a housing member 37 having inturned flanges 38 with threaded openings therein for reception of Allen screws or the like 39, whereby the housing member 37 is secured to the base plate 16.

The quill is provided with a longitudinally extending slot 40 adjacent its lower end, said slot being located above the annular groove 31. The side walls 41 of the slot 40 are chamfered or bevelled so that the slot flares outwardly. The slot is adapted to receive the tapered free end of a pin 42 which is also fixed in the plate 34. It is to be noted that the pin 42 has a greater radius than the pin 33 and block 32 relative to the axis of the shaft 35, said pin 42 and block 32 cooperating to provide the required vertical and rotating movements for the quill 19 and plate 25, as will be hereinafter described, these movements being effected by means of a crank 43, having a handle 43*a*, attached to the outer end of the shaft 35. The crank is attached to said shaft 35 by any suitable means such as a key 44, or by any other well known means.

The crank has a pair of oppositely disposed lugs 45 and 46 adjacent its point of attachment to the shaft 35, each of said lugs having a threaded opening therein for reception of adjustable screws 47 and 48 respectively, which are adapted to engage a stop 49 formed integrally with the housing member 37 so that the rotative movement of the crank 43 is limited. Lock nuts 50 are provided for the screws 47 and 48 respectively, to secure the same in their adjusted positions. A housing member 51 is provided to complete the enclosure of the quill operating mechanism (above described), said housing member 51 being attached to the housing member 37 by means of screws 52 which are threadably received in lugs 53 formed integrally with the housing member 37.

There is provided means for properly positioning the top plate 25 over the base and said means includes a locating pin 55, the lower end of which is press fitted into an opening provided therefor in the base 16, the upper end of said pin 55 having a reduced diameter part 56 which is adapted to be received in the bore 57 of a bushing 58 which is press fitted into an opening provided therefor in the top plate 25. The opening in which the bushing 58 is received is located in the corner portion of the top plate 25 adjacent its point of attachment to the quill, and said bushing 58 is provided with a cut-away portion 59 so as to provide a depending flange 60 which is engageable with the reduced diameter portion 56 of the pin 55 when the top plate is swung into position over the base.

In preparing the jig for use in connection with a particular drilling operation, holes are drilled in said top plate at the exact location required to drill the work piece and the usual drill guide bushings 61 and 62, Fig. 2, are placed in these openings in the well known manner.

Referring further to Fig. 2, a pallet 63 is secured to the base 16 in any well known manner, and has a work locating pen 64 secured in an opening provided therefor by means of a press fit. The work piece, indicated generally at 65, is used only by way of example of one type of piece that may be worked upon and includes a body portion 65*a* and a boss 66 which has a hole 66*a* therein, in which is received the pin 64. The body 65*a* of said work piece 65 rests flat on the pallet 63. As shown, the body of the work piece 65 tapers to a rounded end from the end having the boss 66 and the pallet is provided with locating lugs 70 between which the tapered end of the work piece is received when said work piece is placed on the pin 64. Thus, said work piece is securely held against accidental displacement.

A filler block or pressure plate 67 is secured in any suitable manner to the under side of the top plate 25 so as to be in a position to engage the upper end of the work piece boss 66 when the plate 25 has been swung into position over the base 16 and moved downwardly for clamping the work piece in the jig. At this time the guide bushings 61 and 62 are exactly located over the part of the work piece to be drilled.

The lower ends of the guide bushings 61 and 62 are spaced upwardly of the work piece, as at 71 in Fig. 2, thus providing chip clearance. The pallet and base are also provided with openings 72 and 73 which are axially aligned with the guide bushings 61 and 62 when in the drilling position, and the base 16 is also provided with a recess 74 in the under side, said recess communicating with the openings 72 and 73 to permit chip disposal.

The operation of the above described mechanism is as follows:

Assuming that the jig is empty, the handle is moved to the position shown in Figs. 6 and 7. At this time the top plate 25 is in the position shown in Figs. 6 and 7, having been swung or pivoted outwardly approximately 90 degrees from its position when located over the base 16. At the same time the quill and its actuating mechanism are in the position shown in Figs. 7 and 8. It is to be noted that the free tapered end of the pin 42 is positioned adjacent the lower end of the slot 40 and the point of said pin is in the path of the adjacent slot wall 41 in a position to prevent the plate 25 from being inadvertently swung over the base 16.

The work piece 65 is then placed onto the pin 64 and so positioned that its tapered end is received between the lugs 70. Thereupon the crank is rotated in a clockwise direction as viewed in Fig. 7. Upon initial movement of the crank in this direction the pin 42 moves toward the right and across the slot 40 so as to engage the right hand side of said slot. Upon further movement of the crank in the same direction, the pin 42 will rotate the quill and top plate in a counterclockwise direction, as shown in Fig. 6. Assuming the

crank 43 has been moved counterclockwise to approximately the position shown in dotted lines in Fig. 2, the quill 19 and its operating mechanism will be in approximately the positions shown in Figs. 4 and 5. In Fig. 5 it will be noted that the pin 42 has rotated the quill on the kingpin 18, and in Fig. 4 it will be apparent that said pin 42 has moved upwardly in the slot 40. Also, the block 32 has moved somewhat to the right in the annular groove 31, as viewed in said Figs. 4 and 5, and said block has been rotated downwardly somewhat and moved the quill downwardly a corresponding amount. However, due to the position of the block 32 relative to the axis of the shaft 35, said downward movement is not great.

At this time the quill and plate 25 have made their full anti-clockwise rotative movement and are stopped from further rotation by engagement of the upper end 56 of the locating pin 55, with the flange 60 of the bushing 58, this locating said top plate over the base.

Upon further movement of the crank in the same direction, the pin 42 passes out of the slot 40, while the block 32 slides further toward the right in said groove 31 but will now effect downward movement of the quill and top plate 25 until the pin 33 of said block 32 will be in substantially vertical alignment, or dead center, with respect to the axis of the shaft 35, as shown in Fig. 3. It will be noted that the pin 42 has now moved downwardly to a position, Fig. 3, whereat it is in substantially the same horizontal plane as the pin 33.

As the top plate 25 moves downwardly, the pressure plate 67 engages the upper end of the work piece and firmly clamps same to the pallet. It is to be understood, of course, that the pallet 63 and pressure plate 67 are of such thickness that when the top plate 25 has been moved to its lower or clamping position, the pin 33 is at dead center with respect to the shaft 35 so that the top plate is securely locked against upward movement. At this time the top plate is also held against rotative movement by the entrance of the upper end of the reduced diameter portion 56 into the bore 57 of the locating bushing 58. This locking arrangement may be used where the work pieces are of a substantially uniform thickness.

The apparatus is now ready for the drilling operation, and upon completion of this operation and removal of the drills from the guide bushings 61 and 62, the crank is rotated in the opposite or counter-clockwise direction, as viewed in Fig. 7. This effects lifting of the top plate 25 from engagement with the work piece to a position whereat the upper end of the reduced diameter portion 56 is clear of the bushing 58 and upon such clearance the top plate is automatically rotated to its out-of-the-way position shown in Figs. 6 and 7. When the top plate is in this position, the jig may be reloaded.

It is to be noted that the top plate rotates approximately 90 degrees on the kingpin 18 and that the crank is also rotated approximately 90 degrees. When the crank is moved to release the work piece and move the top plate to the out-of-the-way position, said top plate is raised just enough to clear the top of the locating pin 55 and said plate is raised and moved to its out-of-the-way position by the approximately 90 degree movement of the crank.

The foregoing actuation of the jig may be repeated, and due to the relatively short crank movement that is required to move the top plate between its out-of-the-way position, into its clamping position, and back again, a great saving in operating time and economy is effected so that increased output is possible. Further, fatigue of the operator is greatly reduced.

Alternatively, the device may have means for locking the top plate 25 in various vertical positions, depending upon the thickness of the work piece. This arrangement may be used in cases where there may be variations in the thickness of the work pieces, as where said work pieces comprise castings. This locking mechanism is shown in Figs. 11, 12 and 13 and in this embodiment of the invention, the housing member 37 is provided with a boss 80 to which an annular cup-shaped casing or drum 81 is secured by means of screws 82.

The shaft 35 extends outwardy of the drum 81 and is arranged axially therewith, crank 43 being rotatably mounted on said shaft and secured thereon by means of a nut 83 threaded on a reduced diameter portion 84 of said shaft 35. A washer 85 is disposed between the nut 83 and crank 43 and is held against rotation by a pin 86 which extends into a recess provided therefor in the shaft 35.

Within the drum 81 there is disposed an eccentric hub 87 which is secured to the shaft 35 by means of a key 88 which prevents said eccentric hub from rotation on said shaft. The hub 87 is provided with a flange 87*a* having a notch 87*b* in the periphery thereof, having end walls 87*c* and 87*d*. A locking collar 89 is rotatably mounted on the eccentric hub 87 and said collar is provided with a notch 90 in which is received a finger pin 91 which extends through the notch 87*b* of the flange 87*a*, said pin also extending outwardly of the drum and is secured to the crank 43. The finger pin 91 has a reduced diameter portion 92 which is received in an opening provided therefor through the crank 43, and the outer end of said reduced diameter portion is riveted over at 93 so that the pin 91 is firmly secured to said crank.

In order to keep out dirt and other foreign matter from the drum, there is provided a washer 91*a*, which closes the open end of the drum. The washer 91*a* is mounted on a portion 91*b* of the crank hub which is concentric with the drum 81, and said finger pin 91 extends through an opening provided therefor in said washer.

The locking collar has a point or area 94 for engagement with the inner surface of the drum, and this point serves as a locking contact. The eccentric hub is provided with a recess 95 in which a spring 96 is received. The outer end portion of the spring 96 extends into a threaded bore 97 in the locking collar, said bore opening into the recess 95. A spring retaining screw 98 is threaded into the bore 97 for retention of the spring in operative position and this spring is provided to cause the locking collar to follow the movement of the crank when it is moved in clockwise direction, as viewed in Fig. 12, and keep the point 94 in contact with the inside of the drum throughout the clockwise movement of said crank.

It is to be noted that as the point 94 moves along the inside surface of the drum, it scrapes or wipes said surface and then keeps it clear of foreign particles or material which would adversely affect the locking action of the mechanism.

Assuming the jig is in loading position, that is, with the top plate 25 moved to its out-of-the-

way position, movement of the crank in a clockwise direction as above described effects corresponding movement of the shaft 35 with a lag, which is hereinafter described, to swing the top plate 25 over the base plate 16 and effect downward movement of said top plate and locking of same when it clampingly engages the work piece, as will be more fully described.

In Fig. 13 the various parts are diagrammatically shown, the point 104, indicating the axis of the shaft 35 and drum 81, and line 105 indicating the radius of the internal diameter of the drum 81. Point 106 indicates the center or axis of the eccentric hub 87 and the locking collar, which axis is located to one side of the radius 105 and is spaced therefrom in a clockwise direction. The line 107 shows the amount of eccentricity of the hub, and the line 108, between the center 106 of the eccentric hub 87 and the point 94 of the locking collar 89, indicates the radius of said locking collar with respect to said point 94.

When the crank 43 is moved in a clockwise direction, the pin 91 engages the shoulder 87c of the hub flange 87a and moves the hub 87 therewith and likewise the shaft 35, thereby causing the top plate 25 to be moved to the closed or clamping position. Any tendency of the shaft 35 to move in the opposite direction instantly will be opposed by the locking contact 94, which will firmly engage the inside of the drum and hold said shaft 35 against said tendency. The greater the force tending to move the shaft 35 in the counterclockwise direction, the greater the clamping action, the lines of force between the shaft 35 and the point 94 being along the lines 107 and 108, the combined distance represented by the lines 107 and 108 being greater than the distance between the axis 104 and point 94 along the lines 105. From the foregoing, it is believed that it will be apparent that the mechanism will securely lock the plate against releasing movement at an infinitely variable number of positions within its operative range.

Should the crank be initially moved in a counterclockwise direction, the lost motion of the pin 91 in the slot 90 in the locking collar 89 will be taken up. Further movement of the crank will cause the locking collar 89 to rotate on the eccentric hub 87 in a counterclockwise direction a very slight distance. This will cause the point 94 to be retracted relative to the inner surface of the drum so that the locking mechanism is released. Thereafter, the pin 91 engages the wall 87d of the notch 87b in the hub flange 87a to effect rotation of said hub and shaft 35. Further movement of the handle in the counterclockwise direction will cause the top plate 25 to be raised and moved to its out-of-the-way position.

It will be readily understood from the foregoing that the locking engagement of the point 94 with the drum 81 will be effective at infinitely variable positions, and lock the top plate to suit various thicknesses of work pieces.

I claim:

1. A device of the class described, comprising: a base; a kingpin having one end secured to the base, said kingpin extending upwardly from said base; a quill slidably and rotatably mounted on the kingpin, said quill having a longitudinally extending slot therein intermediate its ends, and an annular groove; a top plate secured to said quill; a locating pin having one end secured to the base, said locating pin extending upwardly from said base; means for said top plate adapted to engage the free end of the locating pin when said top plate is rotated from an out-of-the-way position to a position over the base and vice versa; a rotatable shaft having its inner end positioned adjacent the quill; an actuating arm secured to said shaft for rotating same; a lever secured to the shaft adjacent its inner end; a pin secured to said lever and so positioned as to operably engage the slot in the quill for rotating same on the kingpin; and means interconnecting the lever and said annular groove in the quill for effecting longitudinal movement of the quill on the kingpin toward and away from the base.

2. The invention defined by claim 1, wherein the last mentioned means is movable to a position whereat it is at a dead center position with respect to the shaft, so that the quill is held against movement away from the base.

3. A device of the class described, comprising: a base; a kingpin extending upwardly from the base and having one end secured to said base; a quill slidably and rotatably mounted on the kingpin, said quill having a longitudinally extending slot therein, intermediate its ends, and an annular groove adjacent the lower end and below said slot; a top plate secured to said quill; a locating pin having one end secured to the base, said locating pin extending upwardly from said base; means for said top plate adapted to engage the free end of the locating pin when said top plate is rotated from an out-of-the-way position to a position over the base; a rotatable shaft having its inner end positioned adjacent the quill; a lever secured to the shaft adjacent its inner end; a pin secured to said lever and so positioned as to operably engage the slot in the quill for rotating the same on the kingpin when said shaft is rotated; means interconnecting the lever and said annular groove in the quill for effecting longitudinal movement of the quill on the kingpin toward and away from said base; an actuating arm for effecting rotative movement of the shaft; and locking means adapted to lock the mechanism so as to prevent movement of the quill and top plate away from said base, said locking means being adapted to effect such locking of the quill and top plate at an infinite number of positions within its range of operation.

ALFRED H. BOWLZER.

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