P. O. UNGER.

VISE.

APPLICATION FILED SEPT. 7, 1918.

1,292,930. Patented Jan. 28, 1919.

Fig. 1.

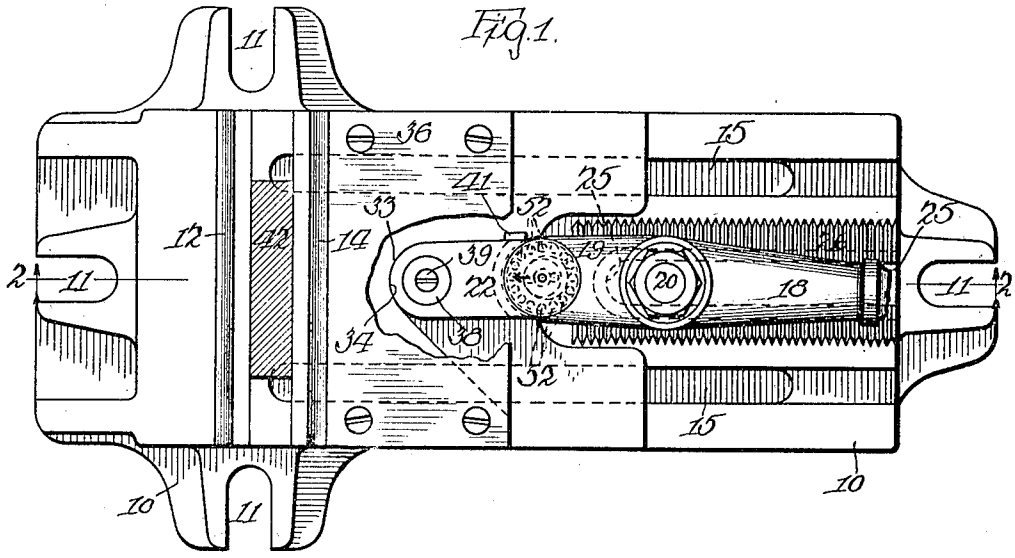


Fig. 2.

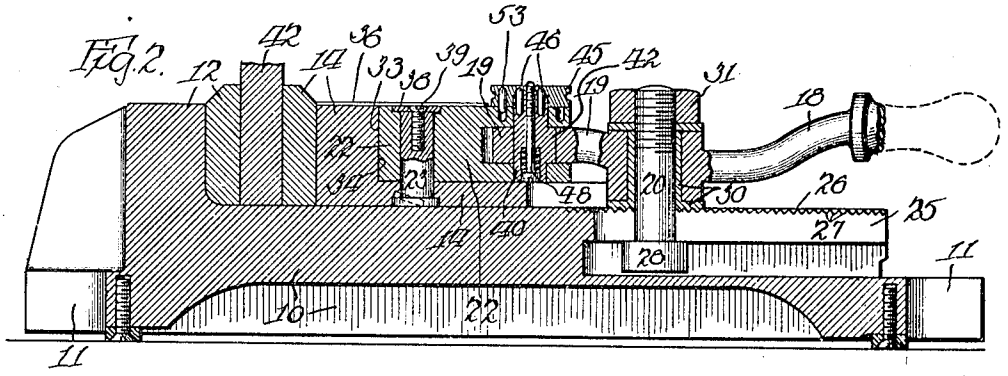


Fig. 3.

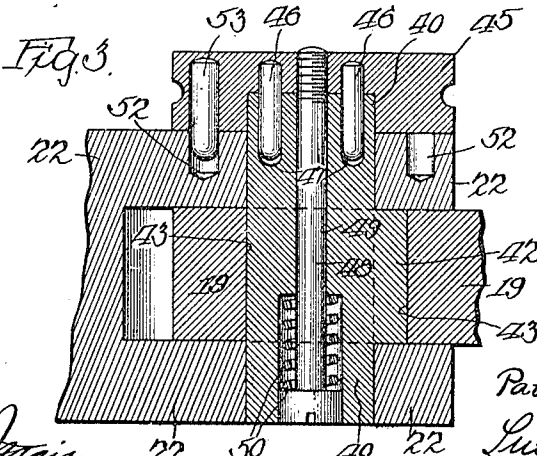
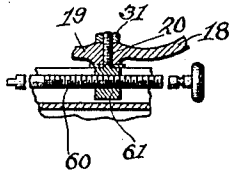


Fig. 4.



Witnesses:

Leo. J. Dubrais.

Inventor:

Paul Otto Unger

Luther Johns

Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PAUL OTTO UNGER, OF OAK PARK, ILLINOIS.

VISE.

1,292,930. Specification of Letters Patent. **Patented Jan. 28, 1919.**

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To all whom it may concern:

Be it known that I, PAUL OTTO UNGER, a citizen of the United States, residing in the village of Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Vises, of which the following is a specification.

My invention relates to vises. In its present adaptation it relates more particularly to clamping means applicable to the bed-plate of milling machines, planers, and the like, for holding the object or "work" to be operated upon.

The principal objects of these improvements are to provide a vise construction of the character described by which a strong and effective grip may be obtained and maintained upon the work; one in which the jaws may be opened and closed quickly, and in which a desirably large space may be almost instantly provided between the jaws, as by merely swinging a lever; one in which the parts may be readily adjusted for work of various proportions; and one which is simple, durable and strong. Other objects and advantages will appear hereinafter.

It is old to provide a bed-plate vise for gripping the work. The usual construction heretofore employed has included a screw-shaft for shifting the movable jaw, the operator turning the shaft with a crank to tighten or release the work, the operation being comparatively slow. It has also been suggested to employ a cam device operated by a hand-lever for moving one of the jaws. As the "throw" of such a cam must necessarily be limited in order to gain sufficient power from the hand-lever one of the objections to that form of device has been the limited jaw movement resulting in difficulty in keeping clean of chips, etc., the space between the jaws when the work is small, owing to the narrow space between the jaws when the work is released. The present improvements include a quick-action, wide-throw toggle arrangement having a powerful binding action upon the work, with adjusting means, etc., all as will be hereinafter more fully pointed out in the description and claims.

In the accompanying drawings, which form a part of this specification, Figure 1 is a top plan of a vise embodying these improvements in a preferred form; Fig. 2 is a medial longitudinal vertical section of the same, as on the line 2—2 of Fig. 1; Fig. 3 is an enlarged sectional fragmentary detail of means for increasing and decreasing the effective length of the toggle connection; and Fig. 4 is a small fragmentary medial vertical sectional view of an alternative construction of the fulcrum-pin shifting means.

The vise illustrated in Figs. 1, 2 and 3 comprises the base 10 adapted to be secured to the bed-plate of the milling machine or the like by bolts in the recesses 11, as in well-known practice. The base 10 carries the relatively fixed jaw 12 and the relatively movable jaw 14, the latter being slidably mounted in ways 15 for movement toward and from the jaw 12.

The movable jaw 14 is moved toward and from the fixed jaw 12 in two ways: first by a bodily movement of the jaw 14 and the associated elements for tightening it upon the work, and secondly through the operation of the tightening elements alone. These tightening elements include the hand-lever 18 and the extension 19 thereof, pivotally mounted on the fulcrum stem or pin 20. This lever 18—19 is thus a lever of the first class, the fulcrum being intermediate of its ends. The inner end 19 is rigid, shown integral, with the outer end 18, and is moved positively when the handle is moved. The tightening elements include also the link 22 pivoted at one end to the movable jaw upon the pin 23, and pivotally connected at its other end at 40 to the extension 19 of the lever 18—19, thus forming a toggle of the parts 19 and 22. In the tightening operation the fulcrum pin 20 is held in a fixed position on the base 10 and the swinging around of the hand-lever 18 operates the toggle 19—22, retracting or extending the jaw 14.

The means illustrated for holding the fulcrum pin 20 in a given position of adjustment nearer to or farther from the fixed jaw 12 comprise the provision of a central longitudinal slot or way 25 in the base 10 providing a rest surface 26 on either side of the slot 25, which rest surfaces are preferably serrated, recessed or grooved transversely with preferably substantially V_5 shaped grooves 27, forming locking elements adapted to hold the pin 20 positively against the pressure exerted by the toggle. The fulcrum pin 20 has a head 28 adapted to engage the under surfaces of the base adjacent to the slot or way 25, and on the pin 20 is a flanged collar 30, the under side

of the collar being serrated, grooved, or otherwise formed to interlock with the holding elements on the rest surfaces 26. The collar 30 is slightly longer than the pivot hole in the lever 18—19 whereby the lever is free to move when the nut 31 binds the collar 30 tightly upon the surfaces 26. Upon retracting the nut 31 a turn or two the lever 18 may be lifted and the jaw 14 and its associated parts may be moved toward or from the fixed jaw 12, the V-shaped recesses in the surfaces 26 and in the flange of the collar 30 permitting the collar to ride over the surfaces 26 even though the flange of the collar be not lifted entirely clear thereof, thus making for speed and facility of this adjusting operation.

The forward end 33 of the link 22 is arcuate transversely and bears against the corresponding arcuate recess 34 in the movable jaw 14. The tightening pressure of the link 22 is therefore applied directly against the jaw. The stud-shaft or pin 23 secured to the jaw 14 and passing through the end of the link 22 concentrically with the arcuate surfaces 33 and 34 serves as a connection for retracting the jaw 14. A washer 38 and screw 39 hold the several parts thereto-gether. The plate 36, partly broken away in Fig. 1, is a protective cover.

As to the connection between the lever part 19 and the link 22 I have thus far merely stated that it is a pivoted one, the knuckle pin or shaft being shown at 40. With this understanding it will be clear that as the hand-lever 18 is swung upward, as viewed in Fig. 1, the toggle parts 19 and 22 will be inclined downward from the pivots 20 and 23 and the jaw 14 will be retracted. The reverse movement of the lever 18 of course advances the jaw 14. It is clear that when the pivots 23, 40 and 20 are coming more and more into a straight line in the jaw-advancing operation the "throw" of the toggle and the forward movement of the jaw 14 are becoming less and less relative to the movement of the lever 18, and that consequently the proportionate power exerted upon the jaw 14 and upon the work, as 42, between the jaws is becoming more and more. It thus occurs that a relatively rapid movement of the jaw 14 takes place until it is just about to bind tightly upon the work, at which time it moves relatively slowly and through only a short distance, accompanied by a great multiplication of the power exerted by the lever 18. Similarly when the work is released the power required to overcome the friction of the tightly bound parts is applied through a relatively large movement of the lever 18 and a relatively small movement of the jaw 14 until the holding pressure is overcome, whereupon the jaw 14 moves more and more rapidly with a given rate of travel of the lever 18.

From Fig. 1 it will be observed that when the work, as 42, is held tightly the pivots 23, 40 and 20 are not in a straight line, but that the middle or knuckle connection 40 is advanced slightly beyond a straight line between the pivots 23 and 20. In other words, the knuckle joint of the toggle is slightly off of the dead center line, having passed through the dead center line in the tightening operation. The forward and rearward movement of the jaw 14 when the pivot 40 is passing through the dead center line is *nil*, so that it is feasible to pass the knuckle pivot 40 beyond the dead center line slightly without prejudice to the tight hold upon the work desired. The effect of thus passing the pivot 40 through and beyond the dead center line is to lock the toggle positively in its work-holding position. A stop 41 (Fig. 1) limits this off-center movement. These tightening and locking effects are thus obtained by a single movement of the lever 18.

Where the device is so constructed that the fulcrum pin 20 is held in a given fixed position of adjustment on the base 10 by means of serrations at 27 spaced apart, it will frequently happen that the adjustment possible by means of the fulcrum pin 20 is not fine enough to produce the desired holding effect upon the work when the lever 18 is moved. In such cases it will either be impossible to throw the lever into the position shown in Fig. 1 or, if possible, the work will not be held tightly enough. In my practice the serrations 27 are one-eighth of an inch apart.

To obtain the fine and close adjustability desired for the various sizes of work which may be in hand, I provide means for increasing and decreasing the effective length of the toggle 19—22. These means comprise an eccentric or cam 42 on the knuckle pin 40 adapted to swing in an opening 43 in the end of the toggle extension 19 of the lever 18—19. By turning the knuckle pin 40 on its axis the cam 42 increases the effective length of the link 22 and also that of the lever extension 19, or in general, of the toggle 19—22 as a whole.

The cam is readily swung into and maintained in a given operative position by means of the knurled head or button 45 locked to the knuckled pin 40 by studs 46 carried by the head 45 and slidable in recesses 47 in the pin 40. A headed bolt or stem 48 is secured axially in the button 45 and passes slidably through the axial hole 49 in the pin 40, and the coiled spring 50 maintains the button 45 in tightly fitting association with the top surface of the link 22. A plurality of adjusting holes or recesses 52 are provided in the link 22 concentric with the axis of rotation of the button 45 and a locking pin 53 secured rigidly in the button 45 is adapted severally to en-

gage the locking recesses 52. When the button 45 is lifted so that the pin 53 comes out of engagement with one of the recesses 52, the button and consequently the cam 42 may be swung around to some other position of adjustment, the pin 53 entering some other hole 52. It will thus be seen that the effective length of the toggle may be adjusted in very small degrees, and in an exceedingly simple and expeditious way.

The vise may be constructed in accordance with mechanical practices well understood and according to the proportions illustrated in Figs. 1 and 2, these drawings being substantially true to scale.

Instead of adjusting the fulcrum pin 20 in some such manner as illustrated in Figs. 1 and 2 a screw-shaft construction may be employed as shown fragmentarily in Fig. 4; in which figure the screw-shaft is shown at 60 passing through a nut member 61 carrying the fulcrum pin 20. When the screw-shaft construction of Fig. 4 is employed the toggle-adjusting device which includes the cam 42 may be dispensed with.

The invention is not limited to the specific construction shown and reference should be had to the appended claims which indicate what I contemplate as being included in the improvements set forth.

I claim:

1. Vise mechanism comprising in combination a base, a relatively fixed jaw thereon, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a lever pivotally mounted on said base, means for moving the pivotal mounting of said lever adjustably toward and from the relatively fixed jaw, a link connecting the relatively movable jaw with a portion of said lever spaced from the pivotal mounting thereof for moving the relatively movable jaw, and adjusting means for increasing and decreasing adjustably the effective length of said link.

2. Vise mechanism comprising in combination a base, a relatively fixed jaw thereon, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a lever of the first class pivotally mounted on said base, means for moving the pivotal mounting of said lever adjustably toward and from the relatively fixed jaw, a link pivoted at one end to said movable jaw and at the other end to the end portion of said lever forming a toggle connection for moving the relatively movable jaw, and adjusting means for increasing and decreasing adjustably the effective length of said toggle.

3. Vise mechanism comprising in combination a base, a relatively fixed jaw thereon, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a fulcrum pin adjustably mounted on the base to move toward and from the fixed jaw, means for holding said fulcrum pin in a given position of such adjustment, a lever of the first class pivotally mounted on said fulcrum pin, a link connecting the relatively movable jaw with a portion of said lever spaced from the pivotal mounting thereof and forming a toggle for moving the relatively movable jaw, and adjusting means for increasing and decreasing adjustably the effective length of said toggle.

4. Vise mechanism comprising in combination a base, a relatively fixed jaw on said base, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a fulcrum pin adjustably mounted on the base for movement toward and from the fixed jaw, means for holding the fulcrum pin in various positions of adjustment on the base, a hand lever pivotally mounted on said fulcrum pin, a link connecting the relatively movable jaw with a portion of said lever spaced from the fulcrum pin for moving the relatively movable jaw, means for limiting the movement of said link in the jaw-closing direction to a position in which its connection to said lever is slightly beyond the dead center line between the fulcrum pin and the connection of said link to said movable jaw, and adjusting means associated with said link for increasing and decreasing adjustably its effective length.

5. In a device of the character described, the combination with a base and a relatively fixed jaw thereon, of a relatively movable jaw mounted on the base to move toward and from the fixed jaw, a lever of the first class pivotally mounted on the base and also mounted thereon to move adjustably toward and from the fixed jaw, a link connecting the end of said lever and said movable jaw, said link and the end portion of said lever forming a toggle connection, means for limiting the movement of said toggle in one direction to a position in which its medial joint is slightly off of and beyond the dead center line between its end connections in the jaw-closing movement, and readily adjustable cam means associated with the knuckle joint of said toggle for increasing and decreasing the effective length of said toggle.

6. In a device of the character described, the combination with a base and a relatively fixed jaw thereon, of a relatively movable jaw mounted on the base to move toward and from the fixed jaw, a lever of the first class pivotally mounted on the base and also mounted thereon to move adjustably toward and from the fixed jaw, a link connecting the end of said lever and said movable jaw, said link and the end portion of said lever forming a toggle connection, and readily adjustable cam means associated with said

lever for increasing and decreasing the effective length of said toggle connection.

7. In a device of the character described, the combination with a base and a relatively fixed jaw thereon, of a relatively movable jaw mounted on the base to move toward and from the fixed jaw, a lever of the first class pivotally mounted on the base and mounted also to move adjustably toward and from said fixed jaw, and a connection between the end of said lever and said movable jaw for moving the jaw when the lever is moved, and adjusting means associated with said connection for increasing and decreasing adjustably its effective length.

8. In a device of the character described, the combination with a base and a relatively fixed jaw thereon, of a relatively movable jaw mounted on the base to move toward and from the fixed jaw, a lever of the first class pivotally mounted on the base, a link connecting the end of the lever and said movable jaw, said link and the end portion of said lever forming a toggle connection, and means for limiting the movement of said toggle in one direction to a position in which its medial joint is slightly off of and beyond the dead center line between its end connections in the jaw-tightening movement of said toggle.

9. Vise mechanism comprising in combination a base, a relatively fixed jaw thereon, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a fulcrum pin slidably mounted on said base, a hand lever pivotally mounted on said fulcrum pin, a link connecting said relatively movable jaw with a portion of said lever spaced from the pivotal mounting thereof for moving the relatively movable jaw, means for limiting the movement of said link in one direction to a position in which its connection to said lever is slightly beyond the dead center line for locking said link in work-holding position, and adjusting means carried by said base independently of said fulcrum pin and operatively connected to said fulcrum pin for moving said fulcrum pin adjustably.

10. Vise mechanism comprising in combination a base, a relatively fixed jaw thereon, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a fulcrum pin movably mounted on said base for movement toward and from said jaws, a hand lever of the first class pivotally mounted on said fulcrum pin, a link connecting the inner end portion of said lever to said movable jaw, forming a toggle, means for limiting the movement of the knuckle joint of said toggle in one direction to a position thereof slightly beyond the dead center line for locking the toggle in work-holding position, and adjusting means carried by said base independently of said fulcrum pin and operatively connected to said fulcrum pin for moving said fulcrum pin adjustably.

11. Vise mechanism comprising in combination a base, a relatively fixed jaw thereon, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a fulcrum pin adjustably mounted on said base for movement toward and from said relatively fixed jaw, a hand lever of the first class pivotally mounted on said fulcrum pin, the inner and outer arms of said lever being rigid with each other whereby movement of one arm moves the other positively, and a link connecting the inner arm of said lever to said movable jaw, forming a toggle.

12. Vise mechanism comprising in combination a base, a relatively fixed jaw thereon, a relatively movable jaw mounted on the base for movement toward and from said relatively fixed jaw, a fulcrum pin adjustably mounted on said base for movement toward and from said relatively fixed jaw, a hand lever of the first class pivotally mounted on said fulcrum pin, a link conecting the inner end portion of said lever to said movable jaw, forming a toggle, and means for limiting the movement of the knuckle joint of said toggle in one direction to a position slightly beyond the dead center line between the end connections of said toggle.

PAUL OTTO UNGER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."