J. S. STULL.

VISE.

APPLICATION FILED JUNE 28, 1917.

1,285,834.

Patented Nov. 26, 1918.

3 SHEETS—SHEET 1.

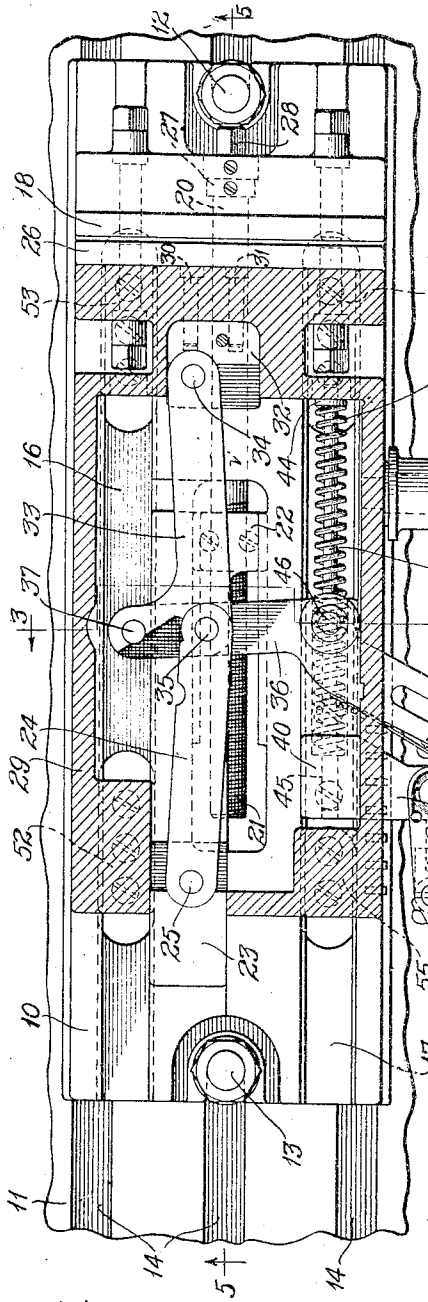


Fig. 1.

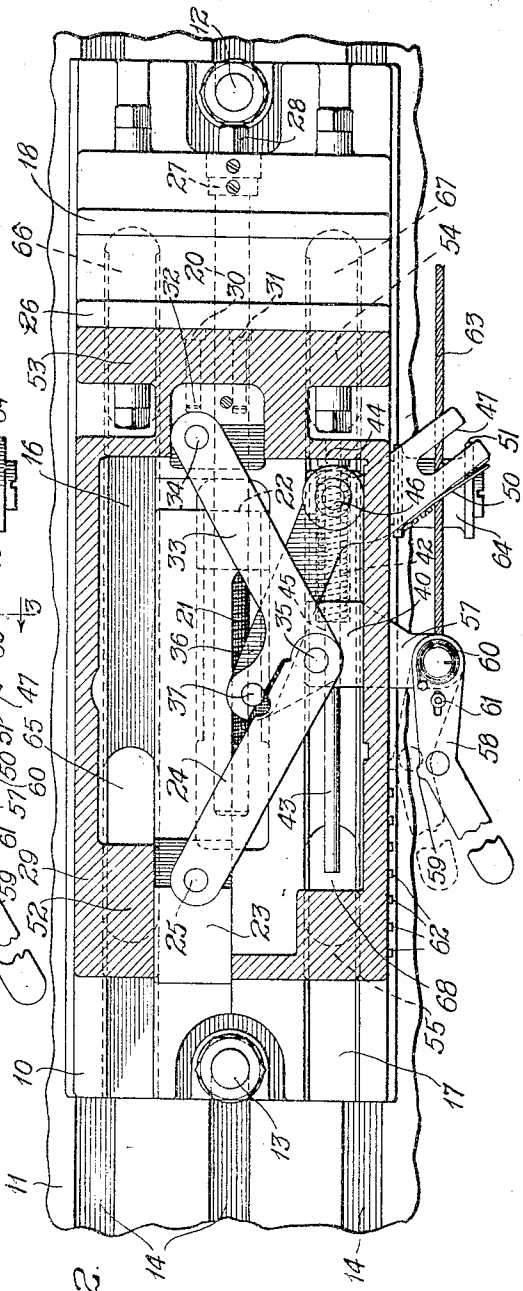


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

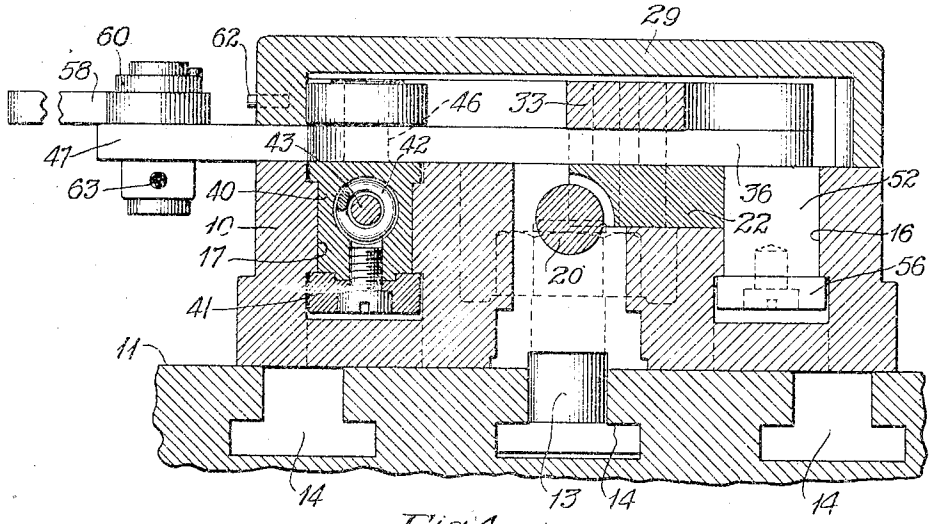


Fig. 4.

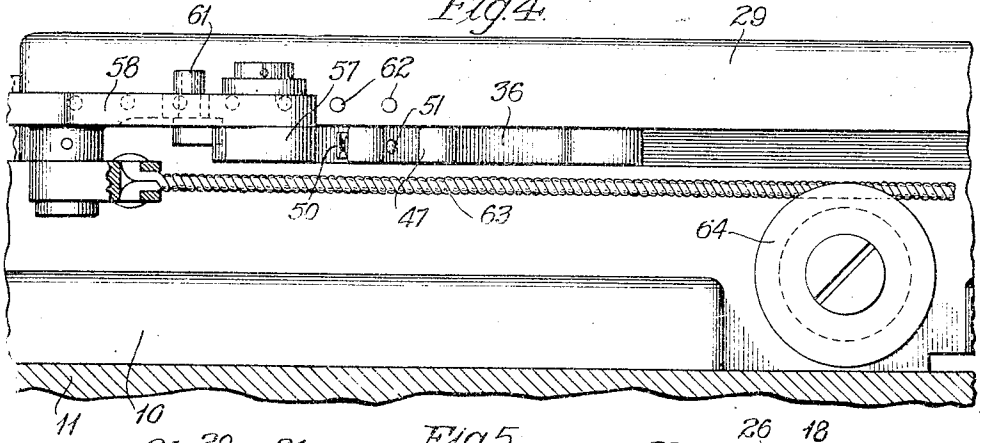
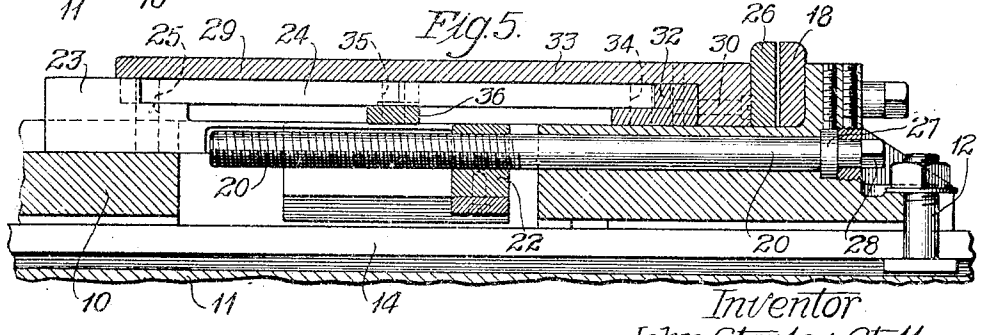


Fig. 5.



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Patented Nov. 26, 1918.

3 SHEETS—SHEET 3.

Fig. 6.

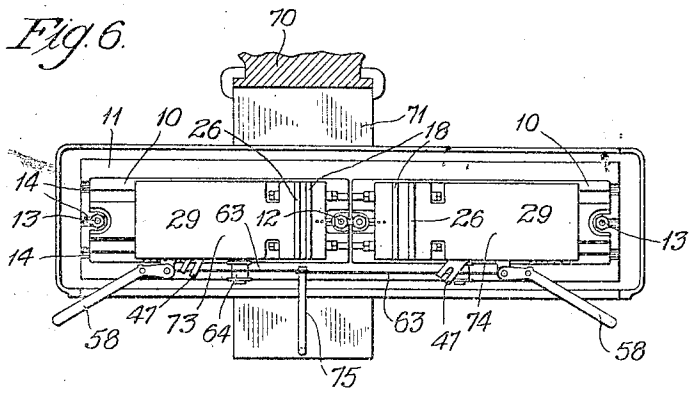


Fig. 7.

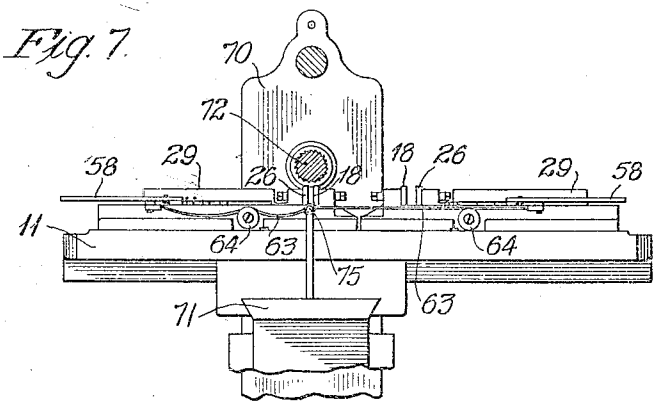


Fig. 8.

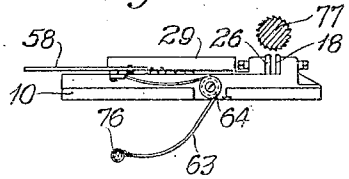
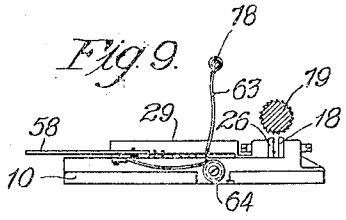


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN STANLEY STULL, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

VISE.

1,285,834. Specification of Letters Patent. Patented Nov. 26, 1918.

Application filed June 29, 1917. Serial No. 177,430.

To all whom it may concern:

Be it known that I, JOHN STANLEY STULL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Vises, of which the following is a full, clear, concise, and exact description.

This invention relates to a vise, and more particularly to a vise arranged for automatic, semi-automatic, or manual operation with machines fitted with movable article mounting carriages. All machines equipped with movable mounting carriages are provided with means for securely clamping or holding on the carriage the article to be operated on. The means that have been utilized for this purpose in the past are ordinarily designed for manual operation and consequently considerable of the operator's time is consumed in clamping the article on and removing the article from the carriage.

It is one of the objects of this invention to increase the efficiency of this operation by utilizing an improved clamping means or vise which is automatically operated by the movement of the carriage, the work of the operator being reduced to merely placing the article between the jaws of the vise.

Another object consists in providing an improved form of toggle vise whereby a tremendous clamping pressure is secured by an automatically operated yielding means.

Another object comprises the production of an improved means for automatically operating the vise by movement in any direction of the movable carriage of the machine.

Another object of the invention consists in producing a clamping mechanism which will give substantially the same clamping pressure for successive operations for any particular adjustment of said clamping mechanism.

Other objects of the invention will be evident from the following description and the appended claims.

The invention in its preferred form as herein illustrated and described has been applied to a standard milling machine. The invention is not limited to this application, however, but may readily be adapted to any machine equipped with a movable carriage.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of the vise with the upper portion of the slide or housing cut away, the vise being mounted in position on the bed plate of the machine with the jaws of the vise closed;

Fig. 2 is a similar view with the jaws of the vise open;

Fig. 3 is a section on the plane 3—3 of Fig. 1 looking in the direction of the arrows;

Fig. 4 is a side elevation of the vise with the housing or slide in place;

Fig. 5 is a section on the plane 5—5 of Fig. 1;

Fig. 6 is a plan view of a milling machine with a vise mounted on either end of the bed plate;

Fig. 7 is a front elevation thereof;

Fig. 8 is a diagrammatical representation of the method of mounting the vise on a milling machine for a longitudinal feed from the right-hand side of the cutter; and

Fig. 9 is a diagrammatical representation of the method of mounting the vise on the milling machine for a vertical feed.

As illustrated in the drawings, the vise consists of a base 10 which is clamped to the bed plate 11 of the milling machine by the bolts and nuts 12 and 13 which are secured in a slot or key-way 14 in the bed plate of the milling machine. The bed 10 of the vise is fitted with the longitudinal slots or slides 16 and 17 and with the stationary jaw 18 of the vise. The middle portion of the bed 10 is cored out to receive the bolt 20, the screw-threaded end 21 of which is screwed into an adjusting bar or block 22. This bar 22 is equipped with a raised portion at 23 which serves as a mounting means for one end of a link 24 which is pivoted at 25 on said block. The shank of the bolt 20 passes through the bed 10, in which it is loosely fitted, and is held against movement to the left by a circular washer 27 integral therewith which rides against a counterbored hole in the bed 10.

The bolt is fitted with the rectangular head 28 which when turned will change the position of the adjusting bar 22 with respect to the stationary jaw 18 of the vise. A slide or housing 29 which rides in the slots 16 and 17 carries the movable jaw 26 of the vise. Secured to the housing 29 by means of the screws 30 and 31 is a thrust block 32, to which is secured one end of a link 33 which is pivoted on the thrust block at 34. The link 33 is pivoted to the link 24 at 35 and pivoted to a link 36 at 37.

Slidably fitted in the slot or key-way 17 of the bed 10 of the vise is the toggle slide 40. The toggle slide 40 is held in position in the key-way 17 by means of the jib 41, as illustrated in Fig. 3. The front end of the toggle slide is perforated to receive the spiral spring 42 which rides on a rod 43 held in position between the shoulder 44 in the front end of the housing or slide 29 and a hole 45 in the toggle slide 40 in which the rod is loosely fitted. One end of the lever 36 is pivotally mounted on the toggle slide 40 by means of the pin or stud 46. The link 36 extends out beyond the housing and is fitted with a bifurcated end 47, said bifurcation serving as a mounting means for a handle when it is desired to manually operate the toggle consisting of the links 24, 33, and 36. Secured to one of the bifurcations of the extended portion of the link 36 is a flat spring 50 which operates a pin 51 which functions to hold the handle in place when inserted into position between the bifurcations.

The slide or housing 29 is fitted at its front and rear ends with the downwardly projecting lugs 52, 53, 54, and 55. These lugs ride in the key-ways 16 and 17 respectively and are held in position in these key-ways by the jibs secured thereto, as illustrated by the jib 56 secured to the lug 52 illustrated in Fig. 3. Secured to the rear end of the toggle slide 40 is the outwardly projecting arm 57 on which is pivotally mounted the lever arm 58 which carries a tooth 59. The lever arm 58 is under the joint control of a sliding spiral spring 60 and a catch or dog 61 working in a slot in the lever arm 58. The spiral spring 60 is so mounted that it tends to throw the lever 58 in toward the housing or slide 29, and this movement of the lever is prevented by the catch 61 which engages recesses in the member 57, as indicated in Fig. 4, and holds said lever out and away from the housing 29. When the catch 61 is thrown out of engagement, the lever 58 will move in toward the housing and assume the position illustrated by the broken lines in Fig. 2. The housing 29 is fitted with a series of projections such as 62, over which the tooth 59 will ride when the lever 58 is in the broken line position shown in Fig. 2 and the toggle slide is moved to the right in its slots.

Rigidly secured to the under side of the arm 58 is one end of a cable 63 which extends along the side of the vise and is carried over a roller 64 mounted on a stud secured to the base 10 of the vise. This cable is extended to some convenient stud mounted on a stationary part of the machine on which the toggle vise is mounted, as illustrated in Figs. 6 to 9 inclusive and more fully explained hereinafter.

In assembling the vise the bolt 20 is first put into place by screwing onto the threaded end 21 thereof the tapped portion of the adjusting bar 22. The link 24 is then secured to the block 23 of the adjusting bar. The toggle slide 40 is next fitted into place with its associated spring 42 on the rod 43, the slide being properly positioned by securing the jib 41 thereto. The links 33 and 36 are then connected to one another, the link 33 also being pivotally connected to the link 24, and the link 36 being likewise pivotally connected to the toggle slide 40. The housing or slide 29 is next placed in position over the levers with the thrust block 32 in proper position so that it can be conveniently secured to the housing by means of the screws 30 and 31. Jibs such as 56 are then secured to each of the projecting blocks 52, 53, 54, and 55, this operation being conveniently performed through the cored out portions of the base plate 65, 66, 67, and 68. The lever 58 and its associated apparatus and the roller 64 may then be mounted in their relative positions and the cable 63 secured to the arm 58. The toggle vise is now assembled for mounting on the bed plate 11 of the milling machine which is readily accomplished by securing the base 10 thereof to the bed plate 11 by means of the bolts and nuts 12 and 13 respectively.

When the vise has been thus mounted on the machine it is first adjusted for the desired amount of opening between the jaws, 18 and 26 of the vise when the toggle has been displaced in the position it is shown in in Fig. 2. This desired amount of opening is obtained by adjusting the position of the adjusting bar 22 on the bolt 20, said position being readily changed by turning said bolt 20 which will move the adjusting bar 22 either to the right or left, depending upon the direction of rotation of said bolt. The movement of the adjusting bar 22 to the left increases the size of the opening between the jaws, and the movement to the right decreases the size thereof. This follows directly from the fact that the pivoted point 25 secured to the adjustment bar 22 is the stationary point of the toggle, and

consequently as the link 24 is secured to the link 33, which in turn is secured to the thrust block 32 which is rigidly secured to the slide or housing 29, any movement of the adjustment bar 22 to the right or left will carry with it the link motion and its associated mechanism which includes the slide or housing 29. Since the right-hand end of the slide or housing constitutes the movable jaw of the vise, any movement thereof will either increase or decrease the size of the opening between the jaws.

Having adjusted the vise for the desired amount of opening, the cable 63 is secured to the stationary stud on the side of the machine and the vise is ready for operation. With the cable secured to the stud on the side of the machine and the lever 58 held out from the side of the housing 29, the vise is arranged for automatic operation. Thus with the vise in the position as shown in Fig. 1, the spiral spring 42 has moved the toggle slide 40 to the extreme left and the cable 63 is slack, allowing said spring 42 to act upon the toggle slide. With the toggle slide in this position the link 36 has moved its associated links 24 and 33 into a substantially straight line, thus forcing the movable jaw 26 of the vise toward the stationary jaw 18 and clamping any material therebetween in position. Due to this action of the toggle links 24, 33, and 36, a very slight force exerted through the spring 42 will exert a tremendous pressure on the jaw 26 of the vise when the links 24 and 33 of the toggle mechanism are in a substantially straight line, and this pressure is substantially uniform for succeeding operations of the vise, which is very desirable. With the links in this position and the article clamped between the jaws of the vise, the bed plate 11 of the milling machine can readily move to the right and subject the article held between the jaws of the vise to the necessary milling operation. As the bed plate 11 returns after the milling operation is performed it will move to the left, and in this action the cable 63 will be drawn taut. When the cable 63 is taut it will pull on the extended arm 58 of the toggle slide 40 which will consequently move to the right, compressing the spiral spring 42, and in this action the link 36 will bend the knee of the toggle mechanism composed of the links 24 and 33 as shown in Fig. 2.

Since the point 25 at which the link 24 is pivoted is stationary, the bending of the knee of the toggle will cause the housing 29 to move to the left. Since the housing 29 carries with it the movable jaw 26 of the vise, this movement will increase the opening between the stationary and movable jaws 18 and 26 respectively and thereby release the article held between the jaws, which may then be removed. Another article to be operated on may now be placed between the jaws which will be again clamped therebetween as the tension on the cable 63 is slackened and the links 24 and 33 of the toggle assume the substantially straight line position shown in Fig. 1.

When it is desired to operate the vise semi-automatically the dog 61 is released which allows the lever 58 to rotate into position against the side of the housing 29 under the influence of the spiral spring 60. In this position of the lever 58 the tooth 59 rides over the projections 62 on the side of the housing 29 when the toggle slide 40 moves to the right and the cable 63 is drawn taut. On the return movement of the vise when the cable is slackened the spring 42 will not operate to close the jaws of the vise but will merely move the toggle slide 40 to the left until the tooth 59 engages the first projection 62 on the side of the housing 29. This will hold the jaws of the vise open notwithstanding the fact that the tension on the cable 63 is slackened. The distance that the jaws of the vise will be held open will depend upon the cable adjustment, which determines the distance that the toggle slide 40 is moved to the right, which in turn determines the particular projection 62 which the tooth 59 will engage as the tension on the cable 63 is slackened. The jaws of the vise with the lever 58 in position against the housing 29 may consequently be retained in an open position until said lever is withdrawn from the side of the housing and the toggle slide 40 allowed to assume the extreme left position, as shown in Fig. 1, under the influence of the spring 42. The lever 58 consequently serves as a means for maintaining the jaws of the vise open, notwithstanding the condition of tension of the cable 63. Therefore, when articles are to be accurately located in the jaws of the vise, which location cannot be successfully accomplished during the period of one reciprocation of the milling machine bed plate, the lever 58 is used to maintain the jaws of the vise open until such location has been properly determined, following which the lever 58 is drawn away from the side of the housing which will permit the toggle mechanism to act and clamp the article between the jaws of the vise.

When it is desired to manually clamp articles between the jaws of the vise, the cable 63 is removed from the stationary stud on the machine and the lever 58 is maintained in a position away from the housing by means of the catch or dog 61. Under these circumstances the toggle mechanism is not affected by the reciprocations of the bed plate 11. The toggle mechanism may then

be operated manually by inserting any suitable handle in the bifurcated portion 47 of the link 36 which will permit the operator to manually move the toggle mechanism into any position desired, the jaws of the vise being automatically closed by the spring 42 as soon as the displacing force applied to the handle is removed. Obviously when the vise is operated manually it may be automatically held open by operating the lever 58 as hereinbefore explained. This manual operation of the toggle mechanism is principally useful during adjusting operations of the toggle vise, after which the operation of the mechanism may be changed for automatic or semi-automatic operations.

Referring now to Figs. 6 and 7, 70 represents the column of the milling machine which carries the horizontal table 71 on which the reciprocating bed 11 of the milling machine is mounted. These drawings show a milling cutter 72 which is served with parts by toggle vises 73 and 74 attached to either end of the bed plate 11. As there indicated, the cables 63 of these toggle vises are connected to a stationary stud 75 on the machine, and as the bed 11 reciprocates to and fro, these cables 63 are alternately slackened and put under tension and the jaws of the vises open and close as hereinbefore described.

In a milling machine such as shown in Figs. 6 and 7, in which two vises are used, the direction of rotation of the cutter may be either reversed after each operation so that the articles will all be milled by the cutter cutting in the same direction with respect to the fixed jaw of the vise, in which case two cutters may be used, one for each vise; or the articles may be milled with one cutter rotating in the same direction for the articles contained in both vises. Obviously the method of milling these articles with a pair of toggle vises, incorporating the invention herein described, may be accomplished in a large variety of ways without departing from the scope or spirit of the invention as hereinafter claimed.

Fig. 8 illustrates in diagrammatical form the method of mounting the vise on a milling machine for a longitudinal feed from the right-hand side of the milling cutter. In this case the cable 63 is looped back to a stationary stop 76 located in back of the roller 64. When the vise is thus mounted on the machine the jaws thereof will be closed to hold the article to be operated upon when the vise is moving toward the left, at which time the article will be operated on by the cutter 77. When the vise moves toward the right the cable 63 will be drawn taut and the vise will be opened.

Fig. 9 illustrates in diagrammatical form the method of mounting the vise on a milling machine which is arranged for a vertical feed. In this case the fixed stud 78, to which the cable 63 is attached, is mounted above the roller 64 on the vise. With the cable thus located it will be slackened when the vise moves upwardly, at which time the article to be operated upon will be firmly held between the jaws of the vise and will be thus held as the article approaches the milling cutter 79. When the vise is moved down, the cable 63 will be drawn taut and the vise will open, so that the article operated on can be removed.

It will be evident from the various applications indicated in Figs. 6 to 9 inclusive that by properly locating the fixed stud, to which the cable 63 is attached, the vise can be arranged for automatic operation for any desired movement of the movable table or bed of the milling machine.

The vise as herein described is particularly useful for automatic milling operations, but obviously is not limited thereto. When utilized for automatic operations of this nature, the work of the operator is reduced to merely dropping the work between the jaws of the vise when these jaws are open and removing the article after the work has been performed thereon. Thus with a machine such as is depicted in Figs. 6 and 7 the operator can very readily feed articles to both vises as they reciprocate to and fro under the cutter, and because of the automatic action of the clamping means, the speed and efficiency of this operation will be greatly increased.

Since the vise is adapted for automatic, semi-automatic, or manual operation, its utility is greatly enhanced, since it is thus capable for use with work which is extremely delicate and difficult to perform, under which circumstances the manual or semi-automatic operation will be utilized, as well as for work of a rougher character, when the automatic operation of the vise can be used. The manual operation of the vise also facilitates the setting and adjustment thereof for subsequent automatic operations. The vise is likewise designed for comparatively delicate adjustments of pressure between the jaws of the vise. This pressure can obviously be regulated by the position of the links of the toggle, the position of the links being controlled by the adjusting rod or bolt 20 and its associated adjusting bar or block 23. Likewise since the vise is always closed automatically, any pressure for which it is adjusted will be applied with substantial uniformity for succeeding operations of the vise.

The invention is obviously not limited to the specific means herein illustrated and described, but is capable of a large number of variations and many applications without

departing from its spirit and scope, as set forth in the following claims.

What is claimed is:

1. In a device of the character described, the combination with a movable carriage, of a stationary and a movable jaw, and toggle means operated by the movement of said carriage for automatically moving said movable jaw from and toward said stationary jaw.

2. In a device of the character described, the combination with a movable carriage, of an article clamping means, and toggle means operated by the movement of said carriage to automatically open and close said clamping means.

3. In a device of the character described, the combination with a movable carriage, of a clamping means, toggle means operated to open and close said clamping means, and means operated by the movement of the carriage to operate said last-mentioned means.

4. In a device of the character described, the combination with a movable carriage, a base plate, and means to rigidly secure said base plate to said carriage, of a stationary jaw integral with said plate, a reciprocating slide, a movable jaw integral with said slide, and toggle means operated by the movement of said carriage to reciprocate said slide and thereby open and close said jaws.

5. In a toggle vise mechanism, the combination with a movable carriage, of a stationary jaw, a movable jaw, a toggle joint interconnecting said stationary and said movable jaws, an adjusting means interposed between said stationary jaw and toggle joint connection whereby the opening between said jaws can be adjusted, and means operated by the movement of said carriage to actuate said toggle and to reciprocate said movable jaw.

6. In a device of the character described, the combination with a movable carriage, of a stationary jaw, a movable jaw, jaw operating means interconnecting said stationary and said movable jaws, an adjusting means interposed between said stationary jaw and said jaw operating means whereby the opening between said jaws can be adjusted, and means operated by the movement of said carriage to actuate said jaw operating means and to reciprocate said movable jaw.

7. In a toggle vise mechanism, the combination with a movable carriage, of an article clamping means, a toggle mechanism, means automatically operated by the movement of said carriage to bend the knee of said toggle mechanism and open said clamping means, and means automatically operated thereafter to straighten the knee of said toggle and close said clamping means.

8. In a toggle vise mechanism, the combination with a movable carriage, of an article clamping means, a toggle mechanism, a toggle slide integral with the operating link of said toggle mechanism, and means automatically operated by the movement of said carriage to reciprocate said slide thereby alternately opening and closing said clamping means for each reciprocation of the slide.

9. In a toggle vise mechanism, the combination with a movable carriage, of an article clamping means, a toggle mechanism, a toggle slide connected to the operating link of said mechanism, a cable connected to said slide which is under tension as said carriage moves in one direction thereby moving said slide and bending the knee of said toggle and opening said clamping means, and means operated to move said toggle slide in the opposite direction when the movement of said carriage relaxes the tension in said cable whereby the knee of said toggle is straightened thereby closing said article clamping means.

10. A toggle vise mechanism comprising in combination, a movable carriage, a base plate, means to rigidly secure said plate to said carriage, a stationary jaw integral with said plate, a reciprocating slide, a movable jaw integral with said slide, a toggle mechanism interconnecting said stationary and said movable jaws, a toggle slide integral with the operating link of said toggle mechanism, means operated to move said toggle slide thereby bending the knee of said toggle mechanism and moving said reciprocating slide to draw said movable jaw from said stationary jaw, and means operated thereafter to move said toggle slide in the opposite direction thereby straightening the knee of said toggle to move said reciprocating slide in the opposite direction and said movable jaw toward said stationary jaw.

11. A toggle vise mechanism comprising in combination, a movable carriage, a stationary jaw, a movable jaw, a toggle mechanism, means connecting one of the links of the knee of said toggle mechanism to said movable jaw, an adjusting means connecting the other link of the knee of said toggle mechanism to the stationary jaw whereby the distance between said jaws may be readily adjusted, and means automatically operated to bend and straighten the knee of said toggle mechanism by the movement of said carriage whereby said movable jaw is moved toward and away from said stationary jaw.

12. In a device of the character described, in combination, a movable carriage, an article clamping means, a toggle mechanism, means to automatically operate said toggle mechanism by the movement of said carriage to open and close said clamping mech-

anism, and means operated to maintain said clamping means open, said clamping means being unaffected by the continued movement of said carriage.

13. In a device of the character described, in combination, a stationary jaw, a movable jaw, a toggle mechanism, means connecting one link of the knee of said mechanism to the movable jaw, adjusting means connecting the other link of the knee of said mechanism to said stationary jaw, said adjusting means being operable to adjust the space intervening between said jaws, means for opening said jaws, and means automatically operated thereafter to close said jaws.

14. In a device of the character described, in combination, a clamping mechanism, a toggle mechanism, means for operating said toggle mechanism to open said clamping mechanism, means automatically operated thereafter to close said clamping mechanism, and means to maintain said clamping mechanism open against the action of said automatically operated means.

15. In a device of the character described, in combination, an article clamping means, means operated to open said clamping means, and means operated to close said clamping means, said last-mentioned means producing a substantially uniform pressure by said clamping means for successive operations thereof.

16. In a device of the character described, the combination with a movable carriage, of an article clamping means, means operated to open and close said clamping means, and means operated by the movement of the carriage to operate said last-mentioned means whereby a substantially uniform pressure will be exerted for successive operations of said clamping means.

17. In a device of the character described, in combination, a movable carriage, an article clamping means, a toggle mechanism, and means to automatically operate said toggle mechanism by the movement of said carriage to open and close said clamping means, said means producing a substantially uniform pressure for successive clamping operations of said clamping means.

18. In a toggle vise mechanism, the combination with a movable carriage, of an article clamping means, a toggle mechanism, means automatically operated by the movement of said carriage to bend the knee of said toggle mechanism and open said clamping means, means automatically operated thereafter to straighten the knee of said toggle and close said clamping means, said means producing a uniform clamping pressure for successive operations thereof and for a given adjustment, and means for adjusting the position taken by the knee of said toggle during the clamping operation to change the amount of pressure which is exerted.

19. In a device of the character described, the combination with a movable carriage, of a clamping mechanism, a toggle mechanism for operating said clamping mechanism, adjusting means associated with said toggle mechanism for varying the pressure exerted by said clamping mechanism, and means operated by the movement of said carriage to actuate said toggle mechanism and said clamping mechanism and whereby a uniform pressure is exerted by said clamping mechanism for successive operations thereof.

In witness whereof, I hereunto subscribe my name this 16th day of June, 1917.

JOHN STANLEY STULL.