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1,454,993

H. R. BOTHWELL

VICE

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Fig. 1.

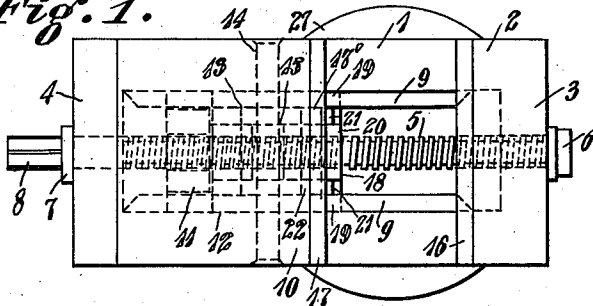


Fig. 3.

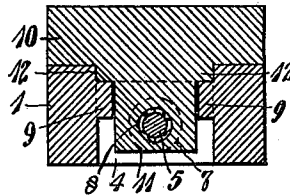


Fig. 2.

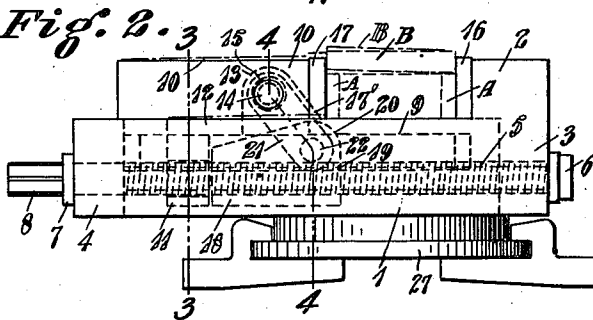


Fig. 4.

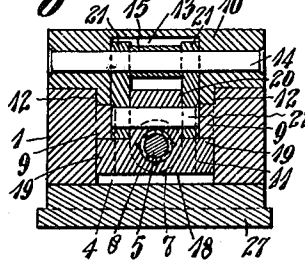


Fig. 5.

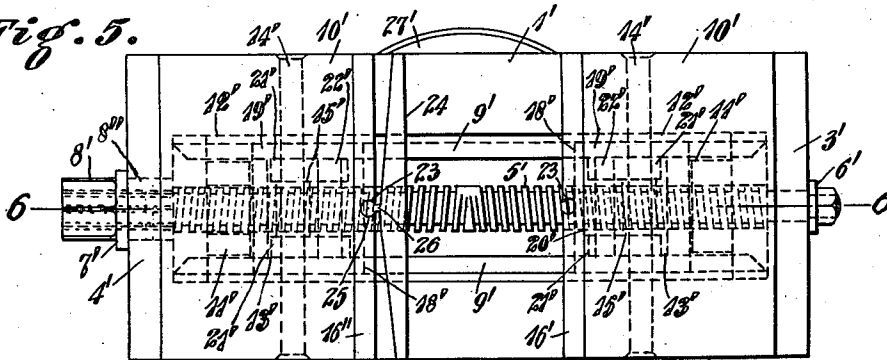


Fig. 6.

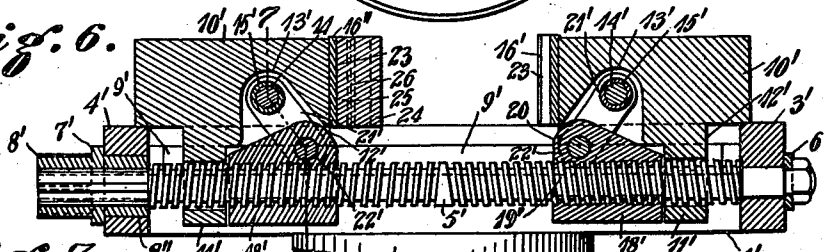
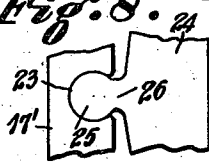


Fig. 7.



Fig. 8.



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UNITED STATES PATENT OFFICE.

HENRY R. BOTHWELL, OF CINCINNATI, OHIO, ASSIGNOR TO SAMUEL NEWMAN, OF CINCINNATI, OHIO.

VISE.

Application filed July 1, 1921. Serial No. 481,872.

To all whom it may concern:

Be it known that I, HENRY R. BOTHWELL, a Canadian subject of the King of Great Britain, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Vises, of which the following is a specification.

My invention relates to vises, and more especially to vises used to hold work on machine tools, such as shapers and the like, where accuracy of adjustment is especially important.

The object of my invention is to avoid the tilting of the work when the vise is tightened thereon. A further object is to provide a vise meeting that requirement, which will be as readily opened as is any ordinary vise. Another object is to provide such a vise for clamping tapered or other irregularly shaped pieces, and avoiding the tilting. Another object is to provide for ample strength, and to relieve the screw of all undue strains, when operating according to my invention as before stated. Other objects will appear in the course of the ensuing description.

I attain these objects by the device illustrated, for example, in the accompanying drawing, in which—

Figure 1 is a plan view of a vise embodying my invention with respect to only one of the jaws thereof;

Fig. 2 is a side elevation of the vise;

Fig. 3 is a vertical cross-section on a plane corresponding to the line 3—3 of Fig. 2;

Fig. 4 is a similar section on planes corresponding to the broken line 4—4 of Fig. 2;

Fig. 5 is a plan view of a vise embodying my invention with respect to both jaws thereof, being to this extent a modification of the previous example of Figs. 1 to 4, inclusive;

Fig. 6 is a vertical lengthwise section on a plane corresponding to the line 6—6 of Fig. 5;

Fig. 7 is a vertical cross-section on planes corresponding to the broken line 7—7 of Fig. 6; and

Fig. 8 is a partial detail plan view of the taper-holding jaw and its mounting.

In the example of Figs. 1 to 4, inclusive, the base 1 and the fixed jaw 2 are integral; the jaw 2 projecting up from one end of the base 1, which latter is elongated and rectangular in shape. The base 1 has its in-

terior slotted lengthwise, from near one end to near its other end; and the remaining end parts 3 and 4, at the middle, form bearings for the screw 5 extending lengthwise of the vise with a collar 6 fixed on its end at the fixed-jaw end of the vise, and having at the other end a flange 7 bearing against the outside of the base part 4 to prevent, in conjunction with the collar 6, end play of the screw. Past this flange 7 the screw has a square end part 8 for application of a wrench. These details are similar to those of usual vises of this character, such, for instance, as are used on shapers.

The slotted interior has along opposite lengthwise sides the ribs 9 facing toward each other across the slot, near the top of the base, and running from end to end of the slot; all surfaces of these ribs 9, and the narrow part above and the wider part below, of the slot walls, being made parallel with the screw 5.

The movable jaw 10 projects above the base 1 coextensively with the fixed jaw 2, with its bottom slidable on the base top; and the lug 11 projects from the bottom of the jaw 10 down between the ribs 9 of the base, with an opening through which the screw 5 extends loosely. The bottom middle part 12 of this jaw 10 from the lug 11 backward, projects down to fit snugly between the narrow upper parts of the base-slot walls, above the ribs 9, to hold the jaw 10 substantially parallel with the base and cause it to meet the fixed jaw 2 parallel to that jaw, as usual in vises. The lug 11 is located far enough from the outer or front end of the jaw 10 to clear the front end of the base slot when the front end of the jaw 10 reaches the front end of the base. The jaw 10 extends somewhat farther rearwardly from this lug 11 than it does forwardly; being amply long to have adequate guiding by its part 12 in the base slot upper part. In the bottom of this rear part of the jaw 10 is the middle recess 13, with its front end vertical, its top curved, and its rear end inclined out to the rear end of the jaw; this recess 13 being about the same in width as the space between the base ribs 9. A pin 14 extends transversely through the jaw 10, about concentric with the curved top of this recess 13, with a collar 15.

The rear or fixed jaw 2 has the facing 16, and the movable jaw 10 has the facing 17, 110

as usual in vises; such facings being of hardened steel to preserve their accuracy. The facing 17 of the jaw 10, as here shown, has its lower edge recessed at 17' coincident with the recess 13, to form a continuation of the inclined rear wall thereof.

The nut 18 is rectangular, with the screw 5 threaded through it, and with its sides bearing against the opposite wider lower parts of the base-slot walls, and the side parts 19 of its top, which are much lower than the middle part 20 of its top, bearing up against the bottoms of the respective ribs 9 of the base. The higher middle part 20 has its top sloped from its rear end, which is rounded down to the rear end of the nut; the front end of the nut being lower, to go under the movable jaw 10 between the recess 13 and the lug 11, while the higher rounded rear part goes under the rear recessed part of the jaw 10 and its facing 17. Also, this middle part 20 is much narrower than the space between the ribs 9 of the base; admitting the links 21 at its opposite sides between it and these ribs 9, which links 21 depend from the pin 14 of the movable jaw 10, spaced apart by the collar 15 therearound. A pin 22 passes transversely through these links 21 and through the part 20 of the nut 18, pivoting them to the nut. Thus connected, these links 21 incline downward rearwardly, from the jaw 10 to the nut 18; being accommodated in this position by the inclined rear wall of the recess. All walls of this recess 13, at rear, above, and in front, leave ample clearance for these links to swing slightly on their pivot pins 14 and 22; and the nut 18 and lug 11 are so proportioned and positioned that slight forward movement of the nut 18 relatively to the movable jaw 10 results in engagement of the nut 18 with the lug 11 to push the movable jaw 10 forward, when the screw 5 is turned in one direction.

When the screw 5 is turned in the opposite direction, the nut 18 acts, through the medium of the links 21, to pull the movable jaw 10 backward toward the fixed jaw; and the action also is to pull the movable jaw 10 downward closely against its sliding bearing on the base top. The advantage of this is illustrated in Fig. 2, where parallel-sided blocks A of equal height (indicated by broken lines) are placed against the respective jaw faces, and a piece B (similarly indicated,) which may be a piece to be operated upon, is supported by the blocks A and is to be clamped by the vise. In usual vises, due to the inevitable slight looseness in the screw-and-nut and the jaw-guiding bearings, the movable jaw tilts upward when tightened, so that the piece B would be tilted as indicated by the dot-and-dash lines in Fig. 2. When the vise is well made, as such vises usually are, this tilting is very slight,

apparently; but is sufficient to be very objectionable where very accurate work is required—as for instance, to shape the upper side of the piece B perfectly parallel with the lower side, or within a fraction of a thousandth of an inch of perfect parallelism. With the usual vise, such an operation with the aid thereof is practically impossible, because the end next to the movable jaw will rise several thousandths of an inch above the other end, away from the supporting block A, permitting this block to be pulled out freely, while the other block, next to the fixed jaw, is firmly held.

With my invention, comprising means to pull down on the movable jaw while tightening it against the work, this tilting is avoided, and the work can be held down tight upon both supporting blocks, insuring that the shaping of the upper side will be parallel with the lower side, for instance, in the example shown. It thus will be seen that any desired setting of the work, for any desired shaping or cutting operation on one side relative to two or more points on the opposite side of the work, can be preserved in the tightening operation, so that accuracy is possible with machines of the kinds depending upon such vises to hold the work, whereas heretofore some inaccuracy was unavoidable.

I have further found that, due to springing of the base 1 and fixed jaw 2 in such a vise as that of Figs. 1 to 4, inclusive, especially where my improvement in the movable jaw is used, there will be some tilting of the supposedly fixed jaw 2; so that although the movable jaw, if provided with my improvement, will hold the work down firmly to its required position, the side of the work next to the jaw 2 will rise slightly. Therefore, to overcome all of this tilting, at either side, I recommend the example of Figs. 5 to 7, inclusive, especially when very accurate setting is desired.

This vise has the base 1' of elongated rectangular shape, slotted lengthwise between end parts 3' and 4', which parts form bearings for the screw 5' extending lengthwise of the vise with a collar 6' fixed on it outside the rear end 3'. For one-half its length between the slot ends, this screw 5' has right-hand threads, and for the other half of this length it has left-hand threads. To permit of its insertion when the other working parts, to be described, have been assembled on it, the front-end part 4' has its opening much larger than the screw diameter; and a head 8' is keyed on the reduced end part of the screw 5', with a journal 8'' fitting in the opening to form the bearing for the screw at this end. Outside the end part 4' this head 8' comprises the flange 7', and the end part of the head is squared to receive a wrench.

The slotted interior of the base 1' has the side ribs 9' similarly to the previous example. Two movable jaws 10' have their bottoms slidable on the base top at the sides of the slot, with lugs 11' projecting down into the slot between the ribs 9, and with the downwardly projecting middle part 12' for part of the length of each jaw 10' to guide the jaws parallel to the base and screw, and to each other. Each jaw has the recess 13' similar to that of the jaw of Figs. 1 to 4, inclusive; and with a pin 14' transversely through the jaw across the recess, as in that example, and having the collar 15' between the links 21'.

The facings 16' and 16'' of these jaws 10' are provided similarly to those of the other example; but here I have illustrated how I provide for holding tapered or irregular pieces. Each jaw face 16' or 16'' has, at its middle, from top to bottom, a bore 23 cutting slightly through the face (Fig. 8,) and the auxiliary jaw 24 is provided, of the height and width of the jaws 10', having at its middle, running from top to bottom, a cylindrical detent-rib 25 joining the jaw 24 by a neck 26 from which the adjacent side of the jaw 24 recedes out to its opposite ends; the opposite, or free, face of the jaw 24 being straight. The detent-rib 25 fits snugly in either bore 23, with the neck 26 extending out through the face where the bore cuts through and clearing the sides of the slot thus formed; so that the auxiliary jaw 25 can swing in a horizontal plane with this rib 25 in the bore 23 as a bearing. Thus the straight face of the jaw 24 can adjust itself to one side of a tapered or irregularly shaped piece, the other side of which is held against the opposite jaw of the vise.

In this vise, the facings 16' and 16'' both are mounted to escape the recesses 13', avoiding recessing of their bottom edges, and accommodating the bores 23 as just described. The nuts 18' are similar to the single nut of the previous example, with side parts 19' bearing up against the ribs 9' and the middle parts 20' receiving the links 21' on the pins 22' transversely therein, to connect to the respective jaws 10' by means of the links 21' pivoting on the pins 14' thereof, and inclining downward in each jaw toward the other jaw. Also, these nuts 18' coact with the lugs 11' of the respective jaws 10' as before described for those parts in the previous example.

Thus, when the screw 5' is turned in one direction, its oppositely directed threads will cause the nuts 18' to recede from each other, engaging the lugs 11' and forcing the jaws apart; and when turned in the opposite direction, the nuts 18' act through the links 21' to pull the jaws toward each other and to pull the jaws downward closely against their sliding bearings on the base

top. Therefore the same advantage is derived for both jaws, that is derived for the one jaw in the first example; and a piece B of Fig. 2, on blocks A as there shown, would here be pulled down tightly against both blocks A while the vise is being tightened, as I have found in practice.

I also have found that, when an auxiliary jaw 24 is used for holding a tapered or irregularly shaped piece in the vise, it also will be prevented from tilting up, because its long pivot bearing of its rib 25 in the bore 23 makes it practically unitary with the jaw face containing the bore 23, so far as concerns up-and-down tilting, but leaves it free to swivel sidewise as described herein. It will be understood that the auxiliary jaw 24 is applicable to either the fixed or movable jaw of the first example; although I have illustrated it only with the vise having both jaws movable, it is not peculiar to that example.

In either example, the bearing of the nut side parts 19 or 19' up against the ribs 9 or 9' relieves the screw of the jaw-pulling reaction as transmitted through the links.

The vises are shown on pedestals, 27 in Figs. 1 to 4, or 27' in Figs. 5 to 7, inclusive, to swivel horizontally, as is usual with shaper vises. However, it will be understood that these mountings, as well as details of construction of the vises themselves, may be varied, depending upon circumstances or the type of vise required.

Therefore, while certain constructional details are deemed preferable, and I have shown and described these rather specifically, I do not wish to be understood as being limited to such precise showing and description, but having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a vise, a pair of jaws, one jaw being movable toward and away from the other jaw, guiding means for said jaws, a screw, a nut on said screw, and a member movably engaging said nut and said one jaw, for simultaneously forcing said one jaw toward the other jaw and toward said guiding means.

2. In a vise, a pair of jaws, one jaw being movable toward and away from the other jaw, a guide for the movable jaw, forcing means below said jaws operatively related to said one jaw for simultaneously forcing said one jaw toward said other jaw and toward said guide, and means rigid on said one jaw, extending from this jaw down to said forcing means whereby said forcing means forces said one jaw away from said other jaw by pressure substantially parallel with said guide.

3. In a vise, a pair of jaws, one jaw being movable toward and away from the other jaw, guiding means for said jaws, a

screw, a nut on said screw, a member movably engaging said nut and said one jaw, for simultaneously forcing one jaw toward the other jaw and toward said guiding means, and means rigid on said one jaw, extending from this jaw to said nut whereby said nut forces said one jaw away from the other jaw by pressure substantially parallel with said guiding means.

10 4. In a vise, in combination with a base, a screw turning in said base on an axis lengthwise of said base, and a pair of jaws on said base, one of said jaws being movable lengthwise along said base toward and
15 away from the other jaw, a link connected to said screw for movement thereby and connected to said movable jaw and inclining away from said other jaw from said screw to said movable jaw.

20 5. In a vise, in combination with a base, a screw turning in said base on an axis lengthwise of said base, and a pair of jaws on said base, one of said jaws being movable lengthwise along said base toward and away
25 from the other jaw, a nut moved by said screw along said base, and a link pivoted to said nut and pivoted to said movable jaw, inclined away from said other jaw from said nut to said movable jaw.

30 6. In a vise, in combination with a base, a screw turning in said base on an axis lengthwise of said base, and a pair of jaws on said base, one of said jaws being movable lengthwise along said base toward and away
35 from the other jaw, a nut moved by said screw along said base, a link pivoted to said nut and pivoted to said movable jaw, inclined away from said other jaw from said nut to said movable jaw, and a guide along
40 said base, on which said nut bears toward said movable jaw when moving toward said other jaw.

45 7. In a vise, in combination with a base, a screw turning in said base on an axis lengthwise of said base, and a pair of jaws on said base, one of said jaws being movable lengthwise along said base toward and away
50 from the other jaw, a nut moved by said screw along said base, a link pivoted to said nut and pivoted to said movable jaw, inclined away from said other jaw from said nut to said movable jaw, and a projection on said movable jaw, engaged by said nut
55 when said nut moves away from said other jaw.

60 8. In a vise, in combination with a base, a screw turning in said base on an axis lengthwise of said base, and a pair of jaws on said base, one of said jaws being movable lengthwise along said base toward and
65 away from the other jaw, a nut moved by said screw along said base, a link pivoted to said nut and pivoted to said movable jaw, inclined away from said other jaw from said nut to said movable jaw, a projection

on said movable jaw, engaged by said nut when said nut moves away from said other jaw, and a guide along said base, on which said nut bears toward said movable jaw when moving toward said other jaw. 70

9. In a vise, in combination with a base, a screw turning in said base on an axis lengthwise of said base, having oppositely disposed threads on opposite end parts, a pair of jaws on said base, each of said jaws
75 being movable lengthwise along said base toward and away from the other jaw, and links connected to respective oppositely threaded end parts of said screw for movement thereby in opposite directions, and connected to respective jaws and inclining away
80 from each other from said screw to said jaws.

10. In a vise, in combination with a base and a screw turning in said base on an axis lengthwise of said base, a pair of jaws on said base, one of said jaws being movable lengthwise along said base toward and away from the other jaw and having a recess in its bottom, a pin in said jaw transversely through said recess, a nut traveling
90 along said screw, having lower side parts and a higher middle part, links in said recess, pivoted on said pin and projecting to opposite sides of said middle part of said
95 nut, a pin transversely through said links and said middle part, and ribs along said base, against which said side parts of said nut bear upward.

11. In a vise, in combination with a base and a screw turning in said base on an axis lengthwise of said base, a pair of jaws on said base, one of said jaws being movable lengthwise along said base toward and away
100 from the other jaw and having a recess in its bottom, a pin in said jaw transversely through said recess, a nut traveling along said screw, having lower side parts and a higher middle part, links in said recess, pivoted on said pin and projecting to opposite
105 sides of said middle part of said nut, a pin transversely through said links and said middle part, ribs along said base, against which said side parts of said nut bear upward, and a projection on the bottom of
110 said movable jaw, between said ribs, to be engaged by said nut on movement away from said other jaw.

12. In a vise, a pair of jaws with substantially parallel faces, one of said jaws
120 being movable toward and away from the other jaw, and one of said jaws having a bore substantially parallel with its face, cutting through said face in a segment of said bore, and an auxiliary jaw having a neck
125 extending through said jaw face where cut through, with a rib removably fitting in said bore, whereby said auxiliary jaw pivots in said bore to swing between said pair of jaws. 130

13. In a vise, a pair of movable jaws, one jaw being movable toward and away from the other jaw, a guide for this one jaw, and forcing means for simultaneously forcing
5 said one jaw toward said other jaw and forcing both of said jaws toward said guide.

14. In a vise, in combination with a base, a pair of jaws on said base, both movably mounted, one of said jaws being movable
10 lengthwise along said base toward and away from the other jaw, a screw extending along said base, a link connected to a threaded part of said screw for movement thereby along said base and connected to said one
15 of said jaws, and a link connected to another part of said screw whereby it allows the screw to turn, and connected to the other one of said jaws, said links inclining away from each other from said screw to said
20 jaws.

15. In a vise, a pair of jaws, one of said jaws being movable toward and away from the other jaw, and one of said jaws being tiltable in a certain plane relatively to the
25 other jaw, and means to prevent tilting of

one jaw away from the other in another plane when an object is clamped between said jaws.

16. In a vise, in combination with a base having a lengthwise slot and openings in its
30 opposite ends, at the ends of said slot, a screw in said slot with its end parts in said openings and having oppositely disposed threads on opposite end parts, a pair of jaws movable along said slot, operative
35 connections from the respective jaws to said oppositely disposed threads, to be assembled on said screw before said screw is assembled with said base, one of said openings being materially larger than the cross-section
40 of said screw thereat, permitting said screw to be inclined therein for assembly of said screw with said base with said connections assembled thereon, and a head fixed on
45 said screw, projecting outside the respective end of said base, and projecting into said larger opening and forming a journal for said screw in said opening.

HENRY R. BOTHWELL.