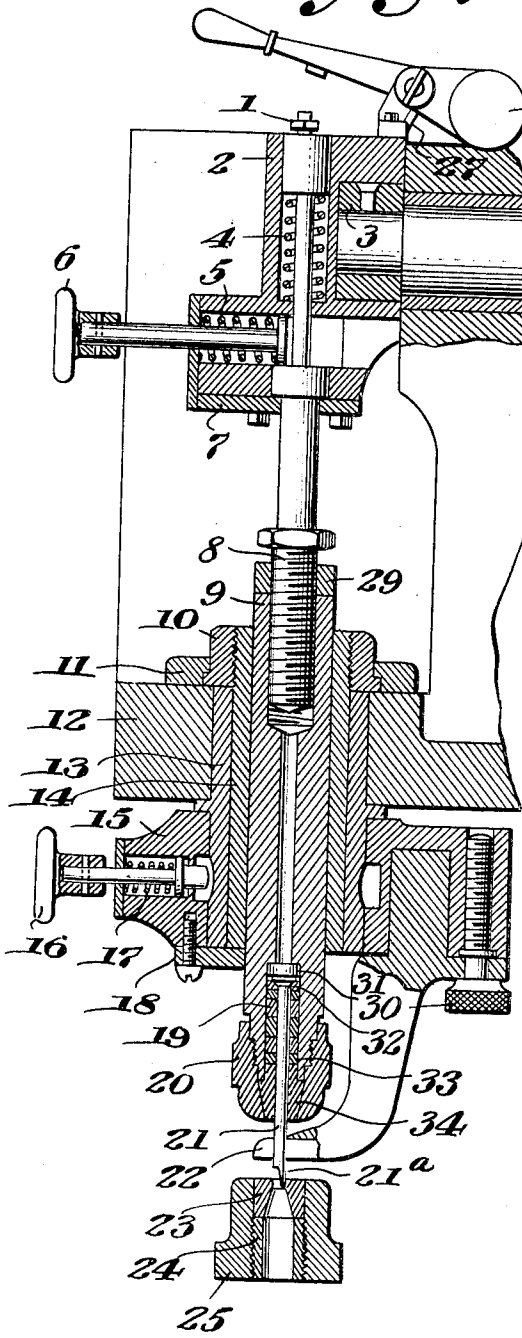
May 15, 1934. K. J. CHAPMAN 1,958,941

TOOL HOLDER FOR NIBBLING MACHINES

Filed Oct. 16, 1930 2 Sheets-Sheet 1

Fig. 1.



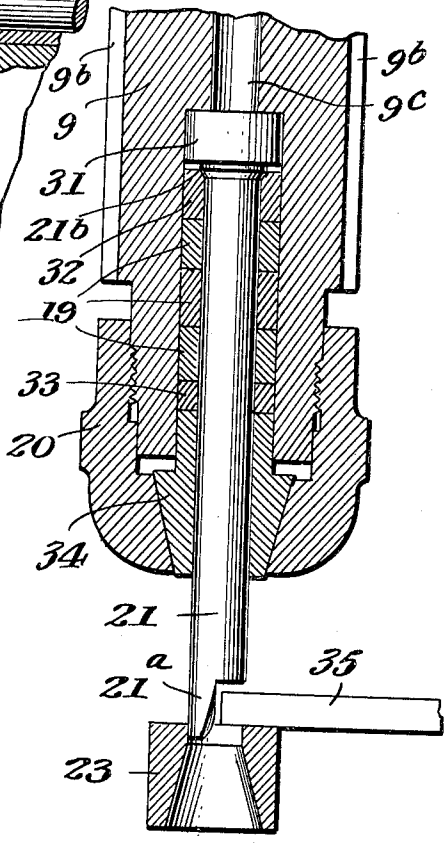


Fig. 2.

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TOOL HOLDER FOR NIBBLING MACHINES

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2 Sheets-Sheet 2

Fig. 3.

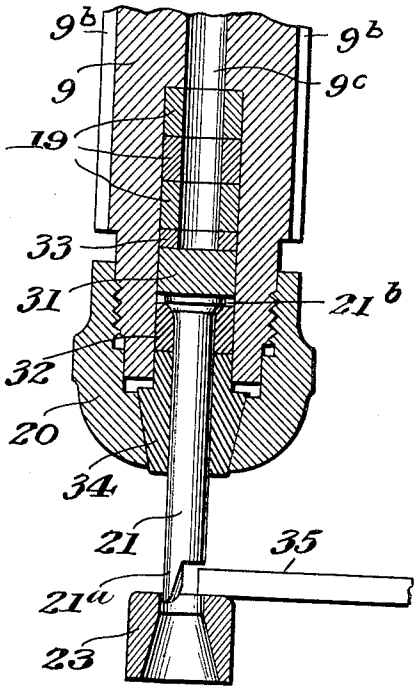


Fig. 8.

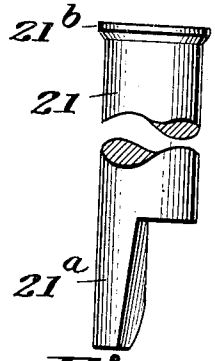


Fig. 9.

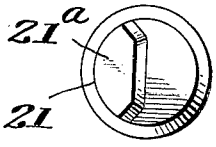


Fig. 10.

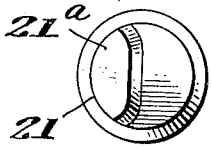


Fig. 11.

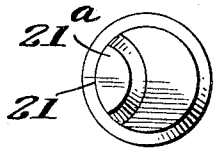


Fig. 12.

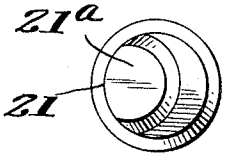
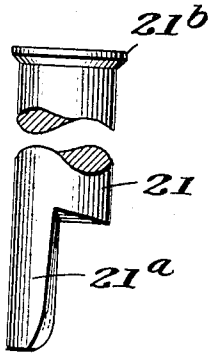


Fig. 4.



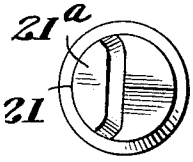
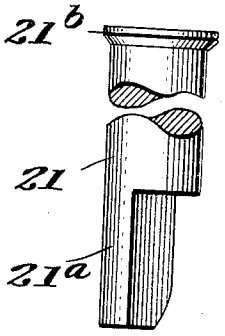


Fig. 5.

Fig. 6.



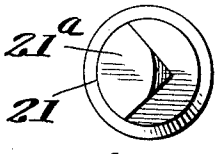


Fig. 7.

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UNITED STATES PATENT OFFICE

1,958,941

TOOL HOLDER FOR NIBBLING MACHINES

Kenneth J. Chapman, Knoxville, Tenn., assignor to W. J. Savage Company, Inc., Knoxville, Tenn., a corporation of Tennessee

Application October 16, 1930, Serial No. 489,161

15 Claims. (Cl. 279—89)

Heretofore, considerable difficulty has been experienced in the use of holders for punches in connection with those sheet metal cutters known as "nibbling" machines. Among the troubles encountered in the use of holders for punches for these machines are, inability of the punch holder to hold the punch against the stripping action of the sheet material being nibbled or cut; prevention of the punch from being pushed up into the ram which carries the punch holder; inability to prevent the punch from being deflected laterally, which results in the cutting edge of the punch coming in contact with the edge of the die and ruining the punch and the die; inability of the tool holder to securely hold punches of different lengths or a punch which, having become broken or dull and redressed or re-ground, becomes shortened.

The object of my invention is to overcome these difficulties by the provision of an improved tool holder and, further, to provide means, such as a turret, whereby the direction of cutting by the punch, without requiring turning of the work, may be readily accomplished and, further, enabling the cut in the work to be started at any desired part in the surface of a sheet where a suitable entry hole for the punch has been provided. In the treatment of heavy-gauge work, such a hole is necessary but if the work is of thin stock, the pilot of the punch will penetrate it and obviate the necessity of providing an entry hole.

It has been found in the practical use of my tool holder that all of the objections above recited are satisfactorily overcome. In my tool holder, positive abutment means of improved construction are provided to back up the punch, regardless of the length thereof and at the same time, to clamp and hold the punch at all times in correct alignment with the cooperating die and to prevent lateral flexing of the punch or lateral distortion as well as shifting of the punch in the direction of its longitudinal axis. The present tool holder not only prevents the punch from being pushed up into the ram and from being deflected sidewise but it also prevents any stripping action.

An embodiment of the invention which has been successfully used in connection with nibbling machines, is hereinafter described in connection with different punches, and disclosure thereof appears in the accompanying drawings, in which:

Figure 1 is a vertical section, broken away, showing the present improvements used in connection with a nibbling machine;

Fig. 2 is a detail sectional view through the improved tool holder and the die, the punch and the work being shown in full lines, all of the washers being below the abutment disc, as when the punch is of the usual length;

Fig. 3 is a view like Fig. 2, the washers being located above the abutment disc, as when the punch has been shortened by re-dressing;

Fig. 4 is a side view of a punch having an improved head, forming a part of the present invention, the shank being broken away, one form of pilot and cutting edges being shown;

Fig. 5 is an end view thereof looking toward the pilot;

Fig. 6 is a view similar to Fig. 3, disclosing another form of pilot and cutting edges;

Fig. 7 is a bottom view of the pilot of Fig. 5;

Fig. 8 is a side view of a punch having another form of pilot and cutting edges; and

Figs. 9, 10, 11 and 12 are bottom or end views showing different forms of pilots and cutting edges which may be used in connection with the punch of Fig. 7.

The improved tool holder is shown in Fig. 1 in connection with so much of a nibbling machine as will illustrate the manner of use of the invention and its purpose. The frame appears at 12 in fragmentary form and only so much is shown as discloses the end of the overhanging arm which carries the parts that operate the ram and the punch holder.

The rotating shaft 28, driven in any suitable manner, carries an eccentrically arranged bearing 3 which co-operates with the vertically reciprocatory, and suitably guided, crosshead 2, from which motion is transmitted to the ram, tool holder, and other movable parts. The ram 9 is adapted for vertical reciprocation within a split tapered bronze bushing 14 which has screw threads on its upper end with which is engaged an adjusting nut 10. The nut enables adjustment of the bushing 14 so that it will precisely fit the ram 9, which reciprocates in said bushing. After adjustment has been accomplished, a plate 11 which engages the flange on the nut 10, is securely fastened to the frame 12 by cap screws (not shown). Surrounding the bushing 14 is a holder 14' which is prevented from moving vertically within frame 12 and hence holds the parts now to be described against vertical movement, although permitting turning movement thereof on the holder 14'. A turret 15 is rotatably mounted on the lower part of the holder 14' and is

adapted to be locked at any part of its turning by a spring actuated lock pin 16 whose spring 17 urges the pin forwardly. If desired, the turret may be freely turned or moved to any point so that cutting or nibbling in any desired direction will be permitted. Secured to the bottom of the turret 15 is a key 18 which engages a key seat 9^b on the ram 9 (see Fig. 2), whereby the ram 9 is caused to rotate with the turret 15, although reciprocatable up and down in relation to said turret.

Secured to the turret 15 by a thumb screw 30, is a stripper 22. A part of the stripper projects into a bore in the turret 15 and said stripper has a lateral extension engaged with a blank part of the screw 30 in consequence of which the stripper 22 may be adjusted upwardly or downwardly in relation to the turret although, in effect, rigid with said turret. This adjustment is for the purpose of compensating for whatever thickness of stock is to be cut and to enable a template to be used when necessary, without there being any interference therewith by the stripper.

The die appears at 23, being set within a cavity in a supporting block or die holder 25, which carries an internally hollow screw 24 on which the die 23 is supported. The screw 24 enables dies of different thicknesses to be used or a die to be redressed by grinding its top surface after it becomes dull.

The ram 9 carries the punch 21 which cooperates with the die 23, said punch being straddled by the stripper 22.

My improved punch or tool holder is shown more in detail in Figs. 2 and 3. The punch or tool 21 is provided at its upper end with a head 21^b and at its lower end with a pilot 21^a and cutting edges, various forms of which appear in Figs. 4 to 12. In each instance, however, the head 21^b on the tool or punch 21 is the same, regardless of the form of the pilot 21^a and the cutting edges. In the lower part of the ram 9, is a cylindrical bore extending inwardly from the lower extremity of said ram. This bore is continued, of smaller diameter, at 9^c clear through to the other end of the ram, the purpose being to enable a wire or rod to be inserted through the bore 9^c to push out certain washers 19, 32, 33, and an abutment disc 31 contained within the tool holder bore, in the event that they stick in place or are held by cohesion of oil. It is not essential that the bore 9^c be used, as the aforesaid washers can be fished out with a hooked wire, if necessary.

In the upper end of the bore of the tool holder is seated a shiftable or removable solid abutment disc 31 which is always placed so that the head 21^b of the tool or punch 21 will bear against said disc. The purpose of the disc is to provide a solid abutment for the upper end of the punch.

The washer 32 which has a bore accurately fitting the punch 21 and through which the punch passes, has a countersink in its upper face which is filleted or bevelled to serve as a seat for the end face of the head 21^b. This washer 32 is always located immediately under the abutment disc 31, regardless of the length of the punch or tool.

There is provided a plurality of washers 19, each having a bore receiving and snugly fitting around the shank of the punch. These washers are similar to the washer 32 in that they have no countersink in their upper faces. As many of these washers are employed as may be found to be necessary. In addition, there is a washer 33 which is similar to the washers 19 and has a bore through which the shank of the punch passes but this washer is only of about one half the thickness of the washers 19, its lesser thickness allowing closer regulation of the position of the punch 21.

All of the washers, and the abutment disc 31, snugly fit the bore in the tool holder.

As previously described, the abutment disc 31 takes the force of the blow during the nibbling or punching operation. The washers 19, 32, 33 reinforce that part of the length of the punch shank which extends through them and prevent lateral movement or deflection thereof. The filleted washer 32 resists all tendency of the stock when stripping off from the punch, to pull the punch out from the holder. This is of considerable importance if satisfactory operation of the machine is to be obtained, as this tendency to strip has been a serious condition which has not, so far as I am aware, heretofore been satisfactorily met.

Another important feature of the invention is the abutment disc 31 which effectively resists all tendencies of the stock being operated on to force the punch upwardly.

A split tapered collet 34, which has a bore through which the shank of the punch passes, is provided with a cylindrical part securely fitting the bore of the tool holder and it is on this cylindrical part that the stack of washers is supported. The lower part of the collet 34 is tapered and is received in a tapered opening in a nut 20, which has screw threads engaging corresponding threads on the exterior of the lower part of ram 9. The nut and the lower part of ram 9 also have concentric cylindrical portions which co-operate and maintain the accuracy of concentric alignment between nut 20 and ram 9. This action, combined with the support obtained from washers 19, 32 and 33, and the tapered collet 34, maintains the correct alignment of the punch 21 and insures that the pilot 21^a and lower part of the punch will co-operate with the die 23 without possibility of interference between the cutting edges of the punch and the die when the work 35 is being operated on, as shown in Figs. 2 and 3.

When the punch becomes shortened through redressing or a shorter punch than usual is employed, one or more of the discs 19 are removed from below the abutment disc 21 and are placed on top of said disc so that the bore of the tool holder is completely filled (Fig. 3). The disc 31 and washer 32 always maintain their positions on opposite sides of the head 21^b, regardless of the length of the punch. The construction permits great ease of adjustment to compensate for the length of the punch, since practically unlimited adjustment is possible through the use of the thickness of the washer 33 and the plurality of washers 19, any or all of which may be superimposed upon the solid abutment disc 3, which will then occupy a position lower down in the bore of the tool holder (Fig. 3) than that shown in Fig. 2, which represents the initial position. With this possibility of adjustment, more than half of the length of the punch 21 may be used up in re-grinding or redressing before it becomes necessary to wholly discard the punch. Any "fine" adjustment of the punch in reference to the die, which is not possible through the use of washers 19 and 33, may be obtained through the screw 9, now to be described.

The eccentric 3 vibrates the crosshead 2 and this motion is transmitted to the ram 9 through

the stem which has the screw 8. The screw 8 is locked, after adjustment, by a nut 29. The stem is supported on a spring 4 which is of sufficient strength to elevate the ram and tool 21 and other parts which reciprocate. The action of the spring 4 is against the part 1, carried by the stem. The spring actuated "gag" 5—6 which operates in the part 7, is used in the usual manner to lock the stem to the crosshead so that the punch will be reciprocated by the turning of the shaft 28. On pulling out the "gag", the stem is unlocked so that reciprocating action ceases, so far as the tool holder is concerned, without interfering with the rotation of shaft 28, thus enabling the tool to be retracted from the die 23.

Figs. 4 to 12 disclose several forms of pilots and cutting edges which may be provided on the tool 21. In all of these forms, provision is made so that the pilot portion 21a will always remain in the opening in the die 23 and resist any tendency for the stock 35 to force the punch out of alignment, due to feeding pressure on the stock or "kick back" action from the cut being made in the stock. The pilot 21a also serves as a feed regulator, definitely determining the amount of material removed with each stroke of the punch. Figs. 11 and 12 show constructions which enable the feed of the punch in the work to be regulated by changing the size of the pilot. The pilot also assists in guiding the work when cutting free hand to a line, without the use of a template. For work of that character, pilots such as shown in Figs. 5, 9, 10 and 12, are best suited, as they more nearly fit the slot or kerf being cut in the sheet. The constructions shown in Figs. 7 and 11 are more practically suited for cutting work when a template is used. This is due to the fact that it is possible to deviate from a straight line, that is to say, cut sidewise without binding on the pilot. This is a desirable feature when cutting by a template, since it enables the operator to keep the template in closer contact with the tool, thereby reproducing the template more accurately. The triangular grinding of the pilot shown in Fig. 7 is extremely easy to produce, due to the fact that such grinding can be duplicated on ordinary grinders available in nearly every shop. The construction shown in Fig. 7 has an additional advantageous feature in that its contact area with the sheet opposing the expansive action of the chip being punched from the sheet, is considerably smaller than with other designs. This is true because there is a tendency for a chip to expand under the compressive forces set up by the punch. It is of distinct advantage, as it reduces the tendency of the chip to break the pilot off the punch. The double bevelled grinding, appearing in Figs. 4 and 5, results in improved shearing action between the punch and die.

When the gag 5, 6 is withdrawn, the spring 4 elevates the ram 9, withdrawing the pilot 21a from the die 23, enabling the stock or work 35, Fig. 2, to be pushed across the die. If a hole has been punched or drilled through the sheet 35 at some point, it will be possible to enter the punch pilot into the hole and start the cut from that point without the necessity of cutting clear through to the edge of the sheet 35. This has an advantage; for example: if it is desired to produce a circular ring, or other shape involving the cutting of an opening in a solid sheet, the punch may be reentered in the work and the reciprocation of the ram and punch resumed by pulling down on a handle or lever 26 pivoted to a bracket 27 and adapted to engage the part 1. When this is done, the stem is depressed against the elevating and sustaining action of spring 4, and the ram 9 is forced downward until the head on the stem passes the gag 6, which is then urged by spring 5 to the position shown in Fig. 1, whereupon the stem, screw 8, ram 9 and punch 21 are arranged so that they will reciprocate as a unit when the shaft 28 is rotated.

What I claim is:

1. A tool holder having a bore or socket provided with stop-means therein, in combination with a tool provided with a shank of lesser size than said bore or socket, abutment-means for the tool, located within the bore or socket and adapted for changing to different positions therein and engaged by the inner end of the said shank, and a plurality of washers adapted to surround and fit the shank of the tool or to be interposed between the abutment-means and the stop-means to receive the thrust of the tool.

2. A tool holder having a bore or socket provided with stop-means therein, in combination with a tool provided with a shank of lesser size than said bore or socket and having an enlargement on its end, abutment-means for the tool, located within the bore or socket and adapted for changing to different positions therein and engaged by the end of the tool having the enlargement aforesaid, and a plurality of washers adapted to surround and fit the shank of the tool or to be interposed between the abutment-means and the stop-means to receive the thrust of the tool, said enlargement on the end of the tool overlying that one of the aforesaid washers which lies immediately beneath the said enlargement.

3. A tool holder having a bore or socket, in combination with a tool provided with a shank of lesser size than said bore or socket and having an enlarged head on its end, and a plurality of washers surrounding and fitting the shank of the tool and located within, and fitting, the bore or socket and adapted for changing to different positions therein, that one of the aforesaid washers which lies immediately beneath the aforesaid enlarged head being countersunk to receive the enlarged head of the shank, and abutment means within the bore or socket adapted for changing to different positions therein and engaged by the inner end of said shank, said washers and abutment means being stationary in relation to both the tool and the tool holder when positioned within the bore or socket.

4. A tool holder having a bore or socket, in combination with a tool provided with a shank of lesser size than said bore or socket, a plurality of washers surrounding and fitting the shank of the tool and located within, and fitting, the bore or socket, and an abutment disc contained within the bore or socket and contacting with the inner end of the shank, said washers and abutment disc being stationary in relation to both the tool and the tool holder when positioned within the bore or socket but also adapted to be changed to any desired positions therein to vary their arrangement.

5. A tool holder having a bore or socket, in combination with a tool provided with a shank of lesser size than said bore or socket and provided with an enlargement on its end, a plurality of washers surrounding and fitting the shank of the tool and located within, and fitting, the bore or socket, that one of said discs which lies immediately beneath the aforesaid enlargement being countersunk and receiving the aforesaid enlarge-

ment on the shank, and an abutment disc contained within the bore or socket and contacting with the inner face of the enlargement of the aforesaid shank, said washers and abutment disc being stationary in relation to both the tool and the tool holder.

6. A tool holder having a bore or socket provided with stop-means therein, in combination with the tool provided with a shank of lesser size than said bore or socket, an abutment-disc for the tool fitting the bore or socket and contacting with the end of the said tool shank, said abutment-disc being adapted for changing to different positions in the bore or socket, a plurality of washers adapted to surround and fit the shank of the tool or to be interposed between the abutment-disc and the stop-means to receive the thrust of the tool, and means on the said tool shank engaging with one of the washers to prevent said tool from being pulled out of the holder.

7. A tool holder having a bore or socket, in combination with a tool provided with a shank of lesser size than said bore or socket, and a plurality of washers surrounding and fitting the shank of the tool and located within, and fitting, the bore or socket and adapted for changing to different positions therein, shiftable abutment means located within the bore or socket and adapted for changing to different positions therein said abutment means serving for the inner end of the said shank, a split collet surrounding and embracing the shank of the tool, and a nut screwed into the tool holder and engaged with said collet, said collet engaging the outermost one of the washers and holding the washers, the abutment means, and tool in position, said washers and abutment means being stationary in relation to both the tool and the tool holder when held by the collet.

8. A tool holder having a bore or socket, in combination with a tool provided with a shank of lesser size than said bore or socket, and a plurality of washers surrounding and fitting the shank of the tool and located within, and fitting, the bore or socket and adapted for changing to different positions therein, shiftable abutment means located within the bore or socket and adapted for changing to different positions therein, said abutment means serving for the inner end of the said shank, said tool holder having a screw threaded part at its end and cylindrical surfaces flanking said screw threaded part, a tapered split collet surrounding the shank of the tool and having a part fitting within the outer end of the bore or socket and engaging the outermost one of the washers, and a nut engaging the collet and provided with screw threads engaging the screw threads on the tool holder and also having a cylindrical bore fitting the cylindrical surfaces aforesaid, said washers and abutment means being stationary in relation to both the tool and the tool holder when held by the collet.

9. A tool holder having a bore or socket provided with stop-means therein, a tool having a shank of lesser size than said socket and contained therein, shiftable abutment-means engageable by the end of said tool shank, and a plurality of shiftable washers contained within and fitting, said bore and constructed to surround and fit said tool shank, said washers being adapted to be located in said bore either around the shank or inwardly of the bore between the abutment-means and stop-means to receive the thrust of the tool, beyond the inner end of said shank.

10. A tool holder having a bore or socket, a tool having a shank of lesser size than said socket and contained therein, a plurality of shiftable washers contained within, and fitting, said bore and constructed to surround and fit said shank, said washers being adapted to be located in said bore either around the shank or inwardly of the bore beyond the inner end of said shank, and an abutment disc contained within and fitting said bore and shiftable therein, said tool shank having its inner end engaged with the abutment disc regardless of the position of said disc within the bore.

11. A tool holder having a bore or socket, a tool having a shank of lesser size than said socket and contained therein, said shank being provided with an enlarged head, a plurality of shiftable washers contained within, and fitting, said bore and constructed to surround and fit said shank, said washers being adapted to be located in said bore either around the shank or inwardly of the bore beyond the inner end of said shank, said enlarged head of the shank overlying one of the aforesaid washers, and an abutment disc contained within, and fitting said bore and shiftable therein, said tool shank having its inner end engaged with the abutment disc regardless of the position of the disc within the bore.

12. In a cutting machine of the reciprocatory type, a ram construction having a bore, a tool in the bore and provided with a head at its upper end, means for transmitting thrust from the ram construction to the upper end of the tool and providing for adjustment of the tool axially of the bore, collet mechanism carried by the lower end of the ram construction for gripping and centering the lower end of the tool, and spacing means fitting the bore between the head and the collet mechanism and fitting the tool shank to resist buckling of the latter.

13. The combination as claimed in claim 12 wherein the thrust transmitting means embodies adjustable spacing means and the spacing means between the head and the collet mechanism is adjustable.

14. The combination as claimed in claim 12 wherein the means for transmitting thrust from the ram construction to the upper end of the tool embodies a plurality of superposed washers and the spacing means between the head and the collet mechanism also embodies a plurality of superposed washers.

15. A tool holder having a bore or socket and provided with a stop-means therein, in combination with a tool provided with a shank having a head said shank and head being received within said bore or socket, and a plurality of washers adapted for disposition within the bore and around and fitting the shank of the tool or within the bore between the headed end of the shank and the stop-means to receive the thrust of the said headed end.

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