

Feb. 23, 1932.

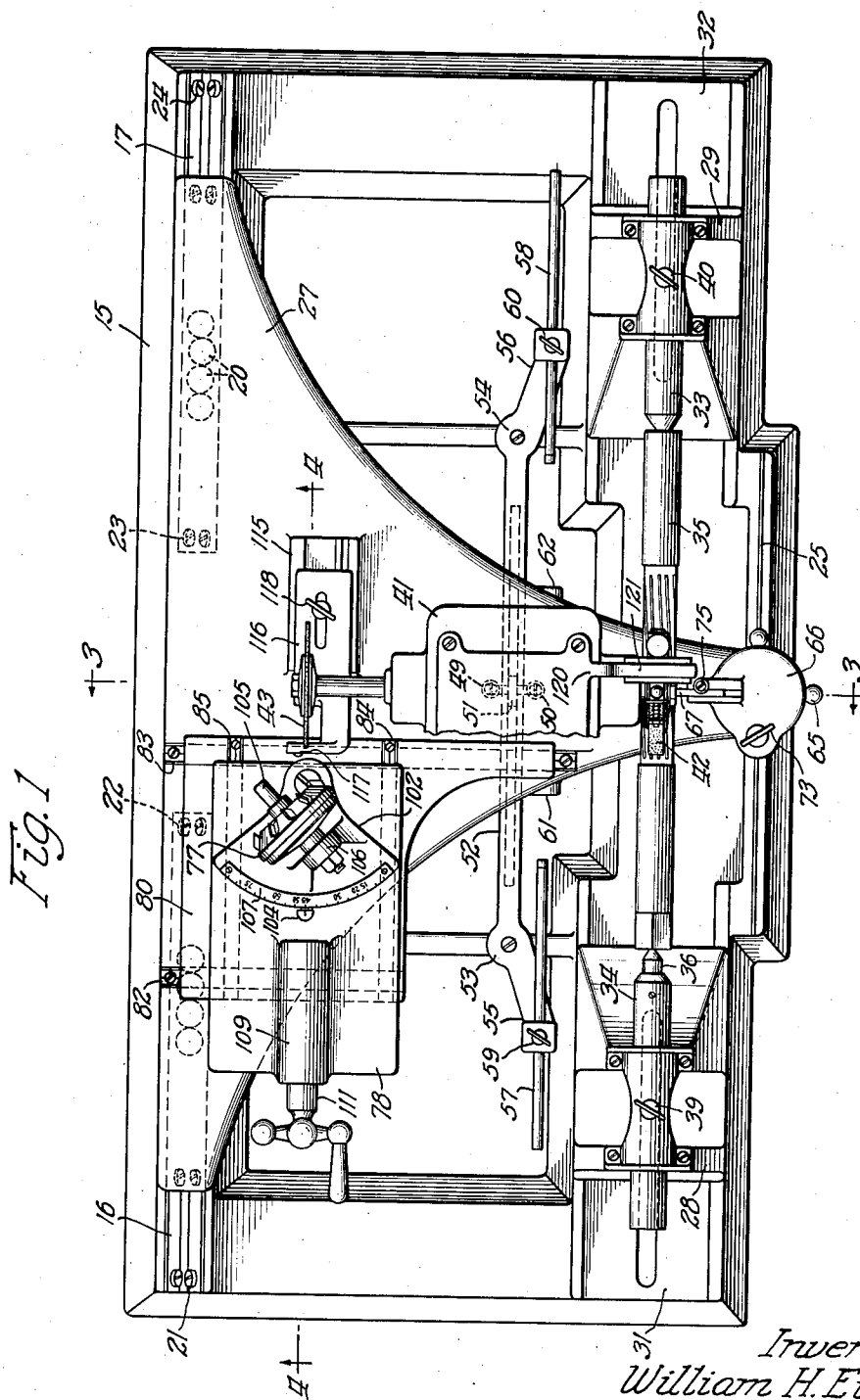
W. H. EVANS

1,847,045

REAMER SHARPENING MACHINE

Filed Nov. 5, 1928

5 Sheets-Sheet 1



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Fig. 2

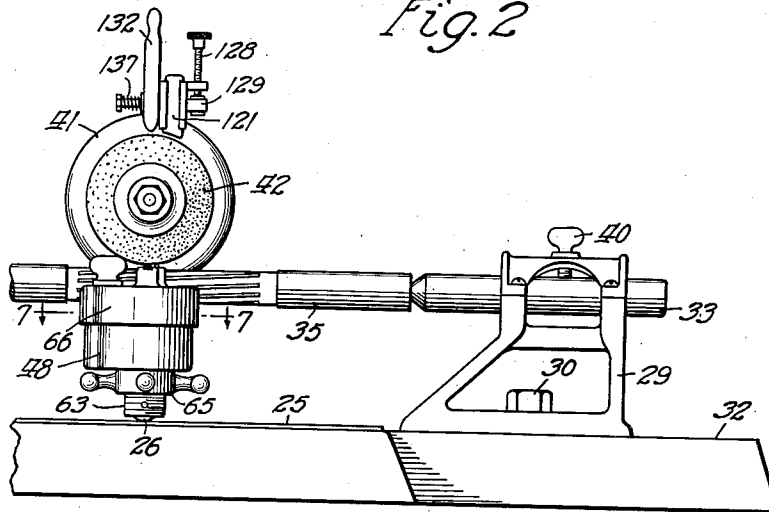


Fig. 12

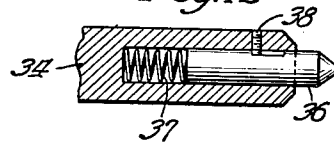


Fig. 13

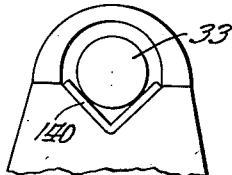


Fig. 9

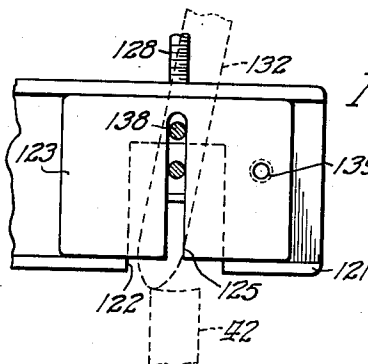


Fig. 11

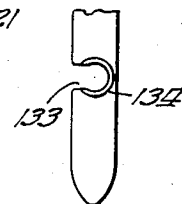
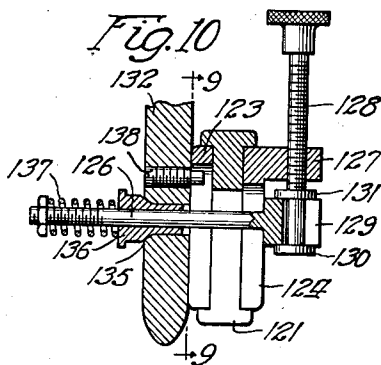


Fig. 10



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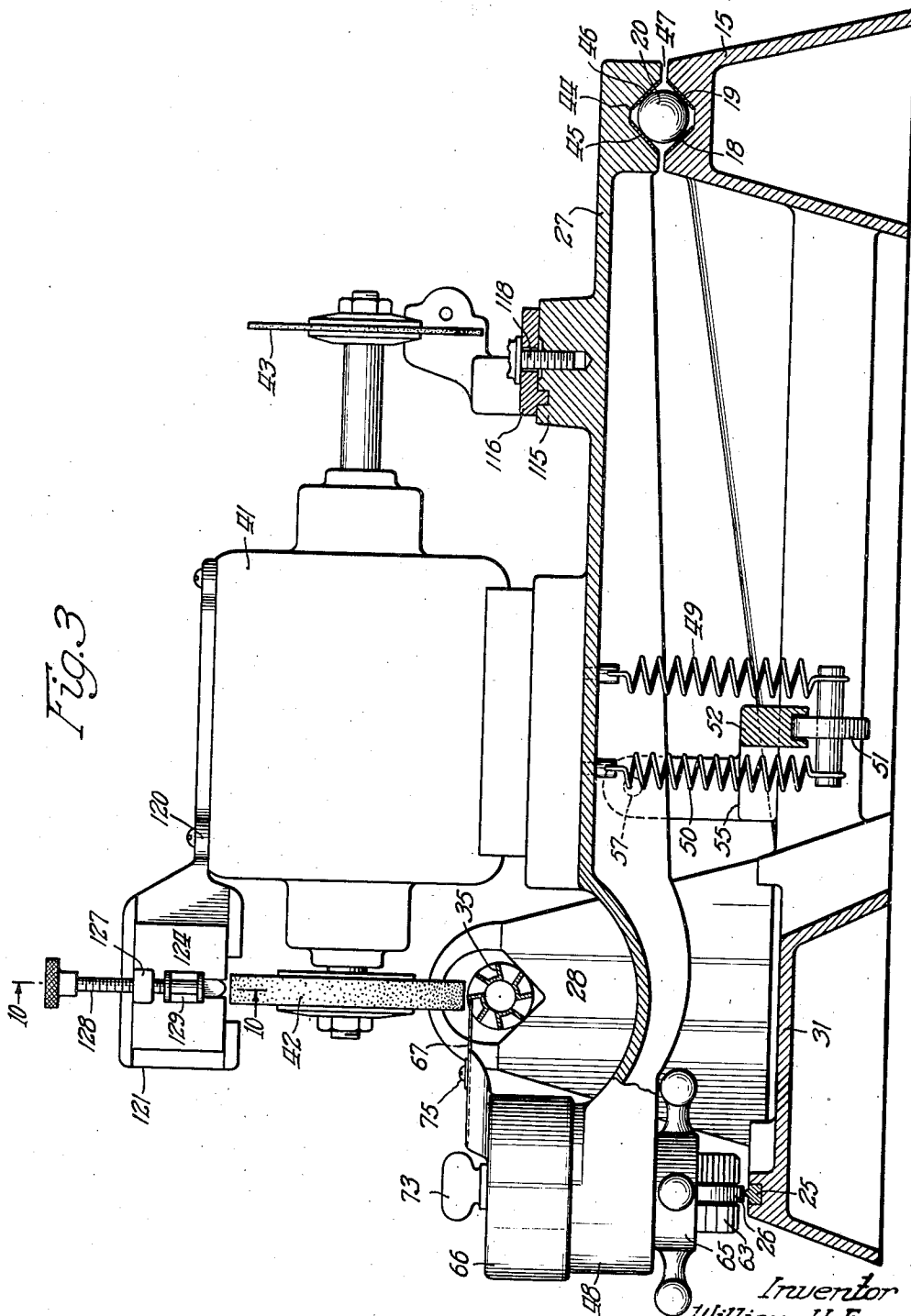
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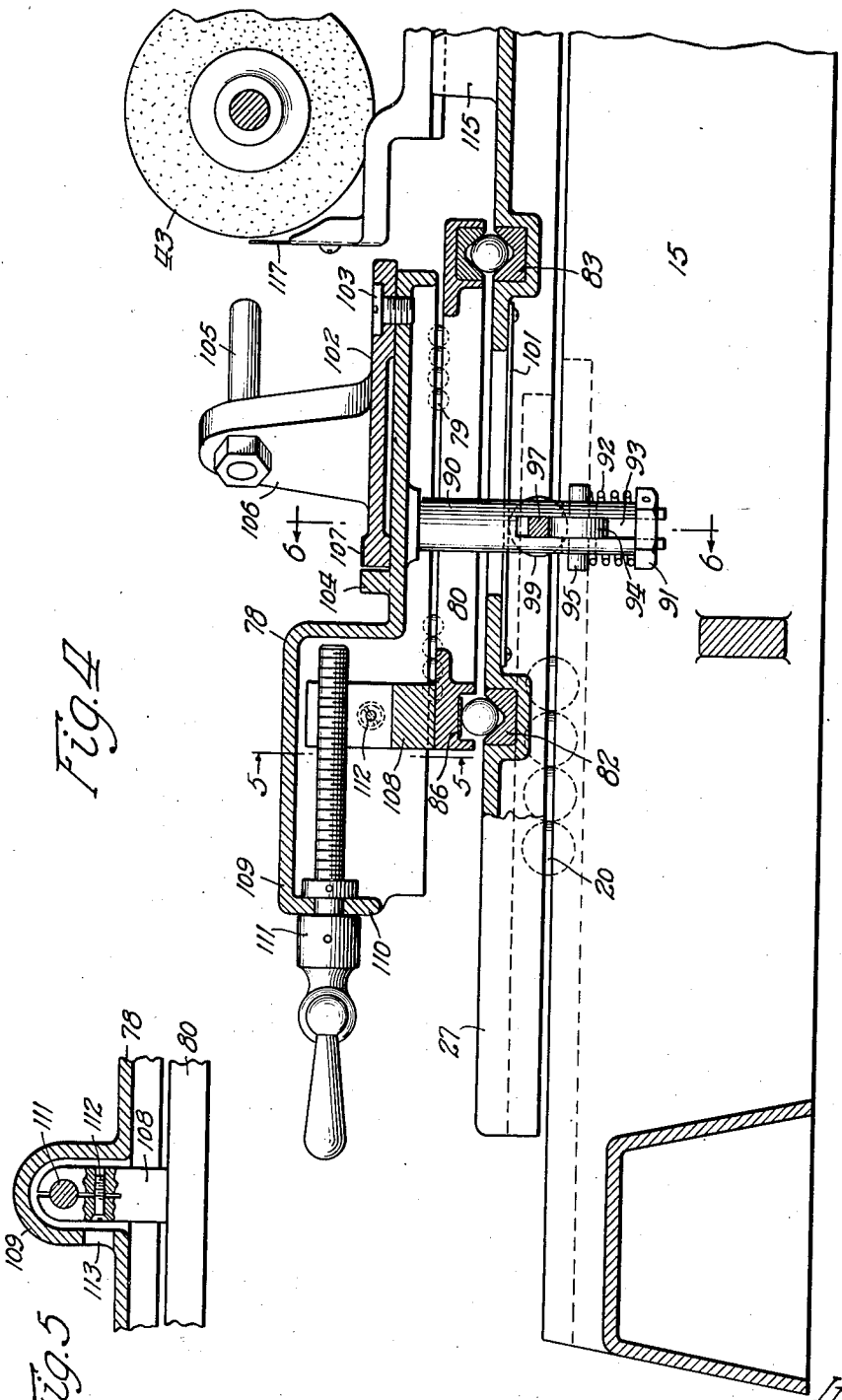


Fig. 4

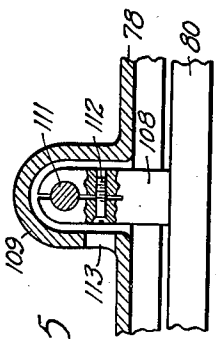


Fig. 5

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Fig. 6

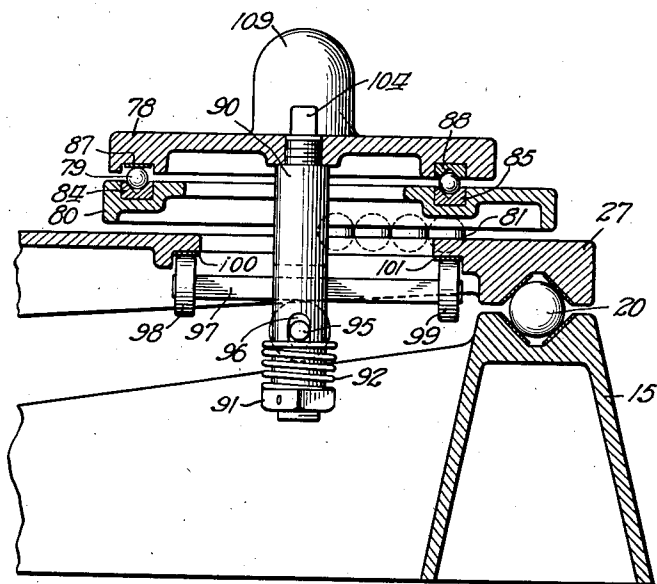


Fig. 7

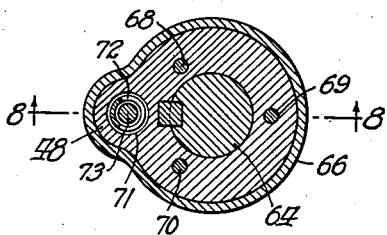
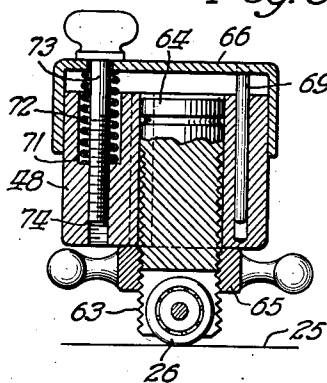


Fig. 8



UNITED STATES PATENT OFFICE

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REAMER SHARPENING MACHINE

Application filed November 5, 1928. Serial No. 317,458.

My invention relates to a machine for sharpening and grinding tools and more particularly for grinding reamers such as valve seat and wrist pin reamers and the like.

The novel features of the machine, however, are not limited to this particular use and may be employed for various purposes.

One object of this invention is to provide a mounting for traveling parts of the machine shall reduce the friction to such an extent that they may be freely moved by hand without the use of handles or feed screws.

It is also a purpose of this invention to provide a novel means of mounting the traveling frame whereby pivotal movement of the frame as well as a horizontal sliding movement may be obtained without the use of hinges or other means aside from the supports necessary for sliding movement.

Another and more particular object of this invention is to provide a machine of this character wherein the traveling frame is mounted upon the supporting frame by means of ball bearings and wherein the traveling frame is also capable of angular adjustment about said ball bearings as a pivot.

It is also an object of this invention to so mount the ball bearings relative to the frames that the normal wear thereof will not cause the loss of the free action of the traveling parts nor destroy the freedom for angular movement of the traveling frame relative to the supporting frame.

It is also a purpose of this invention to provide a machine of this character, having a supporting frame and a traveling frame mounted thereon for sliding movement, novel means whereby with a relatively short supporting frame the necessary stroke of the traveling frame may be varied over a wide range and at the same time the support for the traveling frame remain in such position as to avoid unbalancing of the frame on its support.

Another and more particular object of the invention is to provide in a machine of this character wherein the traveling parts are mounted on anti-friction or ball bearings, a means for maintaining an even pressure on the traveling frame in order to hold it firm-

ly in place by means of a single yielding member even though the traveling frame may be movable in a plurality of directions, with a constant pressure on the bearings to avoid looseness and vibration and provide constant take up for wear on the bearings.

Another and more particular object of the invention is to provide, in a machine of this character having a grinding wheel, novel means permanently mounted on the machine for truing up the grinding wheel so as to give them either a concave or straight grinding face.

It is another object of this invention to provide in connection with the novel mounting of the traveling frame a novel adjusting means whereby the angular position of the traveling frame relative to the supporting frame may be varied.

Other objects and advantages of the invention will appear as the description proceeds in connection with the accompanying drawings wherein one form of the invention is disclosed. However, it is to be distinctly understood that I do not intend to limit myself to the exact details shown and described, but that I intend to avail myself of all such modifications as would readily occur to one skilled in this art and as fall within the scope of the claims.

In the drawings:

Fig. 1 is a plan view of the machine;

Fig. 2 is a front view of one end of the machine illustrating the relative positions of the adjusting device, the work holder, the work, and the grinder;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 1;

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

Fig. 6 is a section on the line 6—6 of Fig. 4;

Fig. 7 is a section on the line 7—7 of Fig. 2;

Fig. 8 is a section on the line 8—8 of Fig. 7;

Fig. 9 is a detailed sectional view of the machine for truing up the grinding wheel;

Fig. 10 is a section on the line 10—10 of Fig. 3;

Fig. 11 is a detailed view of a part of the grinding wheel truing device;

Fig. 12 is a sectional view illustrating a portion of the work holding device;

Fig. 13 is a detailed view of a portion of the work support.

Referring now in detail to the drawings, the numeral 15 indicates the main supporting frame which is preferably in the form of casting and upon which all of the parts of the machine are mounted. This frame is provided as at 16 and 17 with V-shaped troughs which extend longitudinally thereof adjacent one side edge and which are aligned with the hardened steel strips 18 and 19 forming a supporting surface for the ball bearings 20. These hardened steel strips are held in position by means of screws 21, 22, 23, and 24 which screws also serve the purpose of forming stops for the balls 20 so as to limit their motion between adjacent screws. At the opposite side of the machine from the troughs 16 and 17 there is inserted a hardened steel rail 25 which cooperates with a roller 26 to form another rolling bearing for the traveling frame 27 which bearing will be more fully explained hereinafter.

Frame 15 has affixed thereto work supports 28 and 29 which may be adjusted by loosening the nut 30 to vary the distance therebetween these work supports being mounted in grooves 31 and 32 of the main frame, which work supports also carry a centering piece indicated at 33 and 34 which centering pieces are adapted to hold the reamer in proper position to be sharpened. It will be noted from an inspection of Fig. 12 that the centering piece 34 has inserted in the end thereof a small center 36 which is resiliently pressed outward by means of the spring 37 and which is held against dislodgement by means of the set screw 38. It is obvious of course that the centering piece 33 might also be similarly equipped if it were so desired. Centering pieces 33 and 34 are longitudinally adjustable in the supporting frames 28 and 29 so as to give a wide range of adjustment for the reamers 35 the centering pieces being held in adjusted position by means of the set screws 39 and 40.

Referring now to the frame 27, this frame carries a driving motor 41 having mounted thereon the grinding wheels 42 and 43 which wheels are preferably directly connected on the shaft of the motor as shown.

The frame 27 is supported at one side edge by means of the ball bearings 20 and is provided like the frame 15 with the V-shaped trough 44 which is also aligned with the hardened steel strips 45 and 46 which strips of course may be held in position in the same manner by means of screws as strips 18 and 19 are. It will be noted from an inspection of Fig. 3 that considerable clearance between the frames 15 and 27 is maintained as shown at 47 for a purpose which will presently appear. The hardened rail 25 and roller 26 form with the adjusting device 48 a support for the frame 27 on the opposite side from

the bearings 20. This rail 25 is thin and rounded on top so that particles of metal and emery cannot lodge thereon so as to cause roller 26 to rise.

Thus it will be seen that the traveling frame 27 is supported wholly by ball and roller bearings so that the same may be moved horizontally on the main frame 15 with a minimum amount of friction; in fact, the friction is so small that the traveling frame 27 may be moved back and forth easily by merely placing the hand upon it and exerting a small pressure in the direction in which it is desired to move the frame. This is highly advantageous for a machine of this character since it does away with all feed screws and handles and permits a much more rapid operation than is possible with such devices.

The traveling frame is held down upon its bearings with an even pressure by means of the construction shown in Fig. 3 consisting of the springs 49 and 50 secured to the under surface of the frame 27 and carrying at the lower ends the roller 51 which roller is guided in the track 52 secured to the main frame 15 at 53 and 54 by means of the screws shown, or any other suitable means. The track 52 also carries at its opposite ends upwardly extending portions 55 and 56 which portions carry adjustable stops 57 and 58 secured by means of the set screws 59 and 60 and adapted to engage the abutments 61 and 62 on the frame 27.

From the foregoing description it will be seen that the only connection between the frames 15 and 27 consists of the bearings at 20 and 26 and the spring pressure means at 49. It is necessary in order to permit the grinding of various sizes of reamers 35 that the grinding wheel 42 be adjustable up and down relative to the work supports holding the reamer 35. This adjustment I accomplish without the interposition of any hinges or further pivoting structure than has already been disclosed. I utilize the ball bearings 20 as a pivot about which the frame 27 may be angularly adjustable, the clearance at 47 between the frames 15 and 27 being provided for this purpose and also to take up the wear on the balls 20 which comes from the normal usage of the machine.

The particular means for adjusting the frame 27 and thereby the grinding wheel 42 consists of a slotted screw 63 supported by means of the roller 26 which screw is slidable and non-rotatably keyed by means of the key 64 indicated in dotted lines in Fig. 8 to the body 48 of the adjusting device, the member 48 of course being integral with the frame 27 as shown clearly in Fig. 3. The means for adjusting the member 48 so as to move it up and down relative to the screw 63 consists of the handle 65 interiorly screw threaded to fit the threads on the member 63 so that by rotation of the handle 65 to

the right or left as the case may be the frame 27 may be raised or lowered about its pivot at 20 to thereby raise or lower the grinding wheel 42.

The member 48 carries also a cap 66 which carries in turn a guide pointer 67 adapted to engage the teeth of the reamer and turn it into proper position for engagement by the grinding wheel 42 as the frame 27 is moved longitudinally of the reamer. In order to permit vertical adjustment of this guide 67 and to maintain it in proper position, the cap 66 is provided with three downwardly depending pins 68, 69, and 70 which pins extend in corresponding recesses in the body of the member 48 so as to permit vertical sliding of the cap 66 relative to the body 48. The body 48 is provided with a recess 71 housing the lower end of the spring 72, the upper end of which presses against the cap 66 to urge it upwardly at all times. Adjusting screw 73 extends downwardly through the spring and is screw threaded into the portion 74 so that by turning the screw to right or left, the elevation of the cap 66 and the guide 67 may be adjusted. The guide 67 may be adjusted toward and away from the reamer by means of the set screw 75 which secures it to the projection on the cap 66.

To provide for the grinding of bevelled reamers such as that shown at 77 in Fig. 1, I mount upon the frame 27 an auxiliary frame 78 which auxiliary frame is supported by means of the ball bearings 79 upon an intermediate frame 80 which in turn is supported by means of the ball bearings 81 upon the frame 27. Hardened steel inserts 82, 83, 84, and 85 are provided in the frames 27 and 80 for the ball bearings and the hardened steel strips 86, 87, and 88 form the proper bearing surfaces on the frames 78 and 80 for the top of the balls 79 and 81. It will thus be seen that the frame 78 has ball bearing supports permitting it to move in a plurality of directions at right angles to each other upon the frame 27.

It will also be seen that the balls supporting frame 80 at one side edge fit in grooves in both 27 and 80 to serve as a guide for frame 80 while on the opposite side edge of the frame 80 the hardened steel strip forms a bearing surface for the supporting balls that permits lateral movement of the ball thereon. Thus only one side of the support serves as the guide. Frame 78 is similarly mounted.

As a means for holding the frame 78 down in position upon its bearings, I provide the pin 90 screw threaded in the frame 78 as shown in Fig. 6 and depending therefrom through a square opening in the frame 27. This pin has a nut 91 at its lower end and a spring 92 resting upon this nut and furthermore is slotted as indicated in Fig. 4 at 93 to receive the roller 94 which roller has a

pin 95 therein fitting in the elongated openings 96 extending transversely through the pin 90 at right angles to the slot 93, the spring 92 serving to yieldingly press the roller 94 upwardly into engagement with the bar 97 which bar carries at its opposite end rollers 98, and 99 engaging the brackets 100 and 101 provided on the under surface of the frame 27. Thus it will be seen that the spring 92 yieldingly retains the frame 78 upon its bearings while at the same time it permits sliding movement of the frame in two horizontal directions at right angles to each other.

The frame 78 carries a supporting plate 102 which is secured thereto so as to be capable of pivotal movement by means of the screw 103. This screw of course when tightened holds the plate 102 in position. This plate 102 cooperates with a pointer 104 to indicate the angle at which the work support 105 extends relative to the grinding disc 43, the work support 105 being as is obvious from Fig. 4 supported by means of the upwardly extending projection 106 of the plate 102 and serving to support thereon such articles as the reamer 77. An indicating quadrant shown at 107 in Fig. 1 serves to indicate the angle at which the work support 105 extends relative to the grinder 43.

In moving this frame 78 to feed the reamer into the wheel 43, it is found that this adjustment if made by hand is too easy to get out of position and for this reason I mount upon the frame 80 an upstanding split nut 108 and provide, by means of the hollow portion 109 on the frame 78 and the end flange 110 together with the feed screw 111 engaging the split nut 108, means whereby the tool may be fed toward the grinding wheel by means of the feed screw 111 and held in adjusted position. To hold the feed screw against working loose of its own accord, I find it necessary to use the split nut 108 and the tightening screw 112 shown more clearly in Fig. 5 by means of which sufficient pressure may be placed on the feed screw to prevent it from working loose of its own accord when changing the setting. The screw 112 is accessible through an opening 113 in the hollow portion 109 of the frame 78.

The upstanding lug 115 of the frame 27 shown in Fig. 3 is grooved to form a guide for the sliding member 116 which member carries a guard 117 at its end to prevent the bevelled reamer from being forced too far into contact with the wheel 43. A set screw 118 serves to hold this guard member in adjusted position.

In the utilization of the grinding wheel 42 to grind the reamers, it is necessary to keep the face thereof trued up so as to be substantially even all the way across in order to do the proper sharpening upon the reamers. It is also the custom now on certain of the ream-

ers to so sharpen the teeth as to give them a somewhat rounded outer edge on a greater radius of course or at least an equal radius with the radius of the reamer itself. To accomplish this a concave face is used on the grinder 42 and my invention contemplates the provision of means which may be used not only for truing up the ordinary straight face grinding wheel but also without disassembling the grinder to true up a concave grinding wheel. This particular structure is shown more clearly in Figs. 9, 10, and 11.

It will be noted from Fig. 3 that a supporting plate 120 is mounted on top of the motor 41 and extends outwardly over the wheel 42 where it is provided with a vertically extending portion 121 provided with grooves on its opposite side making the portion substantially I-shaped in cross section. This portion 121 is provided directly over the wheel 42 with a slot extending from the lower edge thereof as indicated at 122. See Fig. 9.

Plates 123 and 124 fit in the grooves on opposite sides of the member 121 so as to be slidable therealong. Both of these plates are slotted vertically as indicated at 125 in Fig. 9 to receive the pin 126. Plate 124 also has an outwardly extending lug 127 which is screw threaded to receive the adjusting screw 128 which adjusting screw fits into the slot 129 in the end of the pin 126 and is provided with enlarged portions 130 and 131 so that upon screwing the screw downwardly or upwardly the pin 126 will move therewith.

The diamond holder 132 which is used to true up the wheels consists of a piece of metal rectangular in cross section which carries the diamond at its lower round end, this diamond, however, not forming any part of the present invention is not shown as it may be mounted in any suitable manner.

The holder 132 has a slot extending in from one side thereof as shown at 133 in Fig. 11 and is countersunk at 134 to receive the bevelled edge 135 on the plug 136 carried by the pin 126. This plug is forced inwardly by means of the screw 137 so as to normally hold the holder pin 132 in position. The pin, however, may be released by forcing the plug 136 outwardly against the tension of the pin and sliding the member 132 sideways to remove the plug 133 from the slot. The screw 138 when used as shown in Fig. 10 serves to hold the member 132 in vertical position and prevent any swinging thereof so as to give a straight edge finishing to the grinding wheel 42.

If, however, it is desired to true up a concave wheel screw 138 is removed from the position shown in Fig. 10 and inserted at 139, Fig. 9, through the plate 123 so as to prevent the plates 123 and 124 from sliding in the grooves in the member 121. When this is done, of course, the member 132 is free

to pivot about the pin 126 and is in the proper position to engage the wheel 42.

Another detailed view of the invention is shown in Fig. 13 which consists of means whereby one end of the reamer may be elevated slightly above the other so as to be able to give this end of the reamer a slight taper with the grinder wheel and give it the proper lead in order that it may enter the valve seat. This consists of the angle iron 140 which is provided with the machine and is adapted to be inserted beneath the centering piece 33 to slightly elevate this piece and thereby raise its center which in turn causes elevation of the adjacent end of the reamer 35.

There is another feature of importance in connection with this invention which consists in the change of position of the grinding wheel 42 for different types of reamers. The machine normally has a movement of about 7 inches of the frame 27 for an over all length of 28 inches for the frame 15. This is sufficient for practically all reamers. It is found, however, that with some reamers the teeth are so near one end that the stroke must be shifted to one side or the other of the center of the frame.

To take care of this and still maintain a balanced bearing for the frame 27 my mounting of this frame on the bearings 20 permits of a sliding movement of the frame on the balls. For example, let us suppose that frame 27 be moved to the left in Fig. 1 until the balls strike the stops 21 or 23; that is the normal limit of the stroke. Suppose however that the stroke must be farther to the left to reach the end of the reamer teeth, the frame 27 may then be slid on the balls which cannot travel any farther so that the left end of the stroke is shifted to the left and the entire rolling stroke is shifted to the left. (It is understood of course that the trough in frame 27 is also provided with stops similar to those on frame 15.) This feature permits the stroke of the frame 27 to be shifted to right or left without increasing the length of the machine and without disturbing the balanced bearing for frame 27.

From the above description it is thought that the construction and operation of the machine as well as the advantages thereof will be clearly apparent to those skilled in this art.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In a device of the character described the combination of a supporting frame, a traveling frame, rolling means movably supporting said traveling frame upon said supporting frame and means for moving said traveling frame about certain of said rolling means as a pivot.

2. In a device of the character described a supporting frame having work supporting

means thereon, a movable frame carrying a grinding wheel, means supporting said movable frame for horizontal movement along said supporting frame, said last named means including ball bearings at one side of said frames, said movable frame being angularly adjustable about said bearings as a pivot.

3. In a device of the character described a supporting frame, a movable frame, one of said frames having a work support thereon and the other of said frames supporting a tool, and means for supporting said movable frame upon said supporting frame so that the same may be moved freely in horizontal direction comprising rolling bearings interposed between said frames and yielding means holding said frames together.

4. In a device of the character described a supporting frame, a movable frame, one of said frames having a work support thereon and the other of said frames supporting a tool, and means for supporting said movable frame upon said supporting frame so that the same may be moved freely in horizontal direction comprising rolling bearings interposed between said frames and yielding means holding said frames together, said movable frame being slidable on said bearings.

5. In a device of the character described a supporting frame, a movable frame, one of said frames having a work support thereon and the other of said frames supporting a tool, and means for supporting said movable frame upon said supporting frame so that the same may be moved freely in horizontal direction comprising rolling bearings interposed between said frames and yielding means holding said frames together, said movable frame being angularly adjustable about said bearings.

6. In a device of the character described a supporting frame, a movable frame, one of said frames having a work support thereon and the other of said frames supporting a tool, and means for supporting said movable frame upon said supporting frame so that the same may be moved freely in horizontal direction comprising rolling bearings interposed between said frames and yielding means holding said frames together, said movable frame having a limited pivotal adjustment about certain of said bearings.

7. In a device of the character described a supporting frame, a movable frame, and means for slidably supporting said movable frame on said supporting frame including a rolling bearing at one side of said frames, and ball bearings at the opposite side thereof, said frames having V-shaped troughs therein receiving the balls of said ball bearings.

8. In a device of the character described a supporting frame, a movable frame, and means for slidably supporting said movable

frame on said supporting frame including a rolling bearing at one side of said frames, and ball bearings at the opposite side thereof, said frames having V-shaped troughs therein receiving the balls of said ball bearings, said troughs having hardened steel inserts forming bearing surfaces for said balls.

9. In a device of the character described a support, a movable frame, ball bearings interposed between said support and frame at one side thereof and rolling bearing means interposed between said support and frame at the other side thereof.

10. In a device of the character described, a support, a movable frame, ball bearings interposed between said support and frame at one side thereof and rolling bearing means interposed between said support and frame at the other side thereof, and resilient means yieldingly holding said movable frame against said bearings.

11. In a device of the character described a support, a movable frame, ball bearings interposed between said support and frame at one side thereof and rolling bearing means interposed between said support and frame at the other side thereof, said frame being slidable upon the balls of said ball bearings to permit a change in the relative position of said frame and support for rolling movement on said bearings, and resilient means yieldingly holding said movable frame against said bearings.

12. In a machine of the character described a base, a movable frame, ball bearings supporting said movable frame on said base for movement along two intersecting paths, and means yieldingly retaining said frame on its bearings.

13. In a machine of the character described, a base, a movable frame, ball bearings supporting said movable frame on said base for movement along two intersecting paths, means yieldingly retaining said frame on its bearings, and adjusting means for moving said frame in one direction said last named means having brake mechanism thereon for holding said frame against movement in that direction.

14. In a machine of the character described, a work support, a grinder support, anti-friction bearings slidably mounting said grinder support on said work support in position for said grinder to operate on work held by said work support, a guide finger carried by said grinder support for engaging the work on said work support and means for adjusting said finger to fit different sizes of work, said last named means including resilient means urging said finger away from and adjustable means for moving said finger toward the work.

15. In a machine of the character described, a work support, a grinder support, anti-friction bearings slidably mounting said

- grinder support on said work support in position for said grinder to operate on work held by said work support, a guide finger carried by said grinder support for engaging the work on said work support and means for adjusting said finger to fit different sizes of work, and means supporting said finger for adjusting said finger and grinder toward and away from said work support.
16. In a reamer sharpening machine, a supporting frame, a movable frame, reamer sharpening mechanism carried by said movable frame, ball bearing means supporting the movable frame on the supporting frame along one side thereof for longitudinal movement of the movable frame, a rail carried by supporting frame, and a roller carried by the movable frame to support said frame for longitudinal movement at the side thereof opposite said ball bearing.
17. In a reamer sharpening machine, a supporting frame, a movable frame, reamer sharpening mechanism carried by said movable frame, ball bearing means supporting the movable frame on the supporting frame along one side thereof for longitudinal movement of the movable frame, a rail carried by supporting frame, and a roller carried by the movable frame to support said frame for longitudinal movement at the side thereof opposite said ball bearing, and means for adjusting the position of said roller with respect to said movable frame to raise or lower said frame by tilting it about said balls as a pivot.
18. In a reamer sharpening machine, a supporting frame, a triangularly shaped movable frame, frictionless supporting means between the supporting frame and along one side of the triangle, a roller carried by the triangular frame at the corner thereof opposite said supported side, a rail carried by the supporting frame on which said roller is adapted to travel as the triangular frame is moved, work supports carried by said supporting frame and adapted to support a reamer in positioned to be sharpened, the reamer so supported extending above said corner of the movable frame out of contact therewith, and sharpening mechanism carried by the movable frame in position to operate on said reamer.
19. The combination set forth in claim 18 wherein said corner is provided with a reamer guide and means for adjusting said guide to the reamer.
20. The combination set forth in claim 18 with a reamer guide carried by said corner, and means for adjusting said roller with respect to said movable frame whereby said sharpening mechanism and reamer guide are adjusted together with respect to said reamer.
21. The combination set forth in claim 18 including a separate frame freely adjustable with respect to said movable frame, and means for supporting a reamer thereon, and in which said sharpening mechanism includes a motor with a shaft projecting at each end, and a grinding wheel mounted to each end of the shaft for the sharpening of either one of two types of reamers.
22. In a machine of the character described, a base frame, a movable frame, friction reducing bearings between said frames, a track carried by the base frame, a roller riding along the bottom edge of said track, and spring means connecting with said roller and the movable frame, for holding the movable frame against movement away from the base frame.
23. In a machine of the character described, a base frame, work supporting means carried by the base frame, a movable frame, sharpening mechanism carried by the movable frame, friction reducing means disposed between the base frame and movable frame, a track carried by the base frame, a roller riding along the bottom edge of said track and spring means connecting with said roller and movable frame, whereby the movable frame is held against movement away from said base frame.
- In witness whereof, I hereunto subscribe my name this 20th day of October, A. D. 1928.
- WILLIAM H. EVANS.