J. VAN DER VORN.

BORING TOOL.

APPLICATION FILED MAY 2, 1919.

1,350,394.

Patented Aug. 24, 1920.

3 SHEETS—SHEET 1.

Fig. 1.

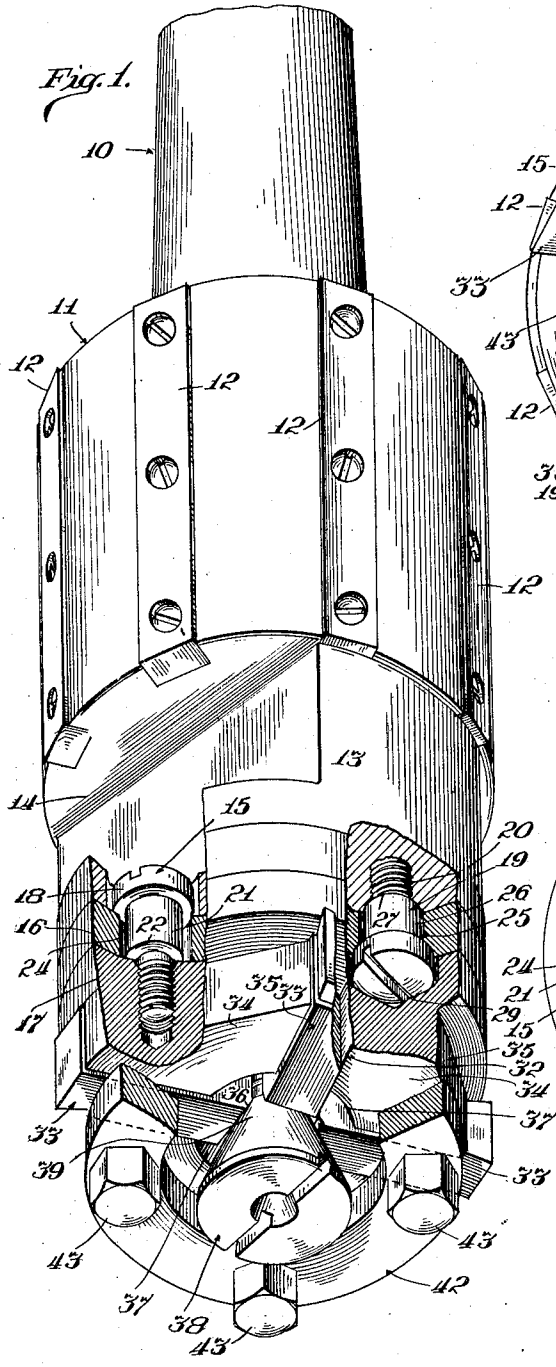


Fig. 2.

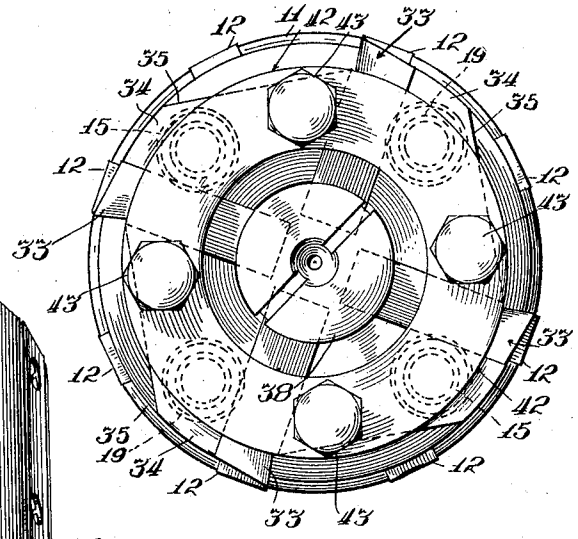
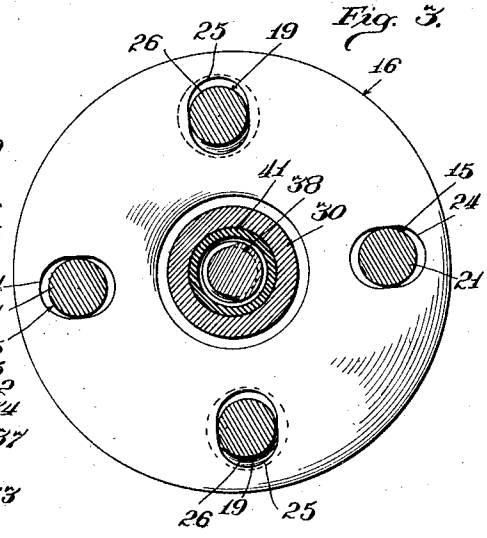


Fig. 3.



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3 SHEETS—SHEET 2

Fig. 4

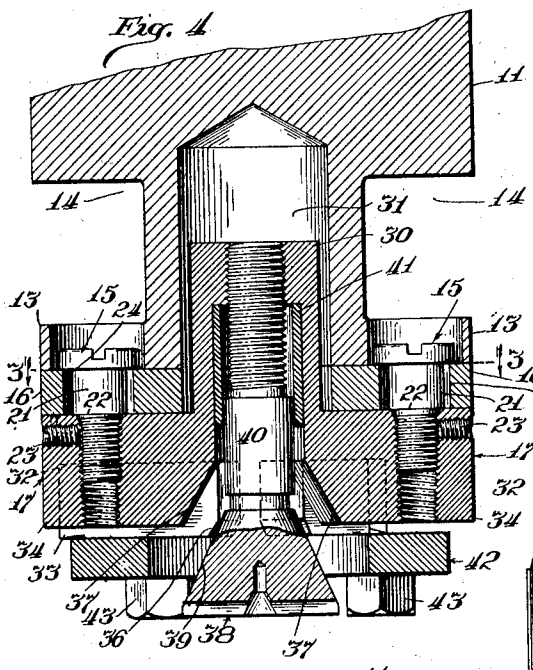


Fig. 5.

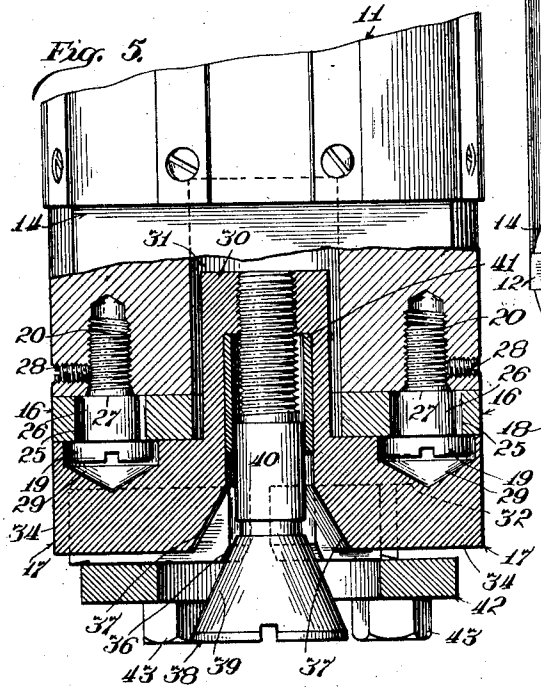
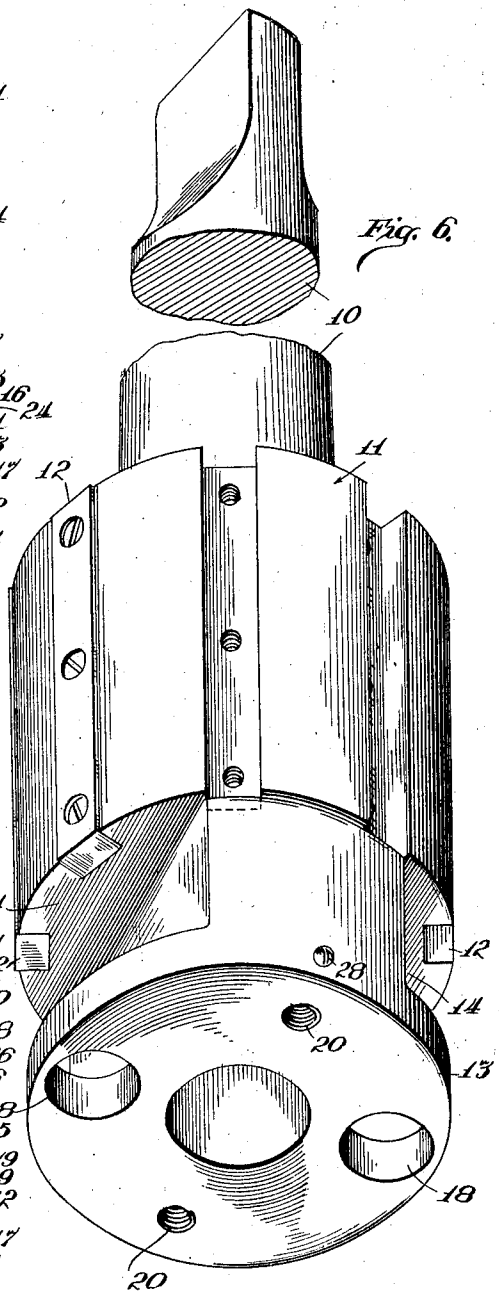


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

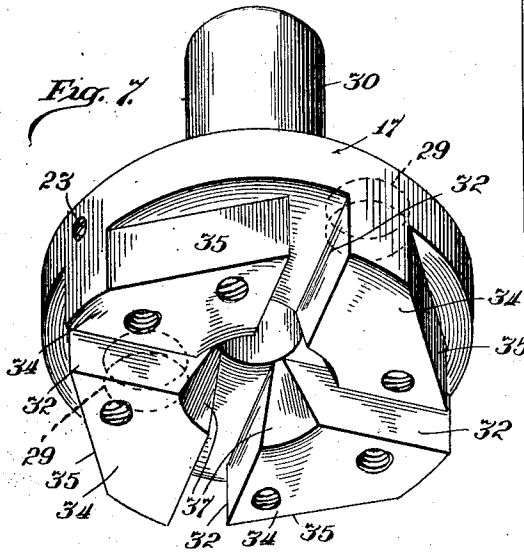


Fig. 10.

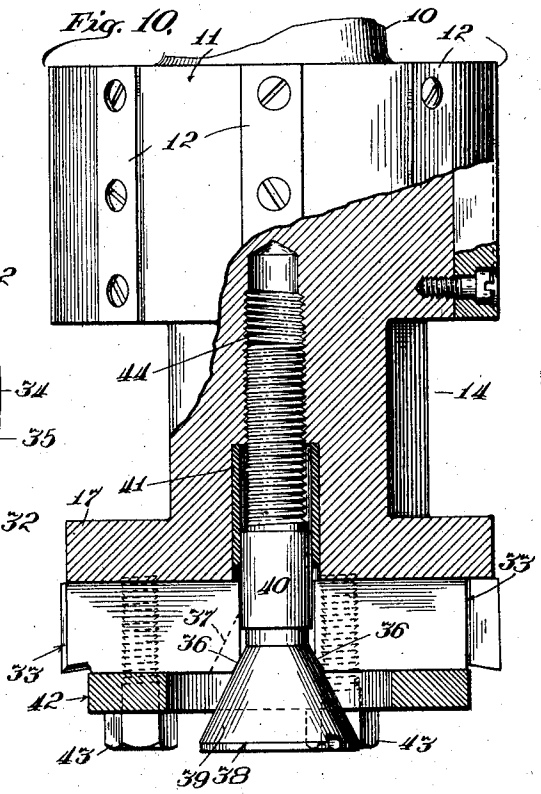


Fig. 8.

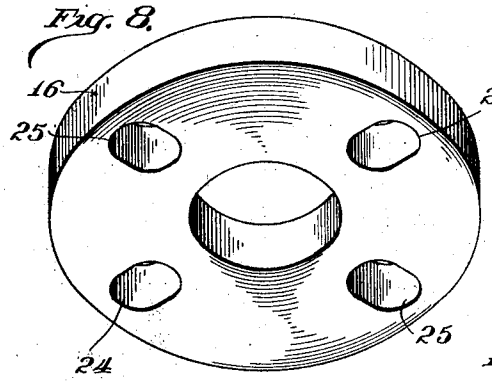


Fig. 11.

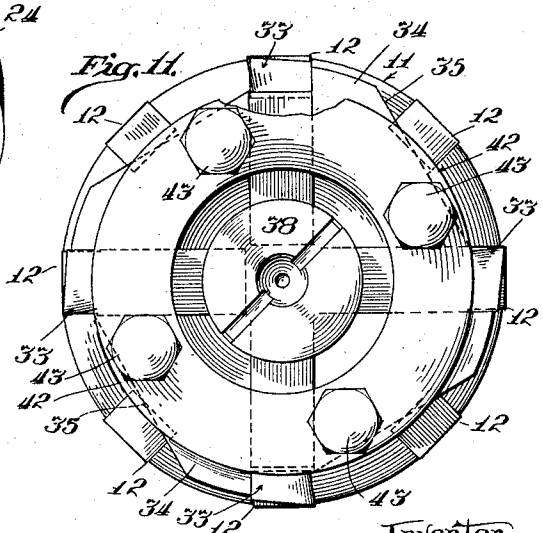
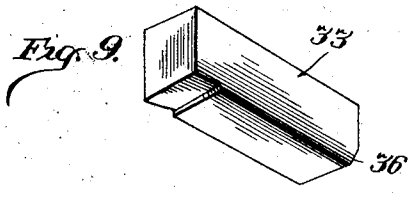


Fig. 9.



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BORING-TOOL.

1,350,394. Specification of Letters Patent. Patented Aug. 24, 1920.

Application filed May 2, 1919. Serial No. 294,193.

To all whom it may concern:

Be it known that I, JACOB VAN DER VORN, 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 Boring-Tools, of which the following is a specification.

The present invention relates to boring tools for metal working and especially to boring tools of the expansion type, wherein the cutter head of the tool is provided with means for readily adjusting the cutters toward and from the axis of the tool to vary the diameter of the cut. In certain aspects, the invention has to do also with tools of this class in which the cutter head is free to "float" in a plane at right angles to the axis of the tool to permit it to readily follow a roughly dressed hole in giving the final finishing cut. The objects of the invention are to provide an improved adjusting means for the cutters, improved means for allowing the necessary floating movement of the cutter head, a rigidity of construction such that the cutters will be firmly held in all operative adjustments, simplicity and economy of construction, efficiency of operation at high, as well as low, speeds, and neatness of appearance and finish.

The invention will be best understood upon reference to the following detailed description taken in connection with the accompanying drawings, while the scope of the invention will be particularly pointed out in the appended claims.

In said drawings, Figure 1 is a perspective view of a boring tool constructed in accordance with the present invention, parts being broken away and shown in section to more clearly illustrate the construction; Fig. 2 is an end view of the tool; Fig. 3 is a view of the intermediate member located between the shank and the cutter head, associated parts also being shown in section; Fig. 4 is a vertical section of the tool taken on a plane through the connecting screws which are screwed into the cutter head; Fig. 5 is a similar section taken on a plane at right angles to that of Fig. 4, that is to say, through the connecting screws which are screwed into the shank of the tool; Fig. 6 is a perspective view of the shank; Fig. 7 is a perspective view of the cutter head with the cutters and retaining ring removed; Fig. 8 is a perspective view of the intermediate member which forms part of the floating connection between the shank and cutter head; Fig. 9 is a perspective view of one of the cutters; Fig. 10 is a vertical section of a modified structure in which the floating feature is not employed; and Fig. 11 is an end view of the same. Throughout these views like characters refer to like parts.

Referring to the drawings in detail, 10 designates the shank which is provided with the usual slotted cylinder 11 and wear plates 12 for use in setting the tool in the chuck or holding member of the machine in which the tool is employed. These parts are old and well known in the art and need not be described in further detail. The lower end of the shank 10 is provided with oppositely disposed flanges 13. These flanges are provided by cutting away opposite sides of the cylinder 11 so as to provide the open spaces 14. In this way access may be had to the upper side of each of these flanges for the purpose of turning up or loosening the screws 15 by which the intermediate member 16 is secured to the cutter head 17. Each of the screws 15 passes freely through an opening 18 in each of the flanges 13. These screws do not serve to connect the intermediate member 16 with the shank 10. This latter function is performed by screws 19 which pass through the intermediate member 16 into threaded engagement with threaded openings 20 in the flanged end of the shank 10. Each screw 15 has a cylindrical portion 21 which is smaller in diameter than the head of the screw and larger than the threaded portion which enters into the cutter head 17. The length of this cylindrical portion is slightly greater than the thickness of the intermediate member 16. Where the screw is reduced in diameter between the cylindrical portion 21 and the threaded portion a square shoulder 22 is provided. The screw may be screwed home until this shoulder bears tightly upon the adjacent face of the cutter head 17. When the screw is thus positioned a set screw 23 in the adjacent wall of the cutter head 17 may be screwed against the screw 15 to hold it against accidental removal. The cylindrical shank 21 of the screws 15 passes in each instance through an elongated hole 24 in the intermediate member 16. By reason of the head of the screw 15 and the length of the cylindrical shank being slightly longer than the thickness of the member 16, the member

16 will be free to move relative to the screws 15 and the cutter head 17 to which they are fixed, in the direction of the elongated slot. In other words, this construction provides a pin and slot connection which allows the cutter head to be moved to and fro in the direction of the holes 24, thus giving the cutter head a floating movement in this direction relative to the member 16. This construction does not provide all of the floating movement but only part of it as we shall see. The balance of the floating movement is provided by the screws 19 passing through other elongated slots 25 into threaded engagement with the threaded openings 20 in the flanged end of the shank 10, as previously noted. In this instance each screw 19 is provided with a cylindrical shank 26 which is slightly longer than the thickness of the member 16, and with a shoulder 27 provided at the point where the shank is reduced to provide the threaded portion of the screw. In this instance also, set screws 28 are used to firmly hold the screws 19 against unintentional displacement when once they are screwed home into the openings in the shank. By this construction the elongated openings 25 in the member 16 allow the latter member a free to and fro movement relative to the shank 10 in the direction of the openings 25. From this description it will be seen that the member 16 has a to and fro movement relative to the shank 10 and the cutter head 17 has a to and fro movement relative to the member 16. It will also be noted that the elongations of the holes 24 through which the screws 15 pass are in a direction at right angles to that of the elongation of the holes 25 through which the screws 19 pass. As a result of this arrangement the cutter head 17 will have a floating movement in any direction in a plane at right angles to the axis of the shank 10. The movement in one extreme case will be that wherein the cutter head 17 does not move relatively to the member 16 but all the movement is obtained by the member 16 moving relatively to the shank 10. The movement in the other extreme case will be one where the cutter head moves relatively to the member 16 and the latter member does not move relatively to the shank 10. In the first of these extreme cases the intermediate member 16 will move only with reference to the screws 19, and in the other of these extreme cases the intermediate member will move only with reference to the screws 15. Between these extremes the intermediate member will move with reference to both sets of screws, the movement being the resultant of the component movements of each pair of screws relative to the intermediate member 16. In assembling the parts, the intermediate member 16 is first secured in place upon the shank 10 by screwing down screws 19 and locking them by set screws 28. Then the cutter head 17 is brought into position and, in turn, is secured to the member 16 by the screws 15 which, after being screwed down, are held in position by the set screws 23. To give space for the heads of the screws 19 the cutter head 17 is provided with cavities 29 into which the heads of the screws pass when assembling the parts. These cavities are large enough to permit the necessary play of the cutter head 17 relative to the intermediate member 16 without engaging with or striking the screws.

An inspection of the cutter head 17 will show that it is provided with a stem 30. When the parts are assembled this stem 30 passes into a central opening 31 in the shank 10. A sufficient clearance is provided between the stem 30 and the walls of the opening 31 to permit the cutter head to move freely to the extent permitted by the elongated openings 24 and 25 in the member 16. The under side of the cutter head 17 is provided with grooves 32 for the reception of the cutters 33. These grooves are of sufficient size to readily receive the cutters and provide a close fit for them. The grooves 32 are located between block-like extensions 34 on the under side of the cutter head. These extensions are continued to the periphery of the cutter head 17 on one side of the grooves 32 but do not extend quite so far on the other side. This arrangement provides a rigid backing for the cutter and leaves space at its cutting edge for the free passage of the metal removed by the cutter. In the present instance the difference in the lengths of the opposing walls of the grooves 32 is brought about by providing the outer edge of each of the blocks 34 with a beveled face 35, as clearly illustrated in Fig. 7. The cutters may be of any preferred construction such, for example, as illustrated in Fig. 9 but in each instance the rear end of the cutter is provided with an inclined face 36. The inner ends of the block-like extensions 34 have conical faces 37. An adjusting screw 38 extends into a central opening in the cutter head and engages the threaded inner end of the opening, as clearly illustrated in Figs. 4 and 5. The head of the screw 38 is provided with a conical surface 39 which has the same inclination as the faces 36 on the cutters 33 and the same inclination as the conical faces 37 on the extensions 34. The screw 38 is also provided with a cylindrical shank 40 which closely fits within a bushing 41 located in the screw opening in the stem 30 of the cutter head 17. The shank 40 and bushing 41 fit closely but the fit is free enough to allow the screw to be readily reciprocated within the bushing. The bushing 41 and the shank 40 provide accurate wearing surfaces and insure an ac-

curate movement of the screw as well as accurate and permanent centering. A retaining ring 42 is secured to the lower face of the cutter head 17 by means of a plurality of screws 43 which pass through holes in the ring 42 into threaded engagement with corresponding threaded openings in the cutter head 17. In assembling the parts, the cutters, of course, are placed within the grooves 32 and when the screws 43 are screwed down tight the retaining ring 42 presses against the under faces of the cutters 33 and firmly holds them in place. When the ring 42 is loose, the cutters may be adjusted to any desired width of cut by pushing them inward toward the axis of the tool, and then by screwing in the adjusting screw 38 the cutters may be gradually forced out until the desired adjustment is obtained. Then the screws 43 are screwed down tight so as to cause the ring 42 to securely clamp the cutters in place. Then the adjusting screw 38 may be tightened. When so tightened it bears more firmly against the inclined faces 36 of the cutters 33 and provides an abutment against which the cutters press when the tool is in service. It will be seen that as the cutters wear away and become shorter, the adjusting screw 38 will be moved farther and farther inward and this inward movement may continue until the conical face 39 of the screw 38 engages the conical faces 37 of the extensions 34 on the cutter head. When this point is reached the limit of adjustment is reached and the cutters must be replaced by new ones.

In the modification shown in Figs. 10 and 11 the same cutter head construction is employed but the cutter head 17 is not arranged with an independent stem 30 but is formed directly at the lower end of the shank 10. In this way the cutter head is attached to and rigid with the shank and does not have the floating action of the preferred form of the invention heretofore described. In this instance the inner end of the adjusting screw 38 passes into a threaded opening 44 in the shank 10 instead of into an opening in the stem 30. The bushing 41 is arranged the same as in the structure previously described and it coöperates in the same way with the shank 40 on the screw 38. The cutters 33 of the same construction and the conical face 39 on the screw 38 coöperates with their beveled ends 36 in the same way as heretofore described. The retaining ring 42 is held by screws 43 as in the case of the other structure.

It will be apparent that in carrying out my invention certain alterations and changes may be made in the parts and their arrangement without departing from the spirit and scope of the invention. Certain of its features may also be employed in other forms of construction. It is my intention to cover the various modifications and adaptations by the terms of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A boring tool having a head grooved on its under side with radial grooves of size and shape to receive cutters, said grooves being located between block-like extensions having their lower faces lying in a common plane, the outer edge of each of said extensions consisting of a beveled face, said faces being positioned so as to make the forward walls of said grooves shorter than the rear walls, a retaining ring positioned on the underside of said head adjacent and parallel to the said lower faces of said extensions, screws passing through said ring into threaded engagement with said extensions at points adjacent to the forward walls of said grooves to securely clamp the cutters in place, and a centrally positioned adjusting screw engaging a central threaded opening in said head and having a cylindrical guiding portion fitting into a guiding portion of said opening and having a conical portion for engaging the cutters to force them outward as said screw is screwed into said threaded opening.

2. A boring tool having a head grooved on its under side with radial grooves of size and shape to receive cutters, said grooves being located between block-like extensions having their lower faces lying in a common plane, the outer edge of each of said extensions consisting of a beveled face, said faces being positioned so as to make the forward walls of said grooves shorter than the rear walls, a retaining ring positioned on the under side of said head adjacent and parallel to the said lower faces of said extensions, screws passing through said ring into threaded engagement with said extensions at points adjacent to the forward walls of said grooves to securely clamp the cutters in place, and a centrally positioned adjusting screw engaging a central threaded opening in said head and having a cylindrical guiding portion fitting into a guiding portion of said opening and having a conical portion for engaging the cutters to force them outward as said screw is screwed into said threaded opening, said extensions having inner conical surfaces, adapted to engage the conical surface of said screw to limit the inward adjusting movement of said screw.

3. A boring tool having a cutter head, means for securing the cutters to said head, means for adjusting said cutters relative to said head, a shank, an intermediate member between said shank and cutter head, and means for securing said member, shank and head together so as to provide a lateral play of said head in all directions relative to said shank.

4. A boring tool having a cutter head, means for securing the cutters to said head,

a single adjusting means positioned centrally of said head and operative to adjust the cutters relative to said head, a shank, an intermediate member between said shank and cutter head, and means for securing said member, head and shank together so as to provide a lateral play of said head in all directions relative to said shank.

5. A boring tool having a cutter head, means for securing the cutters to said head, a single adjusting means positioned centrally of said head and operative to adjust the cutters relative to said head, a shank, an intermediate member between said shank and cutter head, means for securing said member to said shank with a limited movement in one direction, and means for securing said head to said member with a limited movement relative to said member in a direction at substantially right angles to said first mentioned direction.

6. A boring tool having a cutter head provided with radial grooves for receiving radially adjustable cutters, a central adjusting screw threaded into an opening in said head and having its own head positioned near the lower end of the tool so as to be readily accessible for adjusting purposes, said screw having a conical face for engaging the cutters to move them outward as said screw is screwed into said head, a shank, an intermediate member between said shank and cutter head, and means for securing said member, shank and head together so as to provide a lateral play of said head in all directions relative to said shank.

7. A boring tool having a cutter head provided with radial grooves for receiving radially adjustable cutters, a central adjusting screw threaded into an opening in said head and having its own head positioned near the lower end of the tool so as to be readily accessible for adjusting purposes, said screw having a conical face for engaging the cutters to move them outward as said screw is screwed into said head, a shank, an intermediate member between said shank and cutter head, means for securing said member to said shank with a limited movement in one direction, and means for securing said head to said member with a limited movement relative to said member in a direction at substantially right angles to said first mentioned direction.

In testimony whereof, I hereunto subscribe my name this 24th day of April, A. D. 1919.

JACOB VAN DER VORN.