July 19, 1927. 1,636,663

C. E. REED

WELL DRILLING CUTTER AND BEARING THEREFOR

Filed Sept. 27, 1926 2 Sheets-Sheet 1

Fig. 1.

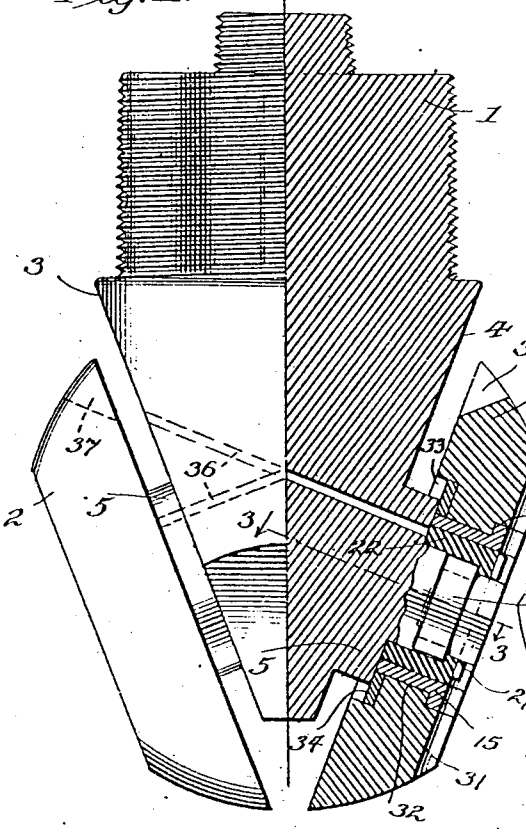


Fig. 2.

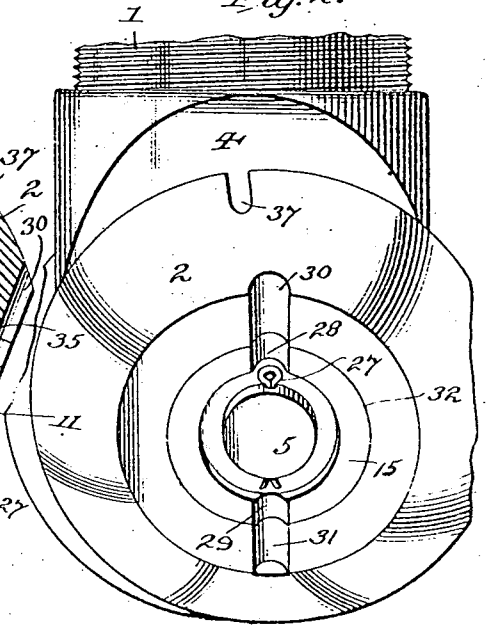
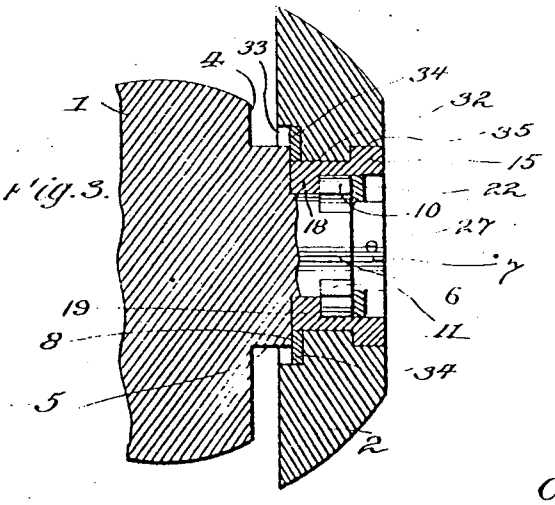


Fig. 3.



Inventor
Clarence E. Reed.

By Dodge Sons
Attorneys

July 19, 1927. 1,636,663

C. E. REED

WELL DRILLING CUTTER AND BEARING THEREFOR

Filed Sept. 27, 1926 2 Sheets-Sheet 2

Fig. 4.

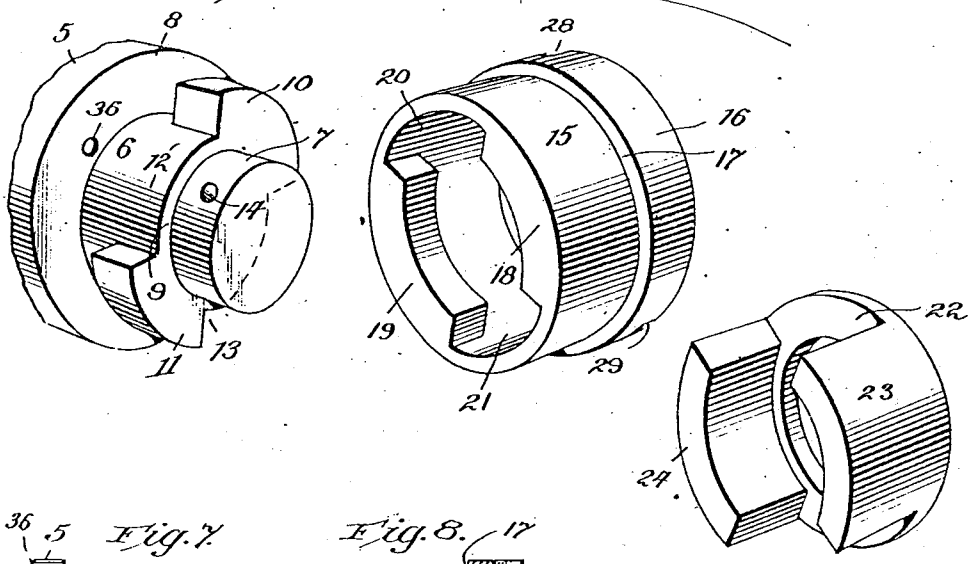


Fig. 7.

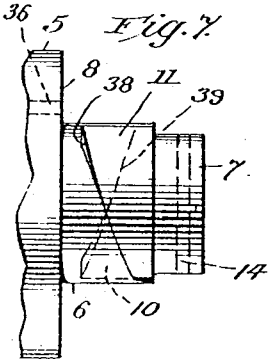


Fig. 8.

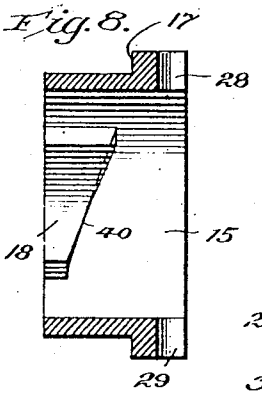


Fig. 9.

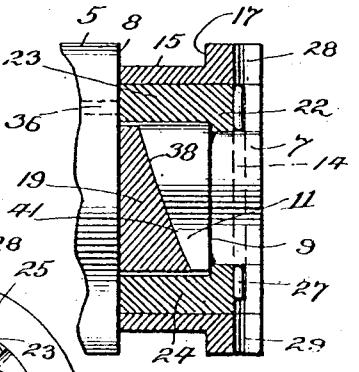


Fig. 5.

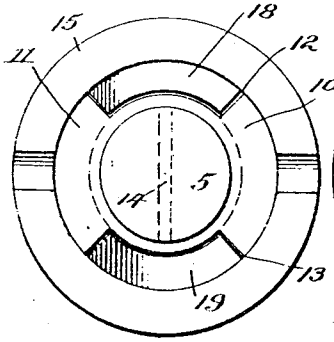
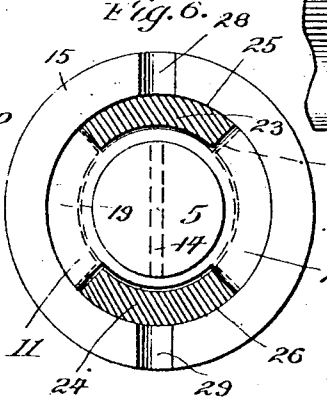


Fig. 6.



Inventor
Clarence E. Reed,
By Dodge & Dodge
Attorneys

Patented July 19, 1927. 1,636,663

UNITED STATES PATENT OFFICE.

CLARENCE E. REED, OF WICHITA, KANSAS.

WELL-DRILLING CUTTER AND BEARING THEREFOR.

Application filed September 27, 1926. Serial No. 138,061.

The present invention pertains to deep well drilling apparatus and particularly to the rolling cutters for rotary boring drills and the bearings on which they are mounted in the drill head.

Heretofore, in ordinary practice the bearings in the drill head for the rolling cutters were attached to the drill head by means of a left-handed thread connection, so that the clockwise rotation of the drill would tend to tighten the threads and thus prevent separation of the cutter and its bearing from the drill head. However, in lowering and raising the drill in the bore hole, contact of the cutters with the sides of the hole rotates them in either direction, frequently loosening the cutter bearing's threaded connection with the drill.

It is the purpose of the invention to provide a strong, serviceable and simple form of roller cutter and bearing assembly in which the above mentioned difficulties are overcome. It is particularly sought to provide a simple form of bearing, that is, one of few parts, thereby enabling them to be made rugged in order to withstand the wear and tear to which they are subjected.

A further object is to provide a roller cutter and bearing assembly which may be manufactured without difficulty and can be assembled and disassembled readily, the latter feature being of the utmost importance to the drill operator. A further object is the construction of the roller cutter and the bearing, so that the entire bearing is located within the body of the cutter. Consequently only the roller cutter, and not the bearing, is exposed to the frictional contact with the bore hole and the débris being carried out of the hole by the flushing fluid.

A construction is provided by the present invention, whereby the cutter bearing parts are assembled and effectively interlocked so as to prevent their accidental separation. It is further contemplated that the cutter and bearing be so constructed and arranged as to prevent wear and tear by the cutter on the drill head.

Reference is had to the accompanying drawings in which is disclosed several practical embodiments of the invention.

Fig. 1, an elevational view, partially in full and partially in section of a rotory boring drill head on which is mounted a pair of roller cutters in accordance with my invention;

Fig. 2, an elevational view of the same device taken at 90 degrees to Fig. 1;

Fig. 3, a section taken on line 3—3 of Fig. 1 looking downward;

Fig. 4, a perspective view of the disassembled parts of one of the roller cutter bearings shown in Figs. 1 to 3;

Fig. 5, a view of the outer end of the same bearing with certain of the parts in partially assembled condition;

Fig. 6, a similar view of certain of the parts in fully assembled condition, certain of the parts being shown in section;

Fig. 7, a side view of a modified form of the inner bearing member;

Fig. 8, a vertical central section of a correspondingly modified form of the outer bearing member; and,

Fig. 9, a side elevation, partly in full and partly in section, of a modified form of the bearing fully assembled.

In the drawings in Fig. 1 there is shown a rotary boring drill having a head 1. Mounted on the lower end of the head 1 is a pair of rolling cutters, these cutters and the bearings on which they are mounted on the drill head being constructed and arranged in accordance with my invention.

The roller cutters are represented at 2, 2 and, since they are duplicates, as is also the case with their bearings, only the cutter and bearing on the right-hand side of Fig. 1 will be described.

The lower end of drill head 1 is tapered so as to form oppositely inclined faces 3, 4 thereon. Forming an integral part of drill head 1 and projecting at right angles from each of the inclined faces 3, 4 is a laterally projecting spindle or roller cutter bearing member 5. Each spindle or bearing member 5 is formed with a reduced intermediate portion 6 and a still further reduced outer portion 7, all of these portions being circular in cross-section and disposed concentrically with reference to each other. Reference is had to Fig. 4 wherein the details of the construction of bearing member or spindle 5 are shown. By reason of the provision of

the reduced portions 6 and 7 on bearing member 5, the member has formed thereon an inner circumferential shoulder 8 and an outer circumferential shoulder 9, the purpose of which will appear hereinafter.

Located on the intermediate portion 6 of bearing member 5 and formed as an integral part thereof are a pair of radially-projecting, arcuate lugs or wings 10, 11, which are of uniform thickness and are spaced from and disposed substantially parallel to circumferential shoulder 8. Lugs 10, 11 each extend approximately one quarter or 90 degrees around the periphery of portion 6 of bearing member 5 and are arranged diametrically opposite each other with their outer faces flush with the circumferential shoulder 9. The arrangement and size of wings or lugs 10, 11 being as described, the arcuate spaces 12, 13 between these lugs also cover 90 degrees on the circumference of portion 6 of bearing member 5. The outer reduced portion 7 of bearing member 5 has a transverse opening 14 formed therein, the purpose of which will appear hereinafter.

Mounted on inner bearing member 5 and securely interlocked therewith is an outer, annular bearing member 15. The outer end of bearing member 15 is provided with a circumferential flange 16 forming a bearing shoulder 17.

At its inner end bearing member 15 is formed internally with a pair of radially-projecting, arcuate wings or lugs 18, 19. Lugs 18, 19 have their outer faces arranged flush with the adjoining end of bearing member 15. The lugs are arranged diametrically opposite each other and each extends one quarter of the way around the inside of the bearing member.

The internal diameter of outer bearing member 15 is such that the member can be fairly snugly telescoped over the outer edges of the lugs or wings 10, 11 of inner bearing member 5. In telescoping bearing members 5 and 15 to assemble the bearing, lug 18 of the outer member 15 passes into the space 12 of the inner member 5 and lug 19 of the outer member 15 passes into the space 13 between the lugs on the inner member 5. At the same time lugs 10, 11 of inner member 5 pass into the arcuate spaces 20, 21, respectively, between lugs 18, 19 in the outer bearing member 15. Lugs 10, 11 and spaces 12, 13 on the inner member 5 and lugs 18, 19 and spaces 20, 21 on outer bearing member 15 are all substantially of the same size and shape so that the parts interfit.

The assembly of the members 5, 15 of the roller cutter bearing is then completed by further telescoping cutter member 15 on inner member 5 until the outer member is brought against the circumferential shoulder 8 on the inner member and then rotating the two members a quarter turn or 90 degrees so as to move lugs 18, 19 of the outer member directly behind lugs 10, 11, respectively, of the inner member. The position of these parts when they are fully telescoped, but before they are rotated to interlocking position, is shown in Fig. 5. In Fig. 6 the positions of the parts are shown after they have been rotated and are fully interlocked.

As heretofore stated, wings 10, 11 in inner bearing member 5 are spaced from the circumferential shoulder 8. This space is approximately the width of wings 18, 19 on the bearing member 15, so that these wings fit into the space between the wings and circumferential shoulder 8 on the inner bearing member when the parts are assembled.

After bearing members 5 and 15 have been assembled and interlocked as just described, they are locked securely in this position by means of an annular member 22. Member 22 is provided on one face thereof with a pair of integral, diametrically-opposed, arcuate legs or lugs 23, 24. This locking member 22 and its lugs are made of such size that the lock member fits in the outer end of the outer bearing member 15 with its lugs extending into and filling the arcuate spaces 25, 26 between the wings 10, 11 and 18, 19 on the completely assembled bearing members 5, 15, respectively, as shown in Fig. 6. In this figure the annular or main body portion of locking member 22 is omitted in order to clearly show the arrangement of the other parts of the bearing. Locking member 22 is shoved into place in the bearing until the inner ends of its legs 23, 24 abut against shoulder 8 of inner bearing member 5 and the inner face of the annular portion of member 22 abuts against shoulder 9 on bearing member 5.

The parts of the bearing are proportioned so that when they are assembled as just described, part of the reduced portion 7 of inner bearing member 5 projects beyond the outer face of locking member 22. In this end of bearing member 5, as heretofore stated, there is provided a transverse opening 14. This opening is adapted to receive a cotter pin 27 which serves to secure locking member 22 in place.

In order to permit access to cotter pin 27 for its insertion or removal, the outer end of bearing member 15 is provided with a pair of diametrically-opposed, radially disposed grooves 28, 29. For the same purpose roller cutter 2 is provided with a similar pair of grooves 30, 31, see Figs. 1 and 2.

Figs. 1–3 inclusive show roller cutter 2 mounted on the preferred form of the cutter bearing which has just been described in detail. As shown in these figures, cutter 2 is provided with the usual central opening 32

by means of which the cutter is mounted for rotation on the bearing. In order to prevent wear on the drill head 1 by reason of the rotation of roller cutter 2 during the operation of the drill, roller cutter 2 at the inner end of its central opening 32 is provided with an annular recess 33 in which is seated a washer 34. Washer 34 takes the thrusts from the roller cutter 2 and transmits them to the circumferential bearing shoulder 8 on the inner end of bearing member 5 against which the washer bears. At the outer end of the circular opening 32 in roller cutter 2, the cutter is provided with another annular recess 35 in which is seated the circumferential flange 16 formed on the outer end of bearing member 15.

All of the parts in the construction described fit snugly together and serve to form a rugged roller cutter and bearing construction which may readily be assembled or disassembled. In assembling the parts, cutter 2 and washer 34 are first mounted on outer bearing member 15 against the bearing shoulder 17 thereon. These parts are then telescoped on the inner bearing member 5 and member 15 rotated so as to interlock the inner and outer bearing members together. Locking member 22 is then shoved into place and secured by means of cotter pin 27. The device is then ready for use.

In dis-assembling the parts, cotter pin 27 and locking member 22 are removed in order. Due to the nature of locking member 22 and the manner in which it is mounted in the bearing, it is most easily removed by means of a punch which may be inserted through an opening 36 extending from the opposite inclined side 3 of the drill head to the circumferential flange 8 on bearing member 5, which is directly in line with lug 23 of locking member 22. In order to insert a punch into opening 36, it is necessary to provide the periphery of the opposite roller cutter 2 with a notch or similar cut-away portion 37. Various other means may be employed for removing locking member 22.

In Figs. 7–9 inclusive, there is illustrated a modified form of the invention in which the co-acting lugs or wings on the inner and outer bearing members 5 and 15 are provided with inclined or wedging locking faces in order to bind or draw the bearing members into close locking relation. Aside from these inclined co-acting faces of the lugs of the two bearing members, the construction and arrangement of the bearing parts are the same. Referring particularly to Fig. 7, which shows the inner bearing member 5, lug 11 is provided opposite bearing shoulder 8 with an inclined face 38, while the corresponding face 39 of the opposite lug 10 is inclined in the same manner, thus giving the spaces between lugs 10, 11 and shoulder 8 a wedge shape.

In Fig. 8 is shown the outer bearing member 15 correspondingly modified. Lug 18 is provided with an inner inclined face 40, while in Fig. 9 which shows the two bearing parts assembled, lug 19 is shown as provided with a similar inclined face 41. The locking wings of the two bearing members 5, 15 are so proportioned that when they are assembled, this being accomplished in the same manner as was the case with the preferred form of the invention, lugs 18, 19 of the outer bearing member fit snugly into the tapered spaces between lugs 10, 11 and shoulder 8 of the inner bearing member.

As member 15 is rotated on member 5 to interlock the parts, the engagement of the inclined faces of the co-acting lugs will serve to draw the two bearing members into firm interlocked relation. In the modification shown in Figs. 7–9, inclusive, outer bearing member 15 is adapted to be rotated in a clock-wise direction which serves to lock the parts. Reverse movement of the parts is prevented by the legs 23, 24 of locking member 22, shown in Fig. 9. It will be understood that the inclined faces on the lugs of bearing members 5, 15 may be inclined in the opposite direction, so that the members are interlocked by rotation of the outer member in a counter-clockwise direction. In Fig. 9 outer bearing member 15 is shown in section in order that the relation between the inter-engaging lugs on the inner and outer bearing members when fully assembled may be made clear. After locking member 22 is put in place it is secured by means of cotter pin 27. In other words, the modified form of the invention is assembled and dis-assembled in the same manner as is the preferred form shown in Figs. 1–4.

The roller cutter bearing described is not limited in its use to a drill or roller cutter of the character illustrated and described herein, but may be used with any type or form of cutter or drill. The inner end of the inner bearing member 5 which is illustrated in Figs. 1 to 3 as forming a part of the drill head 1 need not necessarily form part of a drill, but may be one end of a roller cutter bearing part or assembly which is adapted to be formed as a separate element from the drill head for insertion therein and removal therefrom.

It is contemplated that various modifications and changes of the invention may be made and it is not intended that it be restricted to the embodiments illustrated and described herein, except as it may be limited by the appended claims.

What is claimed is:

1. The combination of a roller cutter; a bearing on which said cutter is mounted, said bearing comprising a plurality of members adapted to be interlocked to form an assembled bearing; means for retaining said

bearing members in interlocked relation; and a pin mounted in one of said bearing members to hold said retaining means in place, said roller cutter being grooved to permit insertion or removal of the pin.

2. A roller cutter bearing comprising a pair of bearing members having a bayonet joint connection with each other; and removable means for retaining said bayonet joint connection in locked condition.

3. A roller cutter bearing comprising a pair of bearing members adapted to be assembled to form a bearing, said members each being provided with means adapted to be brought together and rotated a definite part of a turn relative to each other to interlock the bearing members with each other; and removable means for preventing relative rotation of said members after they are interlocked.

4. In a roller cutter bearing, a pair of interlocked bearing members; and means for retaining said members in interlocked relation, one of said bearing members being provided with a punch-hole for the insertion of a punch to remove said retaining means.

5. A roller cutter bearing comprising a bearing member having a cylindrical portion provided with a pair of diametrically-opposed, arcuate wings formed on the exterior thereof; an annular bearing member also having a similar pair of wings formed on the interior thereof, said bearing members being adapted to be assembled by passing the wings of each member through the spaces between the wings on the other member and then turning the members so as to locate the lugs behind each other; and an annular locking member located within the annular bearing member and provided on its inner face with a pair of arcuate lugs projecting into the spaces between the wings on said bearing members for preventing relative rotation of said members.

6. A roller cutter bearing comprising an inner cylindrical bearing member having a circumferential bearing shoulder formed thereon said member also being provided with a pair of radially-disposed arcuate lugs on opposite sides thereof and spaced from said bearing shoulder; an outer annular bearing member having a circumferential bearing shoulder formed thereon, said member also being provided internally at one end with a pair of radially-disposed, arcuate lugs disposed in line with the lugs on the inner bearing member and located between said lugs and said bearing shoulder; an annular locking member located between the bearing members and provided with a pair of diametrically-opposed, arcuate lugs projecting into the spaces between said lugs on the bearing members to prevent rotation of the members; and a cotter pin mounted in an opening in the inner bearing member to hold said locking member in place, the outer bearing member being provided with a groove to permit removal of the cotter pin.

7. In a roller cutter bearing, the combination of a bearing member having a circumferential shoulder and a lug spaced from said shoulder; a second bearing member telescoped on the first bearing member and provided with a lug disposed between said shoulder and lug of the first mentioned bearing member; and removable means for preventing displacement of the second mentioned lug from between said first mentioned lug and shoulder.

8. In a roller cutter bearing, the combination of a bearing member having a pair of spaced circumferential shoulders; a second bearing member having a lug disposed between said shoulders of the first mentioned bearing member; and means for preventing displacement of said lug from between said shoulders.

9. In a roller cutting bearing of the construction claimed in claim 8, the spaced shoulders on the first mentioned bearing member forming a tapered slot and the lug on the second mentioned bearing member being wedge-shaped to fit into said tapered slot.

10. In a roller cutter bearing of the construction claimed in claim 8, one of the spaced shoulders of the first mentioned bearing member being inclined with reference to the other shoulder and one of the faces of the lug on the second mentioned bearing member being correspondingly inclined for binding engagement with each other to draw the bearing members together.

11. A roller cutter bearing of the construction claimed in claim 5 in which the inner bearing member is provided with an annular shoulder against which the locking member bears.

12. A roller cutter bearing comprising an inner bearing member having a circumferential shoulder at one end thereof and a pair of diametrically-opposed arcuate wings spaced from said shoulder; an annular outer bearing member also having a similar pair of wings formed on the interior thereof at one end of the member, said bearing member being adapted to be assembled by passing the wings of each member through the spaces between the wings on the other member and then turning the members so as to locate the lugs in alinement with each other with the lugs on the outer bearing member fitting snugly in the spaces between the lugs on the inner bearing member and said circumferential shoulder, the opposed, locking faces being correspondingly inclined so as to prevent relative rotation of the bearing members in one direction to move the lugs out of alinement; and an annular locking member located within the outer bearing

member and provided with lugs projecting into the spaces between the wings on said bearing members for preventing relative rotation of said members in the opposite direction.

13. The combination of an inner bearing member; an annular outer bearing member, said members being provided with complementary wings and spaces, the bearing members being adapted to be assembled by passing the wing of each member through the space on the other member and then turning the members so as to locate the wings behind each other; a locking member inserted between the inner and outer bearing members and filling the wing spaces so as to maintain the parts in interlocked relation; means for retaining said locking member in place; and a roller cutter rotatively mounted on the outer bearing member.

14. The combination of an inner bearing member; an annular outer bearing member, said members being provided with complementary wings and spaces, the bearing members being adapted to be assembled by passing the wing of each member through the space on the other member and then turning the members so as to locate the wings behind each other; a locking member inserted between the inner and outer bearing members and filling the wing spaces so as to maintain the parts in interlocked relation; means for retaining said locking member in place, said retaining means comprising a cotter pin passing through an opening in the inner bearing member and bearing against said locking member, the outer locking member being grooved to permit said cotter pin to be placed or removed; and a roller cutter rotatively mounted on the outer bearing member.

In testimony whereof I have signed my name to this specification.

CLARENCE E. REED.