

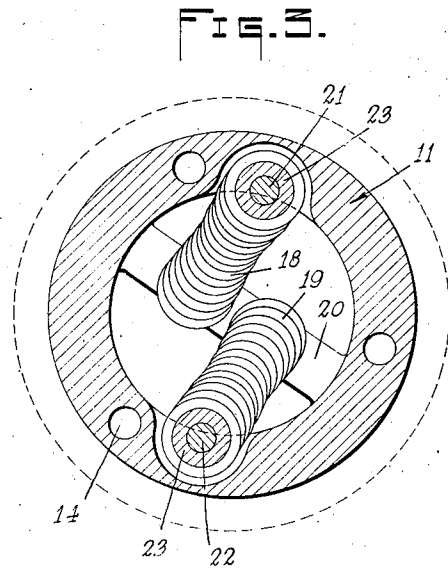
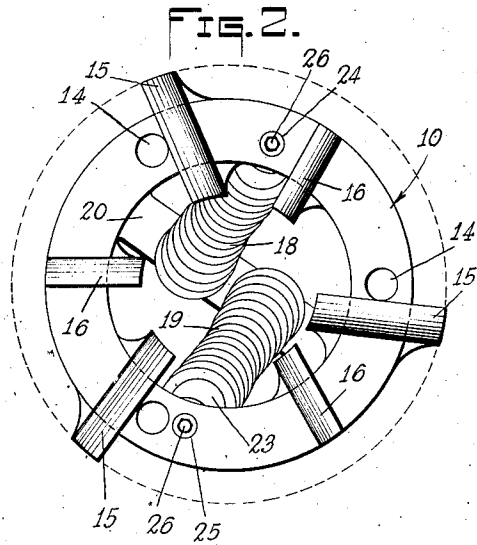
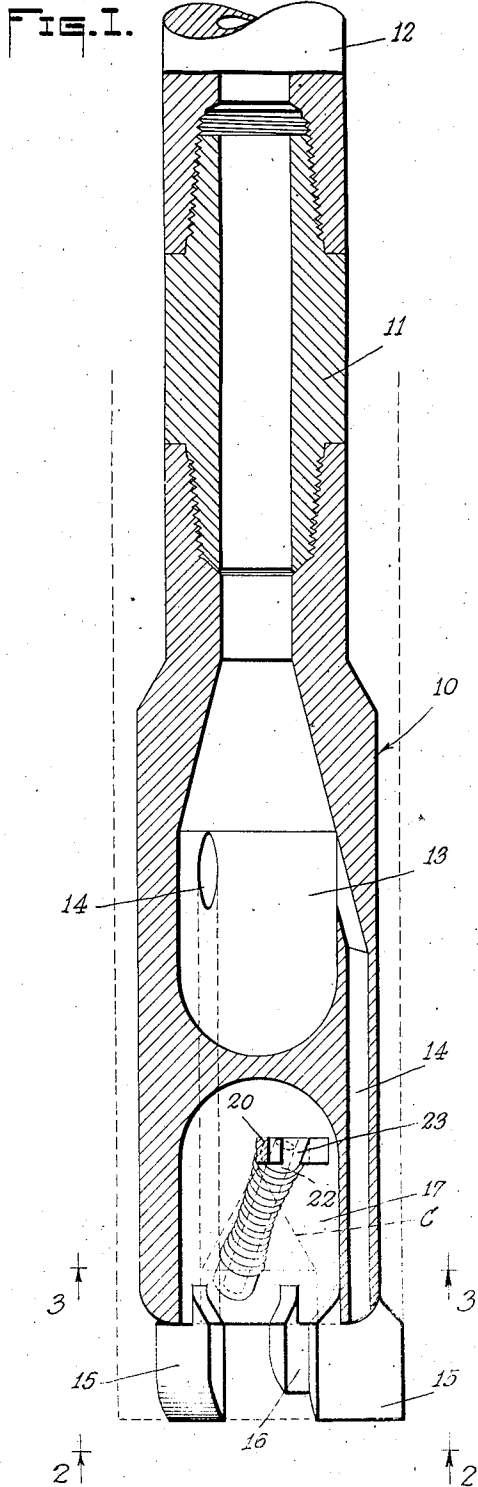
Dec. 17, 1935.

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2,024,730

ROLLER CORE BREAKER FOR BITS

Filed Sept. 17, 1934



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UNITED STATES PATENT OFFICE

2,024,730

ROLLER CORE BREAKER FOR BITS

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Application September 17, 1934, Serial No. 744,325

9 Claims. (Cl. 255—72)

This invention relates to a roller type core breaker for bits, such as well drilling bits.

Heretofore, core type bits have been designed which cut the formation around a central core and in the case of core barrels provision is made for breaking off and removing the core. Other types of bits have been designed which cut the formation wherein the bit is rotated about a vertical, central axis as in the conventional rotary well drilling practice but in such types of bits there is usually no satisfactory provision made for breaking up the core which is left at the center of the well hole. In such types of bits, in hard drilling, the core which remains causes the bit to merely ride on the core, hindering further progress downwardly into the formation.

An object of the present invention is to provide a roller type core breaker for well drilling bits which may be applied to various styles of bits and which is particularly designed for use on core type bits, enabling the advantages of a core bit to be retained and simultaneously and effectively breaking up the core as it is formed, thus reserving core barrels for use only where it is desired to recover a core for geological study.

A further object of the invention is to provide a core breaker for bits of the roller type so that the advantages of a roller in presenting a large amount of cutting edge over which the wear may be distributed are present.

A further object of the invention is to provide a core breaker for bits which is of such design as to have a distributed bearing against the core while breaking up the core so as to thus be effective to stabilize the bit during its rotation.

Still a further object of the invention is to provide a roller type core breaker for bits of rigid, simple, and durable design which will efficiently break up the core and which, when the rollers have become badly worn from continued use, can have the rollers easily and quickly replaced.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, and specifically pointed out in the appended claims, reference is had to the accompanying drawing for an illustrative embodiment of the invention, wherein:

Fig. 1 is a vertical section through a well drilling bit illustrating the invention as having been embodied thereon.

Fig. 2 is a bottom plan view taken upon the line 2—2 upon Fig. 1 in the direction indicated.

Fig. 3 is a horizontal section taken upon the

line 3—3 upon Fig. 1 in the direction indicated.

Referring to the accompanying drawing, wherein similar reference characters designate similar parts throughout, the bit in which the invention has been embodied is shown as consisting of a body 10 attachable such as by a sub 11 to a drill pipe 12. This body has an enlarged interior 13 for circulation fluid which passes therefrom through ports or passages 14 leading to the bottom of the body. On the bottom of the body there are formed cutting blades and in the present instance I have illustrated the blades as consisting of three large blades 15 and three small blades 16. The large blades 15 project outwardly beyond the sides of the body and serve to ream the walls of the well and keep it out to gage as well as to cut the formation. The small blades serve merely as cutters and the inner ends of all of the blades project inwardly beyond the sides of a hollow dome-shaped recess 17 formed in the bottom of the body. The inner ends of the blades define the size of the core cut by the bit. The particular design of the cutting blades 15 and 16 is immaterial insofar as the present invention is concerned and may be varied considerably. These are mentioned for illustrative purposes only to lay the setting for the location of the present invention. The core breaker for breaking up the core, indicated by dotted lines at C on Fig. 1, consists of rollers 18 and 19 disposed within recess 17. A diametrical web 20 extends across the recess adjacent its top and pins 21 and 22 extend from the bottom edge of the body up into this diametrical web. These pins are so arranged as to be upwardly and inwardly inclined but they are disposed otherwise than in radial planes of the bit. In the preferred form of invention wherein there are two rollers and pins therefor, the pins are in parallel planes on opposite sides of a diameter of the bit. Preferably, the upper ends of the pins are provided with bushings 23 disposed in web 20 and in a similar manner the lower ends of the pins of the bushings which fit in the recesses therefor formed in the sides of recess 17. The holes for the insertion of the pins are indicated at 24 and 25 on the bottom service of the body and are preferably closed by screw plugs 26. The rollers are rotatable on the pins between the bushings. The rollers 18 and 19 are provided with circumferentially extending teeth and these teeth may be either a series of annular ridges or they may progress from one end of the roller to the other similar to threads. In the preferred form of construction each roller

is of general hyperboloidal shape. The reason for giving the roller cutters this general shape is to cause them, due to the arrangement of their respective axes, to scarify the core C so that its top will be truly conical. Each tooth, along the length of the rollers, will be caused to do its proper share of cutting on the core. While in certain instances the general shape of each roller may be truly cylindrical when the rollers are so designed, due to the positions of the axes about which the rollers rotate, the top of the core would not be cut or scarified into a true cone but, instead, its sides instead of being straight would be slightly concave, resulting in the center teeth being subjected to the greatest wear. It will be noted that the rollers bearing on the sides of the cone on the top of the core in an oblique direction form a distributed bearing area around the cone and this has the tendency to stabilize the bit around the core.

During rotation of the bit the circumferentially extending teeth on the rollers have the tendency to cause the rollers to track on the teeth. However, as the rotation of the bit is restricted to a horizontal plane or substantially so, due to the limited progress of the bit downwardly through the formation, the rollers are prevented from tracking and effectively scarify the sides of the cone. Although the top of the cone on the core is very near the center of rotation of the bit the design is such that the teeth on the tops of the rollers move freely thereon with considerable travel so as to cause the very center of the core to be effectively scarified and broken up so that there is never any danger of a hard core forming on which the bit might ride.

From the above described construction it will be appreciated that a novel and advantageous core breaker for bits is provided which will completely and continuously break up and scarify the core left by the bit as the bit rotates. The rollers each provide a long length of cutting edge over which the wear is evenly distributed.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as described in the appended claims.

I claim:

1. A bit having a core breaker comprising a roller having teeth formed thereon, said roller being rotatable about an axis which is upwardly and inwardly inclined to the axis of the bit and which is disposed otherwise than in a plane radial of the bit.

2. A bit having a core breaker comprising a

roller having circumferentially extending teeth formed thereon, said roller being rotatable about an axis which is inclined to the axis of the bit and which is disposed otherwise than in a plane radial of the bit.

3. A bit having a core breaker comprising a roller having teeth formed thereon, said roller being rotatable about an axis which is inclined to the axis of the bit and which is disposed otherwise than in a plane radial of the bit, the roller being of generally hyperboloidal shape.

4. A bit having a core breaker comprising a roller having circumferentially extending teeth formed thereon, said roller being rotatable about an axis which is inclined to the axis of the bit and which is disposed otherwise than in a plane radial of the bit, the roller being of generally hyperboloidal shape.

5. A bit having a core breaker comprising rollers, said rollers being rotatable about axes which are upwardly and inwardly inclined and disposed in planes which are non-radial to the axis of the bit and having teeth formed thereon so that on rolling about the core the teeth will scarify the sides of the core.

6. A bit having a core breaker comprising rollers, said rollers being rotatable about axes which are upwardly and inwardly inclined and having teeth formed thereon so that on rolling about the core the teeth will scarify the sides of the core, said rollers being of generally hyperboloidal shape.

7. A bit having a core breaker comprising rollers mounted for rotation on the bit about axes which are upwardly and inwardly inclined and which are arranged otherwise than in planes radial of the bit, said cutters having circumferentially extending teeth formed thereon and being of generally hyperboloidal shape.

8. A bit having cutting edges on its bottom and a hollow center, core breaker rollers disposed in the hollow center, and pins extending through the rollers on which the rollers rotate, said pins extending upwardly and inwardly in planes other than radial of the bit.

9. A bit having cutting edges on its bottom and a hollow center, core breaker rollers disposed in the hollow center, and pins extending through the rollers on which the rollers rotate, said pins extending upwardly and inwardly in planes other than radial of the bit, the rollers being provided with circumferentially extending teeth and being of generally hyperboloidal shape.

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