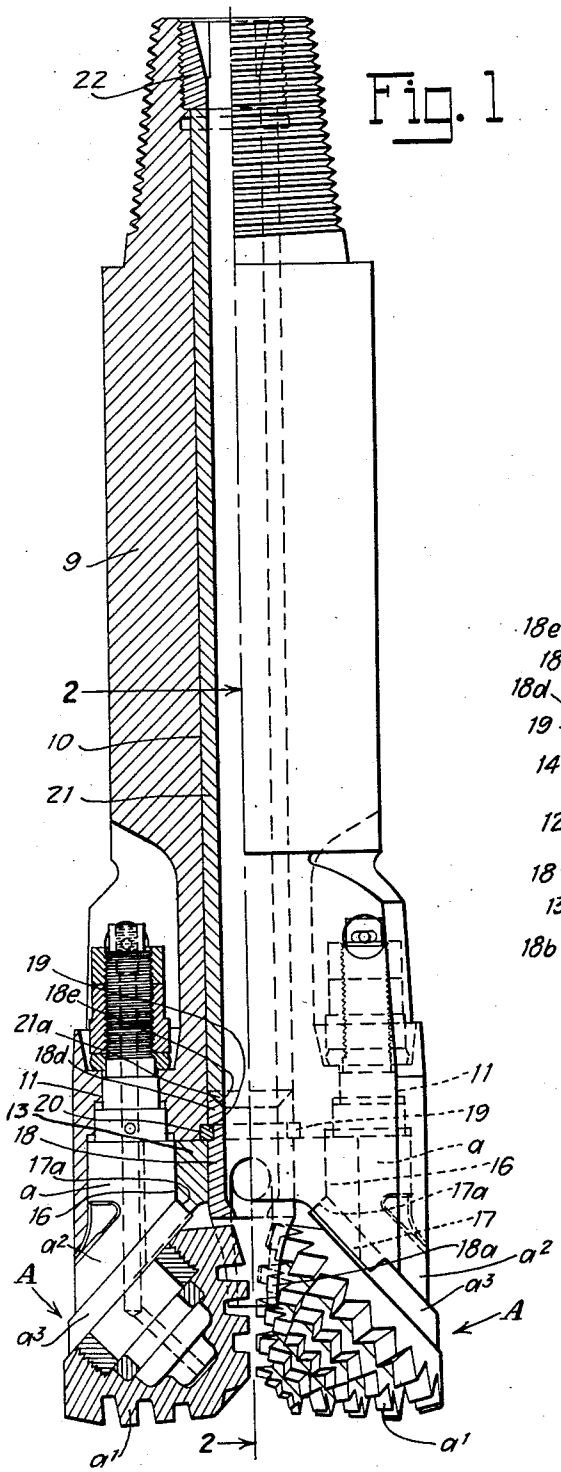
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EARTH BORING APPARATUS

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Fig. 1



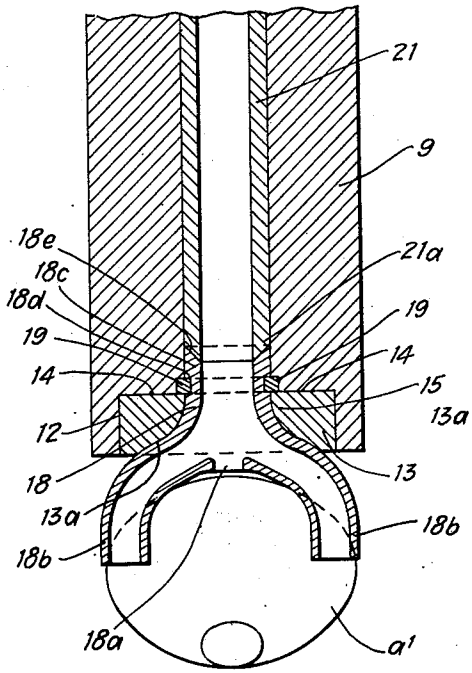


Fig. 2

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EARTH BORING APPARATUS

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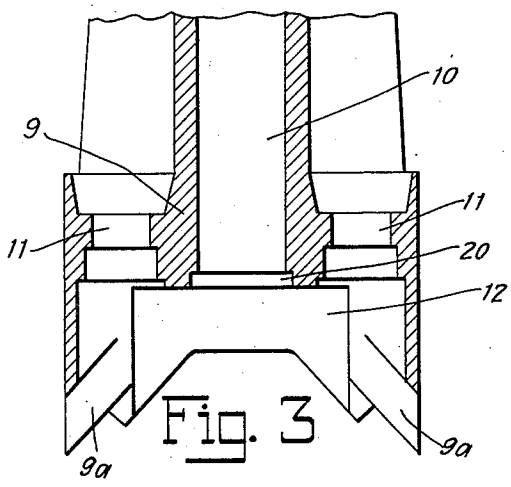


Fig. 3

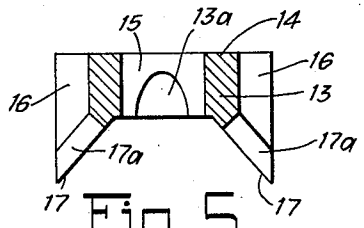


Fig. 5

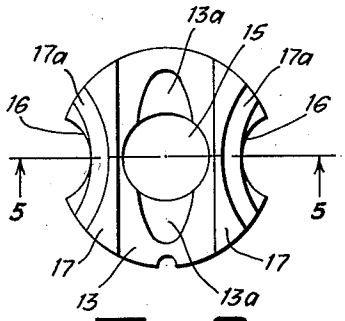


Fig. 6

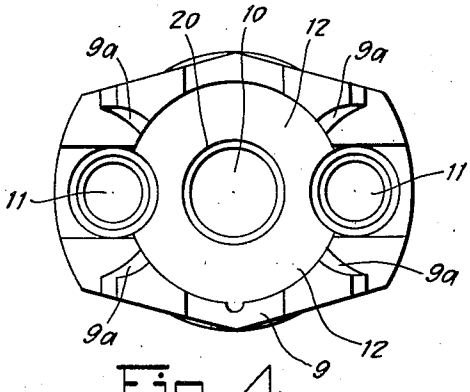


Fig. 4

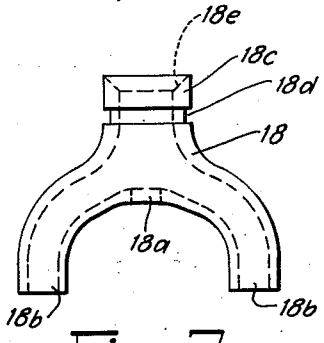


Fig. 7

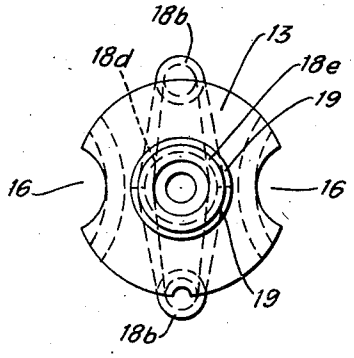


Fig. 8

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UNITED STATES PATENT OFFICE

1,992,992

EARTH BORING APPARATUS

Anthony H. Collins, Bronxville, N. Y., assignor to Chicago Pneumatic Tool Company, New York, N. Y., a corporation of New Jersey

Application January 6, 1932, Serial No. 584,951

9 Claims. (Cl. 255—71)

This invention relates to apparatus for the sinking of deep wells to tap sources of gas, water and oil, to reach mineral deposits, and for operations of a similar character. More particularly it relates to rotary drilling apparatus with special attention to the maintenance of the gauge of the drill hole and to certain details of structure. While it involves features capable of general application, it is particularly directed to rotary bits of the opposed cone type.

In deep well drilling it is customary to use a core bit from time to time to secure samples of the formation being drilled. Since core bits make a smaller hole than the standard bit, it becomes necessary to ream the hole out to full size after each coring operation. The reaming is a rather difficult operation and subjects the bit head to abnormal side thrusts or compression strains of such intensity that the metal of the bit heads is often compressed in certain places and distorted in others with the result that the cutters are pressed inwardly toward each other and the hole is not cut to full gauge.

One object of the invention is to devise means for effectively resisting the side compression strains on a bit head. Another object is to effect such a result with relatively minor changes in conventional and known bit heads. Another object is to devise a construction which is applicable at slight expense to bit heads already in use. Still another object is to provide means for renewably supporting a flush water manifold in proper relation to the cutters. Still another object is to utilize cutter units insertable into one piece bit heads lengthwise of the bit heads for maintaining the compression resisting means, or the flush water manifold, or both, in place. Still other objects will be apparent from the detailed description which follows:

The invention involves the use of a compression resisting member or plate in the bit head in position to resist compression strains and thrust. The member may be of different material than the head, or of the same or similar material provided that it is especially treated or hardened. It is preferably placed closely adjacent to the cutter members. A flush water manifold may be made as a part of or secured to the compression resisting member. In a bit head of the one piece type having cutter units longitudinally insertable therein, the compression resisting member may form a portion of the opposed seat recesses in the bit head and be directly engaged by the shank and bearing members supporting the cone cutters, so that the cutter units maintain the compression resisting member and/or a flushing fluid manifold in place.

In order to illustrate the invention one concrete embodiment thereof is shown in the accompanying drawings, in which:

Fig. 1 is a view partly in vertical section and partly in side elevation of a bit head embodying the invention;

Fig. 2 is a fragmentary transverse sectional view substantially on the line 2—2 of Fig. 1;

Fig. 3 is a transverse sectional view of the bit head shown in Fig. 1 with all auxiliary parts removed;

Fig. 4 is a bottom plan view of the head shown in Fig. 3;

Fig. 5 is a transverse sectional view of the compression resisting plate on the line 5—5 of Fig. 6;

Fig. 6 is a bottom plan view of the compression resisting plate;

Fig. 7 is a side elevational view of the flushing fluid manifold;

Fig. 8 is a top plan view of the compression resisting plate with the flushing fluid manifold assembled therein.

The invention is disclosed as embodied in a bit head 9 of the one piece type provided with a central bore 10 for the flushing fluid and parallel longitudinal bores 11 on opposite sides of the flushing water bore 10 for receiving shanks a of cutter units A, said cutter units mounting roller cutters a' of the cone type in opposition to each other in the lower end of bit head 9. The cutter units A conform to those disclosed in the Reissue Patent No. 17,741 issued July 22, 1930, to Clarence E. Reed and since the manner of mounting is the same further description thereof is omitted.

As clearly indicated in Figs. 2, 3 and 4, the bit head is formed with a deep annular recess 12 in which is mounted with a close or press fit a compression resisting member or plate 13, the form of which is clearly indicated in Figs. 5, 6 and 8. The compression resisting plate is of much harder material than the bit head. It may be a forging or be cut from bar stock and then subjected to heat treatment to harden it all the way through. It has a flat upper face 14 engaging the end wall of recess 12 and a central bore 15 to register with the flush water bore 10 in bit head 9 and arcuate recesses 16 to register with bores 11. Adjacent recesses 16 on its lower side, compression resisting plate 13 has extensions 17 conforming to the contour of the lower end of the bit head and cooperating with the latter to form the inverted V-shape recess within which cone cutters a' are mounted. Extensions 17 are cut away arcuately

as at 17a (Figs. 5 and 6) to cooperate with similar cut-away portions 9a (Figs. 3 and 4) in the bit head to form the seat recesses receiving the base portions a^2 of the cutter units with the base flange a^3 of said units directly engaging said arcuate cut-away portions 17a and 9a of the compression resisting plate 13 and bit head 9 respectively. Hence, when the cutter units A (Fig. 1) are assembled on bit head 9 with compression resisting plate 13 in place in recess 12, it is apparent that the shank and base portions a, a^2 and a^3 of cutter units A engage compression resisting plate 13 in such a manner as to securely maintain it in place in the bit head.

Manifold 18 for distributing the flushing fluid passing through bore 10 of bit head 9 may be made integral with compression resisting member 13 but since the flushing fluid often contains grit which produces rapid wear, the manifold is preferably made as a separate member in order that it may be conveniently replaced. The manifold herein disclosed has three outlets, namely outlet 18a at the center to discharge directly between cutters a' to clean the teeth thereof and side outlets 18b in the form of nozzles for directing a portion of the discharge directly upon the bottom of the hole intermediate the cutters but near the periphery of the hole, as indicated in Fig. 2.

Compression resisting plate 13 may be recessed, as indicated at 13a, in a plane at right angles to recesses 16 to receive the side nozzle portions of manifold 18 and the latter may have an extension 18c directly above outlet 18a to fit and extend through central bore 15 in compression resisting plate 13. An annular groove 18d is cut in manifold extension 18c to receive locking segments 19 (Figs. 1, 2 and 8) which rest upon the upper flat face 14 of compression resisting plate 13 securely to mount manifold 18 upon the compression resisting plate and resist the heavy pressure exerted by the flushing fluid. A counterbore 20 in bit head 9 concentric with flush water bore 10 serves to receive and to maintain locking segments 19 in place when the assembled compression resisting plate 13 and manifold 18 are inserted in the bit head. The upper end of manifold extension 18c may be bevelled inwardly as indicated at 18e to receive with a tight fit the correspondingly tapered end 21a of renewable wash pipe 21 which may be inserted into bore 10 of bit head 9 from the upper end and be tightly wedged in place by wash pipe nut 22.

From the above it will be apparent that the compression resisting plate 13 of the present invention is arranged to stiffen the bit head at the point where it is particularly subjected to compression strains, namely closely adjacent cone cutters a', that in a one piece bit head of the type disclosed in the drawings the hardened compression resisting plate may be arranged for direct engagement by the shank and base portions of the cutter units so as to form a rigid and unyielding abutment against all compression strains, that the compression resisting plate being a separate element may be conveniently formed of special material subjected to a special hardening process so that it will not be deformed in service, that bit heads already in service may be easily modified to use the compression resisting plate by making the necessary recess in the lower end thereof, that a flush water distributing manifold may be similarly mounted in a bit head or combined with the compression resisting plate, and that when the manifold is made as a separate element supported by the compression resisting plate the bit head may cooperate to establish locking engagement of the manifold with the plate.

I claim as my invention:

1. A rotary boring bit comprising a bit head having roller cutter units removably mounted in the lower end thereof, and a one-piece member for maintaining said units against movement toward one another under compression, said member resting on and being maintained in place by said units, and being non-rotatable with respect to the bit head.

2. A rotary boring bit having an inverted V-shaped recess in its lower end, a second recess above said V-shaped, and longitudinal bores on opposite sides of the axis of the bit shank, and bearing members secured in said bores for supporting cone cutters in opposed relation in said V-shaped recess, a compression resisting plate of harder material than said bit disposed in said second recess, said plate having recesses in line with said bores receiving the shank portions of said shank and bearing members rigidly to maintain the latter against movement toward each other.

3. In earth boring apparatus, a one-piece bit head having an axial water course, detachable shank and bearing members mounting cone cutters in opposed relation in opposite sides of said course, a manifold for distributing the flushing fluid in a vertical plane transverse to that of said cutters and between the latter, and means on said manifold engaged by said members whereby the latter maintain said manifold in place against the thrust of the flushing fluid.

4. A bit head mounting cone cutters in opposed relation in the lower end thereof and having an axial water course, a compression resisting plate of hardened material mounted in said head adjacent said cutters, and a manifold mounted in said plate for distributing the flushing fluid issuing from said course.

5. A rotary boring bit having an axial water course and cutter units removably mounted on opposite sides of said course, said units comprising shank and bearing members rotatably supporting roller cutters, a compression resisting plate interposed between said members and secured to said bit by the latter, a manifold extending through said plate for distributing flushing fluid issuing from said course, and means for locking said manifold against removal from said plate.

6. A rotary boring bit having an axial water course and cutter units removably mounted on opposite sides of said course, said units comprising shank and bearing members rotatably supporting roller cutters, a compression resisting plate interposed between said members and secured to said bit by the latter, a manifold extending through said plate for distributing flushing fluid issuing from said course, said manifold having an annular groove in the portion extending above said plate, locking segments engaging the upper face of said plate and extending into said groove, said head having a counterbore adjacent said course receiving said segments and maintaining them against movement to release said manifold.

7. A compression resisting member for insertion into the recessed lower end of a rotary boring bit comprising a plate of hardened material having a central bore for passing flushing fluid and side recesses and extended portions to be directly

engaged by shank and bearing members for supporting roller cutters in said bit beneath said plate.

8. In combination, a compression resisting plate of hardened material for mounting in a rotary boring bit of the opposed cone type between the cutter supports, said plate having a central bore, and a three way manifold having a portion extending through said bore, and locking means engaging the extended portion of said manifold for securing the same in place on said compression resisting plate.

9. A flushing fluid manifold for an earth boring bit comprising a branched conduit forming side nozzles and having a central outlet port intermediate said nozzles, said manifold having an extension in line with said central outlet and an annular groove in the exterior of said extension adjacent the end thereof.

ANTHONY H. COLLINS.