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W. G. LAKE

2,419,901

DIAMOND DRILL

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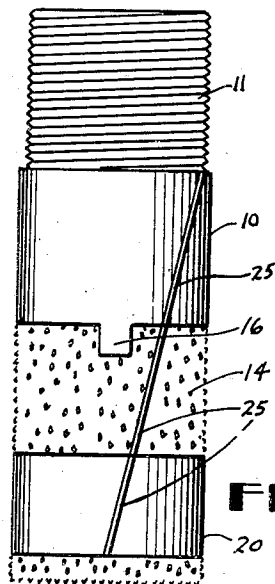


FIG 1

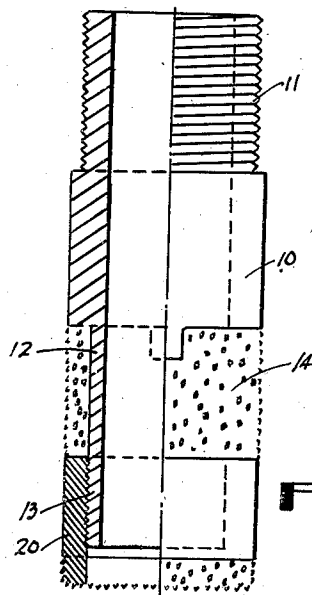


FIG 2

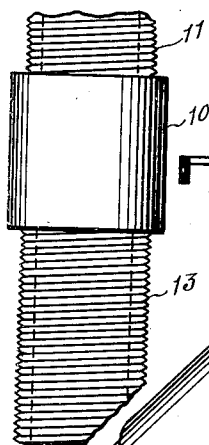


FIG 6

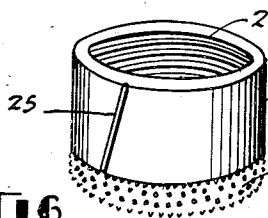


FIG 3

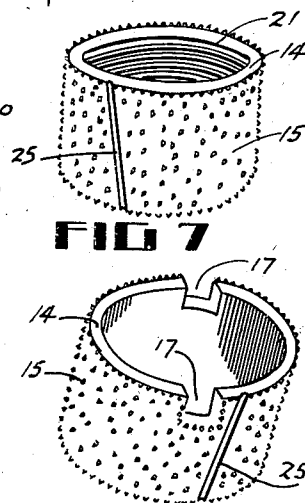


FIG 7

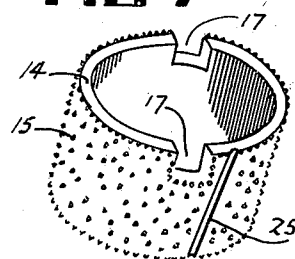


FIG 4

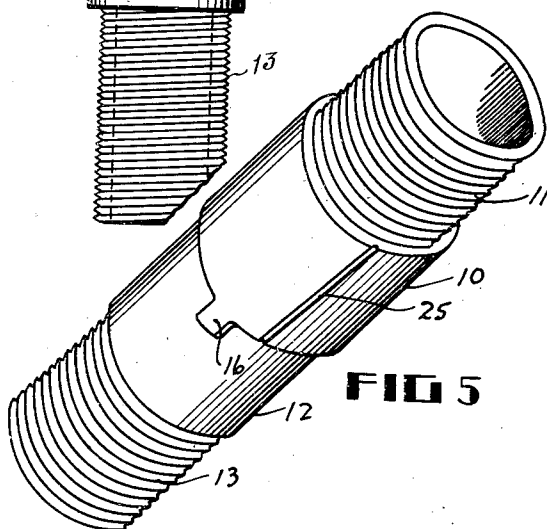


FIG 5

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UNITED STATES PATENT OFFICE

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DIAMOND DRILL

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3 Claims. (Cl. 255-72)

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This invention relates to a diamond drill of the type employed by mines, miners, prospectors, geologists, diamond drill contractors, construction engineers and the like for drilling holes or for obtaining a core or sample of the geological structure or strata through which a drill passes, and is particularly directed to providing improvements in the arrangement and design of the core bit, reamer, and coupler elements at the working end of a diamond drill.

Diamond drills of the type employed for drilling holes or for obtaining a core or sample of a geological structure or strata are well known in the mining art and are extensively used, particularly in prospecting and in mine development operations. Such drills include, in general, a boring column comprising a diamond studded bit for cutting the core, a reaming shell, a core barrel and rods, the reaming shell serving as a coupling between the bit and the core barrel.

In the use of diamond drills, the core sample is cut by the rotation of the diamond studded bit and, at the same time, it is necessary to ream the wall of the drill hole by means of a diamond studded reamer attachment for the purpose of maintaining consistent hole size to permit extraction and insertion of the device from and into the drill hole.

One of the principal objects of this invention is to provide an improved reamer attachment which is located immediately adjacent to the bit, thereby permitting easy withdrawal of the bit and which minimizes the distance to be reamed when a new bit is attached to the core barrel and inserted into the drill hole.

A further object of the invention is to provide a novel design of reamer which is easily attached to or separated from the drilling assembly and when in place is securely locked in fixed position against rotation independently of the core barrel.

A still further object of the invention is to provide a reamer attachment whereby wear on its outer shell through abrasion by rock particles is minimized and the life of this part is prolonged accordingly with corresponding economies in operating costs incident to renewals.

An understanding of the manner in which the above and other objects of the invention are attained may be had from the following description, reference being made to the accompanying drawings, in which:

Figure 1 is an elevation of the working end of a diamond drill incorporating the improvements of the present invention;

Figure 2 is a vertical section;

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Figure 3 is a perspective view of the bit;

Figure 4 is a perspective view of the reamer;

Figure 5 is a perspective view of the reamer coupling;

Figure 6 is a perspective view of an alternative arrangement for securing the reamer to the coupling; and

Figure 7 is a perspective view of an internally threaded reamer for use with the coupling illustrated in Figure 6.

Like reference characters refer to like parts throughout the specification and drawings.

The working end of a diamond drill incorporating the improvements of the present invention, as illustrated in Figure 1, comprises, in general, a tubular coupling having an externally threaded shank, an annular ring having a diamond studded outer face detachably fittable on the shank, means for securing the annular ring in fixed position for rotation with the coupling, and an internally threaded diamond studded bit threadedly securable to said coupling in snug fitting relationship with the annular diamond studded ring, the main surfaces of the coupling, ring, and bit being in approximate alignment and the diamonds of said annular ring extending beyond the main surfaces.

Referring to Figures 1 through 5 of the drawings, the numeral 10 indicates a tubular coupling in the form of a reamer coupling. This coupling is usually of a steel of sufficient strength and hardness to resist the operating strains and the abrasive action of rock particles to which it is exposed. The coupling is formed with an externally threaded shank 11 which is adapted to be threaded into the end of the tubular core barrel, not shown. At the other end of the coupling is provided an unthreaded portion 12 of reduced diameter and of a length approximately equal to the height of the reamer 14 to be described in detail hereinafter. The portion of the shank between the unthreaded portion of reduced diameter 12 and its end is externally threaded, as indicated by the numeral 13, for threading into the internally threaded end of the bit 20 also described in detail hereinafter.

The reamer 14 is in the form of an annular ring of a height approximately equal to the length of the unthreaded portion 12 of the shank of the coupling, of an internal diameter only slightly greater than the external diameter of the portion 12 in order to form a fit which is snug and yet permits of easy attachment and detachment, and of a wall thickness approximately equal to the difference between the external diameters of

the coupling and the unthreaded portion 12 of the shank so that the reamer fits snugly on the shank with the walls of the reamer and the coupling in approximate alignment. The outer face of the annular ring is studded with diamonds 15, such as by moulding or by any other known method, so that the diamonds extend beyond the main surface of the ring, for example, about $\frac{25}{1000}$ of an inch.

The reamer may be secured in fixed position 10 for rotation with the coupling by any one of several means, such as by keying. It is preferred to secure it, however, by providing one or more projections or keys 16 which extend from the periphery of the coupling a short distance along the shank portion 12 and fit snugly into correspondingly shaped keyways 17 cut in the rim of the reamer.

The bit 20 is of tubular design, being internally threaded at one end, as at 21, for attachment to the threaded shank 13, and is studded with diamonds 22 at its opposite end, such as by moulding or other methods according to standard practices. The internal bore of the bit may be tapered suitably to receive a core lifter spring according to standard practice.

One or more shallow grooves 25 are cut longitudinally in the outer wall of the coupling, reamer and bit to carry water from the face of the bit to the diamond studded reamer to prevent excessive heating and wearing of this part. In assembling, the several parts are preferably positioned such that the respective grooves 25 form a continuous channel, as illustrated in Figure 1.

In assembling, the shank 11 of the coupling 10 is threaded tightly into the lower end of the tubular core barrel; the annular reamer ring 14 is fitted, in a light-press fit, on the unthreaded portion 12 of the other shank with the keys or projections 16 fitted snugly into the keyways 17; and the diamond studded bit is threaded on to the threaded portion 13 of the shank, the several parts being drawn tightly together to prevent entrance of rock particles into the joints and to lock the respective parts together for rotation.

An alternative arrangement for securing the reamer to the coupling is illustrated in Figures 6 and 7. The shank 30 to which the reamer is secured is shown as threaded its full length, and the reamer 31 is shown as internally threaded to be threadedly attached to the shank 30. This arrangement has all the advantages of the arrangement described hereinbefore with the exception that the wall thickness of the reamer is less, due to the grooves of the internal threads and, as a result, is not as ideally adapted for the setting of larger size diamonds.

It is found that the novel arrangement of the parts of the working end of a diamond drill of the present invention has many advantages. The arrangement of the reamer and the externally threaded tubular coupling permits of greater thickness in the walls of the coupling and the reamer which makes possible a wide range of diamond sizes which are necessary in drilling in different types of ground; and minimizes wear on the outer surfaces of the parts, thereby greatly extending the useful life of the reamer and coupling parts and minimizing the danger of possible loss of the bit in the drill hole due to breakage at this point. The arrangement of the reamer and the manner in which it is attached to the coupling is of important advantage in that there is no difficulty in maintaining gauge sizes within very narrow limits and when the diamonds

in the reamer are worn low enough to render them unfit for further use without resetting, the parts are readily separable and a new reamer can be readily fitted on the unthreaded portion of the shank.

A further and important advantage is that the reamer is positioned adjacent to the cutting edge of the bit thereby minimizing the distance between the cutting edges of the two parts and the distance required to be reamed in the bottom of the drill hole between the lowermost edges of the reaming diamonds and the bit when a new bit is inserted into the drill hole. The advantage of this feature is important for in instances of hard rock drilling a bit may be useful for a distance of only about 20 feet of drilling, thereby necessitating relatively frequent extraction and insertion of the parts from and into the drill hole.

It will be understood, of course, that modifications may be made in the preferred embodiments of the invention described and illustrated herein without departing from the scope of the invention as defined by the appended claims.

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

1. In a drilling tool, the combination of a tubular coupling having an externally threaded shank, an annular ring having a diamond studded outer face detachably fittable on said shank, and a tubular bit internally threaded at one end for attachment to said shank in snug fitting relationship with the end of the annular ring, said bit securing said ring in fixed position on said shank.

2. In a drilling tool, the combination of a tubular coupling having an externally threaded shank at each end, an unthreaded portion of reduced diameter at one end between the body of the coupling and the thread, an annular ring having a diamond studded outer face detachably fittable on the unthreaded portion of reduced diameter, means for securing the annular ring in position for rotation with the coupling, and a tubular bit internally threaded at one end for attachment to the last mentioned shank in snug fitting relationship with the end of said annular ring.

3. In a drilling tool, the combination of a tubular coupling having an externally threaded shank at each end, and an unthreaded portion of reduced diameter at one end between the body of the coupling and the thread, an annular ring having a diamond studded outer face detachably fittable on said unthreaded portion of reduced diameter, means for securing the annular ring in position for rotation with the coupling comprising at least one key extending from one of said parts into a correspondingly shaped keyway cut in the other of said parts, and a tubular bit internally threaded at one end for attachment to the last mentioned shank in snug fitting relationship with the end of said annular ring.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,907,154	Mitchell	May 2, 1933
2,014,955	Taylor	Sept. 17, 1935
2,268,775	Potvin	Jan. 6, 1942
2,280,851	Ranney	Apr. 28, 1942
1,515,819	Zublin	Nov. 18, 1924
1,725,299	Pickin	Aug. 20, 1929