Sept. 24, 1957 R. A. WYMAN 2,807,443

PERCUSSIVE DRILL BIT

Filed Nov. 2, 1953 2 Sheets-Sheet 1

Fig. 1.

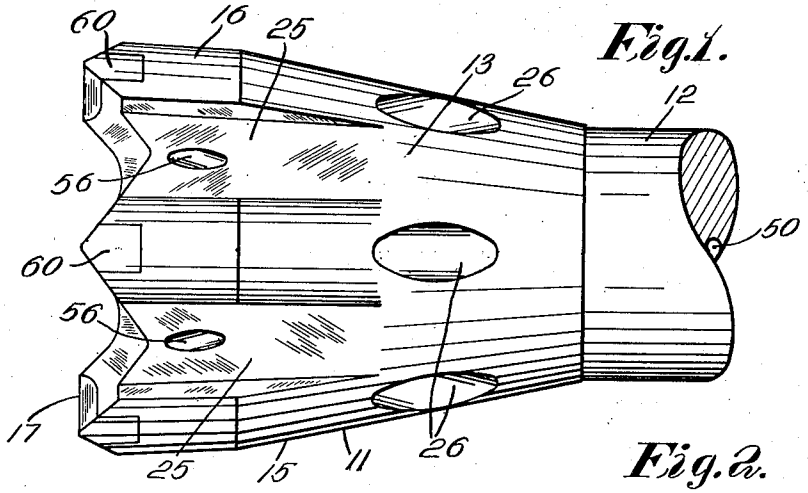


Fig. 2.

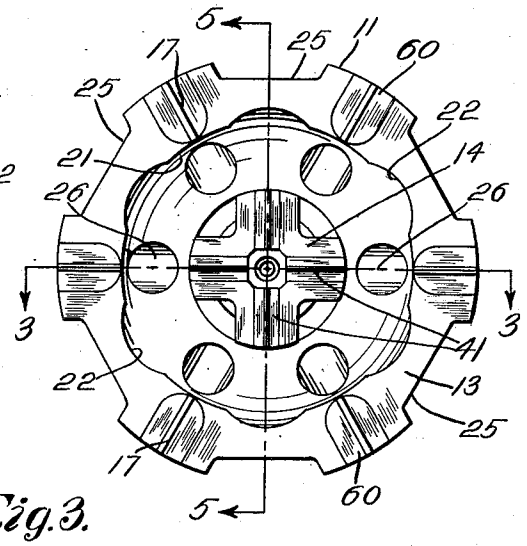


Fig. 4.

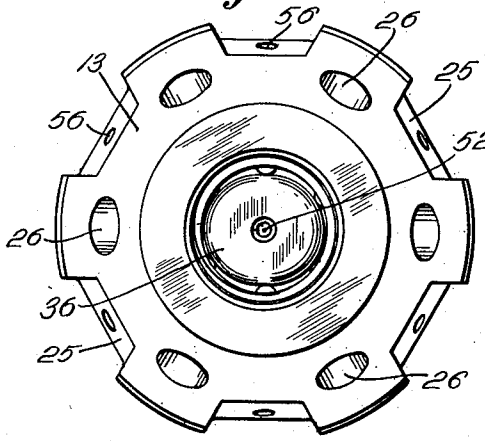
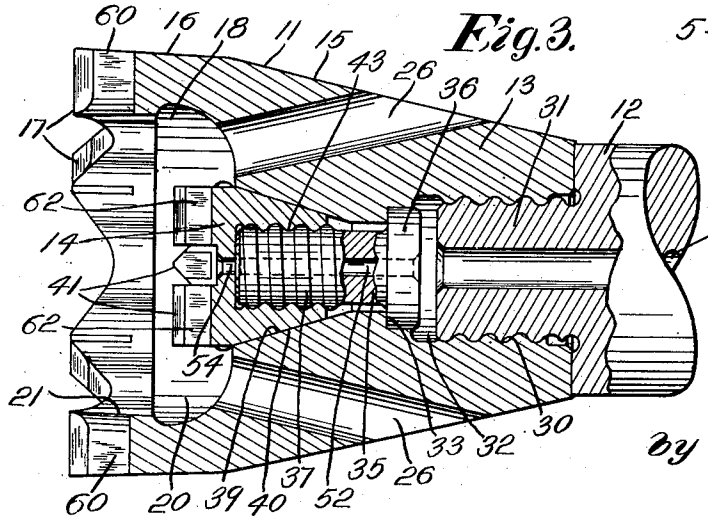


Fig. 3.



Inventor
Robert A. Wyman

by Louis A. Maxon.
Attorney.

Sept. 24, 1957 R. A. WYMAN 2,807,443

PERCUSSIVE DRILL BIT

Filed Nov. 2, 1953 2 Sheets-Sheet 2

Fig. 5.

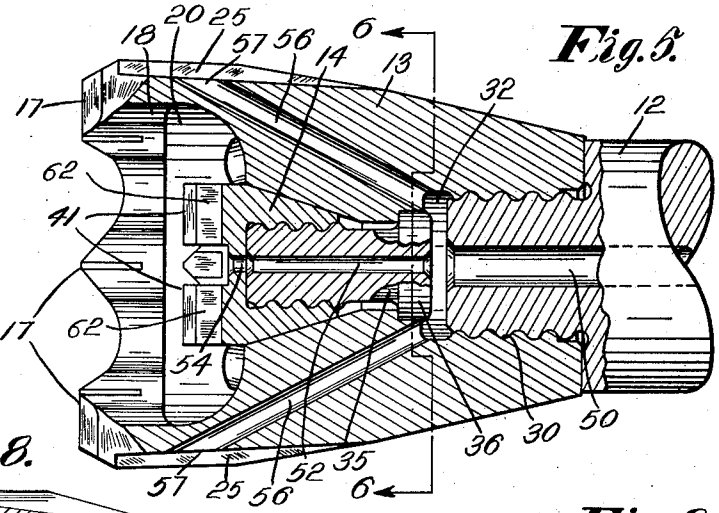


Fig. 8.

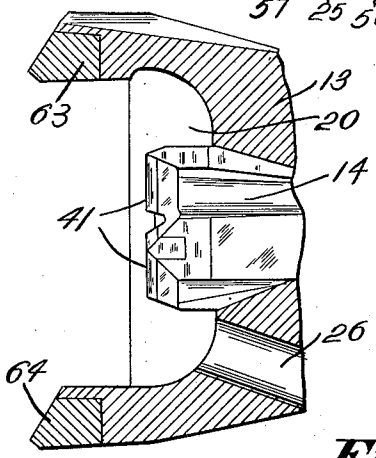


Fig. 6.

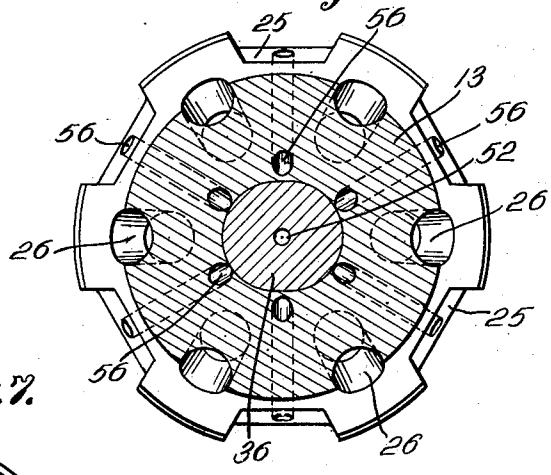
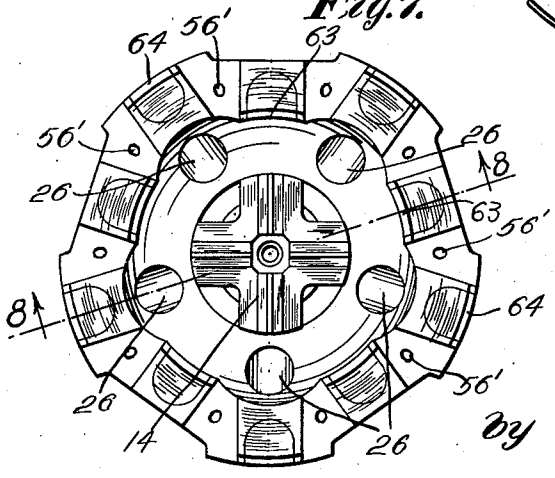


Fig. 7.



Inventor
Robert A. Wyman.

Louis A. Maxon.
Attorney.

United States Patent Office 2,807,443 Patented Sept. 24, 1957

2,807,443

PERCUSSIVE DRILL BIT

Robert A. Wyman, Claremont, N. H., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application November 2, 1953, Serial No. 389,832

14 Claims. (Cl. 255—64)

This invention relates to percussive rock bits and more particularly to such bits for drilling holes of larger than conventional diameters.

To increase the efficiency of bits of the kind mentioned, it is desirable not to have them have to cut away all the material of the full area of the hole bottom. Instead it is a great advantage to form an annular recess and break up the central core which the recess surrounds, rather than to pulverize the rock at the center of the forward end of a hole. Such an arrangement prevents problems in removal of the broken up material, and in the supply of cleansing or blowing fluids, and these are solved with the present invention.

It is an object of the invention to provide an improved rock bit of the percussive type. It is another object of the invention to provide an improved percussive bit structure in which suitably disposed edges cut free peripherally a core of rock of substantial diameter, and a further edge or series of edges breaks up the central core. It is a further object to provide a bit of the character mentioned having improved blowing and cleansing fluid supply means. It is still another object to provide an improved bit of the character mentioned having improved means for the escape of the material of the fractured core. It is still a further object to provide an improved bit of the character mentioned having improved means for effecting its assembly and providing for replacement or resharpening its constituent parts. Other objects and advantages will hereinafter appear.

In the accompanying drawings, in which one illustrative embodiment and a modification are shown,

Fig. 1 is a side elevational view of a bit in which the invention is incorporated, the same shown mounted on hollow drill steel;

Fig. 2 is a front end view of the bit of Fig. 1;

Fig. 3 is a central longitudinal section on the plane of the line 3—3 of Fig. 2;

Fig. 4 is a rear end view of the bit of Fig. 1;

Fig. 5 is a central longitudinal section on the plane of the line 5—5 of Fig. 2;

Fig. 6 is a transverse section on the planes of the line 6—6 of Fig. 5;

Fig. 7 is a front end view of a modified bit, and

Fig. 8 is a fragmentary section on the plane of section line 8—8 of Fig. 7, with some parts back of the section plane omitted and the inner bit shown in elevation.

Referring to the drawings, and first to the embodiment of the invention shown in Figs. 1–6, it will be noted that a bit structure **11** is shown at the forward end **12** of a drill steel. This bit structure includes a hollow bit body **13** and an inside bit **14**. The bit body **13** may assume various shapes, but is here shown as comprising a frusto-conical portion **15** of one taper, a shorter frusto-conical portion **16** of a smaller taper, and a plurality of cutting edges **17** at the forward end of the portion **16**.

Within the body structure **11** is a recess or chamber **18** which includes as shown a generally circular inner or rearwardly disposed portion **20** to which access is had

from in front through an opening **21** which is generally circular in cross section, but which has a somewhat scalloped periphery as shown at **22**, the scalloped periphery being due to the fact that between the edges **17** the circumferential wall of the portion **16** is somewhat reduced in thickness by grooving out to the full diameter of the chamber **20**.

The body portion **13** is provided with a series of, as here shown, flat bottomed cuttings escape grooves **25**, one between each pair of cutting edges.

Holes **26** of substantial diameter—since they are cuttings-egress holes—extend obliquely outwardly from the rearward wall of the chamber **20** and open through the periphery of the frusto-conical portion **15** in the same lines, as shown in Figs. 1, 2 and 3, from front to back, with the cutting edges.

The body portion **13** has a threaded socket **30** to cooperate with a threaded spud **31** on the forward end **12** of a drill steel. There is shown at the forward end of the socket **30** a counterbore **32** and just ahead of the latter there is provided an annular seat or shoulder **33** for engagement by a headed connector element **35**. This element has a rear head **36** and a front threaded connector portion **37**. Just forward of the seat, which is formed to guide the head peripherally and center it and also to prevent its forward motion, is a frusto-conical seat **39** to receive the frusto-conical peripheral portion **40** of the internal bit **14**. The bit **14** is shown as a cross bit, but the number and disposition of its edges **41** may be varied for best adaptability to the rock core to be disintegrated. The bit **14** has as shown an internally threaded socket **43** to cooperate with the connector portion **37**.

The drill steel is shown as a hollow one and its forward portion **12** has a central fluid passage **50** which opens into the counterbore **32**. The connector element **35** has a central fluid passage **52** which communicates with a fluid passage **54** in the bit element **14**.

As shown in the drawings, and particularly in Figs. 1, 4, 5 and 6, a series of radially outwardly diverging passages **56** extend from the counterbore **32**, from points in the latter radially outwardly of the head **36** into the forward ends of the grooves **25** where they have mouths **57**.

The edges **17** are preferably provided by radially extending hard-metal inserts **60**, suitably held in position, and the edges **41** may also be provided by hard metal inserts, these numbered **62**. It is important to note that the edges **41** are set well back of the edges **17**, indeed well back of the bases of the latter, as illustrated.

As illustrated in Figs. 7 and 8, substantial modifications are possible, and in these figures the radial cutting edges are replaced by hard metal insert equipped alternate inner and outer chopping edges respectively numbered **63** and **64**, the cleansing fluid passages **56'** are made more numerous and smaller in diameter and one opens between each pair of chopping edges, and, the total number of chopping edges being shown as ten, the vent passages **26** are here shown as being five, equally spaced about the periphery of the bit.

In both forms illustrated the improved bit structure will form an annular opening, in the one case by cutting, in the other primarily by chopping, and since the edges **41** are set well back of the edges **17** (or **63**, **64**) there will be formed a projecting circular core of rock of substantial projection from the zone in which the cutting or chopping edges, as the case may be, are operating. When this is reached by the edges **41**, the projecting core will be broken up into pieces of substantial size, instead of being pulverized, and the fragments will be blown or washed out of the inside of the space surrounded by the cutting or chopping edges through the passages **26**. The supply of fluid through the central passages in the bit

structure will furnish at least most of what is required, but the fluid passing through the passages 56 will aid in keeping the forwardmost portion of the hole clear and in blowing cuttings and larger particles through the grooves 25 and up the hole around the drill steel.

The bit structure may be readily disassembled for sharpening or the replacement of parts, and will permit the formation of a hole of large diameter without the larger loss of energy in pounding on a central pad of rock dust that would be present with a bit of like diameter but conventional construction. It will of course be understood that the bit will commonly be turned step by step on its axis so that the various edges may engage a fresh point each time a blow is transmitted to the steel.

While there is in this application specifically described one form and a modification which the invention may assume in practice, it will be understood that this form and modification of the same are shown for purposes of illustration, and that the invention may further be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What is claimed is:

1. A percussive drill bit comprising a main body having a forward end presenting an annularly arranged series of forwardly projecting edges and having a central recess extending to the rear of said forwardly projecting edges, and also having a percussive disintegrating device for a core of rock cut free peripherally by said annularly arranged series of forwardly projecting edges, said percussive disintegrating device having its forward end within said recess but to the rear of said annularly arranged series of forwardly projecting edges, said body having a socket in its rearward end for interlockingly engaging a drill steel, and said body having another socket forward of said first socket and communicating with the forward end of the latter and receiving said percussive disintegrating device, there being a shoulder between said sockets, and a threaded spud having a head engaging said shoulder and having an interlocking connection with said percussive disintegrating device for holding the latter in the second socket with its forward end in said recess.

2. A percussive drill bit according to claim 1 in which a cleansing fluid passage opens from the first socket through the spud and the percussive disintegrating device into said recess.

3. A percussive drill bit according to claim 2 in which said main body has cleansing fluid passages extending from said first socket forwardly through the walls of said body and opening near the forward end thereof.

4. A percussive drill bit according to claim 2 in which said main body has longitudinally extending grooves upon its periphery between said forwardly projecting edges and has cleansing fluid passages extending from said first socket forwardly through the walls of said body and opening near the forward end thereof.

5. A percussive drill bit according to claim 2 in which said main body has longitudinally extending grooves upon its periphery between said forwardly projecting edges and cleansing fluid passages extending from said first socket forwardly through the walls of said body and opening into said grooves.

6. A percussive drill bit according to claim 2 in which said main body has cleansing fluid passages extending from said first socket forwardly through the walls of said body and opening near the forward end thereof at points spaced circumferentially between the forwardly projecting cutting edges.

7. A percussive drill bit comprising a body having a forward end presenting an annularly arranged series of forwardly projecting edges and further comprising, coaxial with, but to the rear of said forwardly projecting edges, a percussive disintegrating device, said body having a plurality of grooves extending longitudinally peripherally thereof, one between each pair of adjacent edges, oblique passages for the discharge to its periphery of rock broken by said percussive disintegrating device, and other oblique passages for cleansing fluid opening into said grooves.

8. A percussive drill bit comprising a body having a forward end presenting an annularly arranged series of forwardly projecting edges and further comprising, coaxial with, but to the rear of said forwardly projecting edges, a percussive distintegrating device, said body having a plurality of grooves extending longitudinally peripherally thereof one between each pair of adjacent edges, oblique passages for the discharge to its periphery of rock broken by said percussive disintegrating device, and other oblique passages for cleansing fluid opening into said grooves, said first and second mentioned oblique passages alternating about the periphery of the bit.

9. In combination, in a percussive drilling implement, an outer bit element having a series of forwardly projecting edges arranged in an annulus and further having a recess rearward and inward of said edges, a central bit element having forwardly projecting edges and mounted centrally within said outer bit element with its edges projecting into said recess but rearward of said series of forwardly projecting edges, passage means extending outwardly from said recess for discharging to the exterior of said outer bit element cuttings produced by said central bit element, means for conducting cleansing fluid to said several edges including a central passage extending through said central bit element and forwardly extending passages arranged in said outer bit element to the outside of said central bit element, and means for attaching said outer bit element to a drill steel.

10. In combination, in a percussive drilling implement, a bit element having centrally arranged in its rearward end a threaded socket for the reception of the threaded end of a drill steel, at its forward end a recess and an annularly disposed series of edges surrounding at least the forward end of said recess, rearwardly of said recess a socket for the reception of a central bit, and between said sockets a rearwardly facing shoulder for engagement with the head of a holding element for a central bit, said bit element having, spaced outwardly from said second recited socket, outwardly and rearwardly extended cuttings egress passages connecting the recess at its forward end with the bit element periphery and outwardly and forwardly extending cleansing fluid supply passages connected with said threaded socket and opening at their forward ends through the periphery of said bit element.

11. In combination, in a percussive drilling implement, an annular series of forwardly facing edges, central edges lying inwardly and rearwardly of said annular series of edges, supporting means for said annular series of edges providing a forwardly opening annular recess surrounding said central edges and having outwardly and rearwardly extending passages connecting said annular recess with the periphery of said supporting means, a socket at the rearward end of the implement, and forwardly extending cleansing fluid conducting passages extending forwardly from said socket and terminating at their forward ends to the outside of said annular recess.

12. In combination, in a percussive drilling implement, an outer bit element having an annularly arranged series of edges at its forward end, a recess surrounded by said series of edges, a tapering socket back of said recess, a rearwardly facing shoulder back of said socket, a threaded element having a head engaging said shoulder and a threaded portion extending forwardly along the axis of said tapering socket, and an inner bit element having cutting edges within said recess, a tapering surface fitting said tapering socket and a threaded portion engaged by said threaded element.

13. In combination, in a percussive drilling implement, an outer bit element having an annularly arranged series of edges at its forward end, a recess surrounded by said series of edges, a tapering socket back of said recess, a shoulder back of said socket, a threaded element having

a head engaging said shoulder and a threaded portion extending forwardly along the axis of said tapering socket, and an inner bit element having cutting edges within said recess, a tapering surface fitting said tapering socket, and internally threaded to connect with said threaded portion of said threaded element.

14. In combination, in a percussive drilling implement, an outer bit body having a circumferentially arranged series of spaced, forwardly extending edges surrounding a recess, an inner bit having cutting edges projecting forward into said recess but arranged rearward of said series of edges, cuttings discharge passages opening through the periphery of said outer bit body and communicating at their forward ends with said recess, and cleansing fluid conducting passages opening at their forward ends between said forwardly extending edges on said outer bit body.

References Cited in the file of this patent

UNITED STATES PATENTS

795,433	Foust	July 25, 1905
1,854,911	Scott	Apr. 19, 1932
2,054,255	Howard	Sept. 15, 1936
2,282,596	Wise et al.	May 12, 1942
2,368,512	Zimmerman	Jan. 30, 1945
2,464,781	Baker	Mar. 22, 1949

FOREIGN PATENTS

58,849	Switzerland	Nov. 1, 1911
125,863	Sweden	Aug. 30, 1949
801,389	Germany	Jan. 4, 1951