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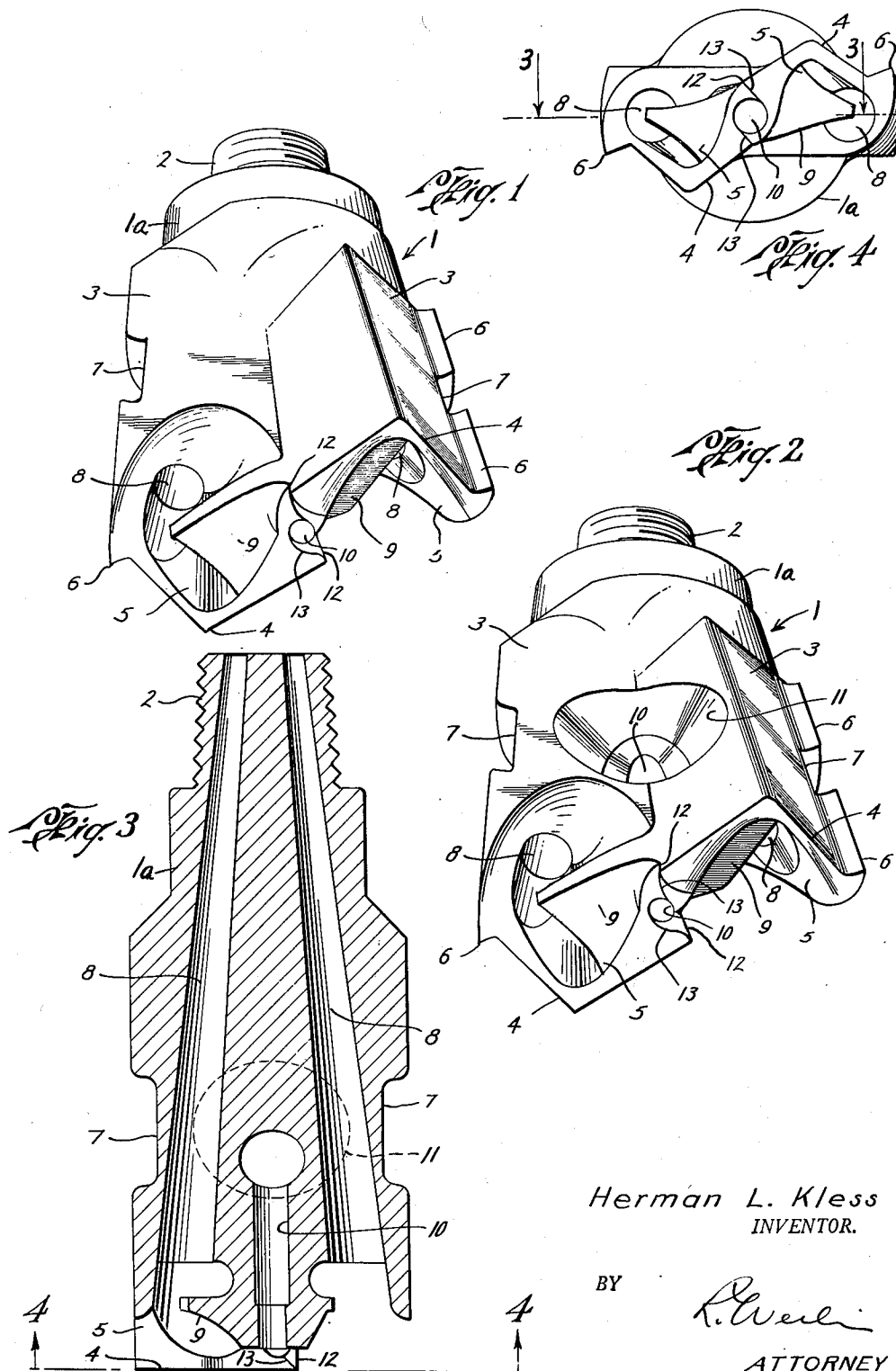
H. L. KLESS

2,628,073

DRILL BIT

Filed March 26, 1951

2 SHEETS—SHEET 1



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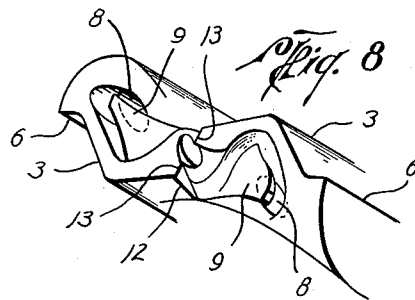
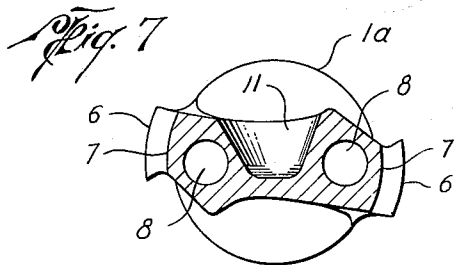
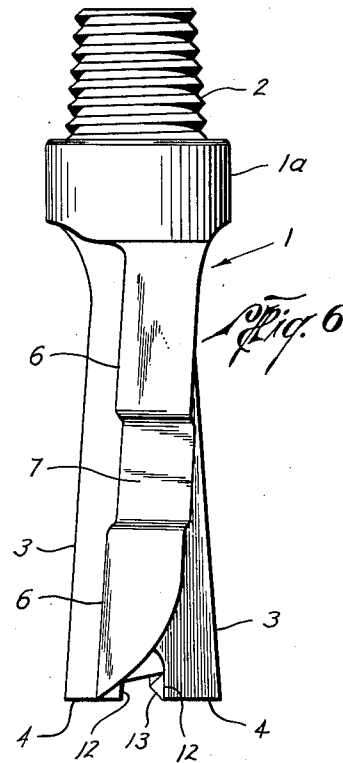
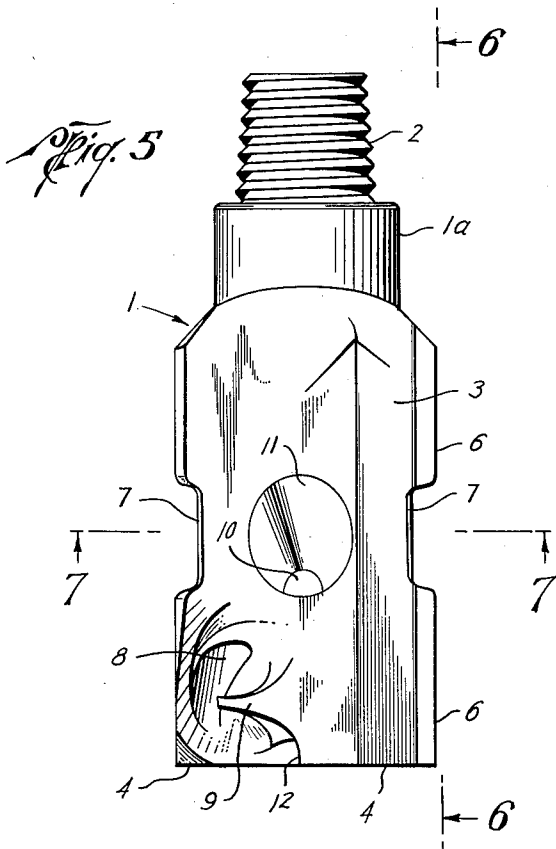
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DRILL BIT

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2 SHEETS—SHEET 2



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DRILL BIT

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11 Claims. (Cl. 255—72)

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This invention relates to drill bits and particularly to drill bits of the fluid discharge type employed in the rotary system of well drilling.

In rotary drilling, the bit is attached to a hollow drill string which is rotated at the top of the well in order to rotate the bit and accomplish drilling of the earth formations. A drilling fluid, such as a water suspension of clay, weighting materials and the like, commonly called "drilling mud," is pumped down through the bore of the drill string and through passages in the bit discharging against the bottom of the well adjacent the bit teeth and then flowing upwardly in the well bore outside the drill string to the top of the well. This drilling mud performs several functions, including lubricating the bit, plastering and sealing the wall of the well bore, and carrying the drill cuttings removed by the bit to the top of the well where such cuttings are separated from the drilling fluid which is then re-circulated through the well.

In present day rotary drilling, most operators examine the returning cuttings in order to obtain information regarding the formations penetrated by the bit and to thereby obtain a log of the well. It is important that the cuttings from the several formations be readily identifiable and correlatable with the formations from which they originated. One way in which this has heretofore been accomplished is by coring the well, that is, by employing a special tubular bit which will cut a cylinder of the earth formations and which may then be withdrawn as a single piece for subsequent examination. This is a time-consuming and relatively expensive procedure.

The present invention has for one of its principal objects the provision of a form of bit having a construction which permits the bit to engage in the usual cutting action while simultaneously continuously coring the formations being drilled.

More specifically the improved bit incorporates a small core bit and barrel as an integral part of the bit body.

The present invention has for additional important objects the provision of improved form and arrangement of the fluid passages in the bit body to obviate plugging of these passages by solid matter in the drilling fluid.

A more specific object is the provision of fluid passages which extend generally longitudinally through the bit body and have a conical taper, being larger at their discharge ends than at their inlet ends.

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A further specific object is the provision of baffle members adjacent the discharge ends of the fluid passages to obviate plugging of the passages by solid matter in the drilling fluid, particularly when the bit is being run into the well.

Another object is the provision of V-or plow-shaped, main cutting teeth.

Still another object is the provision of reaming teeth extending longitudinally along the side edges of the bit body for reaming or smoothing the wall of the well bore as it is drilled by the bit.

Other and more specific objects and advantages of this invention will become more readily apparent from the following detailed description when read in conjunction with the accompanying drawing which illustrates a useful embodiment in accordance with this invention.

In the drawing:

Fig. 1 is a perspective view looking along one side of the bit from its cutting end;

Fig. 2 is a view similar to Fig. 1 looking along the opposite side of the bit;

Fig. 3 is a longitudinal cross-sectional view of the bit and taken along line 3—3 of Fig. 4;

Fig. 4 is a view looking directly toward the lower end of the bit.

Fig. 5 is an elevational view of one side of the bit;

Fig. 6 is an elevational view of one edge of the bit;

Fig. 7 is a cross-section along line 7—7 of Fig. 5; and

Fig. 8 is a perspective view of the cutting end portion of the bit.

Referring to the drawing, the bit comprises a generally rectangular elongated body designated generally by the numeral 1, merging at its upper end in a cylindrical shank 1a having the usual threaded pin 2 for connection of the bit to the usual hollow drill string (not shown). While body 1 is ordinarily forged or cast from a single block of steel, for purpose of this description it may be considered that body 1 is formed of a pair of elongated segments 3—3 integrally joined together along their inner side edges. These segments are generally V-shaped in cross-section and terminate at their lower ends in oppositely facing V-shaped cutting edges or cutting teeth 4—4, the points of the V's facing in the direction of rotation of the bit. The metal at the lower ends of segments 3—3 behind teeth 4—4 is removed to provide upward and rearwardly tapering recesses 5—5 on opposite sides of the central juncture portion of the body

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segments, the cutting teeth thereby being reduced in thickness toward their ends to provide the desired degree of sharpness. At their outer margins segments 3—3 are provided with longitudinal cutting edges 6—6, which merge with the outer trailing ends of teeth 4—4 and are directed generally forwardly, that is, in the same direction as the point of the tooth on the same segment. Cutting edges 6—6 form reaming or scraping teeth for smoothing the bore wall as the bit is advanced, thereby aiding in keeping the bore hole straight. Cutting edges 6—6 may be interrupted along their length by means of notches or gaps 7—7. The V-shape of teeth 4—4 permits faster and more efficient cutting of the earth and rock formations as the bit is rotated and better disintegration of the material cut from the formation, whereby such material may be more easily flushed from the bore hole by the circulating drilling fluid.

Extending longitudinally entirely through the bit body are diverging fluid passages 8—8 which, at their lower ends communicate with recesses 5—5 and discharge along the rear faces of teeth 4 and toward the outer sides thereof. The passages 8 are formed with a general conical taper, being made somewhat larger in diameter at their lower ends than at their upper ends. When the more conventional bit is being lowered into the well bore which contains drilling fluid carrying solid matter, the passages tend to become clogged, a condition commonly encountered in the usual drilling operation and a source of considerable trouble. By making passages 8 of the conical downwardly diverging form described, the fluid circulating pumps can more easily displace the clogging material than in such more conventional designs where the fluid passages are usually cylindrical and thereby more readily become tightly plugged.

To additionally reduce the possibility of plugging passages 8 by cuttings particles and the like, each of recesses 5 is provided at a point intermediate the outlet of passage 8 and cutting-edge 4 with a rearwardly projecting generally horizontal deflector or baffle member 9 which is integral with the wall of the recess and extends laterally along the wall from the inner side edge of the recess to a point adjacent the outlet of passage 8. These baffles 9 act to deflect solid particles in the well fluid rearwardly and away from the outlet of passages 8 as the bit is lowered through the fluid.

Extending longitudinally through the central portion of body 1 is a cylindrical core-receiving passage 10, the lower end of which is open to the lower end of the bit between the adjacent inner ends of teeth 4—4. Passage 10 extends upwardly about one-third the length of body 1 and communicates with an enlarged outwardly flaring port 11 which opens to one face of the bit body. The inner ends of teeth 4 adjacent passage 10 are cut or formed to provide a pair of short longitudinally extending core-cutting edges 12—12 extending on opposite sides of passage 10 and at an angle to the planes of the inner arms of teeth 4, and which are also shaped to curve rearwardly as at 13 to merge smoothly and generally tangentially into the wall of passage 10.

Passage 10 and its associated cutting edges 12 function as a small core bit and operate to continuously cut small cylindrical cores from the earth formations as the well is drilled by the action of the bit as a whole. As the bit advances, the small cores cut by edges 12 are dis-

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placed through passage 10 and are discharged through port 11. As the cores are discharged into the stream of upwardly flowing drilling fluid they are broken up into a series of small sections or pellets which will have a well defined cylindrical shape, as contrasted with the generally non-descript irregular shape of the particles of the cuttings or shavings produced by the cutting and scraping action of teeth 4 and 6. These core pellets may, therefore, be readily distinguished from the rest of cuttings when they return to the surface and provide the operator with well defined particles which are more readily identifiable with the formations from which they are cut and can, therefore, be readily separated from the mass of cuttings for further examination. They are, therefore, highly useful in connection with logging wells from the drill cuttings.

Bits constructed in accordance with the present invention have many advantages over more conventional types of bits. The V-shape of the main teeth provides a substantially increased length of cutting edge which is in continuous contact with the formation and produces a slicing or shearing action which greatly reduces the torsional strain on the bit and drill stem. The arms of the V trailing away from the points thereof tend to continuously pack the wall of the well by crowding the shavings toward the well wall, while the reaming teeth continuously scrape and smooth the bore wall. By placing the discharges of the passages 8 behind the trailing faces of the teeth and enclosing them within the V, the fluid discharging behind one tooth effectively flushes the cuttings away from in front of the cutting edges of the following tooth, thereby continuously presenting a clean surface to the action of the teeth. At the same time the fluid is prevented from striking the sides of well bore and causing undesirable washing down of the wall. The danger of plugging of the passages 8 is greatly reduced by their conical shape and by the employment of baffles 9.

It will be understood that the core-cutting elements, above described, may be incorporated in conventional types of bits, and will be particularly adapted for incorporation in the well known "fish-tail" type of drill bit.

It will be understood that various changes may be made in the details of the illustrative embodiment within the scope of the appended claims but without departing from the spirit of this invention.

What I claim and desire to secure by Letters Patent is:

1. A drill bit, comprising, a body formed at its lower end face to provide a pair of cutters generally V-shaped in transverse section and facing in opposite directions, fluid passages extending generally longitudinally through the body having discharge openings at the rear of the cutters, and transverse baffle members mounted adjacent the discharge openings of said passages and projecting across the path of flow through said passages and in fluid-deflecting relation thereto.

2. A drill bit according to claim 1 wherein each of said fluid passages is of downwardly diverging generally conical shape.

3. A drill bit, comprising, a body formed at its lower end face to provide a pair of cutters generally V-shaped in transverse section and facing in opposite directions, reaming cutters on the longitudinal outer edges of said body fac-

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ing in the same direction as the adjacent V-shaped cutters, fluid passages extending generally longitudinally through the body having discharge openings at the rear of the V-shaped cutters, each of said passages being of downwardly diverging generally conical shape, and transverse baffle members mounted adjacent the discharge openings of said passages and projecting across the path of flow through said passages and in fluid-deflecting relation thereto.

4. A drill bit, comprising, a body formed at its lower end face to provide a pair of cutters generally V-shaped in transverse section and facing in opposite directions, a core-receiving passage extending through said body along its longitudinal axis having its lower end opening to the lower end of the body between the adjacent inner ends of the V-shaped cutters and its upper end opening through a side of the body, said inner ends of the V-shaped cutters terminating in additional cutting edges directed generally tangentially to said core-receiving passage.

5. A drill bit according to claim 4 having reaming cutters on the longitudinal outer edges of said body facing in the same direction as the adjacent V-shaped cutters.

6. A drill bit, comprising, a body formed at its lower end face to provide a pair of cutters generally V-shaped in transverse cross section and facing in opposite directions, a pair of fluid passages extending generally longitudinally through said body on opposite sides of its longitudinal axis and having discharge openings at the rear of the V-shaped cutters, a core-receiving passage extending through said body along said longitudinal axis having its lower end opening between the adjacent inner ends of the V-shaped cutters and its upper end opening through a side of the body, said inner ends of the V-shaped cutters terminating in additional cutting edges directed generally tangentially to said core-receiving passage.

7. A drill bit according to claim 6 wherein each of said fluid passages is of downwardly diverging generally conical shape.

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8. A drill bit according to claim 6 having transverse baffle members mounted adjacent the discharge openings of said fluid passages and projecting across the path of flow through said passages and in fluid-deflecting relation thereto.

9. A drill bit according to claim 6 having reaming cutters on the longitudinal outer edges of said body facing in the same direction as the adjacent V-shaped cutters.

10. A drill bit, comprising, a body formed at its lower end face to provide a pair of V-shaped cutters facing in opposite directions, reaming cutters along the longitudinal outer margins of said body, core-cutting edges extending in opposite directions from the adjacent inner ends of said V-shaped cutters and at an angle thereto, and a core-receiving passage extending longitudinally through said body and opening at its lower end between said core-cutting edges.

11. A drill bit, comprising, a body formed at its lower end face to provide a pair of oppositely facing major cutters arranged at opposite sides of the longitudinal axis of the body and extending generally transversely of the end of the bit, core-cutting edges extending from the adjacent inner ends of the major cutters and at an angle to the planes thereof, and a core-receiving passage extending longitudinally through the body and opening at its lower end between said core-cutting edges.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
767,706	Muender et al.	Aug. 16, 1904
1,479,668	Lyle	Jan. 1, 1924
1,577,244	Brown	Mar. 16, 1926
1,945,160	Pearce	Jan. 30, 1934
2,022,734	Pearce	Dec. 3, 1935