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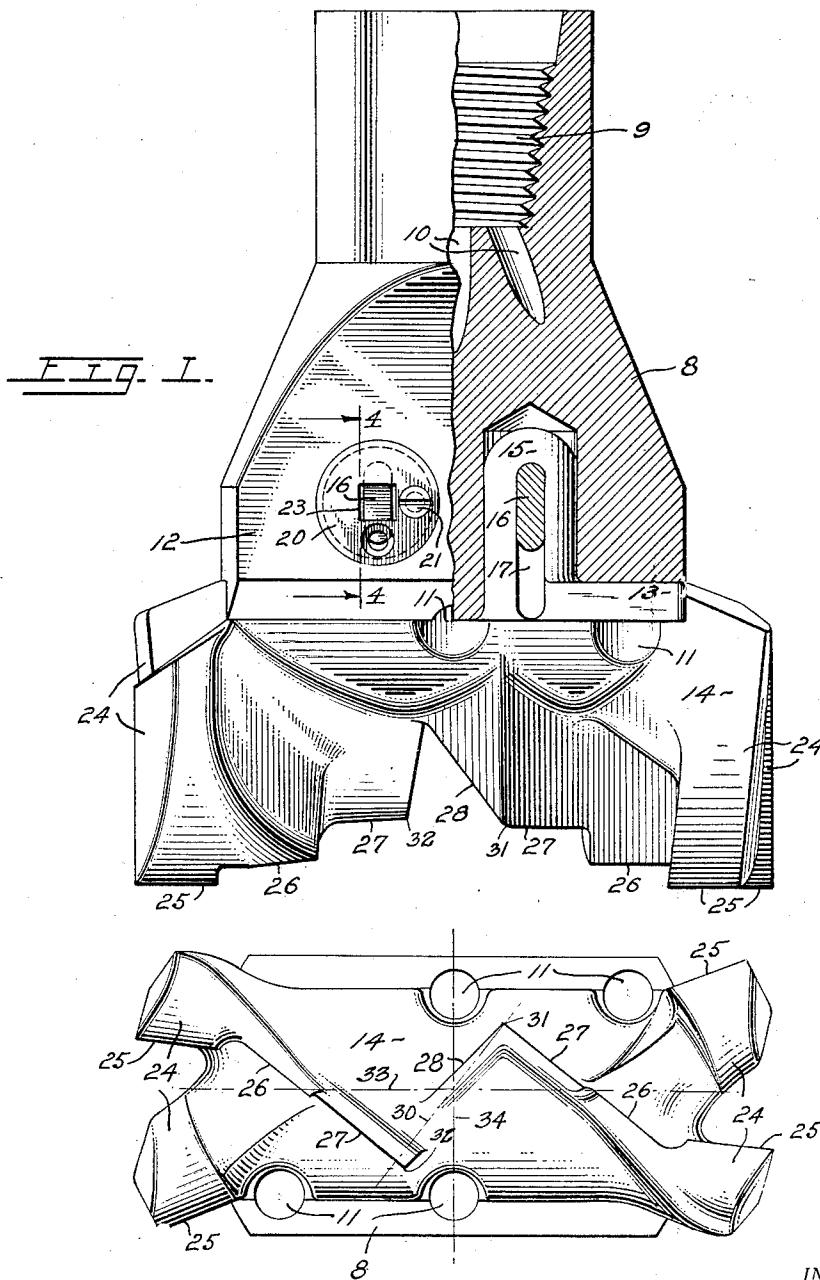
E. M. ERLANDSON

1,859,660

DRILLING BIT

Filed Nov. 20, 1929

2 Sheets-Sheet 1



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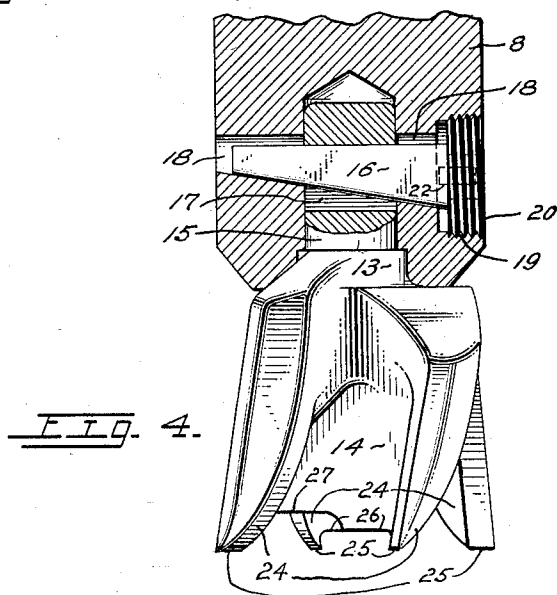
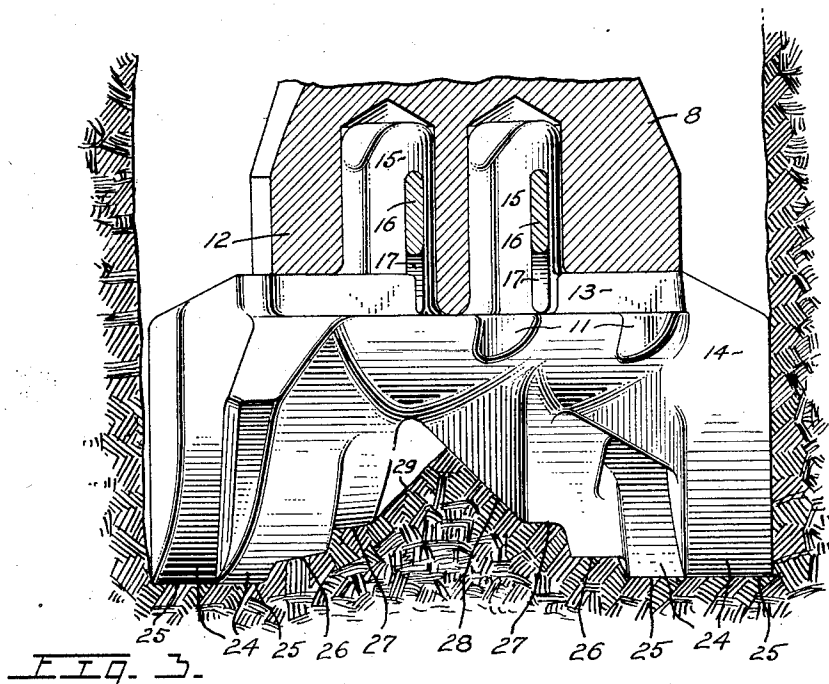
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UNITED STATES PATENT OFFICE

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DRILLING BIT

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In this specification, and the accompanying drawings, I shall describe and show a preferred form of my invention, and specifically mention certain of its more important objects. I do not limit myself to the forms disclosed, since various changes and adaptations may be made therein without departing from the essence of my invention as herein-after claimed; and objects and advantages, other than those specifically mentioned, are included within its scope.

My invention relates to earth drilling bits, and particularly to bits adapted for drilling deep wells for oil and the like. Among its principal objects are; first, to provide an improved type of bit that is particularly adapted for rapid earth-drilling; second, to provide a bit of this kind wherein the wear on the cutting edges will be reasonably uniform, thereby prolonging the periods between times that redressing becomes necessary; third, to provide such a bit wherein the effect of the drilling tends to center the bit in the drill-hole; fourth, to supply improved means for removably attaching the cutting element of such a bit to a bit-shank, whereby said parts may be quickly assembled or detached; fifth, to produce a relatively inexpensive cutting element of the class described, so that it may be scrapped with small loss when sufficiently worn to make re-dressing undesirable; and, sixth, to accomplish the results above stated in a simple and dependable construction of great inherent strength.

My objects are attained in the manner illustrated in the accompanying drawings, in which:—

Figure 1 is an elevation of my complete invention with the cutting element assembled upon the bit-shank, certain parts being shown in section for convenience of this disclosure;

Figure 2 is a bottom view of the above construction, looking upwardly;

Figure 3 is an elevation of the cutting element of my bit in operative relation to a drill-hole it is cutting, the cutting element being shown in a position revolved about its vertical axis, counter-clockwise, several degrees from the position shown in Fig. 1; and

Figure 4 is an end elevation of the cutting element, and of a portion of the bit-shank in a section taken on the plane 4—4 of Fig. 1.

Similar reference numerals refer to similar parts throughout the several views.

In the drawings, I have shown a modified form of bit-shank at 8. This is provided with the usual taper-screwed box 9 at the top, for attaching the bit to a tool-string; and with water-course passages, sloping downwardly therefrom as indicated at 10, and discharging above the forward sides of the cutting blades as indicated at 11. The lower end of the bit-shank is fan-shaped as shown at 12, and its lower extremity is provided at each side with an inwardly extending slot, for receiving correspondingly formed driving-flanges 13 of the cutting element 14, whereby the latter is rotatively driven. A pair of large dowel sockets are drilled in the bit-shank upwardly from the bottom, for receiving slotted dowels 15 of the cutting element.

The cutting element 14 is attached to the bit-shank by means of a pair of tapered keys 16. These are passed through slots 17 of the dowels, and their extremities engage corresponding slots 18 in the bit-shank. The surfaces of these latter slots are so shaped as to permit the sloping key surface to seat thereupon. I prefer to assemble the parts just described so that the upper edges of the keys, whereby the cutting element is held in the bit-shank, will be horizontal, as shown in Fig. 4. In this manner I eliminate any tendency for the keys to back out by reason of the weight of the cutting element that is imposed thereupon.

The bit shank is counter-bored and tapped opposite the entrance of key slots 18, as shown at 19. After the keys are driven home, plugs 20 are screwed into the counter-bores against the heads of the keys, to prevent the keys from backing off. As a further element of safety, I provide these plugs with a pair of counter-sunk screws 21, angularly spaced 90 degrees with respect to each other, and so positioned that, by slightly turning the plugs, one or the other of these screws may be inserted so as to project alongside of one of the flat faces of the keys, as shown by

dotted lines 22 of Fig. 4. Thus the projecting inner ends of these screws, so positioned, will act to prevent the plugs from becoming unscrewed. Square central holes 23 are provided in the plugs for screwing them in by means of a key-wrench.

The cutting element is provided at each side with a pair of blades 24, having a slight rake and adapted to make an annular cut, their cutting edges being indicated at 25. Cutting edges 26, of which there are two, are adapted to make an annular cut immediately within the first cut, and at a slightly higher elevation; and cutting edges 27, of which there also are two, are adapted to make an annular cut immediately within the last said cut, and at a slightly higher elevation. The edge 28, of which there is only one, slopes upwardly, from one of the edges 27, at an angle of about 45 degrees. This may be considered as a scraping edge rather than a cutting edge, and is for the purpose of breaking down, rather than cutting off, the central cone core 29 formed in the drill hole. It will be seen in Fig. 3 that the core 29, opposite edge 28, is unprotected by any parts of the tool, so that it can easily be crumbled away by the lateral pressure of this scraping edge.

It will be noted by referring to Fig. 2, that edges 27 are non-radial, parallel, and overlapping; and that this feature permits of employing the substantially radial edge 28, extending angularly from one of them through a point close to the axis and beyond the center of the tool. In Fig. 2 the broken line 30 is drawn perpendicular to the parallel edges 27. It extends obliquely downwardly from inner extremity 31 of upper edge 27, and intersects lower edge 27 back of its extremity 32. Line 30 may pass, either through the axis of the tool, located as indicated by the intersection of broken lines 33 and 34, or close to the axis. The over-lapping feature of edges 27 permits the base of core 29 to contact with the back side of one of these blades, and thus assists in centering the tool in the drill hole. Since edges 27 are non-radial, the cuts they take are somewhat in the nature of a shearing cut, and in action these blades will move the dislodged material from the center to the outside of the drill hole. In doing this the material has to pass the circulation streams that issue from the outer circulation passages 11, and thus becomes dissolved or held in suspension by the circulation fluid. This action is of great importance, since it effectually prevents any "balling-up" of the bit in operation.

The effect of stepping up the cutting edges 25, 26, and 27, and that of the central cone core 29, is to strongly center the tool with reference to the drill hole. The centering effect is very much greater than can possibly be secured by means of taking a central pilot

cut in advance of the main cuts. In the case of such a pilot cut, the centering tendency is relatively small, and there may even be a decentering tendency, as is well known to those experienced in the art of earth drilling. Each step of the annular cuts made by my tool effects a strong centering tendency, by reason of its relatively great peripheral surface.

I particularly desire to point out that the cutting accomplished by my tool is only done at the outer portions of the drill hole, the inner central core being broken down and crumbled instead of being cut. There is no difficulty about breaking down this central core, by reason of its always being unsupported opposite scraping edge 28, and also by reason of the fact that jars and vibrations are constantly taking place during the drilling operations.

The wear on the cutting edges of the bit is equalized to some degree, by the fact that there are twice as many such edges at the outside of the drill hole, where the greatest rate of cutting takes place. The cutting element may be quickly removed from the bit shank when re-dressing becomes desirable.

I also wish to call attention to the fact that the cutting element 14 is relatively small, and therefore it can be discarded without much loss when it has been so far worn that re-dressing no longer appears to be desirable.

Having thus fully described my invention, I claim:

1. An earth-drilling bit having; a plurality of pairs of cutting edges, of which the innermost pair is non-radial, adapted to make a series of annular cuts at successively increased levels toward the axis of the bit; and a single upwardly sloping edge extending angularly from one of said innermost cutting edges and substantially intersecting the axis, adapted to form a cone-shaped central core.

2. An earth-drilling bit having; a plurality of pairs of cutting edges at its extremity, of which the innermost pair is non-radial, parallel, and in which the inner ends extend beyond each other in spaced relation, said edges being adapted to make a series of annular cuts at successively increased levels toward the axis of the bit; and a single upwardly sloping edge extending at substantially right angles from one of said innermost cutting edges and substantially intersecting the axis, adapted to form a cone-shaped central core extending from the innermost of said annular cuts.

3. A construction as set forth in claim 2 in combination with an additional pair of edges adapted to make the same outer annular cut, whereby the wear upon the said outer cutting edges will be partially equalized with the wear on the other cutting edges.

4. An earth-drilling bit having; a plurality of pairs of cutting edges of which the innermost pair is non-radial, adapted to make a series of annular cuts at successively increased levels toward the axis of the bit; and a single upwardly sloping edge extending angularly from one of said innermost cutting edges and substantially intersecting the axis, adapted to form a cone-shaped central core; the respective blades of said pairs being symmetrically disposed with respect to said axis; and so-positioned that their inner portions rotatively lead their outer portions; and the configuration of the bit being such as to leave the upper portions of said core unsupported against lateral pressure exerted by said sloping edge.

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