

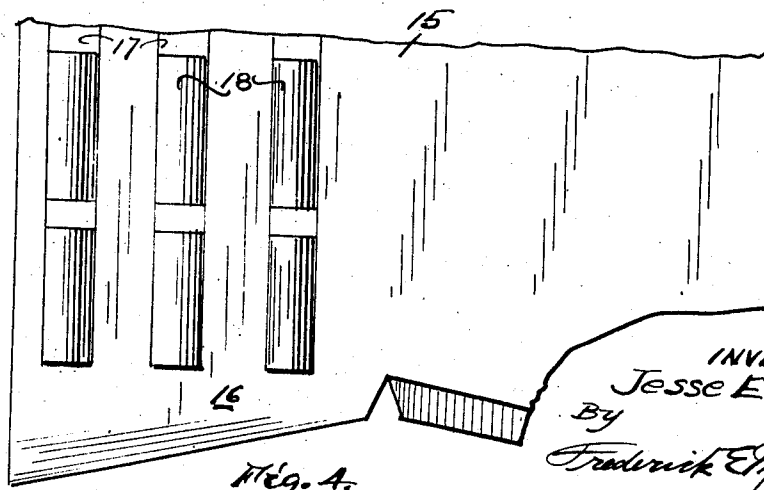
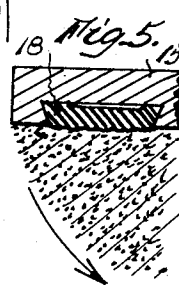
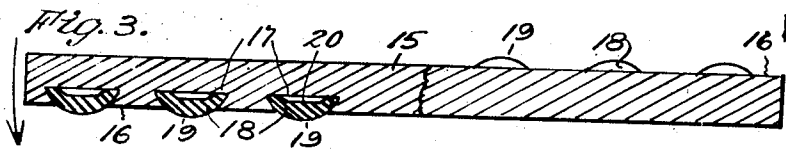
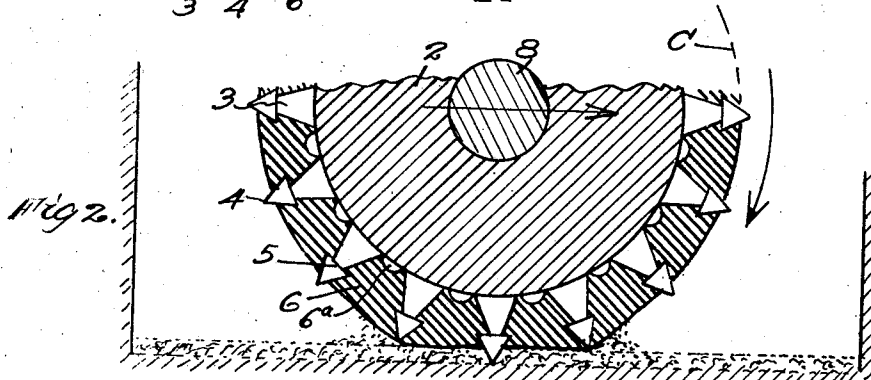
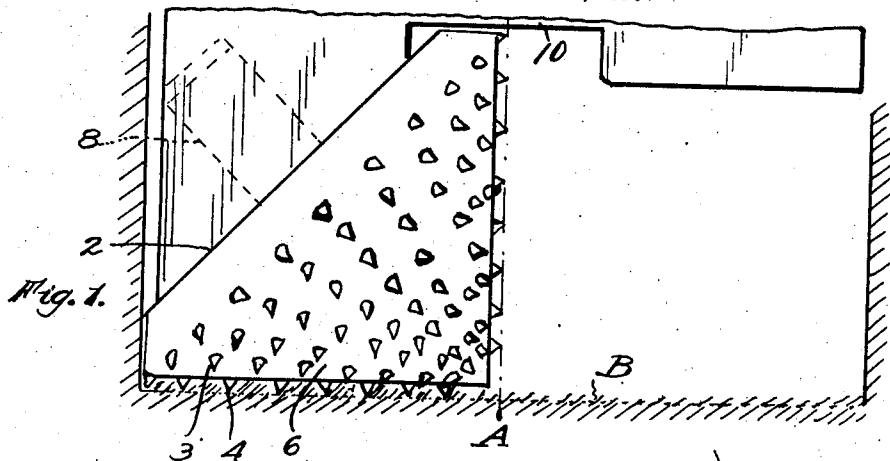
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J. E. HALL

2,107,788

DEBALLING DRILL BIT

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INVENTOR,
Jesse E. Hall;
By
Frederick E. Maynard
his Atty.

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DEBALLING DRILL BIT

Jesse E. Hall, Los Angeles, Calif.

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9 Claims. (Cl. 255-71)

This invention is an earth-boring drill bit.

It frequently happens that in drilling through certain earth formations the bit of the drill string becomes so clogged up with plastic material as to render it useless for cutting effect. This condition is known in the deep well drilling industry as "balling up" of the bit. Heretofore the only remedy has been to pull the full length of the string from the hole and to then manually remove the clotted, plastic mass. It will be obvious that this involves the total loss of the tool for the full period of pulling, cleaning and again lowering the tool, and the expense and the loss of time increases exactly with the increase of the depth of the hole and the involved length of the drill string.

This balling effect is encountered almost regardless of the specific type of the tool.

It is the broad object of the instant invention to provide a drilling bit wherein there is provided means the function of which is to act automatically for elimination of packed cuttings or clay.

Further an object is to provide means for reducing or eliminating the balling tendency without appreciable reduction of the boring efficiency of the tool, and, additionally to provide a de-balling device which may be incorporated with several types of bits without any structural change in the bit affecting its cutting principle.

Also an object is to provide a de-balling means which may be readily incorporated in the bit structure without any mechanical operation thereon in some types of cutters, and with very little of a simple character in others, as will be shown later herein. Particularly, an object is to provide a de-balling device of very simple kind and of readily renewable form, and of low cost of material and installation.

More specifically, an object of the invention is to provide a drilling bit having a repressible facial area of resilient material so constructed, arranged and combined with the bit body as to act automatically in a rebounding reaction as the pressure of the formation material is lessened, in one way or another, according to the type of bit, to eject or loosen up the packing material or clay so that it will fall away from the bit face; this occurring either while the bit is in running contact with the formation forming the bottom of the hole, or while the bit is briefly lifted from the bottom, in the case of use of fish-tail bits and, if deemed desirable, its rotation ceased for a very short while for the purpose of slacking off the pressure set up between the advancing face

of the bit and its normally accumulated burden of clay.

The invention consists of certain advancements in the earth bit art as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose construction, combinations and details of means, and the manner of operation will be made manifest in the description of the annexed, illustrative embodiment; it being understood that modifications, variations and adaptations may be resorted to within the scope, principle and spirit of the invention as more directly claimed in the appendage.

Figure 1 is a side elevation of a conical roller type of bit including the de-balling feature.

Figure 2 is a transverse section of the roller bit in cutting position on the bottom of a hole.

Figure 3 is a cross-section of the blade of a fish-tail type of bit embodying the invention, and Figure 4 is a facial elevation of the fish-tail bit.

Figure 5 is a detail section of the balling effect on a portion of the blade of the fish-tail bit.

Figure 6 is a detail cross-section of a modified form of the de-balling or clay stripping device.

In its preferred form the de-balling or clay stripping agent is in the form of a highly resilient or rebounding, incompressible, non-corrosive, non-metallic, semi-plastic or mobile character, such, for instance as quite firm rubber; this being readily moldable in place on the given bits or into properly shaped units for easy application thereto in field tool shops by mechanics of ordinary skill.

The roller bit of Figs. 1 and 2 comprises a conical body 2 having circumferential rows of spaced teeth 3 of tapered form to provide cutting points 4. The form of tooth here shown provides an intermediate, transverse, annular back shoulder 5. The entire space around the bit body 2 within an arbitrary circle C slightly back of the circle touching the points 4, Fig. 2, of the relative row of teeth 3 is filled with a mass of the desired rebounding agent or rubber 6, which extends, as is shown in Fig. 1, from end to end of the body 2 presenting the spaced rows of teeth 3. The roller is attached in conventional manner to the lower end of an appropriate, rotating, driven, bit carrier only a part of which is shown at 10.

The points of the roller teeth 3 in the adaptation here illustrated stand out somewhat from the conical face (circle C) of the rubber jacket around the body 2 and during rotation of the carrier 10 the points of the teeth are driven into and crack up the earth formation on the bottom

B of the hole; the roller swinging in a circular orbit about the axis A of the bit carrier, and turning on its own axial shaft or support 8, in the carrier 10. If the teeth 3 penetrate the bottom formation far enough the rubber mass 6 thereadjacent will be tangentially repressed and bulged laterally, Fig. 2, with the result that any accumulated layer of adhesive borings will be ejected from the shallow space around the bed of rubber 6 below the circle of the tooth points 4. It will be seen that there can be no packed accumulation of clay to ball up the space about the roller body 2 within a conical surface constructive about the points of the teeth 3 spaced about and along the conical body 2 of the roller. The inner face of the rubber, de-balling jacket 6 is provided with suitable concavities 6^a, if needed, to facilitate the deformation of the incompressible rubber.

20 Fish-tail bits have flat, forged bodies 15 and the diagonally opposite and thus advancing faces 16 of this type bit tend to accumulate adhesive plastic material during the rotation of the bit about its axis with the bottom, sharpened end on the bottom of the earth hole. The de-balling device may be attached to the faces 16 of these bits in any desired of various ways so that a re-bounding area of sufficient degree will be presented and have ample power of reaction to press back the adherent clay as soon as the bit has been lifted enough from bottom, and its rotation stopped if desired, to relieve the clay pack from the compression force incident to the rotation of the bit. As here shown the faces 16 are provided with pockets or channels 17, preferably parallel to the axis of the bit and in these channels are arranged and interlocked therewith bars of firm rubber strippers 18 whose faces 19 stand well outward of the bit faces 16. The backs of the bars or strippers 18 are concaved at 20 to provide for repression of the rubber to some degree under balling pressure of the clay during bit rotation, Fig. 5.

45 If the bit be stopped and slightly lifted from the bottom of the hole, back pressure of the balling clay will be overcome by the resilience of the rubber bars 18 and the layer of clay will drop off the bit.

50 If desired the stripper bars 18 may be mounted in backing elements as in the form of flanged

boxes 21 mountable as a unit in the respective pockets 17 of the fish-tail bit.

What is claimed is:

1. A self, de-balling, earth-formation, drill bit having a resilient, re-bounding means whereby to automatically dislodge accumulated mud or the like.
2. An earth boring drill bit with facial area contiguous to the effective cutting portion provided with elastic, re-bounding means whereby to reduce or eliminate the tendency of the encountered formation cuttings of balling up on the said area of the bit.
3. An earth boring drill bit having cutting portions, and deformative, resilient means mounted on the bit contiguous to said portions and having an inherent re-bounding function whereby to destroy the balling tendency of the plastic cuttings encountered by the operating bit.
4. A toothed roller bit the body of which is provided with an elastic and resilient device mounted thereon between the bit teeth and beyond which the tips of the roller teeth project for cutting action; whereby the rebound of the device acts to overcome or reduce earth-balling during action of the bit.
5. A toothed roller bit having a deformable rubber jacket through which the teeth are exposed at their tips for cutting action; said jacket operative to prevent the balling of earth cuttings between the teeth.
6. An earth boring bit provided with effective cutting portions and facial area, of the bit, adjacent to the said portions being provided with deformable, elastic, resilient means having a re-bounding function whereby to stop balling of clay on said area of the bit.
7. A bit as set forth in claim 6, and in which said means includes rubbers forming a cushion for the plastic material tending to adhere to the bit during its rotation.
8. A bit as set forth in claim 6, and in which said means consists of a bed of isolated rubber units affixed to the bit faces.
9. An earth formation, drill bit the surface of which is subjected to becoming bailed up with clay during drilling operation, is provided with a deformable, resilient means re-boundingly operative to cast off an accumulated packing of clay or cuttings.

JESSE E. HALL.