

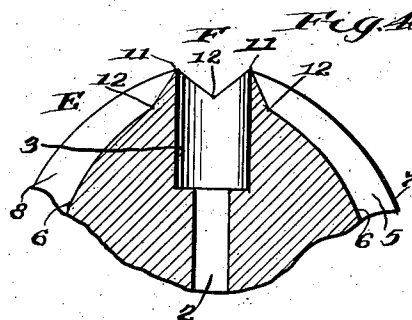
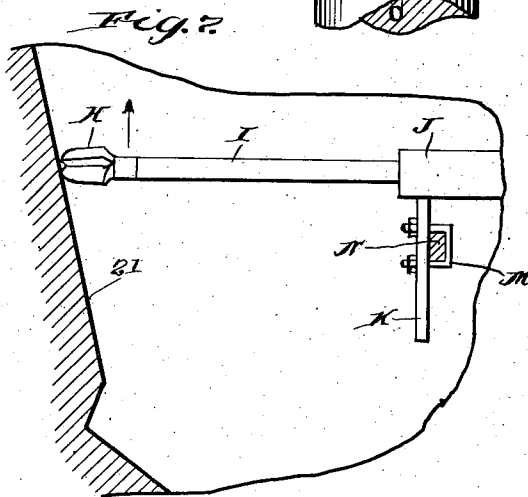
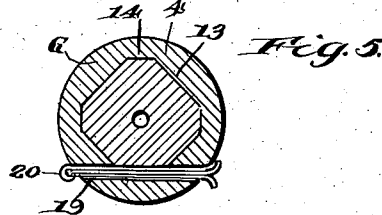
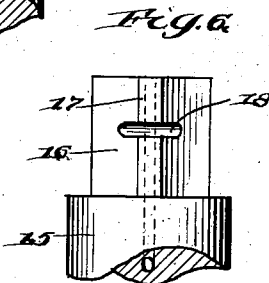
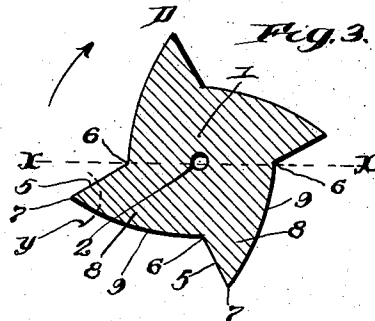
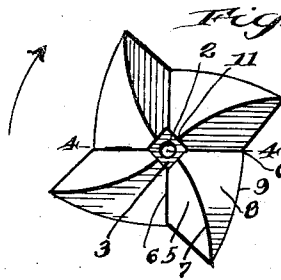
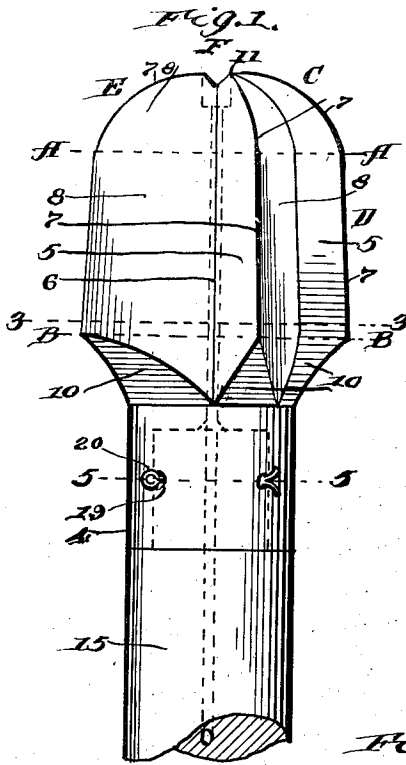
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2,294,004

DEMOUNTABLE DRILL BIT

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2,294,004

DEMOUNTABLE DRILL BIT

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2 Claims. (Cl. 255-61)

The object of this invention is to provide a novel type of hard rock drill bit which is especially adapted for mining but which is equally serviceable in any hard rock formations such as railway, highway and similar work.

A feature of this bit consists in a bit body having a plurality of longitudinally disposed ribs, provided with longitudinally disposed cutting edges with either the bit body or the ribs being tapered rearwardly from the direction in which the bit is advanced, sufficiently so that the cutting edges will be active throughout their length, thereby not only prolonging the effective life of the bit but also affording a more rapid advance of the bit into the formation.

In accordance with this invention, the main body of the bit terminates in a head which is preferably rounded, and it is a very special feature of this invention to provide the head with a penetrating apex that is effective not only in facilitating entrance of the bit into the rock but also in avoiding the objectionable tendency of the bit to swerve when the bit is advanced against a "slip" or a breast that is inclined to the longitudinal drilling axis.

A further feature resides in the formation of ribs which form a series of longitudinally disposed hills and vales along the bit body, each of which is provided with a working face disposed forwardly of its cutting edge, with respect to the direction of rotation, and a releasing face extending circumferentially and eccentrically in a rearward direction from its cutting edge with respect to the direction of rotation in a manner to provide an extensive clearance for the cut rock to discharge, the cutting edges being formed on the hills of said ribs.

The invention has many other objects and features which will be more fully described in connection with the accompanying drawing and which will be more particularly pointed out in and by the appended claims.

In the drawing:

Fig. 1 is a view in side elevation of my improved bit showing the same demountably connected with a drill rod.

Fig. 2 is a top plan view of the bit body.

Fig. 3 is a sectional view of the bit body on line 3-3 of Fig. 1.

Fig. 4 is an enlarged sectional view on line 4-4 of Fig. 2, showing the penetrating points forming the apex of the head of said bit body.

Fig. 5 is a sectional view on line 5-5 of Fig. 1, showing the contour of the non-rotative female and male connecting portions.

No. 6 is a view in side elevation of the end of the drill rod showing the male connecting portion.

Fig. 7 is a semi-diagrammatic view in plan section of an underground formation to illustrate how the bit may be advanced into a "slip."

Like characters of reference designate similar parts throughout the different figures of the drawing.

Reference will first be made to the bit and to Figs. 1 to 4, where I have shown a bit body having an elongated core or central portion 1 and a water bore 2, the latter extending throughout the length of said body and being counter-sunk at 3. This bore serves as a passage for water when drilling and the feature of enlarging the bore at 3 will be later explained. If the drill bit is demountable it may have a socketed end 4 which is cylindrical at its exterior, and which will be later described as regards the features of its interior.

The bit body is provided with a plurality of peripherally disposed ribs extending longitudinally thereof and substantially parallel with the longitudinal axis of said elongated body. There are four ribs shown, as in practically all mining and hard rock drilling this number of cutting members is generally accepted as the most practical, and since all the ribs shown are identical in form and function, only one need be described in detail.

My improved rib has what I will term a working face 5, which is substantially flat and extends substantially throughout the length of the rib. The radially inner edge 6 of said face 5 joins or merges into the periphery of the core 1 forming a vale, and the radially outer edge of face 5 joins or merges into a cutting edge 7 forming a hill which likewise extends longitudinally of the rib. In the preferred form, as shown, the face 5 is not strictly speaking radially disposed with respect to the core 1, but is disposed at an acute angle to a radial line intersecting the vale 6 of said rib, as indicated by dotted line x-x, and this angularity is such that the plane of said face 5 is inclined rearwardly from the radial with respect to the direction of rotation. Thus the face 5 is tangentially disposed to the core 1, and is located forwardly of its cutting edge with respect to the direction of rotation of the bit body.

The rear portion of the rib, as indicated at 8, extends rearwardly from said cutting edge 7, circumferentially of said core 1, and on a peripheral line 9 curving eccentrically with respect to core

1, and terminating at the vane 6 of the next following rib. I have shown a dotted curved line 7, in Fig. 3, which shows how this disposition of the mass that forms the rib assures an ample thickness of stock adjacent the cutting edge 7. It will also be clear that the circumferentially and rearwardly extending part 8 of the rib affords ample strength for the cutting edge 7. This disposition of the metal provides for an extremely capacious clearance for the cut rock, both circumferentially and longitudinally of the bit body. At the rear end of the bit body the ribs are inclined radially inwardly at 10, and merge into the socket 4.

Roughly speaking, the hills or cutting edges 7, if they were continuous circumferentially, would form a cylindrical periphery, but strictly speaking, and in accordance with a feature of primary importance to this invention, the cutting edges taper and I consider it within the scope of my invention either to taper the core 1 and make the ribs of uniform radial height, or make the core 1 cylindrical, and taper the ribs. However, in any event, the body portion is tapered.

In the form shown the ribs rearwardly of the head are of uniform radial height and the core has been tapered so that I provide a front gage, or relatively minimum diameter indicated by dotted line A—A which is less than the rear gage, or relatively maximum diameter, as indicated by dotted line B—B in Fig. 1. This extent of taper is exaggerated in the drawing to clearly illustrate at a glance that a taper is present. However, in actual practice I have found that a taper of three-thirty seconds of an inch on each side gives effective results.

My improved bit has a head, generally indicated at C, and as shown, the head is rounded and enough short of a semi-circular form so that it is slightly blunt, compared to what it would be if it were formed semi-circular from gage line A—A.

The ribs extend about the head C and gradually taper off to relatively shallow heights as indicated in Fig. 4. To facilitate the description and distinguish between the ribs extending along the major body of the bit and the head C, I will generally apply letter D to the ribs along the body portion, and letter E to the same ribs where they taper and extend about the head portion C. It will be understood, however, that the ribs have the same shape in cross section along the head as along the main body, the difference being only in height. Thus, the cutting edges 7, the working faces 5, and the strengthening portion 8 are all present in the head ribs E.

It will thus be seen that this head greatly reduces the area of the bit where the latter first penetrates a formation, and also during its drilling advance through the formation, thereby greatly facilitating the drilling operation and affording a means for a vastly increased speed. This is due partly to the converging shape of the ribs E, and partly to the fact that the ribs are comparatively shallow and of reduced height along the head, as compared to the height of the ribs along the main body of the bit, as indicated at D. Thus, these head ribs enter the formation more readily than if they had a greater extent of projection, or an extent of projection equal to the ribs D.

Reference will next be made to the apex of the head where the initial penetration occurs, and to the novel means whereby this initial penetration is rendered so effective as greatly to decrease the tendency of the bit to swerve when

advanced against a "slip" or similar formation presenting an inclination other than a right angular plane to the longitudinal axis of the drill.

In Fig. 4 I have shown, on a greatly enlarged scale, how the ribs E converge to the penetrating apex, which I will indicate at F. Thus, the hills 7 do not converge and merge into the vales 6, which would result in a substantially smooth apex. On the contrary, the enlarged or countersunk end 3 of bore 2 intersects the ribs E in a manner to form sharp penetrating points 11, equal in number to the number of ribs, which in this case is four. The formation of these apex points is due to the fact that the counter-sunk bore portion 3 intersects the ribs E in advance of the merge of the hills or cutting edges 7 with the vales 6. Thus, a V-shaped formation results with the apices of the V-shaped recesses being indicated at 12.

Now it will be clear that according to this construction the apex points 11 are formed in very close relation to each other, thereby providing an apex F, of a very effective penetrating nature. The Figures 1 to 3, in the original drawing, are full size views, and in practice the distance between opposite apex points 11 is slightly less than one-quarter of an inch, in a successfully operated bit, although I do not wish to be limited to any of the dimensions herein stated because they are given for informative reasons.

It will be seen that the ribs, and consequently the cutting edges 7, thereof, are of uniform length, which is an important feature of the present disclosure. However, in addition to this feature, it will also be clear that the ribs extend about or along the smaller end of the bit body, or in other words along the head thereof in a manner to form a penetrating apex F, which greatly aids in entering the rock initially, and which is effective to speed up drilling throughout the length of the hole, as the cutting edges are active and effective throughout the length of the ribs. In any event, however, enough of the ribs are extended along the free end of the bit body so that they will form a penetrating end or apex.

Reference will next be made to the demountable feature of this invention.

In this form, the bit body is provided with the integrally formed socket 4, hereinbefore referred to, and the exterior is shown to be cylindrical. The interior of said socket is provided with a female polygonal portion having alternately disposed broad and narrow faces or sides 13 and 14, respectively. The drill rod 15 has a reduced upper or outer end forming the complementary male polygonal portion, and it is provided with alternately disposed broad and narrow faces or sides 16 and 17, respectively, which snugly fit the polygonal portion of the socket 4 so that when the parts are assembled the bit body will be non-rotatively connected with the drill rod. Means is provided for preventing the bit body from being detached longitudinally off from the end of said drill rod 15 when assembled thereon, which will next be described.

In the present invention, such means consists in transversely notching the polygonal portion of the drill rod as shown at 18, and it is a feature to dispose the notch 18 across one of the narrow faces 17 to thereby avoid such reduction of the stock as would be necessary if the notch were formed in one of the broad faces 16. In the socket I drill or otherwise form an opening 19, through which an element such as a cotter pin 20 may be inserted with the parts disposed

so that the cotter pin will register with that narrow face in which notch 18 is disposed.

This construction affords all the advantages of a demountable bit without any danger of weakening the parts as a result of loss of stock due to the formation of the polygonal portions because the alternately broad and narrow disposition of these faces conserves enough stock at portions G, of the socket, between the narrow faces 14, to preserve the maximum strength of the socket. It also enables me to temper the polygonal portions with a relatively low "blue" temper, instead of the relatively high "straw" temper, which is a very great advantage in saving time. Heretofore a "straw" temper has always been necessary.

In Fig. 7 I have shown the breast 21 of a mine or other formation that is inclined with respect to the longitudinal axis of the drill, the bit being generally indicated at H, the drill rod at I, and the drill body at J. The drill body or machine J is shown provided with the usual cross bar K, which, in mining, is usually secured by a clamping device M to an upright member N, which is usually jacked up from the floor of the drift against the ceiling.

This practice is resorted to to hold the drill to a desired line of penetration, especially when it is to be advanced into such a "slip" or inclined breast as indicated at 21.

While the operation may be clear from the foregoing description, it will be briefly recapitulated as follows:

In contra-distinction to bits now in use, my improved bit has cutting edges that extend, and are effective throughout the length of the bit from the apex F to the enlarged gage end B—B, hence the life of this bit is not only prolonged, but because of the tapered cutting edges and the vastly greater length of the cutting edges, the drill can be operated much faster and hence drilling can be thus speeded up. After my improved bit has entered a formation it will now be clear that the cutting edges will engage the rock throughout their length, thereby acting to keep the bit to a straight line of travel, and because of this fact the cutting edges will last infinitely longer than the very short endwise cutting portions of the present type of bits.

Assuming that there might be a "fault" or "talk" in the formation, or that the bit might strike any relatively soft formation, in which case the usual bit would "jump," that is, suddenly advance, which would cause the water bore to be plugged up with such soft material, then in that event the driller would have to withdraw the bit and use a wire to open up the water bore so that water could discharge therethrough. This results in an objectionable loss of time.

With my improved bit this "jumping" is avoided because the elongated engagement of the cutting edges 7 with the rock effectively prevents the bit from "jumping." Further, the enlarged counter-sunk end 3 of the water bore prevents the latter from filling up and getting plugged, as is the case with present bits where the bore is of uniform diameter.

There is also a dangerous tendency of the usual form of bit to swerve when one portion engages "talk" and the remaining portion engages hard rock, after the bit has advanced some distance into a formation. Sometimes the miner chooses to "fight" this swerve and try to continue without losing time in withdrawing the bit, but if he does he imposes a strain on the

drill rod and finishes with a crooked hole, and the possibility of not being able to withdraw the bit. This swerving of the bit, with the present invention, is to a primary extent avoided, if not wholly prevented, because of the elongated cutting edges and their prolonged engagement with the rock which tends to overcome swerving, and which drills a hole of clean cut formation.

Another danger of swerving is found when a drill is started into a "slip," as indicated at 21 in Fig. 4. In many cases the drill rod is projected as much as two or three feet from the machine and the inclination of the "slip" has a tendency to cause the bit to shift, in this case, for example, in the direction of the arrow in said figure. However, due to the novel and close relation of the penetrating points 11 at the apex F, the danger of shifting or swerving is reduced to a minimum as these points first scratch or groove themselves into the rock before actually starting the hole.

It will of course be understood that in actual use, my improved bit would be operated by the machine the same as any other bit, the drive being rotary and percussive, and looking from the rear of the bit, the direction of rotation would be contra-clockwise. In Figs. 2 and 3, the observer is looking toward the apex end of the bit and consequently the arrows would indicate a clockwise rotation, which is not a contradiction but is due to the fact that the view is endwise from the apex.

It will also be understood that the bit body is formed of an integral mass of metal.

It will be seen that the ribs and their cutting edges are linearly disposed, and I use the term "linear" in the sense that the ribs and their cutting edges are not spiral and that they are not curved laterally of their length.

It is believed that the operation of the demountable connection will be obvious from the description of the specific structure thereof.

While I have herein shown one specific form of the invention, I do not wish to be limited thereto except for such limitations as the claims may import.

I claim:

1. In a miner's drill bit adapted for rotary and percussive drive, an integral bit body of hard metal having a rounded head portion and an elongated and substantially cylindrical body portion provided with a plurality of peripherally disposed ribs of uniform length extending linearly throughout the length of said body portion and substantially parallel with the axis of rotation thereof and also extending linearly along and about said head portion and forming a penetrating apex therefor, said ribs forming hills and vales and the hills having longitudinal cutting edges extending throughout the length of said ribs, each rib having a substantially flat longitudinally disposed working face projecting forwardly from its cutting edge with respect to the direction of rotation of said bit body and extending from the vale to the hill of said rib at an acute angle to a radial line intersecting the juncture of said working face with its vale, and said rib extending circumferentially of said body rearwardly from its cutting edge with respect to the direction of rotation of said body and having a curved rib stiffening and releasing face extending on a peripheral line eccentric to said body and curving convexly into the vale of the next rearmost rib to afford wide circumferential and longitudinal clearance for the rock,

and said substantially cylindrical body portion being slightly tapered and having a front gage sufficiently reduced in diameter with respect to its rear gage to render said cutting edges effective throughout the length of said body portion. 5

2. In a miner's drill bit adapted for rotary and percussive drive, an integral bit body of hard metal having a relatively short and reduced head portion and a relatively elongated enlarged and substantially cylindrical body portion contiguous with said head portion, said bit body 10 having a plurality of peripherally disposed ribs of uniform length extending linearly throughout the length of said body portion in substan-

tially parallel relation to the axis of rotation thereof and also extending linearly along said head portion substantially to the axis of rotation of said bit body to form a penetrating axis, said ribs forming hills and vales and the hills having longitudinally disposed cutting edges extending throughout the length of said ribs, and said body portion being slightly tapered and having a front gage portion sufficiently reduced in diameter with respect to its rear gage portion to render said cutting edges effective throughout the length of said body portion.

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