Jan. 20, 1953 E. B. LEAR 2,626,023

DRILL POST

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Fig. 1.

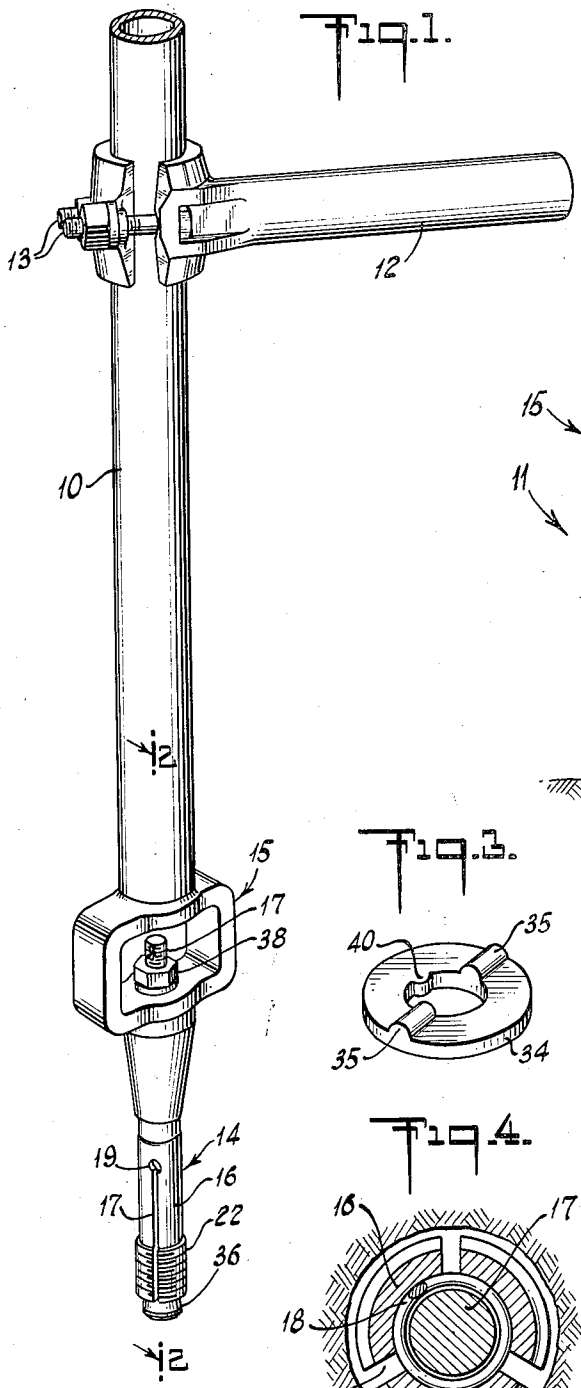


Fig. 2.

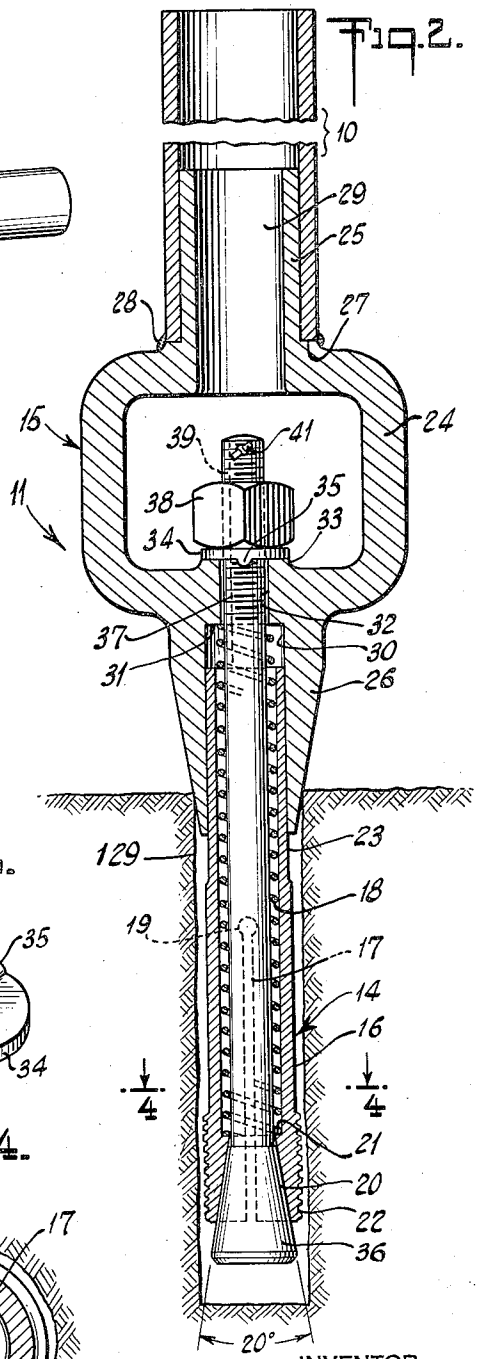


Fig. 3.

Fig. 4.

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DRILL POST

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5 Claims. (Cl. 189—31)

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This invention relates to drill posts and more particularly to a drill post assembly for use in the drilling of earth formations such as rock, coal and the like.

In the drilling of rock or coal it is frequently necessary to use a post for the support of the drilling apparatus, since the weight of ordinary drilling machines is too great to be carried for any length of time by the operator, especially when drilling holes other than those which are vertically downward. Various types of drilling posts are used, ranging from a simple post inserted in a hole to posts which are adapted to be anchored in a hole by means of expanding the anchoring end of the post after it is inserted in the hole. In the simple type of post it is important that the post and hole be of good fit if any sort of stability is to be achieved. This type of post is not entirely satisfactory, especially when mounted in other than a horizontal surface, since there is a tendency for the post to be gradually forced from the hole as a result of the forces of reaction which act parallel to the axis of the post. In the usual expansion type of post, while provision is made by means of the expansion feature to counteract the forces of reaction acting parallel to the post's axis, there is not a rigid support, since the weight of the drilling apparatus and its distance from the work surface are sufficient to develop a moment of force about the base of the post, of such magnitude that it cannot be effectively counteracted by the post anchoring portion.

To avoid the inherent disadvantages of the drill posts as discussed, the drill post assembly of the present invention operates to effectively counteract all the forces of reaction acting on the drill post, which are likely to occur in normal use. The drill post assembly features an anchoring means which has a first portion adapted to effectively resist the forces of reaction which operate parallel to the axis of the post assembly, and a second portion which is adapted to effectively counteract the forces of reaction transverse thereto.

The drill post assembly of the present invention has been found especially useful in quarry work where tripod drill mountings were formerly used in drilling vertical or horizontal holes. It is difficult with a tripod mount to drill holes near a vertical surface. However, with the use of this drill post assembly and a long cross-arm mounted thereon, holes may be easily drilled close to a vertical rock surface.

This drill post assembly is particularly well adapted for channel drilling. Two of these drill

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post assemblies may be set in the surface of the rock, which is either vertical or horizontal, at about eight to ten feet apart, and a long channel bar can then be mounted on the drill post assemblies in the manner which is usual in channel drilling. In general, this drill post assembly can be used in most places which are inaccessible to other types of drill mountings.

An object of this invention is to provide a new and novel drill post assembly, which serves as a rigid and stable drill supporting means.

Another object of this invention is to provide a new and novel drill post assembly which can be readily and securely anchored in either a horizontal, vertical or oblique working surface.

A further object of this invention is to provide a drill post assembly which can be used in channel drilling and can also be readily used in places inaccessible to other types of drill mountings.

In order that the invention may be readily understood and carried into effect reference is made to the accompanying drawing in which:

Fig. 1 is a perspective view of the drill post assembly.

Fig. 2 is a vertical full-section view of the anchoring means thereof shown in operative position.

Fig. 3 is an enlarged perspective view of a washer used in the drill post assembly of Fig. 1, and

Fig. 4 is a cross-sectional view as seen from line 4—4 of Fig. 2.

The illustrative drill post assembly comprises a post or column member 10 supported by an anchoring means 11. The column member supports a cross arm 12 which may be clamped on the column member in any selected position of adjustment by means of bolts 13. The cross arm serves as a support for any suitable drilling apparatus, such as a rock drill drifter (not shown). The column member is most conveniently fashioned from metal tubing, one end being securely fastened to the anchoring means by means of a shrink fit which can be reinforced by welding if desired.

The anchoring means 11 comprises a first portion 14 slidably arranged in part within a second portion 15, the second portion being located between the first portion and the column member 10 as shown.

The first portion comprises an expanding collet 16, which is tubular in form, and is adapted to surround in part a collet expansion means or draw bolt 17, and resilient means in the form of a compression spring 18. The expanding collet has

a laterally expansible part comprising segments formed by three equispaced longitudinal slots 19, extending from the lower extremity to a distance of a little more than one half the length of the collet. The inside surface on each of the three segments at the lower end of the expansible part is arranged to provide a conical surface 20, which is tapered to contact the conical surface portion of the draw bolt, as will later be discussed. Just adjacent the minimum diameter of the conical surface, a shoulder 21 is provided for the abutment of the compressive spring 18. On the outside surface of each of the three segments is arranged a series of parallel grooves or serrations 22. The upper end of the collet has a cylindrical exterior surface 23, which is machined to provide a sliding fit with the interior surface of the second portion 15.

The second portion comprises a rectangular yoke-like body 24 having a tubular protrusion 25 at the upper end, and a tubular protrusion 26, frusto-conical in part, at the lower end. The protrusion 25 has an exterior diameter which is adapted to permit the lower end of the column member 10 to be shrunk fit thereon, and a shoulder 27 about the base to provide a seat for the end of the column member. If desired a weld 28 can be used to reinforce the connection as shown. A hole 29, extends through the protrusion 25 and the yoke-like body 24. The frusto-conical protrusion 26 tapers downwardly to a minimum diameter at the extremity as shown, the minimum diameter being somewhat less than the diameter of a pilot hole 129, in the earth formation in which the drill post assembly is to be anchored. The conical protrusion 26 has a counterbore 30 which extends practically the full length of the protrusion, the diameter being such as to provide a sliding fit with the exterior surface 23 of the collet to prevent lateral movement but permit axial movement between the respective parts. The collet is arranged, during the inoperative position, to engage the counterbore 30 of the protrusion 26 for a distance of approximately four-fifths the length of said counterbore. At the base of the counterbore 30, a shoulder 31 serves for the abutment of the compressive spring 18. A bore 32 of slightly greater diameter than the diameter of the draw bolt, extends from the shoulder 31 through the yoke-like member 24. A boss 33 arranged about the bore 32 and on the inner surface of the yoke-like member has two radial grooves to receive lugs 35 on the bottom of a washer 34, as shown in Fig. 3.

The draw bolt 17 has at one end a frusto-conical head 36 having an exterior surface tapered upwardly at an angle of approximately ten degrees with the axis, or an included angle of twenty degrees, as shown in Fig. 2 of the drawing. The frusto-conical head is adapted to operatively engage the interior conical surface 20 of the expension collet, the contacting surfaces of each being case-hardened to provide good wear. The other end of the draw bolt has a threaded part 37 to receive a draw nut 38 and has a longitudinal groove 39 which is arranged to engage protrusion 40 of washer 34. A transverse hole is arranged in the bolt near the end of the threaded portion to receive a cotter pin 41.

The washer 34 has an internal diameter slightly larger than the diameter of the draw bolt, and the two lugs 35 on the lower surface fit the grooves of boss 33, while the internal protrusion 40 is arranged to slidably engage the groove 39 of the draw bolt. The bolt 17 is thus mounted for axial, non-rotative, movement relative to yoke 24. Upward movement of the draw bolt relative to the yoke causes the bolt to exert a force on the collet, which force may be resolved into a radial component tending to spread the collet segments and an axial component tending to raise the collet against the opposition of spring 18.

All diameters of the elements are concentric with respect the axis of the drill post assembly, as can be seen from the drawing.

In the assembly of the anchoring means 11, the first portion 14 is slidably arranged within the protrusion 26 of the second portion 15, as heretofore set forth, the compressive spring 18 being arranged within the collet to abut at one end the shoulder 21, and to abut at the other end shoulder 31 of the tubular protrusion 26. The spring 18 when positioned in the assembly is compressed to approximately two-thirds its free length and thus serves, to maintain the collet in extended relationship with respect to the conical protrusion 26, and serves to prevent telescoping action therebetween as the draw nut is first turned. The draw bolt 17 passes within the spring, the conical head 36 being in contact with the tapered surface 20 of the collet and the threaded end extends through the wall of the yoke-like body 24 to receive the washer 34, draw nut 38 and cotter pin 41. It can be seen that the arrangement of the washer serves to prevent rotation of the draw bolt as the draw nut is turned thereon. The cotter pin prevents the draw nut from being unintentionally removed from the draw bolt.

To set up the drill post assembly the pilot hole 129 is first drilled in the rock or the earth formation in which it is desired to anchor the assembly, the pilot hole being conveniently formed by means of a hand-held machine of the sinker type. While the dimensions of the pilot hole vary in accordance with the size of the drill post assembly, a pilot hole approximately 2½" in diameter and 1 ft. deep is satisfactory for a drill post assembly having a 3½" diameter column member 10 extending to a distance of approximately 4 ft. above the ground line. The first portion 14 and part of the conical tubular portion 26 are inserted in the hole so that contact is made between the edge of the pilot hole opening and the portion 26, as shown in Fig. 2. The draw nut 38 is then turned, causing the draw bolt to be drawn upwardly and expand the collet as a result of the action of the conical head 36 on the conical surface 20 of the collet; up to this stage, the axial component of force transmitted through the collet 16 is insufficient to overcome the compressive force of spring 18 and relative movement between the collet and second portion 24 is prevented.

After the collet has been expanded a predetermined amount, such being the amount of expansion necessary to cause the serrations 22 to contact the wall of the pilot hole, further turning of the draw nut will cause the serrations to bite into the wall of the pilot hole until further expansion of the collet is effectively resisted by the walls of the hole, after which the collet or first portion 14 in effect becomes rigidly associated with the draw bolt 17. Further turning of the draw nut meets with increased resistance and causes the second portion 15 to be drawn toward the first portion 14, with the result that the conical tapered protrusion 26 moves downward and becomes firmly wedged in the opening of the pilot hole, thereby giving rigid support to the drill post assembly. It can be seen that the spring 18 will be compressed during the latter stages of

the anchoring operation, after the turning force on nut **38** has been increased to overcome the increased resistance.

To knock down the drill post assembly it is merely necessary to turn the draw nut in the opposite direction which results in the release of the conical tubular portion **26**, which is thus forced from the pilot hole by action of spring **18**. Normally, there will be little tendency for the conical head **36** of the draw bolt to become wedged within the conical portion **20** of the collet. However, should such occur a rod can be passed through the column member and hole **29** of the second portion, so that the end of the draw bolt can be tapped slightly and thus break any wedging action at the other end.

What is claimed is:

1. Anchoring means for a drill post adapted for rigid fixation in a pilot hole, comprising a first portion having an expansible collet section, a second portion positioned between the first portion and the drill post, said second portion having an external conical surface tapering in the direction of the first portion and having a minimum diameter less than the diameter of the pilot hole, said first portion being slidably arranged in part within the second portion, resilient means maintaining the first portion and the second portion in opposition, a draw bolt extending through the first and second portions and having a conical portion tapering in the direction of the second portion, and means operable to move the draw bolt in the direction of the second portion thereby forcing the conical surface of the second portion further into the pilot hole after the expansible collet section has been expanded by the conical portion of the draw bolt to fully engage the pilot hole.

2. Anchoring means for a column member for affixing said column member in a hole, said anchoring means including a first portion having an expansible collet section, a second portion positioned between the first portion and said column member and being affixed to the latter and having an external surface tapering in the direction of the first portion said tapered surface being of size to permit partial entry thereof into the anchoring hole, said first portion arranged in part within the second portion for axial movement relative thereto, yieldable means interposed between the first and second portion resisting axial movement therebetween, and means operable for expanding the expansible collet section and forcing the second portion toward the first portion after the collet section is expanded a predetermined amount said latter means including a draw bolt having a tapered head whereby the expansible collet section is forced into engagement with the wall of the anchoring hole.

3. Anchoring means for a column member for affixing said column member in a hole, said anchoring means including a first portion having

an expansible collet section, a second portion positioned between the first portion and said column member and being affixed to the latter and having an external surface tapering in the direction of the first portion said tapered surface being of size to permit partial entry thereof into the anchoring hole, said first portion arranged in part within the second portion for axial movement relative thereto, resilient means compressively interposed between the first portion and the second portion for resisting axial movement therebetween, and means for expanding the collet section a predetermined amount and forcing the second portion toward the first portion after the collet section is expanded said predetermined amount said latter means including a draw bolt having a tapered head whereby the expansible collet section is forced into engagement with the wall of the anchoring hole.

4. Anchoring means for a column member for affixing said column member in a hole, said anchoring means including a first portion having an expansible collet section, a second portion positioned between the first portion and said column member and being rigidly affixed to the latter and having an external conical surface tapering in the direction of the first portion said tapered surface being of size to permit partial entry thereof into the anchoring hole, said first portion being slidably arranged in part within said second portion, guiding means preventing rotary movement of the first portion relative the second portion, resilient means maintaining the first portion and the second portion in opposition, and draw means for expanding the collet section into engagement with the wall of the anchoring hole including a tapered conical surface tapering in the direction of the second portion, said draw means being further arranged for forcing the second portion toward the first portion after the collet section is expanded into engagement with the wall of the anchoring hole.

5. An anchoring means as claimed in claim 4 wherein said expansible collet section is provided with a serrated external surface.

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