Nov. 25, 1941. M. HOKANSON 2,263,579

SECTIONAL DRILL ROD

Filed Aug. 21, 1939 2 Sheets-Sheet 1

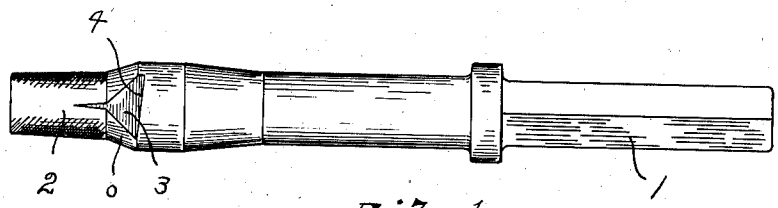


Fig. 1.

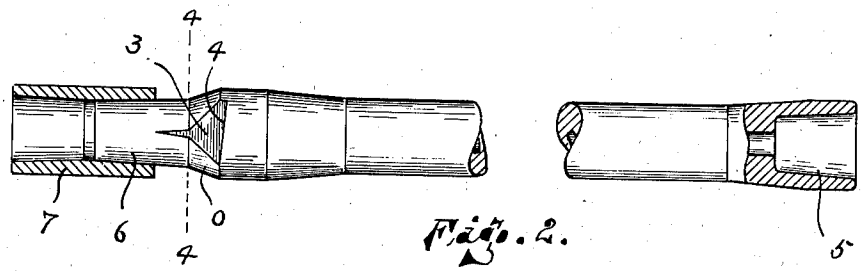


Fig. 2.

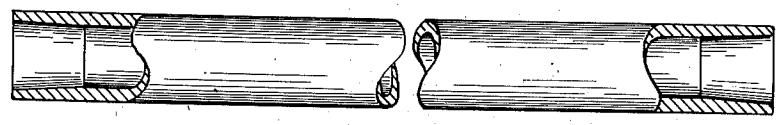


Fig. 3.

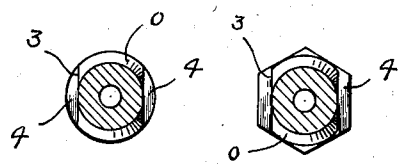


Fig. 4. Fig. 5.

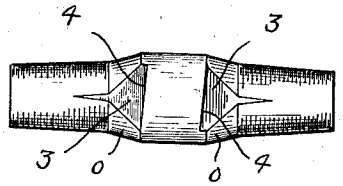


Fig. 6.

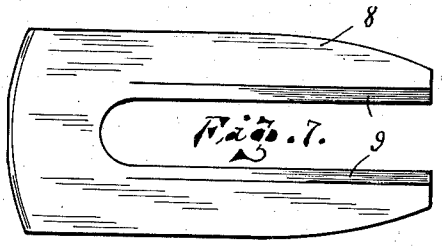


Fig. 7.

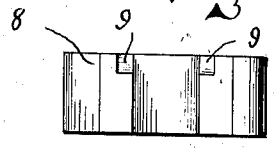


Fig. 8.

INVENTOR.
Martin Hokanson.
BY Geo. Stevens.
ATTORNEY.

Nov. 25, 1941. M. HOKANSON 2,263,579

SECTIONAL DRILL ROD

Filed Aug. 21, 1939 2 Sheets-Sheet 2

Fig. 9.

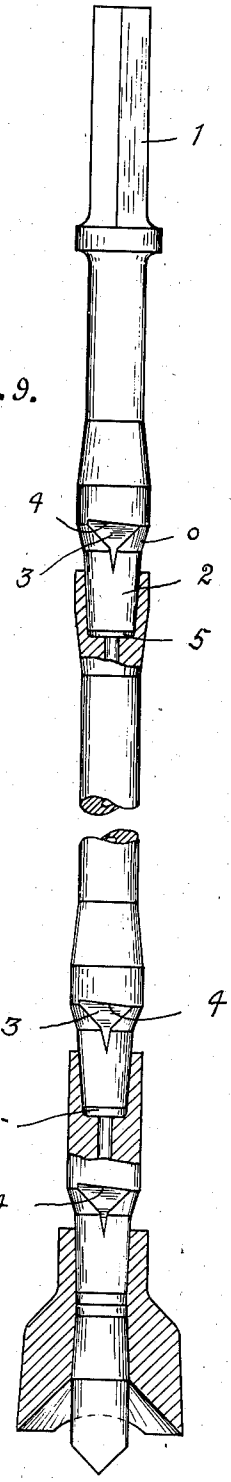


Fig. 10.

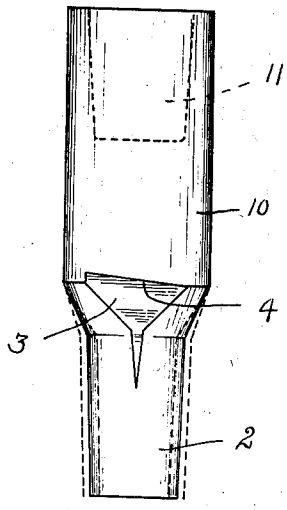
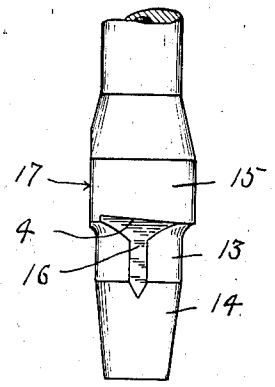


Fig. 11.



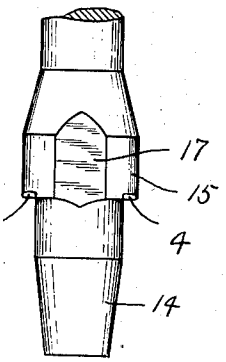


Fig. 12.

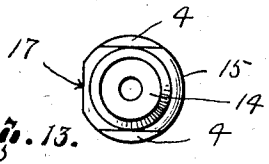


Fig. 13.

INVENTOR.
Martin Hokanson.
BY Geo. Stevens.
ATTORNEY.

Patented Nov. 25, 1941 2,263,579

UNITED STATES PATENT OFFICE

2,263,579

SECTIONAL DRILL ROD

Martin Hokanson, Duluth, Minn., assignor to Eidco, Incorporated, Duluth, Minn., a corporation of Minnesota

Application August 21, 1939, Serial No. 291,170
In Canada October 3, 1938

2 Claims. (Cl. 255—28)

My invention relates to improvements in equipment especially adapted for use in the art of rock drilling, and more particularly to a separable sectional drill rod for such use.

The principal object of the invention is to provide a sectional pneumatic drill rod for rock drilling, said rod having readily separable friction joints of equivalent strength as any other portion of the rod.

Another object of the invention is to produce a practical friction joint for the separable union of pneumatic drilling members that will hold the members together while drilling and yet be readily easily separable when necessary.

Another object of the invention is to provide an improved form of means for separating the various separable parts of the structure.

Other objects and advantages of the invention will appear in the following description thereof.

Referring now to the accompanying drawings, forming part of this application, and wherein like reference characters indicate like parts:

Figure 1 is an elevation of an improved form of drill rod.

Figure 2 is a broken section and elevation of one section of a sectional drill rod having the male member of a friction joint at one end thereof and a female member of such a joint at the other end, and illustrating a female coupling member as applied to the male end of said rod section.

Figure 3 is a central sectional view, partly in elevation, of a hollow drill rod section illustrating the female portion of a friction joint at both ends.

Figure 4 is a cross sectional view on the line 4—4, of Figure 2.

Figure 5 is a view similar to Figure 4 but of a hexagonal drill rod.

Figure 6 is an elevation of a double male friction coupling member.

Figure 7 is a plan view of the preferred form of joint separating wedge.

Figure 8 is a front elevation of Figure 7.

Figure 9 is a reduced, broken, assembly of sectional drill rod and bit, according to the invention.

Figure 10 is an enlarged side elevation of an adapter by the use of which bits of various sizes may be used in connection with such sectional drill rod.

Figure 11 is a side elevation of a modified form of drill rod end to which the invention is applied.

Figure 12 is a similar view of the same except that it is taken at right angles thereto.

Figure 13 is a lowermost end view of Figures 11 and 12.

It is well known that the connection between the power unit and the drill head of rock drilling equipment is one of the most important features in connection with the successful operation thereof, and that while this feature of the invention is particularly adapted to drilling operations, it is obvious that the same may apply to other mechanical devices wherein sections of rod or shafting may be employed to advantage and wherein a secure or dependable separable or non-separable union is desired.

In drill bits and rods applied to pneumatic rock drilling of the type herein illustrated and described, it has been impracticable heretofore to provide a sectional drill rod because of the undependable joint for the union of the sections, but there is here shown such a sectional drill rod having a joint for the sections which is dependable and very satisfactory, it embodying a properly tapered friction joint having knurled or roughened surfaces whereby to increase its efficiency.

In Figure 1 is illustrated the first section of such a sectional drill rod, it being provided at one end with the usual hexagonal shape and integrally formed collar, and which end, indicated at 1, is for application to the drilling machine, and at the other end is provided with the male member 2 of one embodiment of my improved friction joint, the surface of which is knurled to provide greater friction in said joint. It will be noted that the taper of this male member, for insertion within a similarly tapered female member of another section of drill rod, is extended considerably above that which would be normally used, and from the upper terminus of this knurled portion, the taper is materially increased, as indicated at 0, until intersecting the full diameter of the enlarged part of the rod where inclined shoulders 4 are provided on opposite sides for the reception of a similarly inclined wedge employed in the separation of the various parts. This compound angularity of that portion of the rod intermediate of the male member utilized by the cooperative female member applied thereto is deemed essential in that it provides ideal stress flowage from the rod to the coupling member, whatever it may be; furthermore, being thus inclined, and particularly on the major inclination indicated at 0, a decided angularly shaped flattened portion 3 results, this having the marked

advantage of determining positively where the separating wedge must be applied in order to function properly.

I have shown Figure 1 as representing a relatively short section of integral rod, as this section, which fits into the drill machine is subjected to a great deal of breakage both above and below the collar, and by making the same a relatively short separable section, in case of breakage, a new one can be inserted and the rod restored to maximum efficiency, without sacrificing any material length of rod. For example, in present practice, if a two-foot rod breaks it becomes too short to reforge, but in a four-foot and longer rods it is the practice to reforge the end after breakage, but this considerably shortens the rod with each reforging and upsets the unity of drilling, causing much inconvenience, while with my sectional rod, the replacement of the end restores all rods to their original length.

Another advantage of this sectional type of drill rod is that should a section break due to fatigue, which is a common occurrence, the whole rod is not ruined, but a new section can be replaced for the broken one, and the rod is then restored to its normal efficiency. With this type of equipment it enables the driller to drill to any depth desired without having to order special lengths of rod; the contractor need not stock up on different lengths of rods; and, providing the sections all of one length, and relatively short, affords great convenience in transporting same to and from the place of drilling.

In Figure 2 is illustrated one form of drill rod section, wherein is shown the female portion of the joint at one end, as at **5**, and a male member upon the other end as at **6**, similar to that shown in Figure 1, any number of which may be frictionally united one to another as the drilling proceeds to form any length of rod for all practical purposes. In some instances and for economy of manufacture, it may be desirable to form such a rod section with a male member at both ends, in which event, to join one section to another, a double female coupling member **7** may be employed. These couplings can be made very inexpensively from tubing cut off and reamed to proper taper at both ends and heat-treated.

In Figure 3 is illustrated a combined section and elevation of a tubular shaft or rod which may be provided at either or both ends with any desired modification of the friction joint above described, and, if female portions of the joint are provided as shown either in this instance or any modifications thereof, it will be necessary to employ a short double male member, as indicated in Figure 6, to join such sections one to another.

In Figure 9 is illustrated a reduced broken assembly of the various parts making up the combined sectional drill rod and detachable bit structure, and wherein the rod is made up of the relatively short first section **1** for attachment to the drilling machine, a plurality of sections as illustrated in Figure 2, an adapter, and the detachable drill bit. In this particular instance the adapter is not necessary as the spigot on the end of the rod sections is the proper size for application into the socket of the drill bit illustrated, the adapter being shown merely to convey the idea of its application to the invention, and whereby different sizes of bits may be used with one size of rod merely by using the proper adapter for the particular bit to be used in the drilling operation.

The adapter is illustrated, slightly enlarged, in Figure 10 and comprises a relatively short member **10** having a tapered socket **11** at one end and having a tapered spigot **12** at the other end for application into a correspondingly tapered socket of a drill bit. For practical purposes the adapters would be formed with spigots to fit bits having sockets one or two sizes smaller or larger than the socket in the adapter so that with the adapters, one size of drill rod would accommodate five different sizes of bits, two smaller and two larger by the use of the adapters, and one which would fit the rod without an adapter. The adapters, of course, are provided with the inclined shoulders **4** for application of the wedge in separating the parts.

The angle of the taper of the friction joints employed in separably uniting the parts is of considerable importance, as the joint must stand up and not come apart while drilling, and yet be easily separated. Also it will be obvious that in order to provide a strong socketed portion for the joint the angle of the taper should be as large as possible. For example a 5° angle for the taper has a lateral strain 59.5% less than a 2° angle. Or in other words the walls of the socket are over twice as strong with a 5° angle as they would be with a 2° angle. On the other hand, the greater the angle of taper of the friction joint the less holding power to the joint, the easier it is separated, etc., and therefore there is a practical limit to the degree of angle used for the taper both ways. While in my Patent No. 2,145,262 dated January 31, 1939, it was stated that the proper taper for such a friction joint was not to exceed 10° from the axis of the bit, my continued experiments have proven that the single taper for such a joint which would hold under all required circumstances and yet be readily separable should not be less than 2° nor greater than 7°, or the inclusive angle should not be less than 4° nor greater than 14°. Within these limits I have proven that the joint will hold under all practical circumstances and yet be readily separable when desired.

In Figures 7 and 8 is illustrated the preferred type of wedge **8** for most convenient separation of the novel form of frictionally united sectional rod joint, which is of general U-shape with the opposed edges of the bifurcated portion stepped and inclined as clearly shown at **9**.

This wedge is shaped to closely fit against the flattened sides **3** of the tapered portion **0** of either the rod or the male coupling member, as the case may require, and has proven a very effective instrumentality for the purpose.

Furthermore the stepped inclined channel serves as an unmistakable guide for the user of same in determining which is the face of the wedge in placing same for best results in the separating process.

In the last three figures of the drawing is illustrated a modified and preferred form of rod end, wherein that portion **13** intermediate of the tapered end **14** and the enlargement or upset portion **15** of the rod is cylindrical with the exception of the fillet about the upper end, thus resulting in a relatively larger flattened area **16** than that illustrated in the other views of the drawings.

Furthermore, in this modified form there is shown an additional flattened area indicated at **17** on one side of the enlarged portion **15** which is intended as a guide for the insertion of the wedge, as this flattened area occurs upon the en-

trance side of the enlarged portion and at right angles to the flattened portion 16, thus further insuring proper assembly of the wedge; such provision being made without materially affecting the efficiency of the joint.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

1. A friction joint for the separable union of drilling members comprising a tapered socket in one of said members and a similarly tapered spigot on another of said members, one of said members having a flat surface at right angles to the axis of said members and another having a flat surface inclined to said axis, and a wedge for separating said members, said wedge being of general U-shape with the opposed edges of one side being stepped and inclined correspondingly to the inclined surface on said member.

2. A friction joint for the separable union of drilling members, consisting of a tapered socket in one of said members, and a similarly tapered spigot on the other of said members, an outwardly tapered portion issuing from the larger end of said spigot, opposed flat cut away areas formed in planes parallel with the bit axis on opposite sides of said tapered portion and providing shoulders at right angles to said flat areas and extending across the axis of the bit at an angle slightly less than a right angle, a surface on said socket member at right angles to the bit axis, and a wedge for separating said members, said wedge being of general U-shape with the opposed edges of one side being stepped and inclined correspondingly to the inclined shoulders.

MARTIN HOKANSON.