

Nov. 26, 1935.

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2,022,055

DRILL BIT

Filed July 30, 1932

2 Sheets-Sheet 1

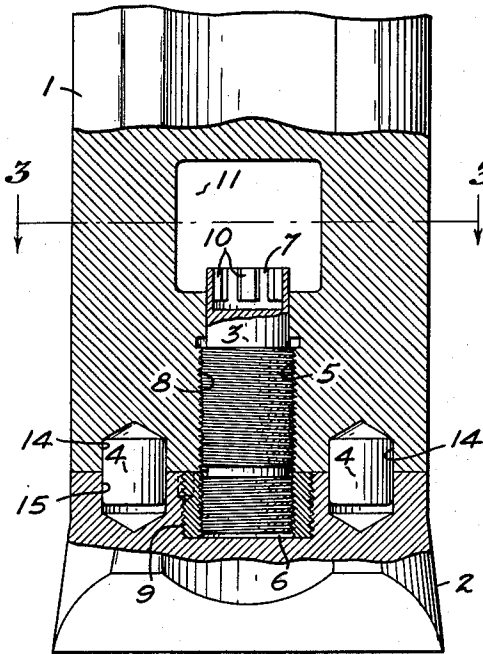


Fig. 1.

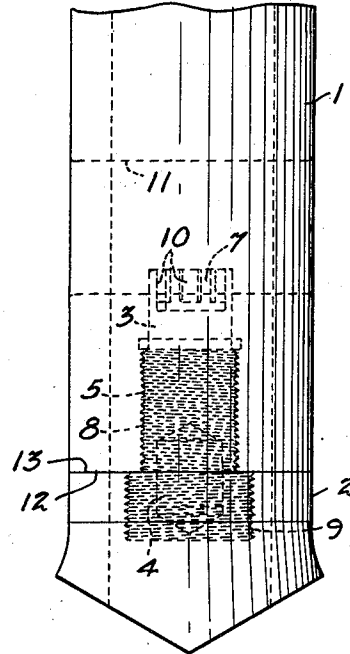


Fig. 2.

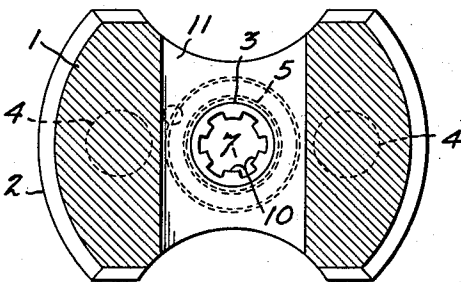


Fig. 3.

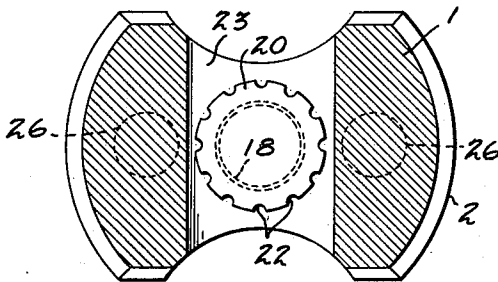


Fig. 5.

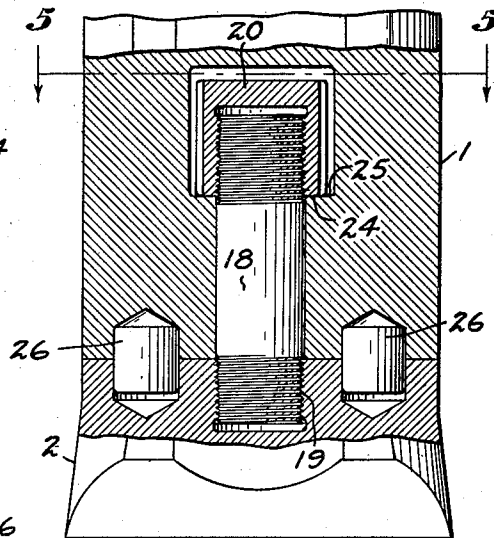


Fig. 4.

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2 Sheets-Sheet 2

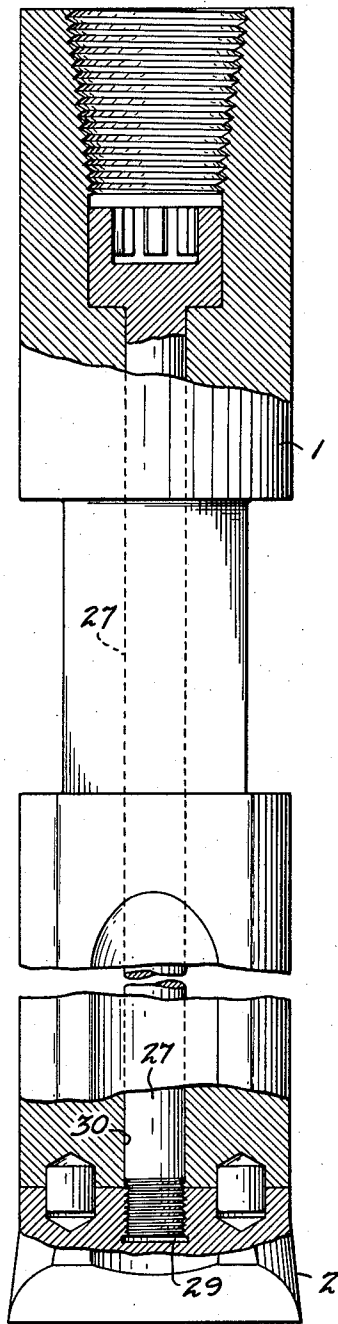


Fig. 6.

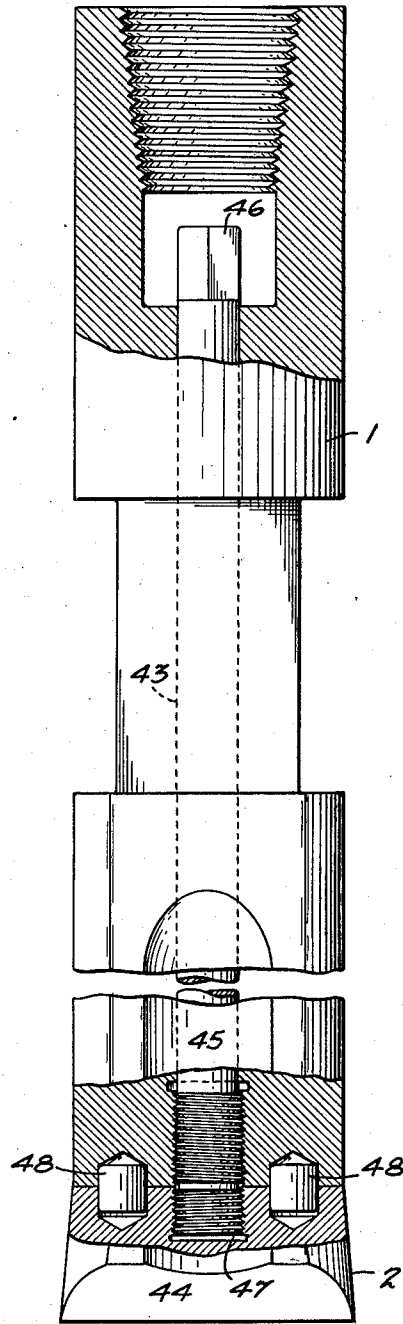


Fig. 7.

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2,022,055

DRILL BIT

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Application July 30, 1932, Serial No. 626,902

7 Claims. (Cl. 255—63)

This invention relates to assembled drill bits comprising a blade and removable tip for use in churn and percussion drilling and more particularly to means for securing the drill bit tip to the drill bit blade, and is an improvement of the drill bit assembly shown and described in my co-pending application Serial No. 614,866 that was filed June 2, 1932.

Drill bits conventionally used in churn and percussion drilling are commonly of single piece construction and are of great weight. In the past it has been the practice when using a bit of this type to disengage the entire bit from the drill stem when the cutting tip of the bit dulls or when the character of the particular formation in which the bit is being used changes so that a different form of cutting edge of the bit is advisable. The labor and time required for removing and replacing such bits by bits of proper character for use in the particular formation being worked in, and the expense and delay incident to resharpening drill bits in the field, discouraged the changing of such drill bits before it was absolutely necessary. The equipment for properly dressing and tempering drill bits in the field is so limited that the best tempering and dressing is seldom achieved.

Removable drill bit tips heretofore proposed for use in churn drilling have not been satisfactory for commercial use because of the inherent weakness of the union between the bit tip and the blade, the tendency of the union between the bit tip and the blade to loosen in service and for other reasons. So far as known, no commercially satisfactory removable drill bit tip for churn drilling has been produced heretofore, although the need for such removable drill bit tips has been fully recognized in the industry.

Many distinct advantages accrue from the use of inexpensive, properly hardened and properly shaped drill bit tips in the industry. Removable drill bit tips may be made from the best character of materials for the service expected of them and the forming, sharpening and tempering of the bit tip may be carefully controlled by factory equipment, so that greatly superior cutting edges for the tools are produced, the drill bit tips wear longer in service and the ease with which such drill bit tips may be changed induces the driller to make desirable changes in the drill bit tip for different character of rock formation which otherwise would not be made.

In accordance with the present invention, a single drill bit blade forming a piece of permanent equipment may be carried to the site of the

drilling operation along with a plurality of interchangeable drill bit tips of various and desirable design of cutting edge adapted to the particular rock structure characteristic of that region. This greatly decreases the expense and labor involved in carrying two or more of the heavy, cumbersome and unwieldy drill bits to the site of the drilling, which has been the practice in the past.

One of the objects of the present invention is to provide a drill bit assembly which permits quick and easy interchange of drill bit tips upon the end of a drill bit blade, so that a plurality of such drill bit tips may be consecutively and interchangeably used in replacing a bit tip made dull or worn in the drilling operation or for drilling different characters of rock or ground formation, the cutting edge of the drill bit tip being unbroken by wrench-receiving apertures for assembling and disassembling the bit tip.

A further object of the invention is to provide a drill bit tip and blade assembly embodying means for securing the drill bit tips to the drill bit blade, which securing means is confined entirely within the assembled drilling tool and wherein no apertures extend into the cutting face of the tool.

A further object is to provide a drill bit tip in combination with means for rigidly securing the bit tips to a bit blade in such a manner that the blade and tip cannot be readily separated from or be deformed while in a drill hole irrespective of the angular torque to which the junction of the drill bit tip and drill blade is subjected.

Another object is to provide a drill bit blade and tip assembly in which the drill bit tip has an unbroken cutting edge and may be quickly and easily replaced so that the proper shape and design of drill bit tips to provide the most rapid cutting rate and a maximum length of life for each character of rock may be secured to the end of the drill bit blade without objectionable labor.

With the above and other objects in view, which will be readily apparent from the following detailed description, the present invention consists in certain constructions and combinations of parts which will be readily understood by those skilled in the art to which the invention appertains.

In the accompanying drawings, which illustrate suitable embodiments of the present invention, Fig. 1 is a side elevational view partly in section of a preferred means for securing a drill bit tip to a drill bit blade;

Fig. 2 is an end elevational view of the assembled bit shown in Fig. 1;

Fig. 3 is a transverse sectional view taken along line 3—3 of Fig. 1;

Fig. 4 is a side elevational view of a modified form of means for securing the drill bit tip to the drill bit blade;

Fig. 5 is a transverse sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a side elevational view shown partially in section of a second modification of means for securing a drill bit tip to a drill bit blade;

Fig. 7 is a side elevational view shown partially in section of a third modification of the preferred form of securing means for securing a drill bit tip to a drill bit blade.

The drill bit assembly shown in Figs. 1, 2 and 3 comprises a drill bit blade 1 to which a drill bit tip 2 is rigidly secured by means of the anchor stud 3 that is preferably disposed centrally and longitudinally of the drill bit blade. A plurality of keys, dowels or other suitable members 4 are positioned in apertures formed in the drill bit blade and the drill bit tip at their junction, and serve to effectively prevent rotation between these members.

In the preferred form of drill bit assembly the anchor stud 3 is positioned within an aperture 5 disposed centrally and longitudinally of the drill bit blade and an internally threaded aperture 6 formed in the drill bit tip. The aperture 5 opens upwardly into a transversely disposed wrench-receiving aperture 11 that is positioned somewhat away from the end of the drill bit blade. The stud-receiving portion of the aperture 5 is suitably threaded for receiving the anchor stud 3. The threaded portions 9 of the aperture 6 formed in the drill bit tip and the threaded portion 8 of the aperture 5 formed in the drill bit blade are preferably of opposite direction.

The anchor stud 3 is preferably provided with suitable wrench engaging means, such as a plurality of internal splines 10, at its upper extremity 7. Other means may be provided for the rotation of the stud 3, such as external wrench squares or other suitable means. The aperture 11 is cut transversely of the drill bit blade in such a manner as to permit free access to the wrench-receiving end of the stud.

As in all constructions of the removable drill bit tip, the impact face 12 of the drill bit blade and the impact face 13 of the drill bit tip are each designed to be substantially perpendicular to the longitudinal axis of the drill bit blade. Dowel apertures 14 and 15 formed in both the drill bit blade and the drill bit tip are designed to index accurately with each other for the accommodation of the dowels or keys 4.

In assembling the preferred form of drill bit tip and blade, suitable dowels 4 are inserted into the apertures 15 in the drill bit tip and the anchor stud 3 rotated by means of a splined wrench socket 10 to draw the impact faces 12 and 13 rigidly together.

In order to remove a worn drill bit tip from the drill bit blade upon which it is mounted the above operations need only be reversed.

The structure shown in Figs. 4 and Fig. 5 comprises a drill bit blade 1 and a drill bit tip 2 secured together by means of the bolt 18 that is secured within the internally threaded aperture 19 formed within the drill bit tip 1. The upper end of the bolt 18 has a rack nut 20 threaded thereto. The rack nut 20 carries a plurality of

vertically disposed splines or grooves 22 by means of which a suitable rack wrench (not shown) may engage the rack nut 20 and rotate the nut on the bolt 18 to removably secure the bit tip in place. By having the nut move on the bolt, the nut engages the overlying face of the aperture and pushes the bit tip free from the blade.

A suitable transversely disposed aperture 23 is formed through the upper portion of the drill bit blade 1 for the accommodation of the rack nut 20. The shoulder 24 of the rack nut 20 is designed to rest in compressing relation against the shoulder 25 surrounding the bolt-receiving aperture formed in the drill bit blade to lock the bit tip in place and to substantially exclude water from access to the threaded portions of the bolt 18. Suitable dowels 26 or other means serve to prevent rotation of the drill bit tip 2 relative to the drill bit blade 1.

The construction shown in Figs. 4 and 5 provides a very simple and rapid means of assembling and disassembling a drill bit tip upon the end of a drill bit blade. This construction has the further advantage that it also substantially seals the threaded portion of the assembly bolt from water that tends to corrode the parts.

The construction shown in Fig. 6 comprises a drill bit blade 1 to the end of which the drill bit tip 2 is secured by means of the headed bolt 27 having a threaded lower end 28 that engages the internally threaded aperture 29 formed in the drill bit tip and extending along the aperture 30 formed centrally and axially of the drill bit blade 1. The bolt head has a suitable splined wrench socket formed therein for turning the bolt. The assembly of the bit tip for this construction will be obvious. The pin of the drill stem (not shown) is then assembled in place. The reverse operation is necessary for the removal of the bit tip.

This form of construction has some advantages over previously described constructions. The assembly bolt may be placed under sufficient tension to prevent dislodgment of the bit tip even under severe impacts that somewhat compress the body of the bit blade. The bolt may be made of a high tensile steel that will meet the needs of this service.

The necessity of breaking the joint with the drill stem when a new bit tip is installed has the advantage of insuring that this joint is tight before the tool is replaced in the hole. Many times tools are lost in a hole because of failure to tighten this joint before the tool is replaced in the hole.

In this assembly the only joint that might permit the ingress of water to the mechanical parts of the assembly is between the impact faces and, since these are ground faces, they are tight and seal the mechanical parts.

The assembly shown in Fig. 7 comprises a drill bit blade 1 and a drill bit tip 2 secured together by means of the elongated bolt 43 terminating at its lower end in the right-left threaded portions 44 and 45 and at its upper extremity in the wrench square portion 46. The threaded portion 44 at the lower extremity of the bolt 43 is designed to thread into the internally threaded aperture 47 formed in the drill bit tip 2. The threaded portion 45 of the elongated bolt 43 is preferably of twice the length of the threaded portion 44, since as the drill bit tips are replaceable, it is much more important to protect the threaded area of the bolt 43 which is positioned

within the drill bit blade 2 than the portion securing the bit tips in place. Suitable dowels 48 are seated within dowel apertures to prevent rotation of the bit tip, as previously explained. The assembly of this structure is the same as the assembly of the structure shown in Fig. 6, and many of the advantages are common. The use of the right-left threaded assembly bolt also has the self-tightening features described in my co-pending application previously referred to.

It will be noted that in each of the embodiments of the invention shown herein the cutting face of the drill bit tip is unbroken, and that there are no projections on the sides of the bit assembly that retard the free fall of the bit assembly in service. The substantially sealed joint between the impact faces excludes water and prevents corrosion of the assembly parts of the bit.

It is to be understood that the particular embodiments of the present invention shown and described are presented for purposes of illustration and explanation, and that various modifications, including the form of wrench socket or wrench connecting means or the type of dowel or key used for preventing rotation of the drill bit tip, may be made without departing from the invention as defined in the appended claims.

What I claim is:

1. A drill bit, comprising a bit blade having a bolt-receiving socket and a wrench aperture extending transversely of an intermediate portion thereof and connected with the bolt-receiving socket, a bit tip having a cutting face and a bolt-receiving socket arranged in registered relation with the corresponding socket of said bit blade and closed at the end adjacent the cutting face, a bolt for securing said parts together, an impact transmitting face formed on said blade and a corresponding impact-receiving face formed on said tip and arranged normal to the longitudinal axis of said bit blade, and interfitting means on said blade and tip laterally offset from said sockets for preventing relative rotary movement of said bit tip relative to said bit blade.

2. A drill bit tip and drill bit blade assembly for churn and percussion drilling, comprising a drill bit tip having an internally threaded stud-receiving socket with closed bottom formed therein and opening thru an impact face formed on said bit tip, a bit blade having an impact face registering with the impact face of the bit tip and when assembled said bit blade and bit tip having a smooth and continuous external surface along their junction and a bolt-receiving aperture formed longitudinally of said bit blade and opening at one end into an internally threaded stud-receiving socket formed in said bit blade and opening at its other end into a wrench aperture formed transversely of said bit blade, an anchor stud having externally threaded end portions of oppositely directed threads and serving to secure the impact faces of said bit blade and said bit tip together, and wrench engaging means forming a part of said anchor stud and accessible in said wrench aperture from outside the drill bit after assembly of the bit tip and the bit blade.

3. A drill bit for churn and percussion drilling, comprising a bit blade having an impact face forming the lower end of said bit blade and being substantially normal to the longitudinal axis of said bit blade, a bit tip having a continuous cutting edge and having an impact face of con-

tour and area substantially conforming with the contour and area respectively of the impact face of said bit blade and arranged to form uniformly close contact therewith, separate means that is partially housed within both said bit blade and said bit tip and passing thru the contact plane of the impact face of said bit blade with the impact face of said bit tip for preventing relative rotary movement between said bit tip and said bit blade, a bolt for securing said bit tip to said bit blade, and wrench engaging means for rotating said bolt and that is positioned within an aperture formed within said bit blade in such a manner as to be operable from outside the drill bit after assembly of the bit tip and the bit blade.

4. A blade and tip assembly for churn and percussion drills comprising a blade having a central aperture, a wrench receiving opening in communication with said aperture, a tip having a cutting edge at one side and a central threaded bolt socket at the other side, said socket being closed adjacent said edge, said blade and tip having impact transmitting and receiving surfaces in engagement with each other, means outwardly of said central aperture for locking said tip and blade against relative rotation, and bolt means disposed within said central aperture and threaded into said socket, said bolt means having portions interfitting with said blade whereby to hold said blade and tip against relative longitudinal movement, said bolt means being accessible through said wrench receiving opening, said opening being disposed through said blade transversely of said central aperture.

5. A drill bit for churn or percussion drilling comprising a bit blade having an impact transmitting lower end face substantially normal to its longitudinal axis, a longitudinal bore opening to said lower end face and dowel sockets opening only to the lower end face inwardly of its margin and laterally of said bore, a bit tip adapted to form a continuation of the blade and having an upper impact receiving face conforming to the lower end face of the blade and adapted to seat against said end face of the blade, said bit tip having a threaded socket adapted to register with the bore of the blade and dowel sockets adapted to register with the sockets of the blade, the sockets of the bit opening only to the upper face thereof, dowels adapted to extend across the contacting faces of the blade and drill bit with their upper ends in the sockets of the blade and their lower ends in the sockets of the drill bit, and means for clamping the drill bit against the lower end of the blade comprising a bolt in the bore of the blade which has a threaded lower end adapted to screw into the threaded socket of the bit tip.

6. A drill bit for churn or percussion drilling comprising a bit blade having a flat impact impacting lower end face normal to the axis of the blade, an axial bore opening at its lower end to said face and dowel sockets on opposite sides of the axial bore and opening only to the lower end face, a bit tip of the upper portion of which is of the same size and shape as the lower end of the blade, said bit tip having a flat impact receiving face adapted to seat against the lower end face of the blade, a central threaded socket opening only to the upper face thereof and adapted to register with the axial bore of the blade and dowel sockets on opposite sides of the socket opening only to the upper face of the bit tip, said bit tip having bottom faces tapering to a cutting edge normal to the axis and directly beneath

the bit tip sockets, dowels fitting in the dowel sockets and extending across the plane of contact between the abutting faces of the blade and bit tip, and means for clamping the bit tip to the blade comprising a bolt threaded in the central socket of the bit tip and extending through the axial bore of the blade.

7. A drill bit for churn or percussion drilling comprising a bit blade having an impact transmitting lower end face substantially normal to its longitudinal axis and a longitudinal bore opening to said lower end face, a bit tip adapted to form a continuation of the blade and having an upper impact receiving face adapted to seat against the lower end face of the blade, said bit tip having a threaded socket opening only to its

upper face and adapted to register with the bore of the blade, key members disposed between the bore and margins of the contacting faces for holding the bit tip against turning movements with respect to the blade, and permitting axial movement of the tip toward or away from the blade, and a bolt in the bore of the blade having a threaded lower end adapted to screw into the socket of the bit tip, said bolt having wrench receiving means at its upper end and with end thrust receiving parts coacting with the body of the blade whereby the bolt may be actuated to exert a thrust on the bit tip in a direction to clamp the bit tip to the blade or in the opposite direction to separate the bit tip from the blade.

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