

July 23, 1940.

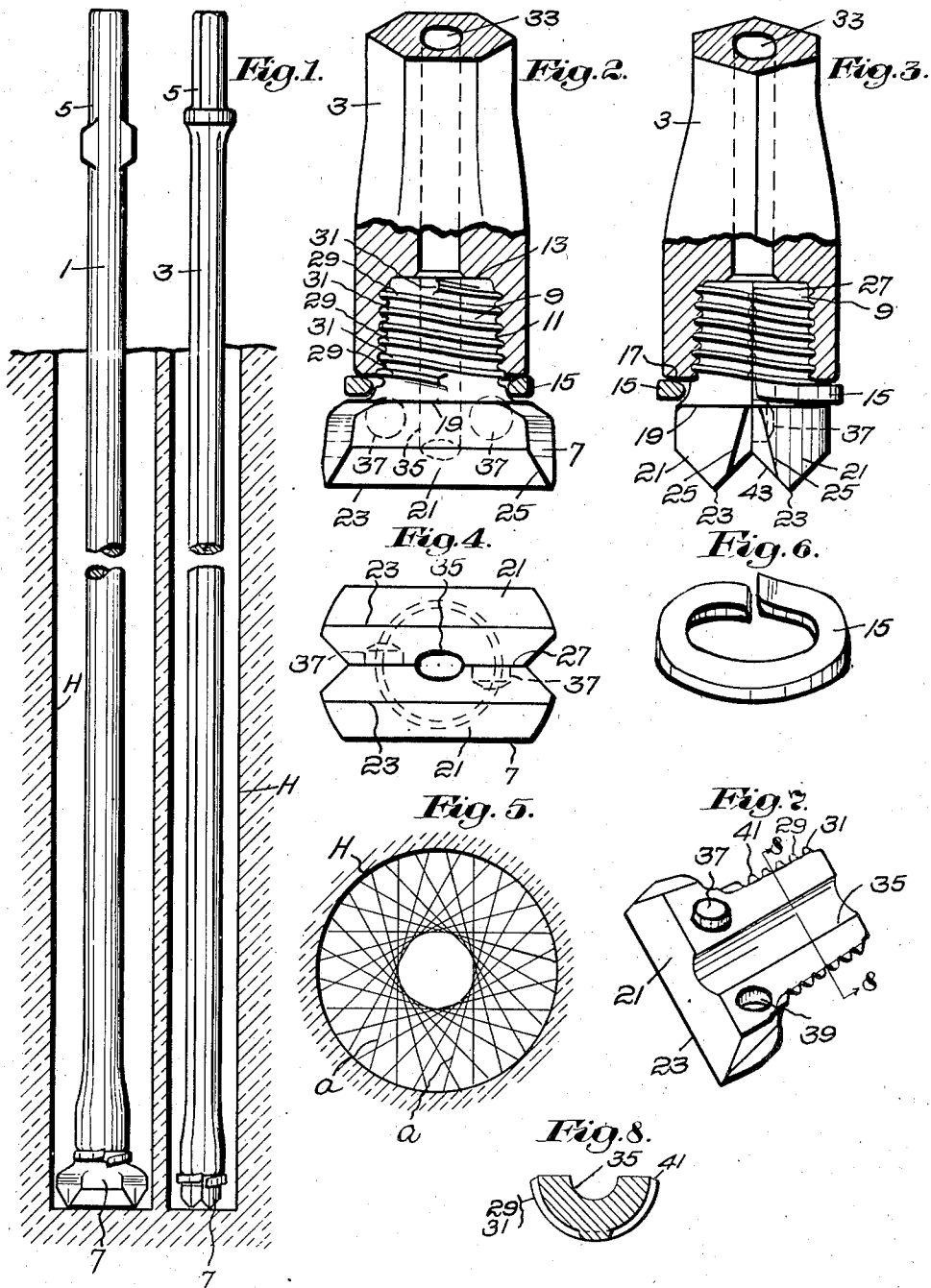
G. H. GILMAN

2,209,079

TOOL

Filed July 25, 1939

2 Sheets-Sheet 1



Inventor:
 George H. Gilman,
 by Mary Ruth Townsend Miller & Wiedner
 Attys

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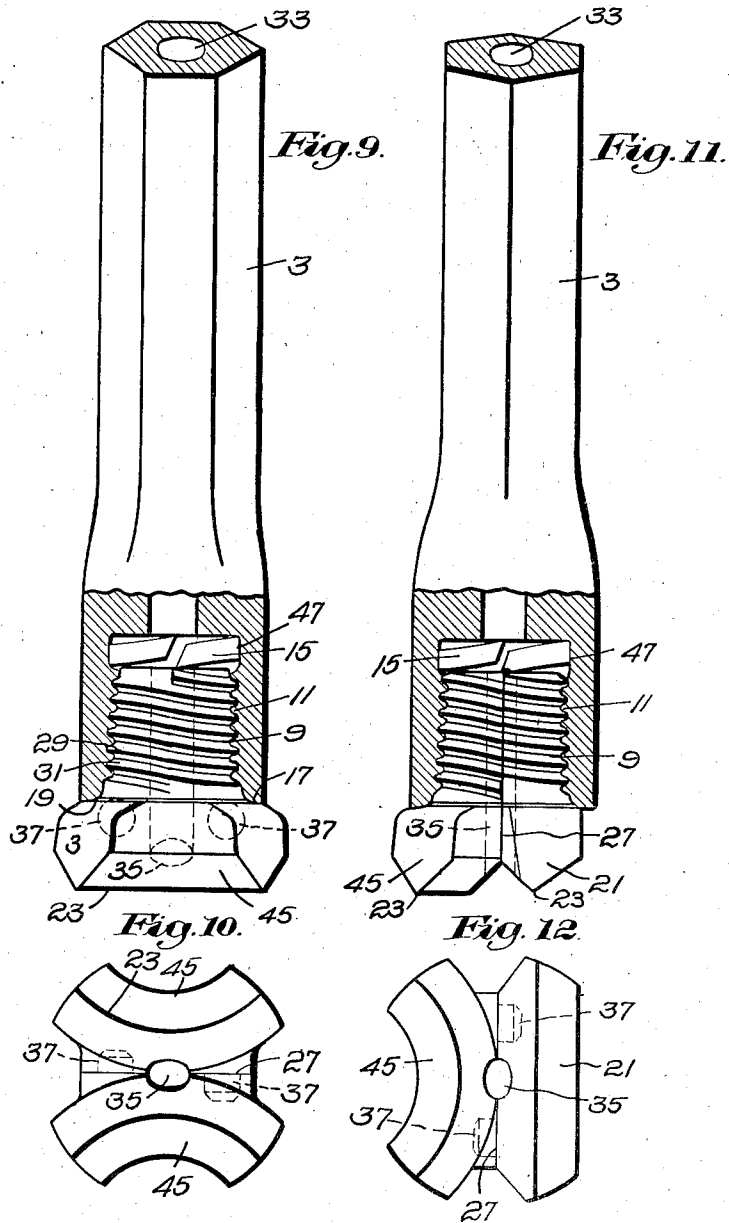
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Inventor:
George H. Gilman
By *Ernest Booth* Attorney
Tanner & Miller & Weidner
Attys

UNITED STATES PATENT OFFICE

2,209,079

TOOL

George H. Gilman, Newark, N. J.

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14 Claims. (Cl. 255-64)

My invention relates to tools, and particularly, but not exclusively, to rock drills.

More specifically the invention relates to tools comprising a part for operating upon the work and a holder which detachably carries said part, such a tool, for example, being exemplified by a rock drill comprising a rock drill steel which detachably carries a rock drill bit.

The invention has among its objects the provision of a detachable part for operating upon the work as, for example, a detachable rock drill bit, that may be inexpensively fabricated and maintained in operating condition with a minimum of machining operations or special equipment. The invention, however, will be best understood from the following description when read in the light of the accompanying drawings, the scope of the invention being more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 represents a vertical section of ground or rock showing rock drills in the process of forming drill holes;

Fig. 2 is a side elevation, on an enlarged scale and with parts broken away, of the lower end of the right hand rock drill of Fig. 1 as viewed from the right;

Fig. 3 is a side elevation of the lower end of the rock drill according to Fig. 2, with parts broken away;

Fig. 4 is a bottom view of the rock drill according to Fig. 2;

Fig. 5 is a diagram illustrating the operation upon the work of the rock drill bit according to Figs. 2, 3 and 4;

Fig. 6 is a perspective of the lock washer according to Figs. 2 and 3;

Fig. 7 is a perspective of one of the bit sections of the rock drill according to Figs. 2, 3 and 4;

Fig. 8 is a section on the line 8-8 of Fig. 7;

Fig. 9 is an elevation of the lower end of a modified form of rock drill, with parts broken away;

Fig. 10 is a bottom view of the rock drill according to Fig. 9;

Fig. 11 is an elevation of the lower end of a further modified form of rock drill, with parts broken away; and

Fig. 12 is a bottom view of the rock drill according to Fig. 11.

As will be understood by those skilled in the art, a rock drill commonly comprises a length of drill steel which at one end is provided with a rock breaking or cutting bit, the bit being integral with the steel. It has been proposed in

the interests of economy to make such bits detachable from the steel. However, detachable bits heretofore proposed commonly have been integral structures which, besides requiring a forging operation roughly to shape them, have required expensive machining operations to finish and sharpen them, this resharpening operation commonly necessitating the use of expensive facilities not ordinarily possessed by the occasional user of rock drills, and as detachable rock drill bits have their greatest potential application with such users the use of the same heretofore has been seriously restricted.

The present invention seeks therefore to provide, among other things, a detachable rock drill bit which, among other things, will avoid the above mentioned objections. The invention however is not limited to rock drills or detachable rock drill bits, but may be applied to other forms of tools having detachable parts for operating upon the work.

Referring to the drawings, a rock drill according to the invention may comprise a steel which, without limitation thereto, may be a round steel 1 or a hexagonal steel 3, or the steel may have any other suitable cross-sectional shape as will be understood by those skilled in the art. These steels, which are adapted to extend into the drill hole H, are formed at their upper ends with suitable shanks 5 adapted to be received by the chuck of a rock drilling engine, and at their lower ends carry detachable drill bits 7. The drilling engine, as will be understood by those skilled in the art, operates upon the shank end of the steel by percussion, and also commonly rotates the steel, so as to cause the bit to operate upon the work and properly form the drill hole.

As illustrated in Figs. 2 to 4, the detachable bit 7 is provided at one end with a coarsely screw-threaded shank portion 9, which latter is received in a socket 11 provided with internal screw-threads complementary to those on the shank, the socket opening on the end of the tool holder constituted by the drill steel. This socket, which as heretofore may be formed integrally with the steel, or, for example, as a sleeve in the nature of a pipe coupling screw-threaded partially on the end of the steel so that the portion thereof beyond that end constitutes a socket, in the drawings, for convenience of illustration, is shown as integral with the steel. As shown in Figs. 1 and 2, when screwed into the socket the end of the shank 9 of the drill bit rests against the bottom wall 13 of the socket so that the

blows imparted by the rock drilling engine at the opposite end of the drill steel may be effectively imparted to the drill bit.

As illustrated, a split lock washer 15 of common form may be placed between the lower surface 17 of the socket portion of the drill steel and the shoulder 19 of the bit so as to resist screwing of the bit out of the socket 11. Such lock washer however ordinarily may be omitted on account of the screw-threads on the shank of the bit being pitched in such direction that the rotation of the rock drill tends to screw the shank of the bit into the socket.

In the bit illustrated by Figs. 2, 3 and 4, the forward end of the drill bit is formed with a pair of parallelly disposed chisels 21 having cutting or rock breaking edges 23 and reaming edges 25. A bit so formed will cause the chisel edges 23 to break or cut the rock on a series of pairs of parallel lines as indicated in Fig. 5 at *a*. As the rock drill is relatively slowly rotated, as compared to the rate blows are imparted to it by the drilling engine, these parallel lines of cutting will act on the rock at the bottom of the drill hole along a multitude of intersecting lines, as indicated in Fig. 5, and effectively remove the rock so as to advance the drill hole.

As illustrated by Figs. 2 and 3, the bit is split longitudinally thereof on a plane disposed diametrically with relation to the shank 9, as indicated at 27 in Figs. 3 and 4, to divide the bit into two identical sections each having a chisel 21, while so that the shank portions of the sections may be identical the shank is provided with two parallel relatively interposed screw-threads 29 and 31, that is to say a so-called "double thread."

In respect to the above paragraph, it will be understood that were a single screw-thread employed for the shank the shank portions of the two sections of the drill bit would not be identical. By having two screw-threads which intersect a given plane normal to the axis of the bit at points diametrically opposite each other each section in respect to its screw-threads may be made identical. Were the shank split longitudinally into three sections by planes disposed radially of the bit and angularly spaced 120° apart, as would be convenient with the common form of bit having three equally spaced chisel edges radiating from the axis of the bit, it would be necessary to have three parallel relatively interposed screw-threads, that is to say a so-called "triple thread," to make the shank portions of the sections identical in respect to their screw-threads. Likewise with the common so-called "cross bit" which has four equally spaced chisel edges radiating from the axis of the bit the latter could be split on planes radiating from said axis each midway pairs of adjacent chisel edges, and in such case the shank of the bit must be provided with four parallel relatively interposed screw-threads, that is to say a so-called "quadruple thread," to make the sections identical in respect to their screw-threads. In all of these cases each series of screw-threads in respect to a given plane transverse to the axis of the bit should follow paths which intersect that plane at points which are angularly spaced the same distance from the adjacent planes which split the screw-threads of the bit. It will be understood therefore that according to the invention the shank of the bit is split longitudinally into a plurality of sections and the shank of the assembled bit has a plurality of parallel relatively in-

terposed screw-threads corresponding in number to those sections, the screw-threads being so positioned that each section in respect to its screw-threads will be substantially identical.

As is common practice, each of the drill steels illustrated is provided with an axial bore 33 through which water or air, or both, may be supplied from the drilling engine to discharge at the bottom of the drill hole. This bore 33 opens into the socket 11 and is continued by the bore 35 of the drill bit to the front end of the latter, as clearly indicated by Figs. 4 and 7.

As shown in Figs. 2, 3, 4 and 7, each section of the drill bit is provided with a projecting lug 37 on its surface which abuts the other section, and is also provided with a recess 39 for receiving the lug 37 of the adjacent section. This construction acts to lock the sections together and facilitates assembling them in proper relation to each other.

Referring particularly to the drill bit above described, it will be observed that each section of said bit may be readily forged, say by a "drop forging" operation employing a single pair of cooperating dies, to render it suitable for use without further machining operations except grinding the faces of the chisel to sharpen it. It would not be possible to do this in any simple way were the drill bit an integral structure, it being necessary, for example, with an integral structure to forge the bit by use of several pairs of differently shaped dies, to bore in the bit the axial hole for passage of air and water, and to form the screw-threads on the shank of the bit by a machining operation. It is entirely feasible however to forge the screw-threads on a part which has a circumferential extent of not more than 180°, such as that illustrated, without forming burrs on the threads, and in this connection it will be understood that the end portions of each turn of the screw-threads on each section may be beveled as a result of the forging operation, as indicated at 41 (Fig. 8), or otherwise shaped to prevent such burring as a result of that operation.

Further, as will be clear from Figs. 3 and 4, the chisel parts of each bit section may be readily ground by use of simple grinding apparatus, say by use of the ordinary cylindrical disk emery-wheel, which would not be possible were the bit an integral structure as will be readily apparent when it is observed that the two chisel parts in the assembled bit form a V-shaped groove 43, as indicated in Fig. 3. Still further, it will be observed that the sections of the bit are interchangeable with each other, which permits a large number of sections to be fabricated and any two to be assembled to form the bit without the necessity of matching the sections, and at the same time the bits may be removed from the steel and the sections thereof resharpened in the field by use of the ordinary grinding apparatus with which the user is commonly equipped, and the resharpened bits may be reassembled without the necessity of matching parts. Again it will be obvious that with a bit so constructed damage to one section does not prevent continued use of the other section, whereas were the bit integrally constructed breakage of one chisel, for example, might necessitate discarding the entire bit.

It will be understood that other forms and arrangements of chisels may be employed besides those above referred to as, for example, that shown in Figs. 9 and 10 in which the chisels are of arcuate shape. Otherwise this bit may

be identical with that shown by Figs. 2, 3 and 4. However, as illustrated in Fig. 9, the washer 15, instead of being placed at the outer end of the socket which receives the drill bit shank, is placed in the socket at the rearward end of that shank, while the shoulder 19 of the bit bears against the forward surface 17 of the socket to cause the blows imparted to the drill steel to be effectively conveyed to the bit. The washer 15 in this case, if desired, may be placed in an annular enlargement 47 at the inner end of the bore of the socket for permanently retaining the washer in place even upon removal of the bit.

It will be understood that the drill bit sections so far described, although identical in respect to the screw-threads of the shank portions thereof, need not be identical in respect to their chisel portions even though interchangeable with each other. In other words, drill bit sections having different shaped chisels may be assembled with each other as, for example, a section according to Figs. 2, 3 and 4 with a section according to Figs. 9 and 10 to give the drill bit shown by Figs. 11 and 12. A bit formed with sections having different shaped chisels may be deliberately employed in situations where the cutting properties of the bit are improved thereby. Otherwise the arrangement may be employed in emergencies where the desired number of sections having like chisels are not available.

It will be understood that according to the invention the detachable drill bit or other tool is split into longitudinal sections, which sections in respect to at least the interrupted plural screw-threads of the shank portions thereof are substantially identical, while the socket which receives the shank of the assembled drill bit is provided with internal screw-threads corresponding in number to and complementary with the plural screw-threads of said shank. Further, these sections, although otherwise not necessarily identical, nevertheless are so constructed that they are interchangeable in the sense that for any section may be substituted a section identical with any other section, in which sense the word "interchangeable" is used in the appended claims. It will be clear that it would be impossible to have the sections interchangeable in that sense were they so formed that the shank of the assembled drill bit or other tool presented a "single" screw-thread.

It will be understood that, within the scope of the appended claims, wide deviations may be made from the forms of the invention described without departing from the spirit of the invention.

I claim:

1. A tool comprising a part for operating upon the work and a holder for said part, said holder having a socket portion and said part a shank portion received by said socket portion, which shank portion is provided with a plurality of external parallel relatively interposed screw-threads and which socket portion is provided with a like number of complementary internal parallel relatively interposed screw-threads, the screw-threads of one portion cooperating with those of the other portion whereby said part may be detachably secured to said holder, said part being split longitudinally of the screw-threaded shank portion thereof into a plurality of entirely separate sections corresponding in number to the threads on the screw-threaded shank portion thereof, which sections are interchangeable with each other and in respect at

least to the screw-threads thereof are substantially identical.

2. A tool according to claim 1 in which each section is provided with an instrumentality for operating upon the work.

3. A tool according to claim 1 in which the sections are provided with complementary means acting to lock them together.

4. A tool according to claim 1 in which each section is provided with an instrumentality for operating upon the work, the sections being provided with complementary means acting to lock them together.

5. A tool according to claim 1 in which the holder is a drill steel operatively carrying the socket portion, with the socket opening on an end thereof, the part for operating upon the work being a detachable rock drill bit the screw-threaded shank portion of which is received by said socket, each section of said bit having a rock cutting chisel on its end opposite said shank portion.

6. A tool according to claim 1 in which the holder is a drill steel operatively carrying the socket portion, with the socket opening on an end thereof, the part for operating upon the work being a detachable rock drill bit the screw-threaded shank portion of which is received by said socket, each section of said bit having a rock cutting chisel on its end opposite said shank portion, the sections having complementary means acting to lock them together.

7. A sectional element of a tool adapted to be assembled with one or more other sectional elements interchangeable therewith to form a completed tool part for operating upon the work, said element having a shank portion which is a segment of a shank of circular cross-section provided with a plurality of external parallel relatively interposed screw-threads, the segment being such that a plurality thereof equal in number to said screw-threads may be assembled to form said shank.

8. A sectional element according to claim 7 in which the shank portion is substantially a 180° segment of a shank of circular cross-section.

9. A sectional element according to claim 7 having, at its end opposite the shank portion thereof, an instrumentality for operating upon the work.

10. A sectional element according to claim 7 having means adapted to interlock with complementary parts on another sectional element to be assembled therewith, and also having like complementary parts adapted to interlock with like means.

11. A sectional element of a detachable rock drill bit adapted to be assembled with one or more other sections interchangeable therewith to form a completed drill bit, said element having at one end a shank portion which is a segment of a shank of circular cross-section provided with a plurality of external parallel relatively interposed screw-threads, and having at its opposite end a chisel for operating upon the rock, the segment being such that a plurality thereof equal in number to said screw-threads may be assembled to form said shank.

12. A sectional element according to claim 11 in which the shank portion is substantially a 180° segment of a shank of circular cross-section.

13. A sectional element according to claim 11 having means adapted to interlock with complementary parts on another sectional element to be assembled therewith, and also having like com-

plementary parts adapted to interlock with like means.

14. A sectional element of a detachable rock drill bit adapted to be assembled with a like element to form a completed drill bit, which element
5 at one end has a shank portion which is substantially a 180° segment of a shank of circular cross-

section provided with a double screw-thread, and having at its other end chisel means symmetrically disposed with relation to a plane which both includes the axis of such shank and is normal to that plane which also includes said axis
6 and defines said 180° segment.

GEORGE H. GILMAN.