W. H. WAKFER.

IMPACT ROTARY DRILL.

APPLICATION FILED JUNE 16, 1913.

1,136,987.

Patented Apr. 27, 1915.

2 SHEETS—SHEET 1.

FIG. 1.

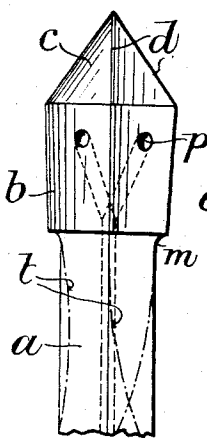


FIG. 3.

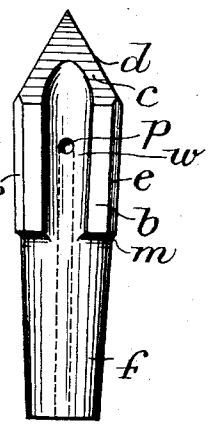


FIG. 2.

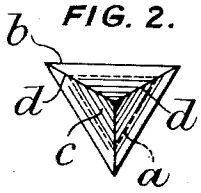


FIG. 4.

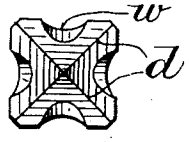


FIG. 5.

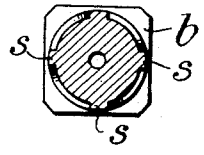


FIG. 6.

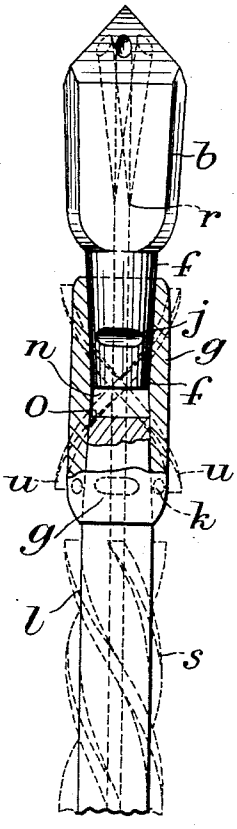
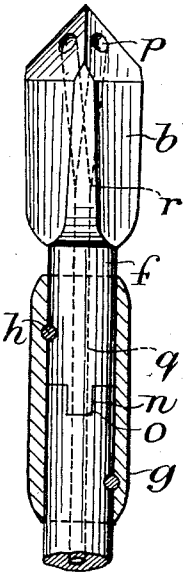


FIG. 7.



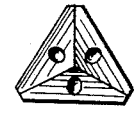


FIG. 8.

Witnesses
B. Sommers
E. Leckert.

Inventor.
William Henry Wakfer.
By Henry Orth & Co.
Attys.

W. H. WAKFER.

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2 SHEETS—SHEET 2.

FIG. 9.

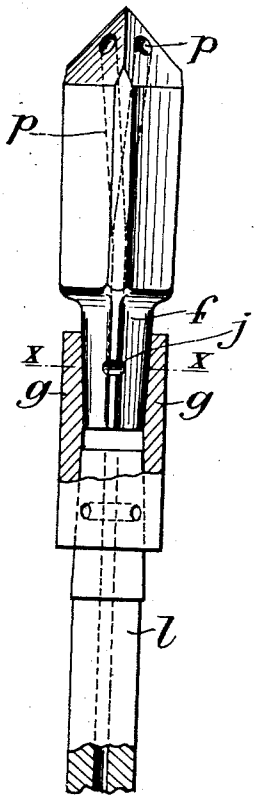


FIG. 10.

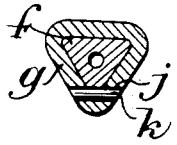


FIG. 11.

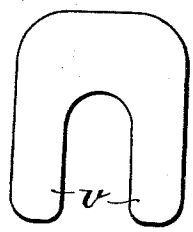


FIG. 12.

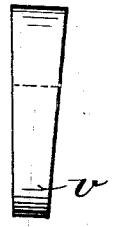


FIG. 14.

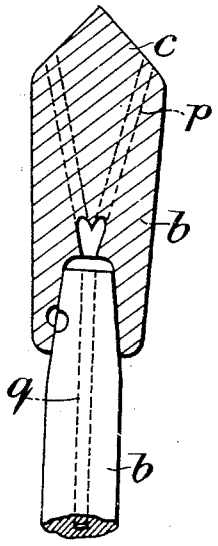
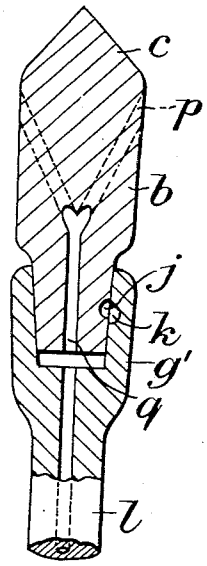


FIG. 13.



Witnesses:
B. Donmers
E. Leckert

Inventor.
William Henry Wakfer.
By Henry Orth & Co.
Atty

UNITED STATES PATENT OFFICE.

WILLIAM HENRY WAKFER, OF SOUTH NORWOOD, ENGLAND, ASSIGNOR OF ONE-HALF TO SAMUEL PECK, OF WALLINGTON, ENGLAND.

IMPACT ROTARY DRILL.

1,136,987. Specification of Letters Patent. Patented Apr. 27, 1915.

Application filed June 16, 1913. Serial No. 773,994.

To all whom it may concern:

Be it known that I, WILLIAM HENRY WAKFER, a subject of the King of Great Britain, and resident of 67 Whitworth road, South Norwood, in the county of Surrey, England, have invented new and useful Improvements in Impact Rotary Drills, of which the following is a specification.

This invention comprises improvements in and relating to percussive rock-drills, bits and like appliances for boring in earth, rock and the like and has for its object to provide drills or bits which can be manufactured cheaply and are more efficient in operation and entail less cost in respect of maintaining them in an efficient condition than drills or bits heretofore in use.

According to this invention the cutting or boring head of the percussive drill steel is solid or prismatic and at the end is formed with three or more cutting edges which meet at the point of the tool, three or more triangular faces being bounded by the said edges. These faces may be flat, or concave or otherwise suitably formed and are preferably continuations of the flat hollow or fluted sides of the prismatic head. The cutting or boring heads thus fashioned may be formed as separate heads or bits adapted to be connected to the body or bar of the drill by means for example of a sleeve coupling or of a socket in one with the body of the drill bar or in one with the bit, as hereinafter described, or the heads or bits may be formed on or welded on the end of the body or bar of the drill.

In order to enable this invention to be readily understood reference is made to the accompanying drawings in which various examples are illustrated and wherein:—

Figure 1 is a side elevation of a simple form of the improved drilling or boring tool when made three sided. Fig. 2 is a plan of Fig. 1. Fig. 3 is a side elevation and Fig. 4 is a plan of a four sided tool or bit. Fig. 5 is partly a cross section and partly a rear end elevation of a tool the head of which may be similar to that shown in Figs. 3 and 4 but the body or bar of which is formed with helical ribs. Fig. 6 is a sectional elevation of a head or bit coupled by means of a sleeve to the drill bar or body. Fig. 7 is a view similar to Fig. 6 the plane of the section being at right-angles to the plane of the section Fig. 6. Fig. 8 is a plan of Fig. 6. Fig. 9 is a view similar to Fig. 7 but illustrating a modified coupling arrangement. Fig. 10 is a sectional elevation the section being taken on the line X—X of Fig. 9. Fig. 11 is an elevation of an appliance employed for facilitating the removal of a head or bit from its coupling sleeve. Fig. 12 is an elevation as seen from one side of Fig. 11. Fig. 13 is a sectional elevation showing the head connected to the bar by a socket on the end of the bar and Fig. 14 is a similar view showing the head formed with a socket for receiving the end of the bar.

In producing the construction shown in Figs. 1 and 2 a bar *a* of steel of suitable section, such as the triangular section shown, may be hammered or otherwise formed or fashioned at the end so that a thickened prismatic head *b* is produced. The prism shown is three-sided, and at one end is joined to, or in one with, the bar *a* and the opposite end is formed as a three sided pyramid *c*, the sides of the pyramid being preferably continuations of the sides of the prism. With this three-sided form of head or bit the cutting edges *d* bounding the sides of the pyramid are sharper than is the case when a pyramid having a greater number of sides is employed, because the angles of the triangular base are more acute than the angles of a rectangular or polygonal base. Nevertheless, as already mentioned and as seen in Figs. 3, 4 and 5, heads or bits *b c* having four sides and four cutting edges *d* may be employed. Or heads having even more than four sides and cutting edges may be produced. The corners of the prismatic portion of the head or bit may be flattened or rounded if desired as indicated by the reference letter *e*. It will be readily understood that the head *b c* may be formed from a short length of steel which may be welded to the body or bar of the drill steel, or such head may be formed at one extremity of a bar of suitable length for serving as a drill steel.

In the case of a separate head or bit, this is formed on a short length of steel and the portion *f*, Figs. 3, 6, 7 and 9 not formed into the thickened head, which may be termed the reduced portion, serves for connecting the head with the bar. For example this reduced portion *f* may be inserted into one end of a coupling sleeve or socket *g* and may be

secured therein by a pin *h* or the like inserted through apertures *k* in the sleeve or socket and through a groove or hole *j* formed in the reduced portion *f* when the groove *j* has been brought into alinement with the apertures *k* in the sleeve or socket *g*. The end of the body or bar *l* of the drill may be similarly secured in the opposite end of the sleeve *g* if a sleeve is preferred. The pins *h* may be tapered so that they may be readily driven in from one side of the sleeve and driven out by a blow struck from the opposite side. It may be preferable to avoid a sharp angle at the junction between the head *b* and the bar *a* or reduced portion *f*, as for example by forming the curved portion *m* Figs. 1 and 3.

If desired the reduced end of the head may be interlocked with the end of the bar *l* within the sleeve *g* by an interlocking tongue *n* and groove *o*, or other interlocking devices formed on such ends.

As an alternative, the ends of the portion *f* and bar *l* may be of triangular or other angular cross section and the coupling sleeve or socket *g* may be similarly formed or may be formed with a similar angular bore as seen for example in Figs. 9 and 10 wherein a sleeve of triangular cross-section is illustrated. It is preferred to employ the securing pins *h* as above described so that the head or bit *b c* cannot be left in a hole or fissure when withdrawing the bar *l*. It is obvious that the sleeve *g* may be formed as a socket *g'* on the end of the bar *l* as shown in Fig. 13. As an alternative and as seen in Fig. 14, the bar *l* of any cross-section may be tapered, if desired, and inserted into a socket or recess formed in the head *b* and securing pins may be used as before. If desired the bar *l* may be mainly of circular cross section and the end only need be of angular cross section.

When it is desired to deliver air or water at or near the point of the drill, one or more holes *p* may be drilled at an angle into the head *b* so as to meet a central bore *q* which terminates at a suitable distance in the rear of the point of the drill. Preferably a hole *p* is drilled from each face of the pyramidal cutting-end at such an angle as to meet the central bore say at the point *r* Fig. 7, although such hole or holes may be drilled at an angle into the flat, hollow or fluted faces of the prism *b* as indicated in Figs. 1 and 3.

The bar *l* of the drill may be formed with helical or twisted ribs indicated by dotted lines *s* in Fig. 6 and shown in full lines in Fig. 5, or the bars *l* may be of any angular cross section and may be twisted. For example the angular bar *a* in Fig. 1 may be helically twisted as indicated by the dotted lines *t* in Fig. 1. Preferably the number of ribs *s* or the number of sides of the bar *a*, is the same as the number of sides of the prismatic head. The ribs *s*, or the twist, aforesaid serve or serves to feed back to the mouth of the drill-hole the cuttings or debris produced by the operation of the cutting edges *d* of the drill.

The coupling sleeve or socket *g* may be formed with helical or twisted ribs or projections as indicated by dotted lines *u* in Fig. 6, or if the sleeve *g* is angular as in Fig. 9, it may itself be twisted so that the conveyance of the cuttings or debris takes place immediately from the rear of the cutting head *b*.

When a separate head or bit is employed, the same may be released from the coupling sleeve by means of a driver or tommy *v* which may be U-shaped as seen in Fig. 11 and tapered or of wedge form as seen in Fig. 12. This device is placed astride the reduced end *f* of the head *b* between the end of the sleeve *g* and the rear end of the enlarged head *b* and, when the appliance *v* is driven on, it loosens or ejects the head *b* in or from the sleeve *g*. The reduced end *f* of the head may of course be tapered as seen in Fig. 3 and the bore of the sleeve or socket *g* may be similarly formed.

Figs. 3 and 4 clearly show at *w* how the sides of the prismatic head *b* may be hollowed out for facilitating the working of the drill. It is preferable to gently taper the head *b* from the cutting end toward the rear or reduced end *f* as shown in the various figures.

It will now be evident that whenever the edges *d* become blunt or broken, it is an easy operation to remove one head or bit *b c* and to substitute another therefor, if the coupling sleeve is employed. In any case it is a simple matter to sharpen the edges *d*, (whether the head *b c* be integral with a tool bar *a*, or with only a connecting reduced portion *f*) by applying the faces of the pyramid *c* to a stone and grinding such faces until the desired edges are produced. This offers great advantages as compared with the procedure in sharpening an ordinary drill, which requires skill and time both for sharpening and re-tempering or fettling the cutting head of the tool.

What I claim is:—

1. An impact rotary drill comprising a prismatic head of larger cross sectional dimensions than the shank or bar upon which it is carried, said head having a short pointed end the faces of which meet in edges having a length substantially equivalent to that of the base of said faces, whereby the edges of the faces perform a cutting operation during rotation.

2. An impact rotary drill comprising a prismatic head of larger cross sectional dimensions than the shank or bar upon which it is carried, said head having a short pyramidal end, the faces of which are inclined

at such an angle to the base of the pyramid that the edges of said faces form substantially equilateral triangles, whereby the edges of the faces perform a cutting operation during rotation.

3. An impact rotary drill comprising a prismatic head of larger cross sectional dimensions than the shank or bar upon which it is carried, said head being formed with hollow or concaved sides and with a short pyramidal end, the faces of which are inclined at such an angle to the base of the pyramid that the edges of said faces form substantially equilateral triangles, whereby the edges of the faces perform a cutting operation during rotation.

4. An impact rotary drill comprising a prismatic head of larger cross sectional dimensions than the shank or bar upon which it is carried, said head having a short pyramidal point formed on one end, the sides of the pyramid being continuations of the sides of the prism, the angle of inclination of the sides of said pyramid being such that the edges of said sides form substantially equilateral triangles, whereby the edges of the sides perform a cutting operation during rotation, and means formed on the other end of said head for attaching said head to a shank or bar.

5. An impact rotary drill, comprising a prismatic head of larger cross sectional dimensions than the shank or bar upon which it is carried, said head having a short point formed on one end, the converging edges of the sides of said end forming substantially equilateral triangles, said point being adapted to penetrate under impact and to cut during rotation, and a tapered shank portion on the opposite end of said head.

6. An impact rotary drill, comprising a tapering shank, a short prismatic head on the flaring end of said shank and of larger cross sectional dimensions than said shank, said head having grooves formed in its sides and a pyramidal point formed on its end, the edges of the sides of said end forming substantially equilateral triangles, whereby the point is adapted to penetrate under impact and to cut during rotation.

WILLIAM HENRY WAKFER.

Witnesses:

W. MORBEY,

H. D. JAMESON.