

No. 694,535.

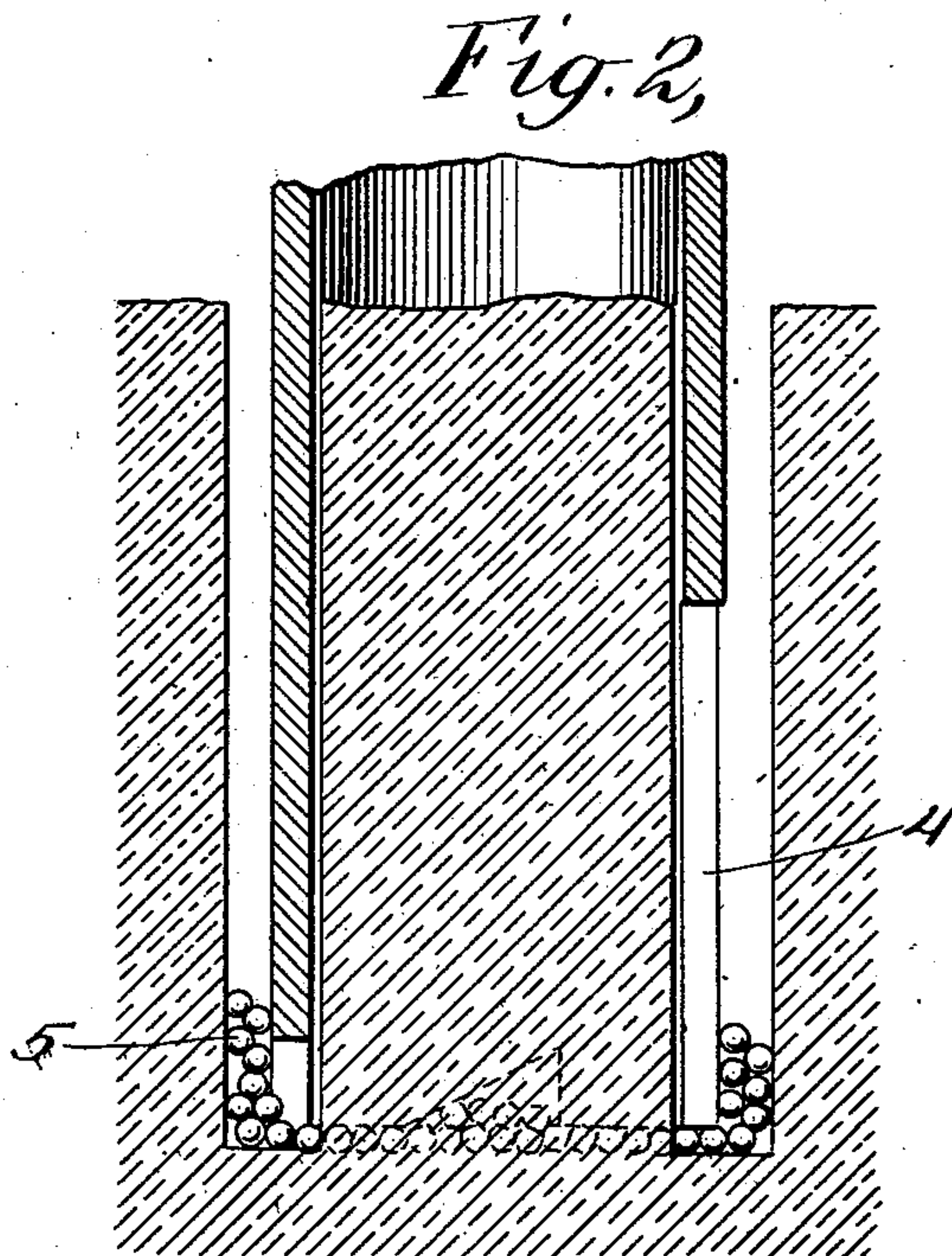
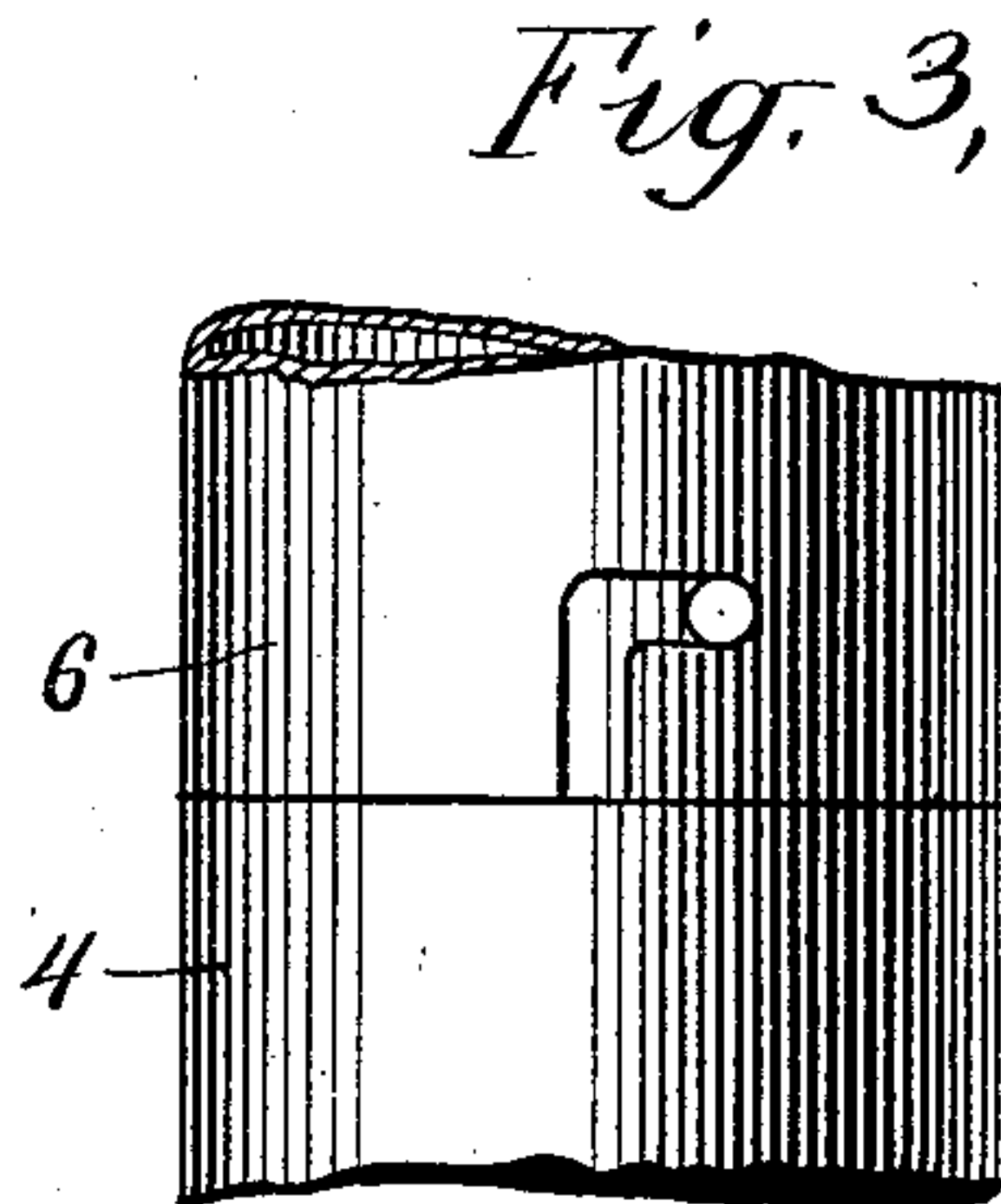
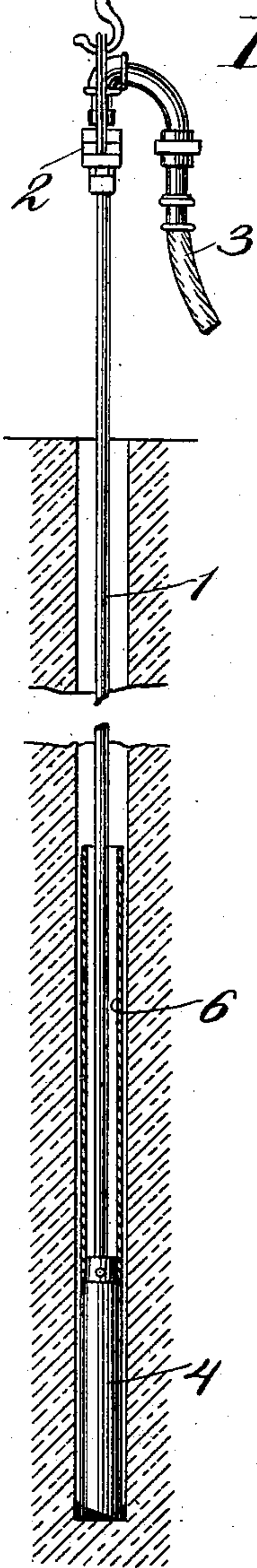
Patented Mar. 4, 1902.

F. H. DAVIS.

APPARATUS FOR BORING HOLES IN ROCK OR SIMILAR MATERIAL IN THE
EARTH'S STRATA.

(Application filed Sept. 7, 1901.)

(No Model.)



WITNESSES:

Harry Goss.
Benj. E. Teale

INVENTOR

Francis H. Davis

BY

Chapin & Raymond
his ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANCIS H. DAVIS, OF NEW YORK, N. Y., ASSIGNOR TO DAVIS CALYX DRILL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

APPARATUS FOR BORING HOLES IN ROCK OR SIMILAR MATERIAL IN THE EARTH'S STRATA.

SPECIFICATION forming part of Letters Patent No. 694,535, dated March 4, 1902.

Application filed September 7, 1901. Serial No. 74,865. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. DAVIS, a subject of the Crown of Great Britain, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Boring Holes in Rock or Similar Material in the Earth's Strata, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My improved apparatus refers particularly to the boring of holes in rock or similar material forming a part of the earth's strata, and comprises a boring-rod and a hollow bit carried thereby, said hollow bit adapted upon rotation to cooperate with a free or loose grinding material, such as a plurality of chilled-iron spheres and known in the art to which this invention appertains as "shot," and thereby to mill and grind an annular channel in the rock or other material operated upon, together with means whereby water may be forced into said bit and from thence upwardly around same to carry away the millings or grindings therefrom, and a cup carried by the drill-rod and disposed above the bit, said cup adapted to catch the said millings or grindings carried upwardly by the water. This improved apparatus permits the use of the "shot system," as it is known in the art, for boring to a very much greater depth than has heretofore been possible.

Heretofore it has only been possible to use the shot system for holes of inconsiderable depth, for the force of water necessary to be used in carrying up the millings or grindings from the bottom to the surface of the hole where the hole is of considerable depth would necessarily be sufficient to carry up the shot or milling material therewith. This is especially true of holes of large diameter.

In my improved apparatus I provide a cup which is carried by the boring-rod and which is disposed above the boring-bit. This cup is adapted to catch particles carried upwardly by the water from the bottom of the hole, and thus to prevent the same from falling back and clogging or jamming the bit. In thus providing a cup or receiver for the particles carried upwardly by the water I am enabled to carry the hole down to an indefinite

depth, for I do not have to increase the force or head of water in proportion as the depth of the hole is increased, as heretofore has been necessary where the millings or grindings had to be carried to the surface of the hole. Thus I regulate the force of water so as to carry up the millings or grindings a predetermined distance only, and the force or head of water may be substantially the same regardless of the depth of the hole.

I will now proceed to describe an apparatus embodying my invention and will then point out the novel features in claims.

In the drawings, Figure 1 is a view in vertical sectional elevation of a drill embodying my invention, showing the same as it would appear at work boring in the earth's strata. Fig. 2 is an enlarged sectional detail view of a portion of the same, taken at the foot of the hole. Fig. 3 is a detail view of the bayonet-joint connection of the cup or receiver.

A boring-rod 1 is provided, and a hollow bit 4 is carried thereby at its lower end. The boring-rod is preferably hollow and is connected at its upper end with a suitable swivel 2 and a water connection 3. Suitable rotating apparatus (not shown herein) may be applied to the boring-rod in order to rotate same in a manner well known.

The boring-bit 4 is adapted to cooperate with a free or loose grinding material, herein designated by the reference character 5. This free or loose grinding material is commonly called "shot" in the art and preferably comprises a number of small chilled-iron spheres. The rotation of the bit 4 and its cooperation with the shot produces a milling or grinding action upon the rock or similar material upon which it is operated.

Water is forced through the hollow boring-rod 1 from the water connection 3 and swivel-head 2, and the same passes through the hollow bit 4 and up around the said bit and boring-rod, carrying with it the millings or grindings. The force or pressure of this water must not, however, be sufficient to carry away the milling or grinding material 5, and the limit of depth to which a hole has been made under the shot system prior to my invention has been reached when the force of water required to carry the millings or grind-

ings up to the surface has substantially reached the point at which the milling or grinding material would also be carried up.

In drilling holes certain material is often encountered which it is practically impossible to penetrate except with the shot system, even the so-called "diamond drills" being unable to penetrate it. Such material is frequently encountered at such depths that the shot system as heretofore used cannot be employed on account of the enormous water-pressure required to carry the detritus to the surface, such pressure being, as before stated, after a certain depth has been reached sufficient to also carry the shot away from the bottom of the hole, and so to entirely stop the boring. In my apparatus herein, however, I provide a suitable receiver or cup 6, carried by the boring rod and bit, in which the grindings or millings may be received at a point intermediate of the bottom and top of the hole, and said cup will always occupy substantially the same relative position to the shot and bit no matter what may be the depth of the hole being bored. I do not, then, attempt to apply a sufficient force of water to carry the millings or grindings up to the surface of the hole, but merely apply a sufficient force to carry them a part of the way up—that is to say, to the upper surface of the cup or receiver in which I then receive them—and it is obvious the water-pressure can be substantially uniform regardless of the depth of the hole. By the use of this receiver or cup, in combination with the shot system of drilling, I am then enabled to carry the hole down to an indefinite depth, such depth being far greater

than has heretofore been possible with the shot system. The cup or receiver may be secured to the drill-rod or bit in any suitable manner, either rigidly or removably. I have found that a convenient method of securing same is by the use of a bayonet-joint 7, so that the cup may be removed, if desired, in order to empty same of the millings or grindings therein.

I do not desire, of course, to be limited to the precise form of apparatus herein shown and described, as the same may obviously be varied within wide limits without departing from the spirit and scope of my invention.

What I desire to claim and to secure by United States Letters Patent is—

In an apparatus for boring holes in rock or similar material in the earth's strata, the combination with a hollow boring-rod, a hollow bit carried thereby, the working face of which is adapted to cooperate with shot substantially as described, and means whereby water may be forced into said bit and thence upward around same at a substantially uniform pressure regardless of the depth of the hole, to carry away the millings or grindings therefrom, said means including a cup disposed above the bit for catching the said millings or grindings, said cup carried by the drill-rod and adapted to be lowered and raised therewith as the drill-rod descends and ascends, substantially as set forth.

FRANCIS H. DAVIS.

Witnesses:

ABRM. H. GOLDBERG,
D. HOWARD HAYWOOD.