No. 797,622. PATENTED AUG. 22, 1905.

W. S. SMITH.

CORE DRILL.

APPLICATION FILED APR. 11, 1905.

3 SHEETS—SHEET 1.

Fig. 2.

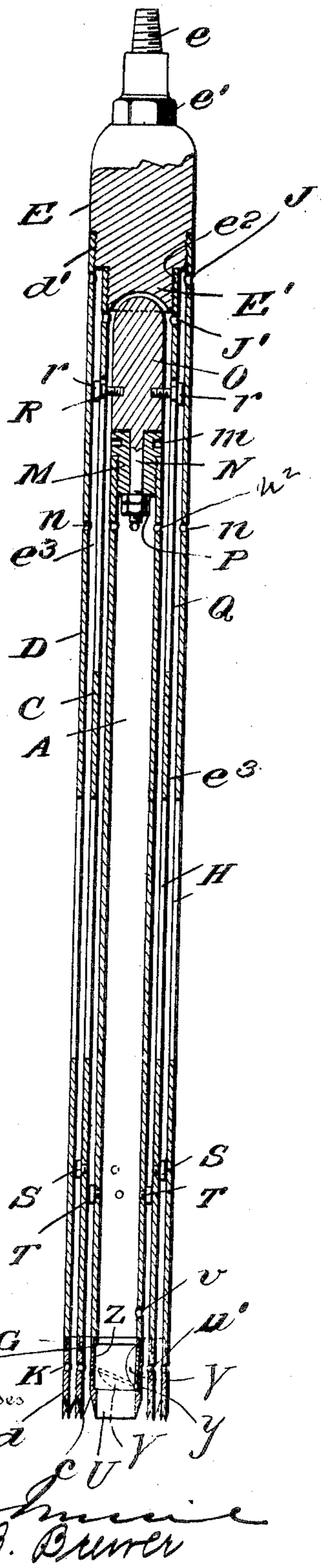


Fig. 1.

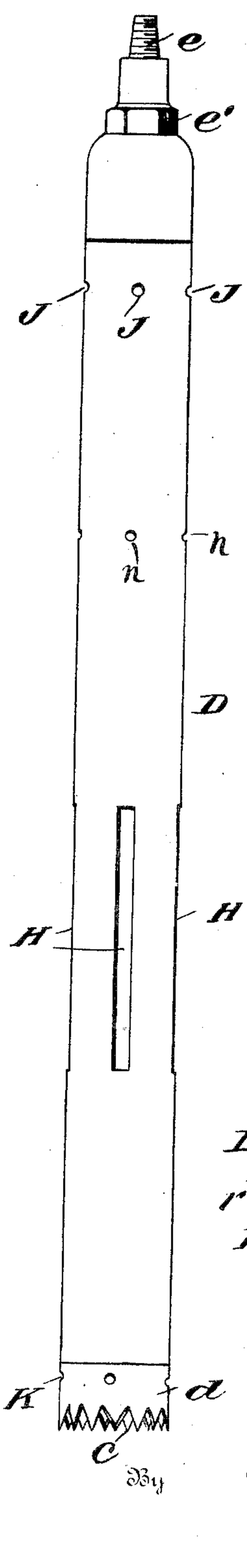


Fig. 4.

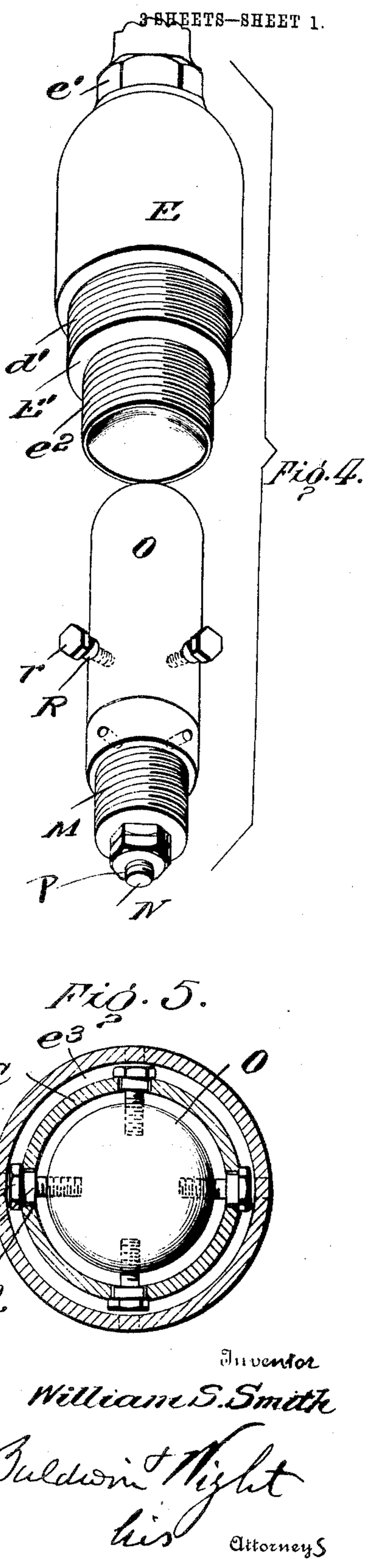


Fig. 5.

Witnesses

E. B. Bruer

Inventor

William S. Smith

Baldwin & Wight

his

Attorneys

No. 797,622. PATENTED AUG. 22, 1905.

W. S. SMITH.

CORE DRILL.

APPLICATION FILED APR. 11, 1905.

3 SHEETS—SHEET 2.

Fig. 3.

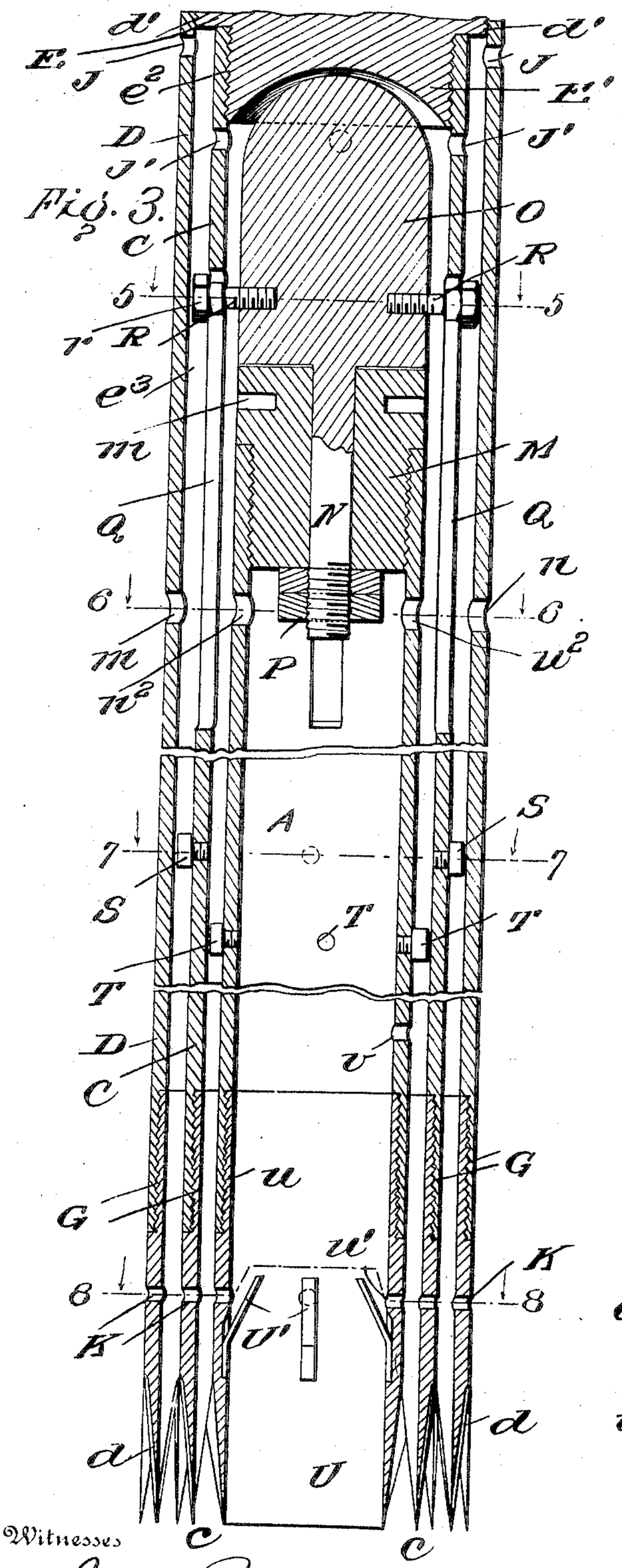


Fig. 6.

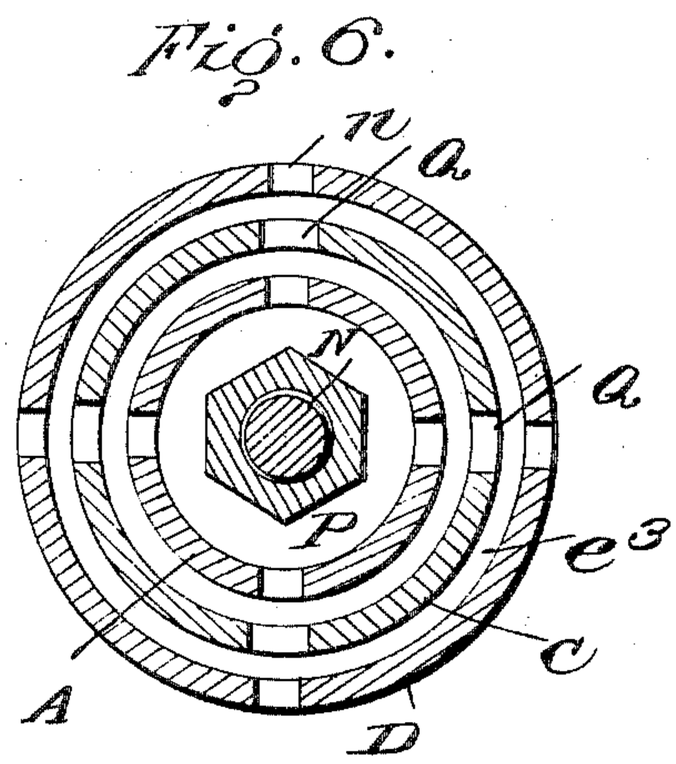


Fig. 7.

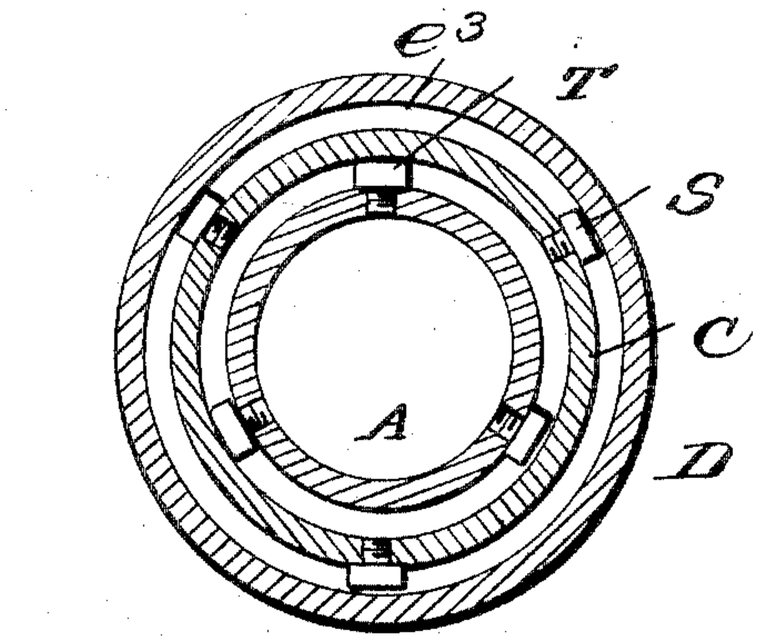
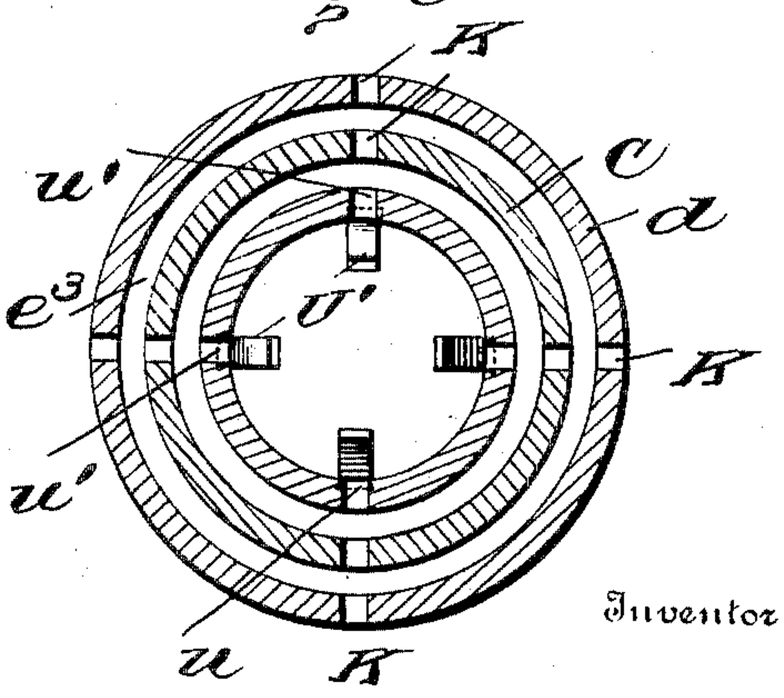


Fig. 8.



Witnesses

J. Annie

C. B. Bauer

Inventor

William S. Smith

By Baldwin & Wright

Attorneys

No. 797,622. PATENTED AUG. 22, 1905.

W. S. SMITH.

CORE DRILL.

APPLICATION FILED APR. 11, 1905.

3 SHEETS—SHEET 3.

Fig. 9.

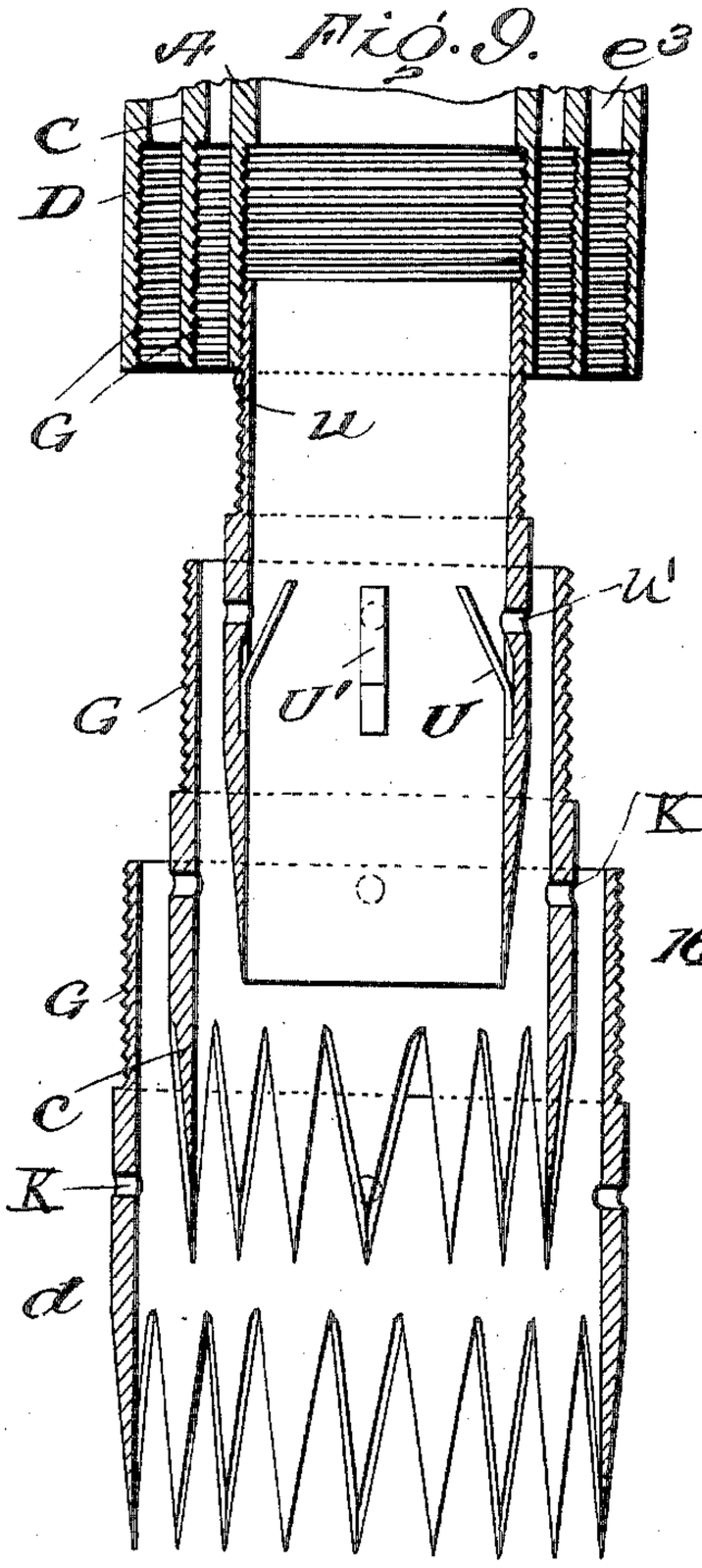


Fig. 10.

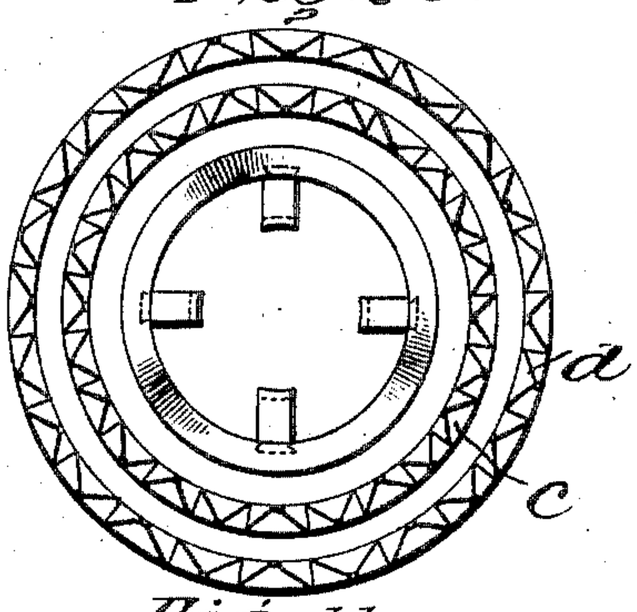


Fig. 11.

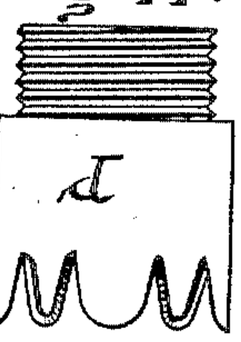


Fig. 12.

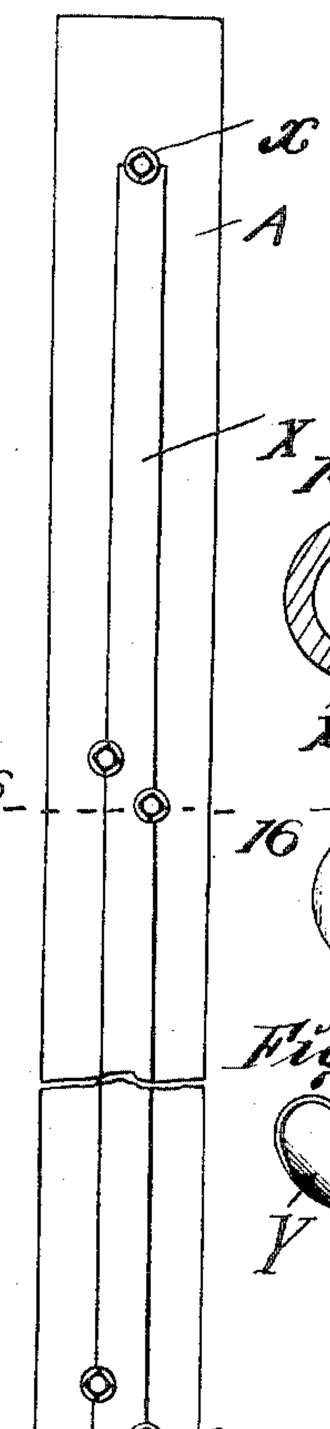


Fig. 14.

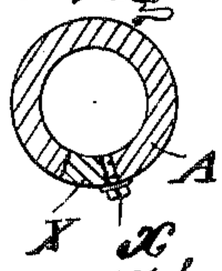


Fig. 17.

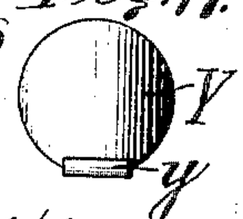


Fig. 18.

Fig. 16.

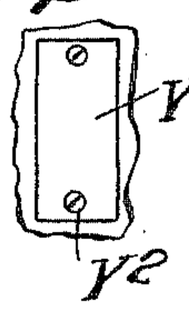


Fig. 13.

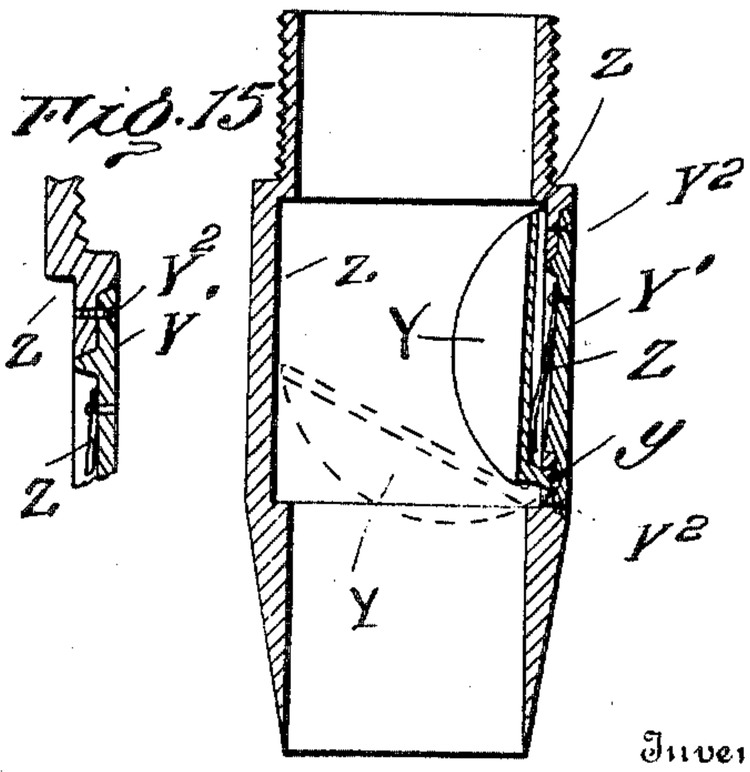


Fig. 15.

Witnesses

E. B. Brewer

By

Inventor

William S. Smith

Baldwin Wright

his

Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM S. SMITH, OF BIGRUN, PENNSYLVANIA.

CORE-DRILL.

No. 797,622 Specification of Letters Patent. Patented Aug. 22, 1905.

Application filed April 11, 1905. Serial No. 255,037.

To all whom it may concern:

Be it known that I, WILLIAM S. SMITH, a citizen of the United States, residing at Bigrun, in the county of Jefferson and State of Pennsylvania, have invented certain new and useful Improvements in Core-Drills, of which the following is a specification.

This invention relates to that class of drills in which a tubular drilling-tool is used to make an annular cut and form a central body or core which extends into the tool and which may be removed for examination in order to determine the character of the material through which the boring is effected.

Ordinarily the cutter carries diamonds and is rotated rapidly, water being supplied to the cutter in order to wash away the material as fast as cut out in order to allow the diamonds to operate most efficiently; but there is an objection to the use of water in this way, because this water will often destroy or injure the core received by the tool and which it is desirable to preserve and inspect. Sometimes the core instead of being hard is relatively soft and easily affected by water.

One object of my invention is to provide a tool of the class specified which will operate efficiently without the necessity of using water; and a further object of my invention is to provide a tool which need not be rotated, but which can be reciprocated to cut the annular hole around the core, the powdered material being allowed to rise between the core-barrel and the outer casing and find its exit through suitable openings in the casing.

In my drill the inner tube or core-barrel is stationary while the cutter is being reciprocated, and inasmuch as the cutter is adapted to turn to a limited extent during reciprocation provision is made for allowing this turning movement without moving the core-barrel or inner tube.

Inasmuch as the core-barrel does not reciprocate or rotate it is desirable in order that the core may be properly formed to provide the core-barrel with a cutting edge which shall shave down around the core as the operation progresses, thus allowing the core-barrel to descend properly with the main cutter. The tool is so constructed that each time that the main cutter drops it imparts a smart blow to the core-barrel, causing the cutter at its lower end to cut or shave the core in the manner before specified.

In some cases the core is so soft and crumbly that it is difficult to remove it from the core-barrel for inspection intact. I therefore provide a way by which the material may be inspected without removing the core from the core-barrel, and I have also provided means by which the core-barrel may be readily detached from the tool without separating other parts of the tool from their support. Sometimes the core is of such soft material that the ordinary gripping devices will not hold the core in the barrel. I have provided a device which will hold the core in place no matter how soft it may be.

Other features of my invention are plainly illustrated in the accompanying drawings and will be hereinafter fully described.

Figure 1 shows a side elevation of my improved core-drill. Fig. 2 shows a longitudinal section thereof, the upper part, however, being shown in elevation. Fig. 3 is a view in longitudinal section, on an enlarged scale, with parts broken away of my improved drill. Fig. 4 is a perspective view of the drill-head and the weighted head of the core-barrel. Fig. 5 shows a transverse section on the line 5 5 of Fig. 3. Figs. 6, 7, and 8 are transverse sections on the lines 6 6, 7 7, and 8 8 of Fig. 3. Fig. 9 is a view, on an enlarged scale, illustrating particularly the way in which the bits or cutters are connected with their tubes. Fig. 10 shows an end view of the cutters. Fig. 11 shows an elevation of a modified form of cutter. Fig. 12 shows a side elevation of a core-tube provided with a removable section allowing the core to be inspected without its removal from the core-barrel. Fig. 13 shows a vertical section of a modified form of cutter for the core-barrel and a device for sustaining the core when the latter is of powdered or soft material, this device taking the place of the gripping springs or dogs usually employed. Fig. 14 shows a transverse section on the line 16 16 of Fig. 12. Figs. 15 and 16 are detail views of the construction shown in Fig. 13. Fig. 17 is an elevation of the valve sometimes used in the core-barrel, and Fig. 18 is a perspective view thereof.

My improved core-drill is adapted to be attached to the apparatus usually employed for operating the ordinary churn-drills, in which a reciprocating motion is given to the drilling-tool and no rapid rotary movement is given to the tool, although, as is common in such apparatus, the tool is usually turned to some extent at each reciprocation. My core-

drill can be easily applied to the lower drill-rod of such apparatus when the ordinary churn-drill is removed.

In the drawings I have shown a core-barrel A surrounded by two concentric tubes C D, each carrying cutters *c d*. I prefer to use two such tubes and cutters, although in some cases only one need be employed. The head or cap E is formed with a screw top or end *e*, adapting it to be attached to a drill-rod, and it is formed with a square or hexagonal surface *e'*, to which a wrench may be applied when detaching or attaching the core-drill to the rod. The outer tube D is attached at *d'* to the drill-head by screw-threads, and the tube C is attached to a reduced portion E' of the head at e^2 by screw-threads. In this way an annular space e^3 is left between the tubes C and D. The cutters *c d* are preferably of the form shown on an enlarged scale in Figs. 3, 9, and 10. It will be observed that the teeth are quite long, and they are beveled in opposite directions so as to efficiently cut the material by being merely reciprocated therein.

The cutters are connected by screw-threads at G to the tubes C and D, respectively, and are detachable therefrom. By the use of two concentric cutters a clear annular cut is made around the core, and some of the material cut out finds its way up between the core-barrel A and the tubes C and D. The tubes C and D are slotted, as shown at H, to allow the pulverized material to escape, and if water filters through the earth it will also find its way out through these slots. Openings J J' are also made at the top of the tubes C and D for the escape of the powdered material and any water that may find its way to the top of the tubes.

Each of the bits or cutters is formed with perforations K to receive a spanner-wrench, by means of which the cutter may be detached from its tube. The core-barrel A is attached by screw-threads to a cap M, which surrounds a pivot N, projecting downwardly from a head O, which latter is weighted or made of heavy material, so as to normally hold the core-barrel depressed while the other parts of the tool are being elevated in the ordinary operation of drilling. Nuts P are attached to the pivot or stem N below the cap M to hold the core-barrel in place but permit the head O to turn without turning the barrel. The middle tube C is formed with a series of longitudinal slots Q, through which project pins R, attached to the head O and having heads *r* interposed between the tubes C and D. By these devices the tubes C and D are held a proper distance apart at their upper ends, and the tubes are allowed to reciprocate without reciprocating the core-barrel. Similar bolts S T are employed for holding the core-barrel and the tubes C and D the proper distances apart near their lower ends. The arrangement is such, however, that while these devices space the tubes the tubes C and D are allowed to reciprocate freely without reciprocating the core-barrel.

The cap M is formed with recesses *m*, and recesses or holes *n* are formed in the outer tube D. By bringing the holes *m* and *n* into alinement one or more pins may be inserted so as to connect the core-barrel A and the tubes and to cause the core-barrel to project at its lower end beyond the cutters *c* and *d*. When this is done, the core-barrel may be detached from its cap by means of a spanner-wrench, and the barrel, with the core, may be taken out without separating any of the other parts. The cutters *c* and *d* may be easily removed by spanner-wrenches engaging the holes K. The core-barrel is provided with an annular cutter U, which is connected by screw-threads *u* to the core-barrel, so as to be detachable therefrom. The cutter has one or more holes *u'* to receive a spanner-wrench. The core-barrel is formed with a hole *v*, which may be made to register with the holes K K. If a pin is inserted through these holes, the core-barrel will be prevented from rotating, and the bit or cutter U may be removed by a spanner-wrench engaging the holes *u'*. This may be done without detaching the core-barrel from its cap; but, as before stated, the core-barrel may be detached from its cap in the manner before explained whenever desired.

The core-barrel is shown in Fig. 2 as carrying ordinary spring gripping-dogs U'. The core-barrel is formed, preferably, at its upper end with holes u^2 to permit the exit of water that may find its way into the core-barrel. Preferably the upper end of the head O is rounded to fit a concave recess at the lower end of head E. As the head E reciprocates it strikes the head O a smart blow at each downward movement and causes the cutter U to shave the core while it is being formed by the cutters *c d*. It is not absolutely essential that the slots H and the other exits should be employed, as the drill will operate under some circumstances without these provisions, and, as before stated, it is not essential that both tubes C and D should be used, as one may sometimes be employed in connection with the core-barrel.

Different kinds of cutters are often used on different kinds of materials. In Fig. 11 I have shown a modified form of cutter which may sometimes be employed.

In Figs. 12 and 14 the core-barrel is shown as provided with a removable section X, which is held in place by screws *x*. By removing these screws the core may be inspected without removing it from the core-barrel. This is a very desirable feature, inasmuch as often the core is so soft or crumbly that it cannot be removed as a whole from the barrel, so that it is impossible under such circumstances to examine the various strata or arrangement

of the material of the core; but by my improvements this can readily be done.

Sometimes the material is so soft that the ordinary gripping-dogs will not properly hold the core. I therefore under such circumstances preferably use the construction shown in Fig. 13 as a substitute for the cutter U of the core-barrel. In this instance I have shown a valve Y, hinged at *y* to a removable section Y′ of the cutter. The section Y′ is ordinarily held in place by screws Y^2; but by detaching the screws Y^2 the section Y′, with the valve Y, may be taken out. A spring Z, attached to the section Y′, bears against the valve Y and tends to close it or move it to the position shown by dotted lines in Fig. 13. In the operation of drilling as the core-barrel descends the core as it rises in the core-barrel will hold the valve Y in the elevated position (shown in full lines in Fig. 13) within the recess *z;* but when the core-barrel is raised with the tool—that is, when the tool is being removed from the hole which it has formed—the valve Y will be moved to the position shown in dotted lines in Fig. 13 in such manner as to sustain the core and prevent it from being broken up or otherwise destroyed or injured. It will be observed that the valve is curved, so that, while it can entirely close the bore of the barrel when it is elevated, as shown in Fig. 13, it will allow the core to entirely fill the bore of the barrel.

I claim as my invention—

1. A non-rotary drill comprising a core-barrel adapted to remain at rest during the drilling operation and a reciprocating annular cutter surrounding the core-barrel and having a swivel connection with the upper end thereof.

2. A non-rotary drill comprising a core-barrel having an annular cutter at its lower end and a reciprocating tube carrying an annular cutter surrounding the core-barrel having a swivel connection with the upper end of the core-barrel and adapted to strike the upper end of the core-barrel on its downward movement.

3. The combination of a core-barrel, a tube or casing surrounding it carrying a cutter at its lower end, a head to which said tube is secured, a head for the core-barrel to which the latter is swiveled and a cutter on the core-barrel.

4. The combination of a core-barrel having a cutter at one end and a cap at the other, a head to which the cap is swiveled, a tube or casing surrounding the core-barrel carrying an annular cutter and a head to which the tube or casing is attached and which is adapted to strike the head of the core-barrel for the purpose specified.

5. The combination of a core-barrel, its head, a slotted tube surrounding the core-barrel and carrying a cutter, pins secured to the core-barrel head and extending through the slots, and a head to which the latter tube is attached.

6. The combination of a surrounding tube or casing carrying a cutter, a core-barrel, a head for the core-barrel adapted to turn with the tube or casing, a cap detachably connected with the core-barrel and swiveled or pivoted to the head and devices for connecting the cap with the casing, whereby the cap is locked to the casing for the purpose specified.

7. The combination of a tube or casing carrying a cutter and provided with longitudinal slots, a core-barrel, a head to which it is swiveled, and pins connected with said head and extending through the slots, whereby the head is guided and the movement of the tube or casing relatively to the head is limited.

8. The combination of a core-barrel, two concentric tubes surrounding the core-barrel and both carrying cutters at their lower ends and the headed bolts interposed between the tubes and barrel for holding them proper distances apart.

9. The combination of a core-barrel, its head, the cap secured to the top of the core-barrel having a swivel connection with the head, tubes surrounding the core-barrel and provided with openings *m* and holes *n* in the surrounding tubes adapted to register with the holes *m* for the purpose specified.

10. The combination of a head E adapted to be attached to an ordinary drill-rod, a tube or casing attached thereto carrying an annular cutter at its lower end formed with oppositely-beveled teeth, a core-barrel, a head therefor adapted to be struck by the first-mentioned head, and a swivel connection between the core-barrel and its head.

11. The combination of a reciprocating annular cutter and a core-barrel contained within but removable from the cutter and which is provided with a removable side section which enables the core to be inspected without its removal from the core-barrel.

12. A core-barrel for drills having a removable side section extending approximately from end to end of the barrel and being formed when in place to constitute an integral part of the barrel.

13. The combination of a core-barrel having a removable side section Y′, and a spring-actuated valve attached thereto adapted to close the core-barrel below the core.

14. The combination of a core-barrel, having an annular cutter at its lower end, devices for engaging or holding the core in the core-barrel, a cap for the barrel, a head to which the cap is pivotally connected, a head adapted to be secured to a drill-rod, two concentric tubes detachably connected with said head, means for holding the tubes a proper distance apart, exit-openings for permitting the powdered material to escape from the

tubes, and exit-openings for permitting water to escape from the core-barrel.

15. The combination of a core-barrel having the perforation *v* and provided with a detachable cutter, a surrounding tube carrying an annular cutter and having an opening K adapted to register with the opening *v*, whereby a tool or pin may be inserted to lock the core-barrel to the surrounding tube and the cutter may be detached from the core-barrel.

In testimony whereof I have hereunto subscribed my name.

WILLIAM S. SMITH.

Witnesses:
SAMUEL S. ATWELL,
W. B. PURVIS.