Aug. 19, 1924. 1,505,779

C. C. HANSEN

SOIL SAMPLING TOOL

Filed Sept. 14, 1923

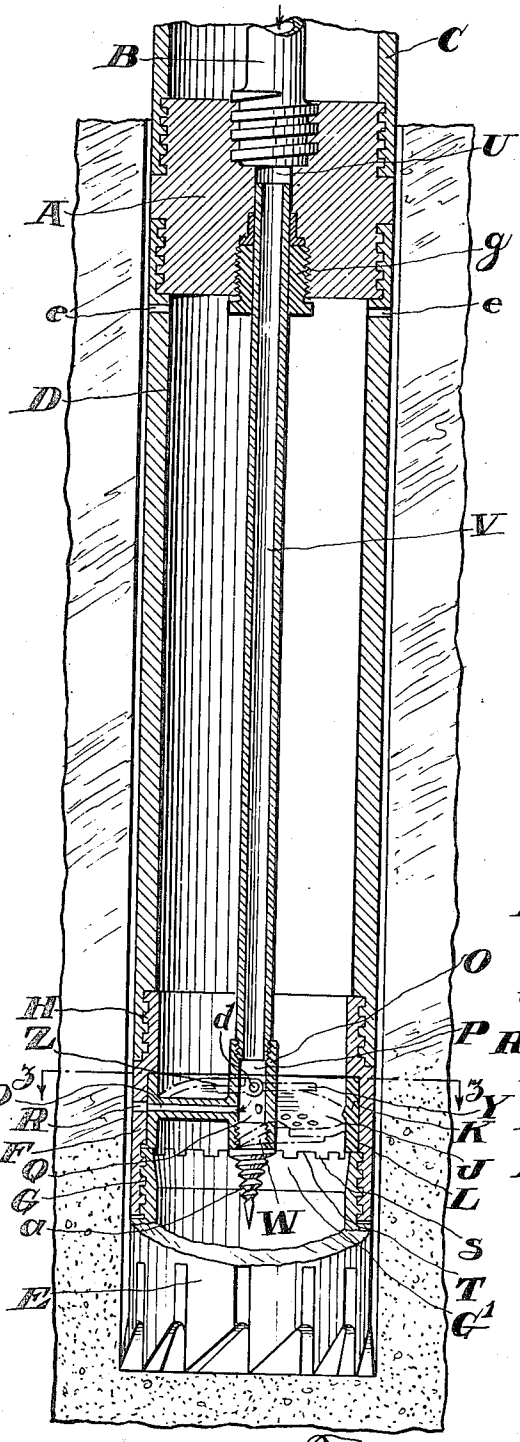



Fig. 1.

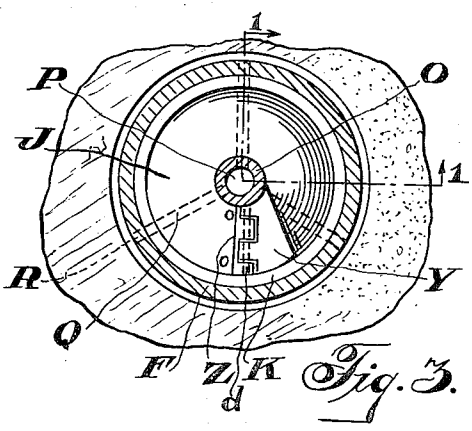



Fig. 3.

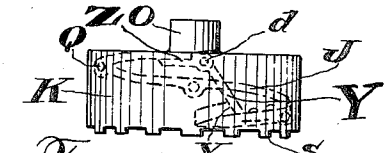
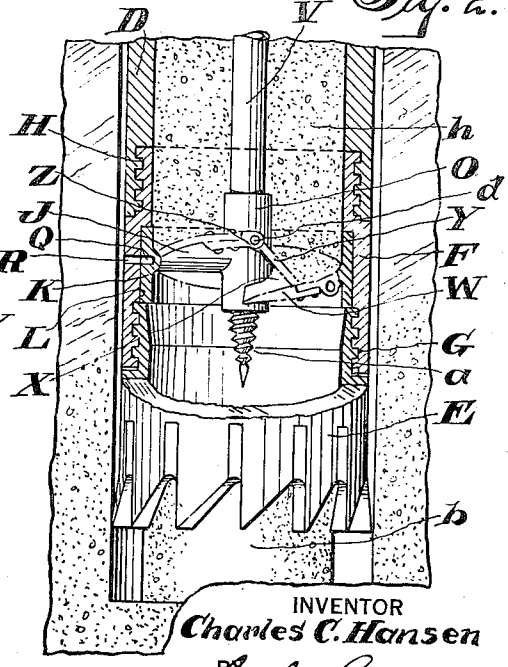



Fig. 4.

Fig. 2.




INVENTOR
Charles C. Hansen
BY
Herbert E. Ogden
HIS ATTORNEY

Patented Aug. 19, 1924. 1,505,779

# UNITED STATES PATENT OFFICE.

CHARLES C. HANSEN, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## SOIL-SAMPLING TOOL.

Application filed September 14, 1923. Serial No. 662,749.

*To all whom it may concern:*

Be it known that I, CHARLES C. HANSEN, a citizen of the United States, and a resident of Easton, county of Northampton, State of Pennsylvania, have invented a certain Soil-Sampling Tool, of which the following is a specification accompanied by drawings.

This invention relates to core drills and particularly to a drill of this general type having a single core barrel and adapted to obtain samples of earth or other material which is more or less dry or loose in formation. Heretofore it has been extremely difficult to obtain satisfactory specimens of earth formation where the subsoil or other material is dry and loose, particularly where several different strata are encountered at one location. These strata may comprise clay, loose earth, sand, stone, ashes and gravel which will not hold together en masse for obtaining a core by the usual or standard form of core drill. This is mainly due to the fact that rotation of the core drill tends to separate the strata and loosen the material.

The objects of this invention are to efficiently and expeditiously obtain samples composed of loose earth or other incohesive material; to protect the core while the tool is being advanced and maintain its identity; to convey the débris from the hole during the drilling and to facilitate the handling of the sample during its removal from the hole.

A further important object is to enable a core drill of the type having a single core barrel to be used as a soil coring or sampling tool for obtaining positive specimens of earth strata by the simple addition of an auxiliary part forming an intermediate section between the core barrel and cutting bit, or which may form a permanent part of either the core barrel or bit as desired, thus rendering unnecessary the use of a special type of core drill when loose formations are encountered. A still further object is to generally simplify and improve the construction and enable the cleansing liquid to be readily conducted through the core drill to the base of the hole outside of the bit. Further objects of the invention will hereinafter appear and to all these ends the invention consists of a soil coring or sampling tool having the features of construction, arrangement of parts and combinations of elements substantially as hereinafter fully described and claimed in this specification and shown in the accompanying drawings, in which

Figure 1 is a longitudinal elevation partly in section of one preferred form of the invention taken on the line 1—1 of Figure 3, showing the device as it appears during the drilling;

Figure 2 is a fregmentary elevation partly in section of the lower end of the drill showing the cutting edges of the bit and the lower end of the core barrel and contained core as they appear during removal of the sample from the hole;

Figure 3 is a transverse sectional view taken on the line 3—3 of Figure 1, looking in the direction of the arrows; and

Figure 4 is a detail side view of the removable intermediate core saver.

In the drawings a single barrel core drill is shown, including a core barrel plug A adapted to be rotated through the agency of the usual rotatable spindle or drill rod B. A "calyx" or collector barrel C is threaded to the upper end of the plug A and a cylindrical core barrel D is threaded to the lower end of the plug A. The core drill is adapted to be used in any character of formation, a bit of the proper type for such formation being generally secured directly to the core barrel D. In drilling in hard formations a shot bit is frequently used, and for soft formations a fish-tail bit or a "cutter bit" has been found to be most satisfactory. In the present instance the bit E has been shown as a "cutter bit," or toothed cutter, and instead of being attached directly to the core barrel, a removable intermediate section F is interposed between the core barrel D and bit E in accordance with the purposes of this invention. The bit E is threaded to the lower portion of the intermediate section F, as shown at G, and the section F which has the same external diameter as the bit E and core barrel D is threaded within the lower portion of the core barrel D as at H. The threaded portions of the lower ends of the core barrel D at H and intermediate section F and G correspond so that the intermediate section F is interchangeable with the bit for attachment to the core barrel for use under certain conditions.

The intermediate removable section F with contained parts, I term a "core saver,"

and these parts include a spiral blade or conveyor J having an annular flange K fitting the enlarged bore L in the inner wall of the intermediate section F. The spiral flight or conveyor J is provided with an axial hollow hub O having a chamber P and a plurality of passages Q lead transversely through the conveyor J and flange K. These passages Q are adapted to communicate with the exterior of the intermediate section F through apertures R located in the section F. The lower rim of the annular flange K is preferably provided with serrations S adapted to interlock with serrations T in the upper surface of the threaded portion G of the bit E when the bit E is screwed in place, and the spiral conveyor blade J is thus secured in the groove L against rotation. Any other suitable means may be employed for the purpose, however.

The core barrel plug A is provided with a chamber U communicating with the interior of the hollow spindle B and supplied with liquid through the spindle. A water tube V extends longitudinally through the core barrel D, the upper end of the tube V being secured in the chamber U by means of a packing gland *g* and the lower end being threaded in the axial hub O. The liquid used for washing away the débris traverses the chamber U and tube V, enters the chamber P of the hub O and passes out through the passage Q and apertures R in the intermediate section F to the bit E at the base of the hole. The cuttings are expelled from the hole by the upward flow of liquid along the outer sides of the core barrel D in the usual manner.

The conveyor J is in the form of a spiral blade or disc, adapted to close and substantially seal the bottom of the core barrel D. The blade has a smooth upper surface and is disposed about the longitudinal axis of the barrel and rotatable with the core barrel D and bit E. A cutter W is also provided for breaking up the core of material *b* as the drilling progresses. As the core barrel and bit rotate the core of material is broken up or disintegrated and is carried by the spiral blade J into the interior of the core barrel D, where the material rises in the form of a loose sample *h* of the formation being drilled.

The spiral conformation of the blade J commences at the cutter W, and continues for substantially a single turn, terminating at a point substantially above the point of commencement, and a radial entrance opening X is formed between said points of commencement and termination. A closure is provided for the opening X and in this instance the closure comprises a shutter Y suitably hinged or pivoted at Z to the upper terminus of the spiral blade J and substantially at the end thereof. The shutter Y is adapted to meet the lower end of the blade J substantially at the point of commencement of the spiral, rearwardly of the cutter W, and is disposed at an angle to the longitudinal axis of the core drill when seated over the entrance opening X.

A spiral screw *a* inserted in the base of the axial hub O closes the base of the chamber P and projects downwardly from the conveyor blade J in position to enter the core of material *b* during rotation of the core barrel and bit, and acts to maintain intimate contact between the cutter W and core *b* while the drill is in operation. The shutter Y is adapted to be raised on its hinges *d* by the core *b* to permit entrance of the drilled material past the cutter W and into the interior of the inner core barrel D during rotation of the drill. When rotation ceases, the shutter Y falls to its seat on the lower end of the blade J closing the radial opening X, substantially sealing the inner core barrel and preventing the passage of material out of the core barrel D when lifting the core drill and contained sample out of the hole.

As the sample *h* rises in the barrel D, a certain amount of pressure might be set up due to air or liquid, or both, confined within the barrel D above the sample. This might tend to impede the upward progress of the material forming the sample, and to prevent such interference means are preferably provided for relieving the pressure or other accumulation within the core barrel D. In the present instance these means comprise a plurality of radial apertures *e* in the upper end of the core barrel D which allow the air or liquid to pass to the exterior of the core barrel D. The sample *h* is expelled from the barrel D by removing the bit E, which will permit the conveyor J to be unscrewed from the tube V, leaving the barrel D open at the bottom. The sample *h* is then readily passed into a glass tube, trough or other suitable container.

Substantially perfect samples of material are expeditiously and economically obtained with the use of the present core saver in a drill having a single core barrel, for one reason because it is not necessary to use a special type of drill when loose formations are encountered. The standard core drill used for obtaining solid cores of hard material is quickly converted into a soil coring or sampling tool by the simple addition of the intermediate section containing the core saving device.

I claim:

1. A soil coring tool comprising in combination, a core barrel, a water tube therein, a cutting bit adapted to cut a core of material and an intermediate removable conveyor secured between said core barrel and bit, said conveyor being rotatable with

the core barrel and adapted to break up the core of drilled material, permit ingress of the broken material to the core barrel, and prevent egress therefrom during the drilling, and passages in said conveyor adapted to conduct liquid from the water tube to the exterior of the core barrel.

2. A soil coring tool comprising in combination, a core barrel, a water tube therein, a cutting bit adapted to cut a core of material, an intermediate removable section secured between said core barrel and bit, and a removable conveyor in said section, said conveyor being adapted to break up the core of drilled material, permit ingress of the broken material to the inner core barrel and prevent egress therefrom during the drilling, said conveyor being secured to said water tube and having passages for conducting liquid from the water tube to the exterior of the core barrel.

3. A soil coring tool comprising in combination, a rotatable core barrel, a water tube therein, a cutting bit adapted to cut a core of material, an intermediate removable section secured between said core barrel and bit, said section being interchangeable with the bit for attachment to the core barrel, and a removable conveyor in said section adapted to break up the core of drilled material, permit ingress of the broken material to the inner core barrel and prevent egress therefrom during the drilling, said conveyor having a central hollow hub and passages leading from the interior of said hub to the exterior of the intermediate section.

4. A soil coring tool comprising a core barrel, a water conveying tube therein, a bit adapted to cut a core of material, and a removable intermediate conveyor secured to said water tube and adapted to enclose the bottom of said inner core barrel, said conveyor comprising a spiral blade disposed about the longitudinal axis of the tool and rotatable with the core barrel and bit and having a cutter for breaking up the core of material as the drilling progresses, said blade having a radial opening, and a closure for said opening, said closure being adapted to permit entrance of the drilled material into the casing during rotation of the outer core barrel and to prevent passage of the material out of the inner core barrel when rotation ceases, and radial passages in said conveyor adapted to conduct liquid from the water conveying tube to the exterior of the intermediate section.

In testimony whereof I have signed this specification.

CHARLES C. HANSEN.