No. 782,636. PATENTED FEB. 14, 1905.

H. L. ZANDER.

EARTH BORING DEVICE.

APPLICATION FILED SEPT. 16, 1904.

Fig. 4.

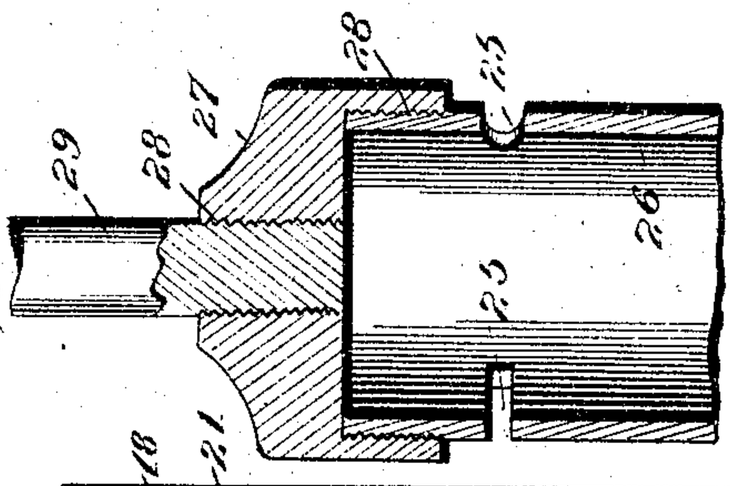


Fig. 5.

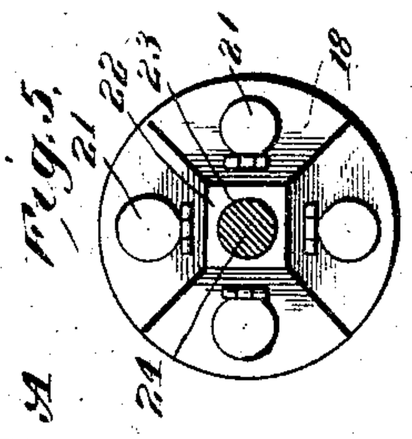


Fig. 6.

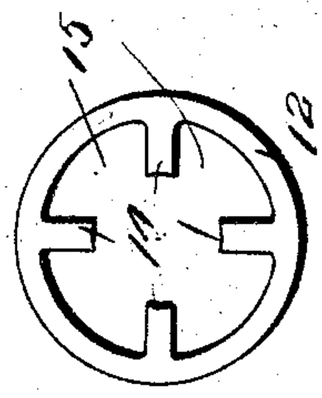


Fig. 3.

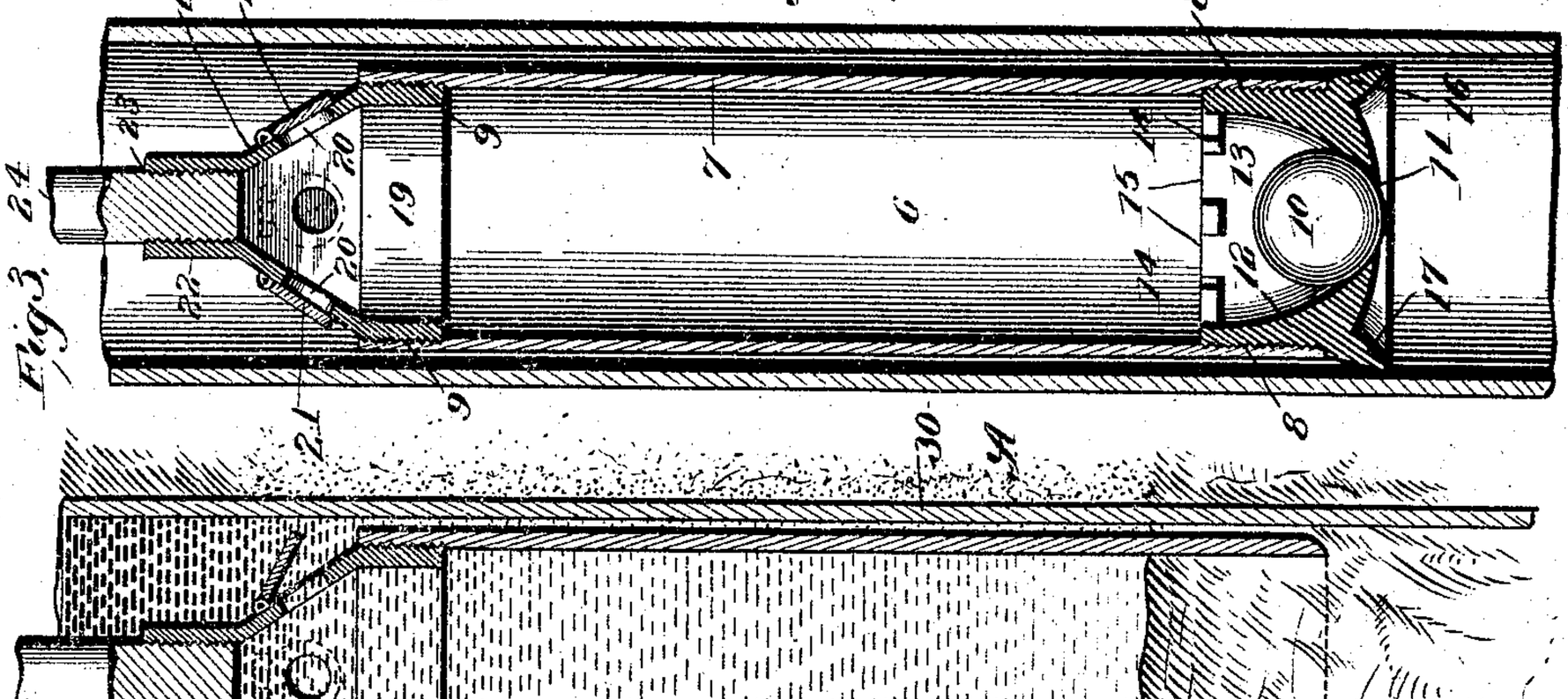
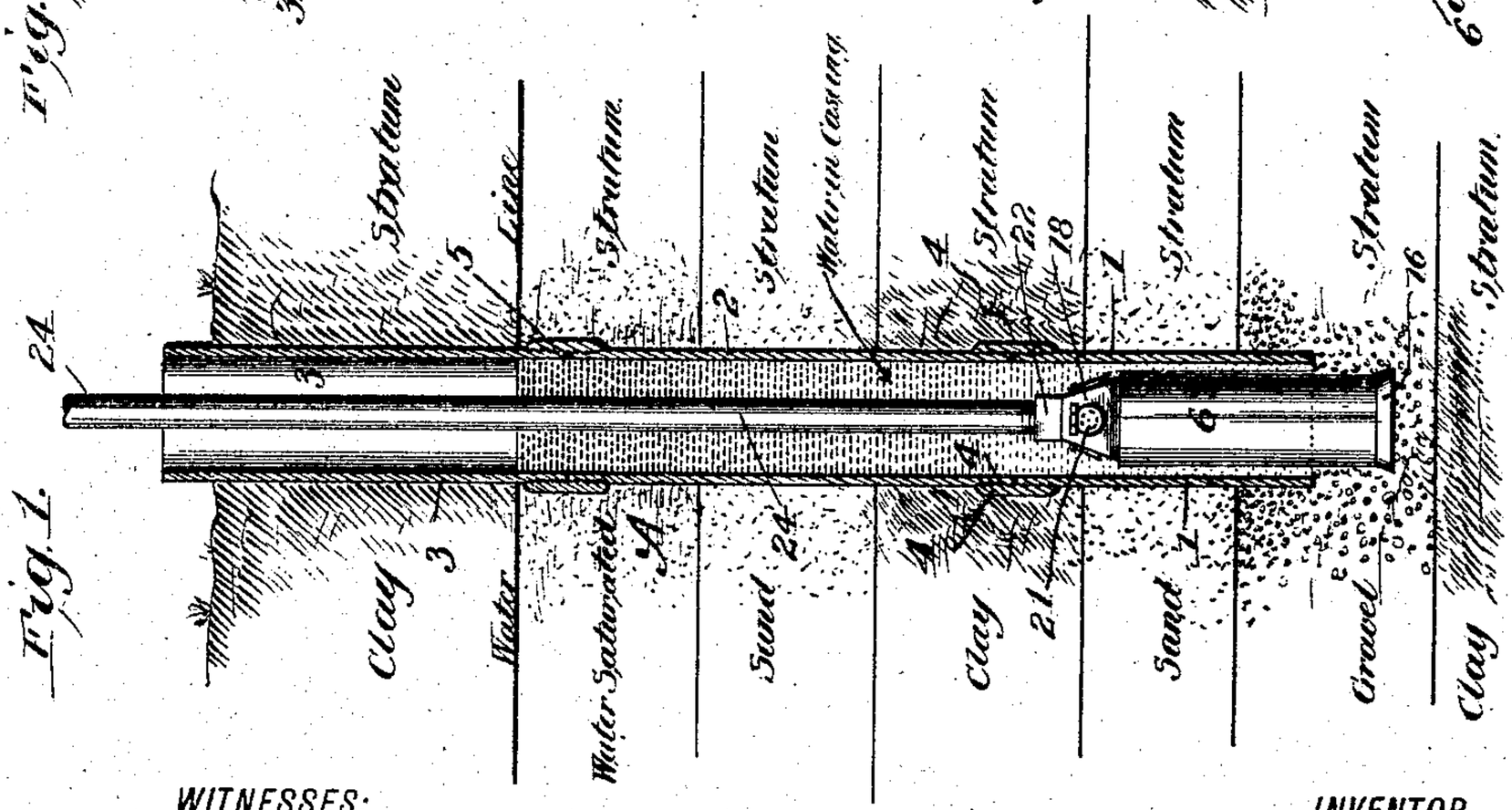


Fig. 2.

Fig. 1.



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No. 782,636. Patented February 14, 1905.

UNITED STATES PATENT OFFICE.

HENRY LOUIS ZANDER, OF NEW ORLEANS, LOUISIANA.

EARTH-BORING DEVICE.

SPECIFICATION forming part of Letters Patent No. 782,636, dated February 14, 1905.

Application filed September 16, 1904. Serial No. 224,689.

To all whom it may concern:

Be it known that I, HENRY LOUIS ZANDER, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have made certain new and useful Improvements in Earth-Boring Devices, of which the following is a specification.

This invention relates to earth-boring devices; and it consists, substantially, in the improvements hereinafter more particularly described, and pointed out in the claims.

Preliminarily to the driving of piles or other supports for structures which are to be built or erected over low-lying or water-saturated lands it is usual to endeavor to ascertain the consistency and geological or structural formation of the strata of the earth to at least the depth at which such piles or supports are to be driven in order to determine whether or not a structure may be built over a particular or selected site of the land with safety or without liability to caving. To this end it has hitherto been the practice in some instances to sink a tubular casing into the earth at each place it may be desired to locate a pile and to then force a drill down into the casing in an attempt to remove or withdraw therefrom a specimen or portion of the earth core therein, such specimen, if obtained, being subjected to examination by the expert or operator in charge after the drill has been lifted up to the surface of the earth. Pending such examination another drill is inserted into the now open upper portion of the casing until its lower end rests upon the remainder of the earth core therein, whereupon this drill is forced down in like manner as the first in the attempt to obtain from a farther depth than before another specimen or portion of the earth core, and so on until the entire core has been taken out or removed. When the lower end of the casing is reached, the latter (after attaching another section thereto) is driven still farther into the earth, and so on repeatedly, according to the depth desired to be attained, the coring operations being proceeded with each time as before.

The operations referred to have been only partially successful hitherto, as will now be attempted to be explained. In the first place water is frequently struck or encountered a very short distance below the surface of the earth in which the core or test-borings are to be made and much of it enters the sunken casing either before or during the time the coring-drill is being driven thereinto, it being stated that the coring-drill usually employed comprises a hollow body having its lower end open and its upper end closed, and to which latter end is attached in some manner an end of a section of rod or other connection through the medium of which the drill is operated to be driven by any suitable means, other sections of rod being added to the first as the drill is forced to successively greater depths. Now as the coring-drill is driven into the casing a large percentage of water held or contained by the core of earth therein is caused to enter the lower end of the drill as the latter gradually takes into the same a specimen or portion of such core, and this water rises within the drill above such specimen, there being no escape therefor on account of the entire upper portion of the drill being closed. The result is that on attempting to withdraw the earth specimen by lifting up the drill, the said specimen is forced out of the drill by the weight and resistance of the column of water above it, and therefore nothing is accomplished. So, also, in the use of the form of drill referred to when a stratum of sand is encountered by the drill and a specimen quantity taken up thereby such quantity will slip out of the drill as the latter is lifted in the casing. Again, if the earth specimen taken up by the drill is only slightly saturated with water it will also slip out in the same way. Even when the upper closed end of the drill has connected thereto a pipe (sometimes employed to sink or drive the drill) having communication with the interior of the drill the effect is precisely the same, since while the pipe will enable the column of water in the drill to be displaced sufficiently to permit a specimen portion of the earth core to enter or be taken up by the drill still the said column by its weight again forces the specimen from the drill on lifting up the latter.

The principal objects of the present inven-

tion are to obviate or overcome the disadvantages and objections pointed out above and to provide earth-boring devices for the purpose named which are comparatively simple and inexpensive in their embodiment and which may be easily and readily operated and controlled.

A further object is to provide devices by which earth specimens may be obtained from any desired depth of the earth in practically the state of original consistency and geological formation thereof, and also to provide devices for this purpose which are effective and reliable in operation, besides possessing the capacity for long and repeated service.

The above and additional objects are attained by means substantially such as are illustrated in the accompanying drawings, in which—

Figure 1 is a part-vertical sectional view illustrating the general embodiment of my improved devices as ordinarily employed. Fig. 2 is an enlarged vertical sectional view of the earth-sunken casing and the drill operating within the same. Fig. 3 is a similar view representing the preferred construction and organization of the devices. Fig. 4 is a sectional view in detail, representing a modification of the construction of the upper part of the drill. Fig. 5 is a top plan view of the drill, the operating-rod or connection therefor being in section. Fig. 6 is a plan view of the cage in which works a valve located at the lower end of the drill.

Before proceeding with a more detailed description it may be stated that in the form of my improvements herein shown I employ a tubular casing which may be sunk into the earth to any desired depth and operating in connection with which is a valve of special construction provided with a suitable follower, and while I have herein represented my improvements in certain selected embodiments it will be understood, of course, that I am not limited to the precise details thereof in practice, since immaterial changes therein may be resorted to coming within the scope of my invention.

Reference being had to the drawings by the designating characters marked thereon, 1, 2, and 3 designate sections of a tubular casing A, which is driven in the earth to any desired depth, the section 1 being first driven in for its full height, and then after its contained earth core has been drilled out or removed therefrom, as hereinafter described, the section 2 is connected to the upper end thereof in any suitable way, as by means of a water-tight coupler 4, whereupon the said section 1 is driven farther down in the earth, the said section 2 taking the place previously occupied thereby. In like manner after again drilling out the earth core in section 1 the section 3 is connected to the upper end of section 2 by coupler 5, and both the sections 1 and 2 are driven still farther downward, the section 3 taking the place previously occupied by section 2, and so on to the full depth desired to be attained. In connection with the said casing I employ my improved drill 6, which is driven down into the casing for successively increasing depths to successively remove therefrom portions 6^a of the earth core as specimens from which may be determined the consistency and structural formation of the different strata of earth, as previously explained. Said drill 6 may be operated to be driven by any suitable means, and the construction thereof may be modified in different ways; but preferably I employ the embodiment shown in Fig. 3. Referring to said figure, it will be seen that the drill comprises a tubular body 7 of suitable length and diameter, said body being internally threaded at 8 a short distance from its open lower end and similarly threaded at 9 a short distance from its closed upper end. In order to retain the earth specimens or core portions within the drill-body, I preferably employ any suitable form of inwardly opening and downwardly closing valve, having illustrated herein a ball-valve 10, seating within an opening 11 in the bottom of a cage or housing 12 therefor, said cage being of suitable depth or height to form the inner chamber 13 for said valve and having the walls thereof externally threaded a suitable distance to be screwed up into the lower end of the drill-body 6 by engaging the threads 8 of the latter. The valve-cage is provided at different points of its inner diameter with inwardly-projecting fingers 14, having spaces 15 therebetween, and it will be observed that the lower part of said cage is formed or provided with an annular pendent member 16, beveled outwardly and downwardly all around, as shown, to form a cutting edge 17, it being noted that the depth of the cage 12 is such as to enable the valve 10 to be lifted high enough to permit the earth specimens to enter the interior of the drill-body through valve-opening 11. The inward or upward movement of the said valve is limited by the fingers 14, and it may be stated that the spaces 15 between said fingers are never closed by the valve, as will be apparent.

The upper end of the drill-body 7 is preferably surmounted by substantially a pyramidal head or cap 18, having a pendent base-ring 19 threaded externally to engage the internal threads 9 of said drill-body, said head or cap being provided with vents or openings 20, closed by suitable upwardly-closing valves—as, for instance, hinged flap-valves 21, as shown. The head or cap 18 terminates upwardly in an internally-threaded member 22, in which is screwed the lower externally-threaded portion 23 of a rod, pipe, or other follower 24 for driving or operating the drill within the earth-sunken casing in the ordinary way. It is apparent that I am not limited to the par-

ticular form of head or cap referred to, and I desire to mention that in some instances good results may be obtained by the employment of simple vents 25 in the upper part of the drill-body, (see Fig. 4,) which vents may or may not be closed or controlled by properly-operating valves. In such instances I may close the upper end of the valve-body 26 by means of a solid head or cap 27 screwing therein at 28, said cap having fitted centrally thereof the lower end of a follower 29, as shown.

In each of the embodiments of my improvements herein shown the head or cap for the upper end of the drill-body is removable, thereby enabling the samples of earth or test-borings to be readily taken out of the said drill-body after the latter has been elevated to the surface of the earth. Thus the head or cap is an important element of the invention irrespective of whether the same be solid, as shown in Fig. 4, or provided with vents or openings controlled by valves.

In further instances of use of the devices I am enabled to dispense with a valve at the lower open end of the drill-body, (see Fig. 2,) although it will be understood that the preferred form of my invention includes such valve. Thus in said Fig. 2 the lower end of the drill-body 30 is open to receive the earth specimen 6^a, while the upper end of said body is surmounted by a head or cap 31, having a follower 32 attached thereto, said elements in all respects being substantially identical with the elements corresponding thereto in Fig. 3.

From the foregoing it will be seen that much of the water entering the drill-body on descent thereof will be caused to pass out through the vents or valve-controlled openings at the upper part of said body, while such of the water as still remains in said body will be gradually displaced or lifted up and similarly forced out by the earth specimen or core portion received into said body. Thus with my devices the earth specimen is never liable to be forced out of the lower end of the drill-body by the weight of the column of water resting therein, and, indeed, when the earth specimen taken up almost fills the interior of the drill-body there is of course practically no water above said specimen. Whatever the consistency and geological formation of the earth strata, it will be apparent that the different specimens thereof taken up by the drill will be prevented from slipping out at the lower end of the drill-body by means of the valve shown at the lower end of said body in Fig. 3, and it will also be apparent that I am enabled to obtain earth specimens from different depths having practically the same consistency and structure as the natural strata from which they may be taken.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In earth-boring devices, a drill comprising an integral hollow body having practically an equal internal diameter throughout, and a detachable closure for the upper end of the body, said drill having means for the escape of water therefrom as the drill descends into the earth.

2. In earth-boring devices, a drill comprising an integral hollow body having practically an equal internal diameter throughout, and a detachable closure for the upper end of the body, said drill having valve-closed outlets for the escape of water therefrom on descent of the drill into the ground.

3. In earth-boring devices, a drill comprising an integral hollow body having practically an equal internal diameter throughout, and a detachable closure for the upper end of the body, having valve-controlled outlets for the escape of water from the body on descent of the drill into the ground.

4. In earth-boring devices, a drill comprising an integral hollow body having practically an equal internal diameter throughout, and a detachable closure for the upper end of the body, having valve-controlled outlets for the escape of water from the body on descent of the drill into the ground, each of the valves opening in an outward direction.

5. In earth-boring devices, a drill comprising an integral hollow body having practically an equal internal diameter throughout, and a detachable pyramidal closure for the upper end of the body, having valve-controlled outlets in its sides for the escape of water from the body on descent of the drill into the ground.

6. In earth-boring devices, a drill comprising an integral hollow body having practically an equal internal diameter throughout, a detachable closure for the upper end of the body, and an inwardly-opening valve at the lower end thereof.

7. In earth-boring devices, a drill comprising an integral hollow body of practically equal internal diameter throughout, and provided at its upper part with outlets for water and at its lower part with an inwardly-opening valve, said body being devoid of inner suction devices.

8. In earth-boring devices, a drill comprising an integral hollow body of practically equal internal diameter throughout, and provided at the upper end thereof with a detachable closure, said body being devoid of inner suction devices.

9. In earth-boring devices, a drill comprising a hollow body closed at its upper end and devoid of inner suction devices, and provided at such end with outlet-vents for water, a valve-cage fitted to the lower end of said body, and a loose valve working in said cage and controlling an opening at the bottom thereof.

10. In earth-boring devices, a drill compris-

ing a hollow body devoid of inner suction devices and closed at its upper end, and provided at such end with outlet-vents for water, a valve-cage fitted to the lower end of said body, and having an opening in its bottom, and a loose valve in the cage for closing said opening, said cage having inwardly-extending separated fingers above the valve.

11. In earth-boring devices, a drill comprising a hollow body devoid of inner suction devices and provided at its upper part with outlet-vents for water, a cage fitted to the lower end of the body, and having an opening in its bottom, and an inwardly-opening loose valve controlling such opening, said cage being provided with an annular pendent member having a cutting edge.

HENRY LOUIS ZANDER.

Witnesses:
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W. C. KIRKLAND.