

Sept. 24, 1957

L. I. LIPSCOMB
CORING DEVICE

2,807,439

Filed March 16, 1955

2 Sheets-Sheet 1

FIG. 1.

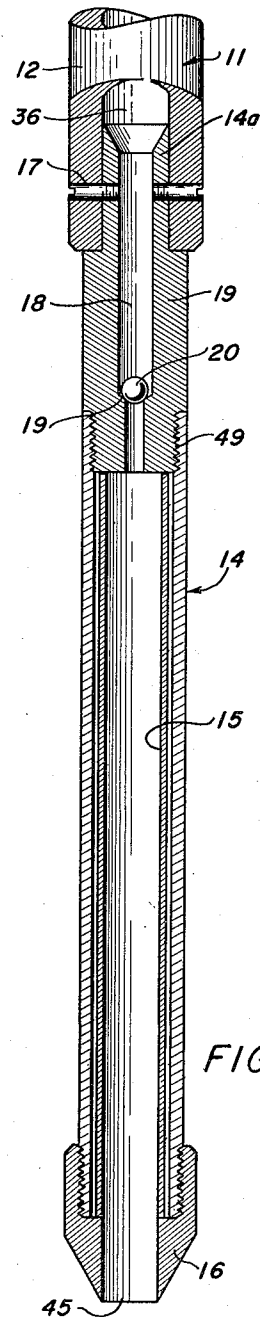
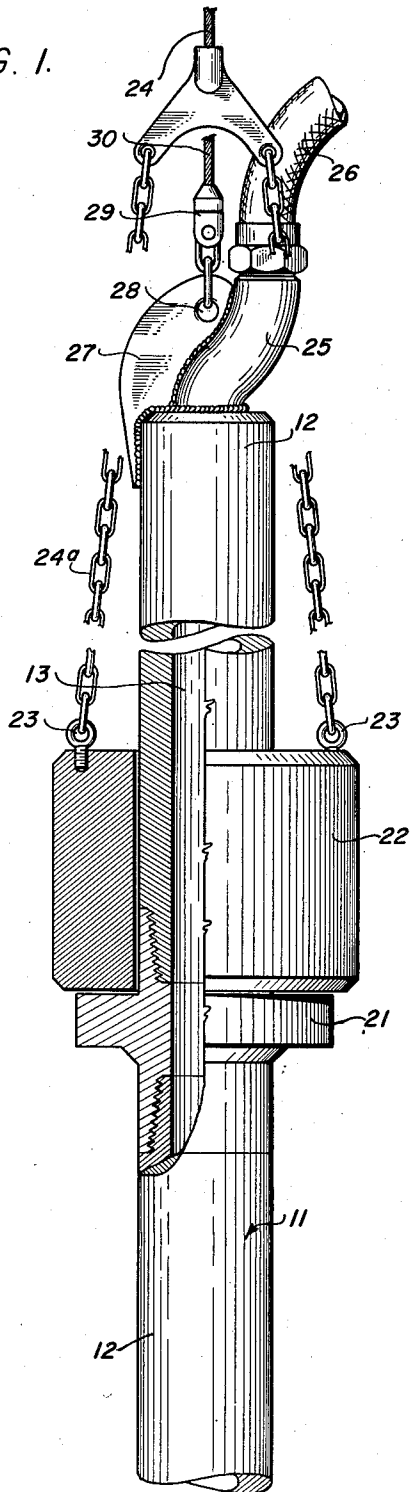


FIG. 2.

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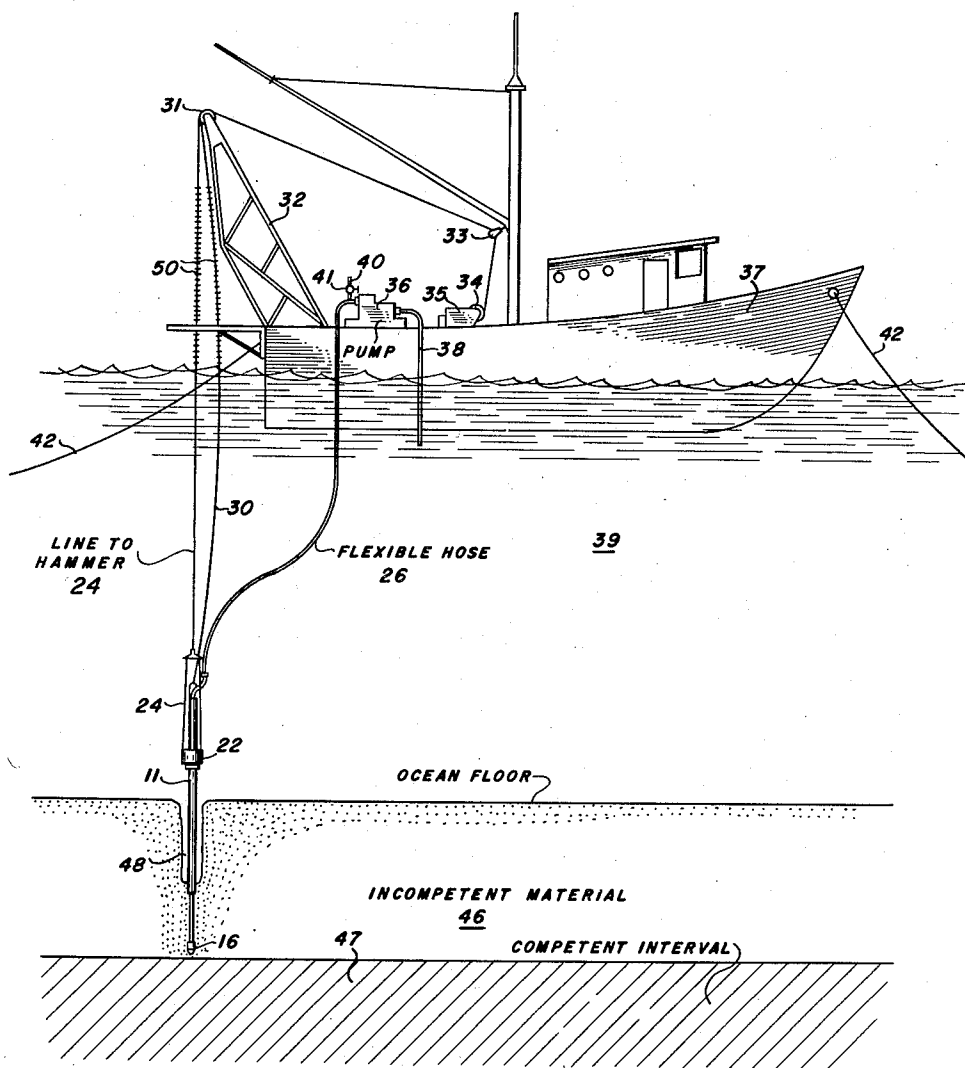
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2 Sheets-Sheet 2



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2,807,439

CORING DEVICE

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4 Claims. (Cl. 255-1.4)

The present invention is directed to a device for obtaining a core at a marine location. More particularly, the invention is directed to a device for obtaining a core from an earth interval below an incompetent earth interval. In its more specific aspects, the invention is directed to a core-taking apparatus which will allow the taking of a core from submerged and partly submerged lands.

The present invention may be briefly described as a device for obtaining an earth core from a subsurface interval below an incompetent interval which comprises an elongated tubular member provided with a cutting edge on its lower end for cutting a core in the subsurface interval. The tubular member has a lower section providing an elongated core barrel and an upper section providing a chamber. Between the chamber and the core barrel is a passageway of restricted cross-sectional area in which a valve seat is provided. A spherical valve member may be introduced into the tubular member to seat on the valve seat. Means are connected to the upper end of the tubular member, such as a conduit for introducing fluid which may be fresh or salt water and the like, into and through the tubing member to wash the tubular member through the incompetent interval. Arranged on the exterior of the tubular member intermediate the upper and lower ends thereof is an annular shoulder. Arranged slidably on the tubular member above the annular shoulder is a hammer member which is adapted to strike the annular shoulder to drive the tubular member into the subsurface interval when the hammer member is reciprocated on the tubular member. Separate means, such as wire lines, ropes and the like, are connected to the tubular member for lowering and raising same and to the hammer member for reciprocating same.

A pumping means is connected to the conduit and means connected to the pumping means are provided for introducing the spherical valve member into the conduit and chamber to seat on the valve seat.

The present invention is of particular utility in marine locations, swamps, partly submerged lands, and the like, wherein a stratum of mud or incompetent material overlies the more competent earth structure, to determine the characteristics of the competent structure. It is necessary to core the competent material without contamination of the incompetent material or mud. The present invention is, therefore, of considerable utility in obtaining such core samples.

The present invention will be further illustrated by reference to the drawing in which:

Fig. 1 is a partial sectional view of the upper portion of the assembled apparatus;

Fig. 2 is a partial sectional view of the lower portion of the assembled apparatus; and

Fig. 3 illustrates the mode of employing the apparatus.

Referring now to the drawing and particularly to Figs. 1 and 2, numeral 11 designates an elongated tubular member comprised of a first section 12, provided with an elongated chamber 13 and a second section 14 provided

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with an elongated core barrel 15. The lower end of the tubular member 14 has a hardened and bevelled cutter edge 16 for cutting a core sample for entry into the core barrel 15.

5 The lower section 14 has attached to its upper end by threads 49 a valve body 19 which, in turn, is connected to the lower end of section 12 by threaded pins 17. Valve body 19 is provided with a passageway 18 of restricted cross-sectional area provided with a valve seat 19' adapted to receive a spherical valve member 20. Arranged on the exterior of section 12 of the tubular member 11 intermediate its upper and lower ends is an annular driving head or shoulder 21. Slidably mounted on the tubular member 11 and particularly on the section 12 above shoulder 21 is an annular hammer 22 provided with eyes 23 to which by means of chains 24a wire lines or ropes 24 may be attached leading to the surface for reciprocating same.

15 Connected to the upper end of the tubular member 11 and communicating fluidly with the chamber 13 through a connection 25 is a flexible conduit 26. A connection member 27 provided with an eye 28 is arranged on the upper end of the tubular member 11 to which a swivel 29 connected to a wire line 30 is attached. The wire 25 line 30, as shown particularly in Fig. 3, passes over a sheave 31 in a hoisting means 32 and thence over a sheave 33 to a hoisting reel or drum 34 powered by power means 35.

The flexible hose 26 is connected to a pumping means 30 36 carried, like the hoisting mechanism 35, by a marine vessel 37. The pump 36 has an inlet line conduit 38 which connects to a source of water, such as fresh or salt water, and may be dropped over the side of the vessel 37 into the body of water 39. A branch conduit 35 40 controlled by a valve 41 is provided for introduction of the spherical valve member 20 into the pumping system.

It is to be noted that the vessel 37 is suitably moored or anchored by mooring lines 42 which lead to anchors, 40 not shown.

In employing the device illustrated in the drawing for securing a core sample at a prescribed depth below the mud line, the tubular member 11 is assembled with the section 12 having a total length below the driving head or shoulder 21 equal to or slightly greater than the depth at which it is desired to obtain a sample. Above the driving head or shoulder 21 the portion of the section 12, which serves as a hammer-guide, is placed in position and the flexible conduit 26 and the wire line 30 are 45 attached. A wire line or rope, such as 24, which may have a harness on the lower end is attached to the hammer 22 by eyes 23. The section 14 is then connected to the lower end of the section 12 and the whole assembly is lowered over the side of a marine vessel 37 or offshore platform. Before the assembly reaches the 50 bottom of the body of water, such as 39, the pump, such as 36, on the vessel 37 is started and a stream of water is forced out of the opening 45 in the lower end of the cutter 16. This forms a jet of water and provides a washing action.

By lowering the assembly at a proper rate, a hole is washed through the incompetent material which may be generally designated by the numeral 46 to a point just above the stratum 47 which may also be incompetent 65 material of a greater resistance or strength than the incompetent material in interval 46 but generally is a competent earth stratum. In any event, the stratum 47 is desired to be sampled. At this point in the operation, the pump is shut down, valve 41 in line 40 is opened, the spherical valve 20 is dropped into line 40, valve 41 is then closed and the pump started up again. This forces the valve member 20 down through conduit 26 and chamber 70

13 to seat on the seat 19'. This closes off the passageway 18 and the pump is then shut off and valve 41 in line 40 is opened. The assembly is then lowered to rest on the bottom of the washed out hole generally designated by the numeral 48. Tension is relaxed on the wire line which slacks off to a slight degree but an insufficient amount to allow the tubular member 11 to depart from the vertical. Ordinarily, the rate of washing and penetrating of the tubular member 11 may be properly controlled such that the diameter of the hole 48 will be such that the apparatus may rest against the wall of the hole without deviating substantially from the vertical. Any tendency of the tubular member 11 to topple is reduced by not having a greater length of the section 11 below the driving head 21 than is necessary to reach the depth of sample desired. With the assembly resting on the bottom of the washed hole 48 and tension on the main wire line 30 slackened off, penetration of the assembly into soil 47 is achieved by raising and dropping the hammer 22 by raising and lowering the line 24 to cause reciprocation of the hammer 22 on the section 12. This produces a driving effect and causes the assembly to penetrate the formation 47.

Measurement of penetration of the washing out and driving operations is made by means of graduations on the wire line 30. These graduations are generally indicated by the numeral 50. Similarly, graduations may be provided on the line 24 as may be desired.

As the cutting head or edge 16 of tubular member 14 is driven into the formation by the hammer 22, the core is forced up into core barrel 15. With the valve 41 of line 40 open, the water in the assembly above the incoming core is allowed to escape through line 40. During the hammering operation the ball valve 20 opens and closes by being moved off and on its seat 19' as the water is pushed ahead of the entering core. The ball valve 20 prevents the core from being blown out if the fluid line above were pressurized such as by the pump being accidentally started. At times the core may be driven into the core barrel tight enough to eliminate the danger of its slipping out when the assembly is raised off bottom. However, if the core were loose and began to slip down in the core barrel, the suction created above the core would cause ball valve 20 to seat snugly against the seat and tightly close the passage 18. With the chamber immediately above the core sample closed, the initial slippage downwardly of the core creates a vacuum within the core barrel above the core and prevents any further downward movement of the core.

After the core sample has been obtained by the combined washing out and driving operation, the assembly is raised by the wire line 30 to the vessel 37, which may be of offshore platform. The assembly is then disconnected by releasing the threaded pin 17 and slipping the neck 14a out of the valve body 19. The section 14 can then be unscrewed from the valve body 19, the core removed and the ball valve 20 recovered for future use. Thereafter, the section 12 may be lengthened for the next depth of sampling and another section, such as 14, provided with a core barrel attached and the operation repeated.

From the foregoing brief description, it will be seen that I have provided a new and readily usable device for obtaining samples in marine locations and where incompetent formations overlie a competent earth structure.

The apparatus has been used successfully in obtaining a core sample from depths of 30 feet and more below the ocean bottom offshore from the coasts of California and Texas.

As exemplary only of the device of the present invention, the section 12 above the shoulder 21 may be approximately 8 feet in length while the section 12 below the shoulder 21 may have a length in the range from about 5 to about 25 feet. The core barrel section generally indicated by the numeral 14 may have an overall length

including the cutter 16 of approximately 30 inches while the chamber 15 may have an effective length of about 24 inches.

A hammer, such as 22, of about 300 pounds weight may suitably be employed. The inside diameter of the chamber 13 and core barrel 15 may be from about 2 to 3 inches although other diameters may suitably be used.

Under some occasions, it may be desirable to dispense with the valve member 20 when it is unnecessary to maintain the core sample clean or free from contact with water. Under these circumstances, it may be desirable to provide a core catcher in the lower end of the chamber 15.

The nature and objects of the present invention having been completely described and illustrated what I wish to claim as new and useful and to secure by Letters Patent is:

1. A device for obtaining an earth core from subsurface interval below an incompetent interval, which comprises an elongated tubular member provided with a cutting edge on its lower end for cutting a core in said subsurface interval, said tubular member having a lower section providing an elongated core barrel and an upper section providing a chamber, said tubular member having a passageway of restricted cross-sectional area between the chamber and the core barrel, an annular valve seat arranged in said restricted passageway, means connected to the upper end of said tubular member for introducing fluid into and through said tubular member to wash said tubular member through said incompetent interval, means connected to said fluid introducing means for inserting a valve member into said tubular member to seat on said valve seat and close off said passage against downward flow therethrough, an annular shoulder on the tubular member intermediate the upper and lower ends thereof, an annular hammer member slidably arranged on the tubular member above the annular shoulder and adapted to strike the annular shoulder to drive said tubular member into the subsurface interval when the hammer member is reciprocated on the tubular member, means connected to the tubular member for lowering and raising said tubular member, and means attached to the hammer member for reciprocating same.

2. A device for obtaining an earth core from a subsurface interval below an incompetent interval at a marine location, which comprises an elongated tubular member provided with a cutting edge on its lower end for cutting a core in said subsurface interval, said tubular member having a lower section providing an elongated core barrel, and an upper section providing a chamber, said tubular member having a passageway of restricted cross-sectional area between the chamber and the core barrel, a valve seat in said passageway adapted to receive a valve member to close said passageway against flow downwardly therethrough, a conduit connected to the upper end of said tubular member for introducing fluid into and through said tubular member to wash said tubular member through said incompetent interval, pumping means connected to said conduit, a spherical valve member insertable in said tubular member and seatable on said valve seat, means connected to said conduit between said tubular member and said pumping means for inserting said spherical valve member into said conduit whereby said spherical valve member is pumpable to said valve seat to close off said passageway against downward flow therethrough, an annular shoulder positioned on the tubular member intermediate the upper and lower ends thereof, an annular hammer member slidably arranged on the tubular member above the annular shoulder and adapted to strike the annular shoulder to drive said tubular member into the subsurface interval when the hammer member is reciprocated on the tubular member, means connected to the tubular member for lowering and raising said tubular member, and means attached to the hammer member for reciprocating same.

3. A device in accordance with claim 2 in which the

lowering and raising means and the reciprocating means are separate lines manipulated from the marine location.

4. A device in accordance with claim 1 in which the lowering and raising means and the reciprocating means are separate lines manipulated from the marine location. 5

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