Jan. 12, 1937. E. C. CAREY 2,067,693

SAMPLING MACHINE

Filed May 8, 1936 4 Sheets-Sheet 1

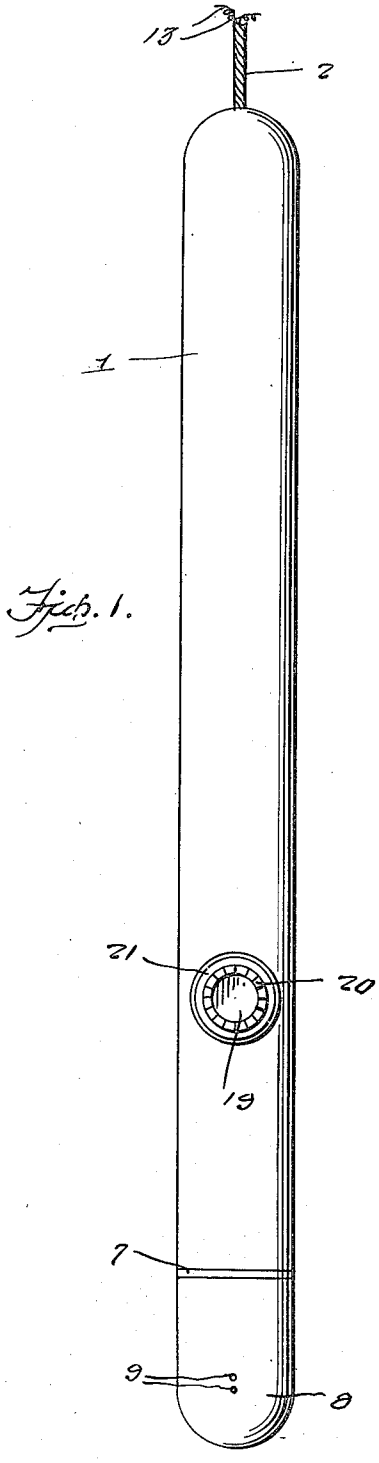


Fig. 1.

Fig. 4.

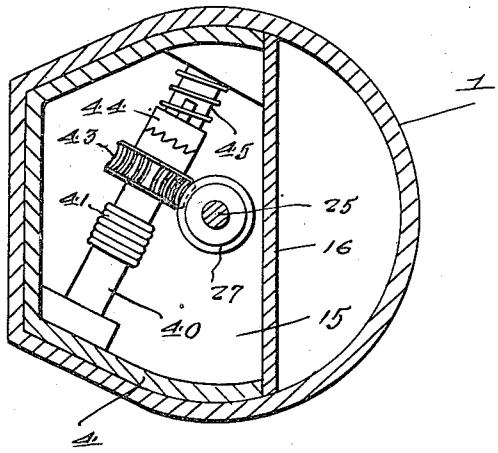
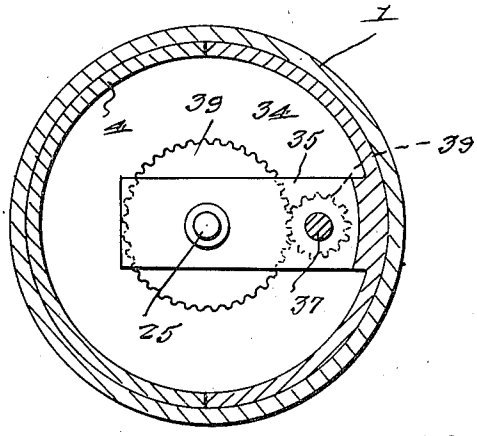


Fig. 5.



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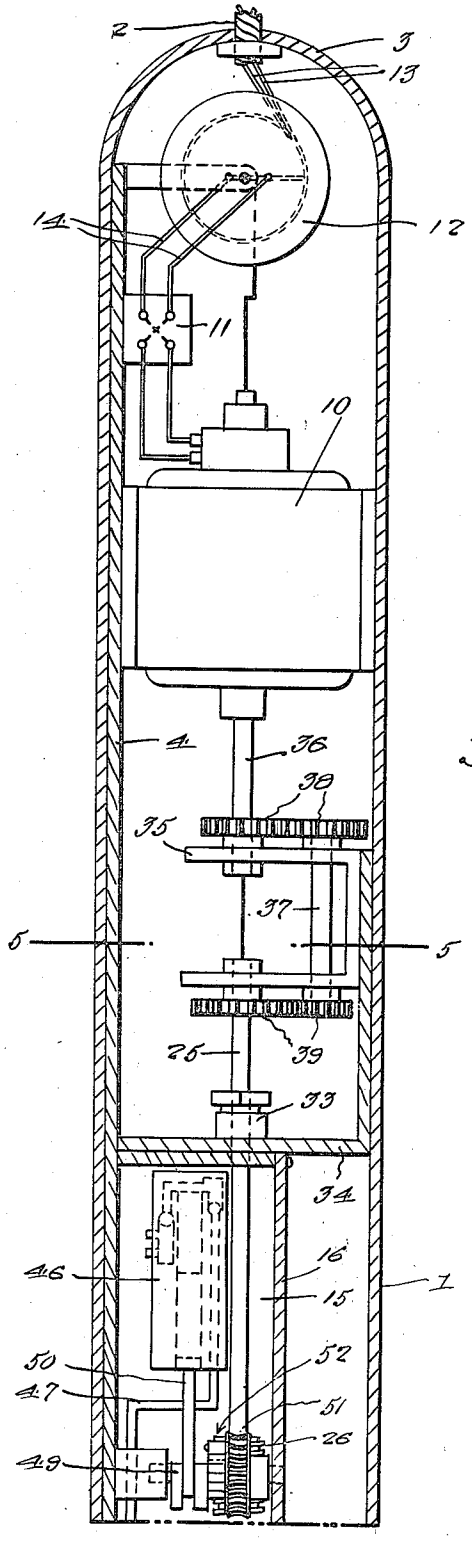


Fig. 6.

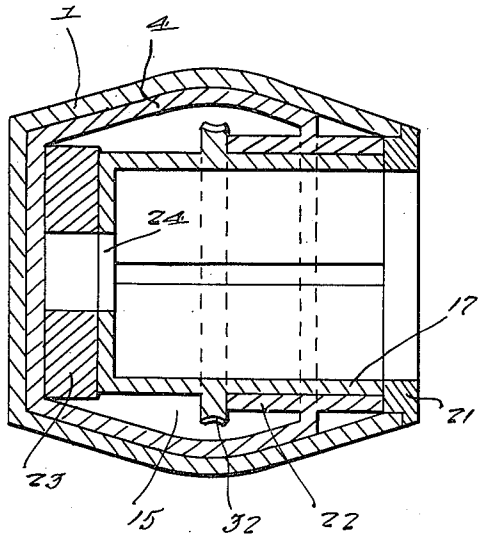
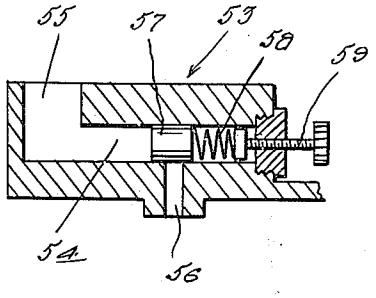


Fig. 2a

Fig. 10.



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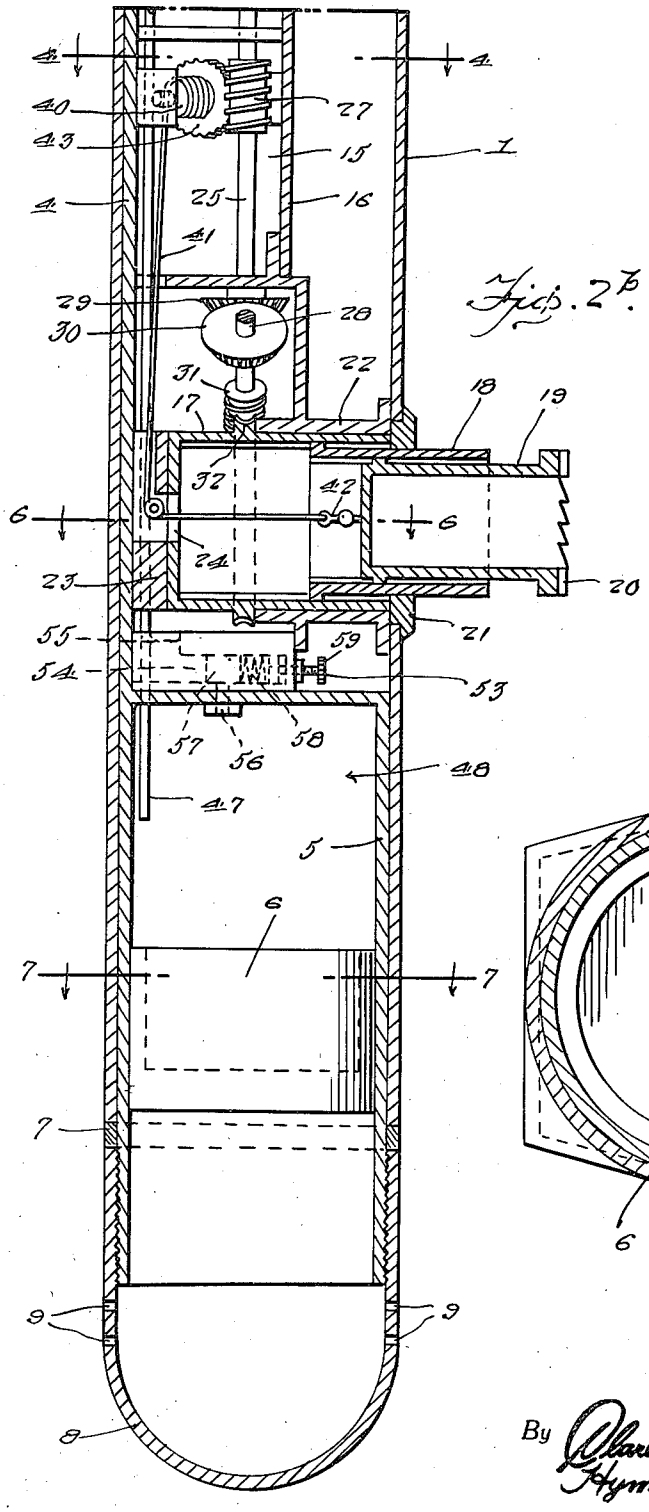


Fig. 2.

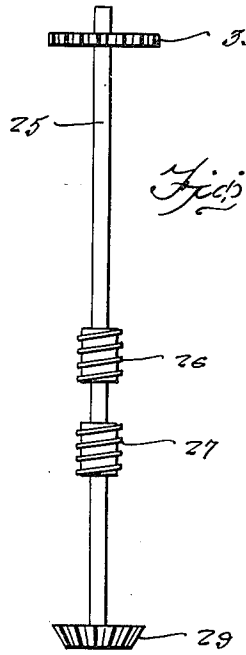
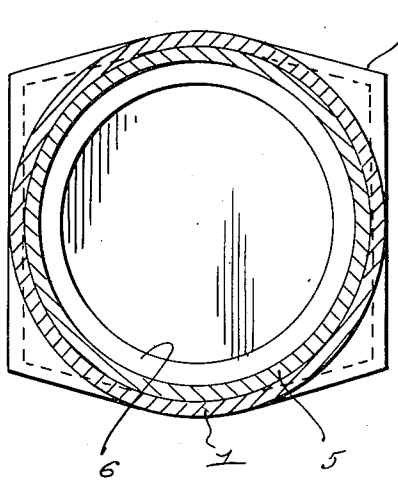


Fig. 11.

Fig. 7.



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SAMPLING MACHINE

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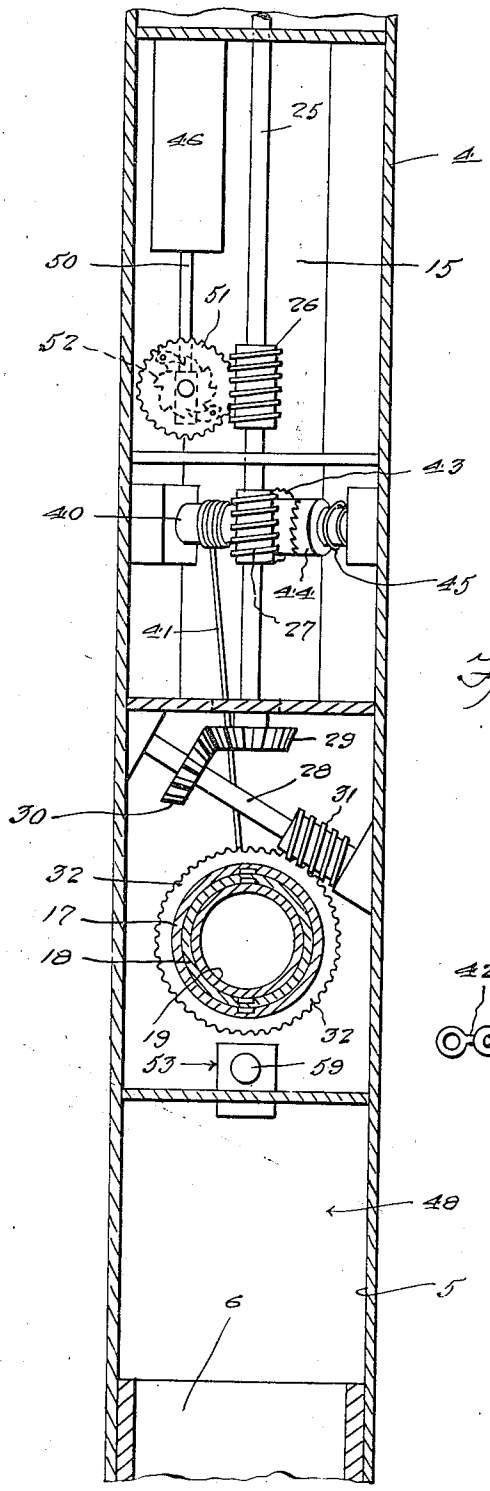


Fig. 8.

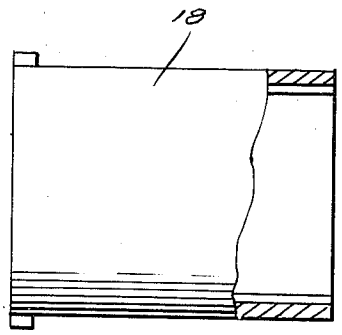
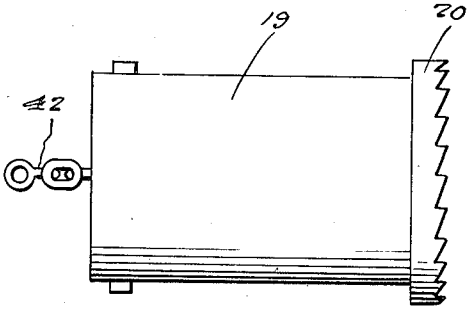


Fig. 3.

Fig. 9.



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2,067,693

UNITED STATES PATENT OFFICE

2,067,693

SAMPLING MACHINE

Ernest Comer Carey, Corpus Christi, Tex.

Application May 8, 1936, Serial No. 78,737

4 Claims. (Cl. 255—1)

The present invention relates to new and useful improvements in sampling machines and has for its primary object to provide, in a manner as hereinafter set forth, a device which is adapted to be lowered in bore holes for the purpose of obtaining samples of sub-surface formations at different levels.

Another important object of the invention is to provide, in a sampling machine of the aforementioned character including a slidable and rotary corer, novel hydraulic means for actuating said corer into engagement with the formation.

A further important object of the invention is to provide a sampling machine of the character described comprising novel means for rotating the corer and for retracting same.

Still another very important object of the invention is to provide means for automatically balancing the pressure of the fluid in the machine which projects the corer to operative position with the pressure of the fluid in the bore hole.

Other objects of the invention are to provide a sampling machine of the character set forth which will be comparatively simple in construction, strong, durable, highly efficient and reliable in use, compact, light in weight and which may be manufactured at low cost.

All of the foregoing and still further objects and advantages of the invention will become apparent from a study of the following specification, taken in connection with the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views and wherein:—

Figure 1 is a view in front elevation of a sampling machine constructed in accordance with the present invention.

Figure 2*a* is a vertical sectional view through the upper portion of the machine.

Figure 2*b* is a vertical sectional view through the lower portion of the machine.

Figure 3 is a view in vertical section through an intermediate portion of the machine, taken at right angles to Figures 2*a* and 2*b*, the casing being omitted.

Figure 4 is a horizontal sectional view, taken substantially on the line 4—4 of Figure 2*b*.

Figure 5 is a view in horizontal section, taken substantially on the line 5—5 of Figure 2*a*.

Figure 6 is a horizontal sectional view, taken substantially on the line 6—6 of Figure 2*b* with parts omitted.

Figure 7 is a view in horizontal section through the lower portion of the machine, taken substantially on the line 7—7 of Figure 2*b*.

Figure 8 is a detail view partially in side elevation and partially in cross-section of the slidable sleeve.

Figure 9 is a detail view in side elevation of the corer.

Figure 10 is a detail view in vertical section through the fluid pressure regulator.

Figure 11 is a detail view in elevation of the main shaft which drives the corer and the fluid pump.

Referring now to the drawings in detail, it will be seen that the embodiment of the invention which has been illustrated comprises an elongated casing 1 of suitable metal which is adapted to be lowered into a bore hole on a cable 2 which is anchored in the rounded upper end 3 of said casing. Mounted in the casing 1 is a removable frame 4 the lower portion of which is formed to provide a cylinder 5 in which a free piston 6 is mounted for reciprocation. Fixed on the cylinder 5 is a collar 7 beneath which a removable cap 8 is threadably mounted on said cylinder 5. The cap 8 is rounded and has formed therein openings 9 for the entrance beneath piston 6 of the fluid from the bore hole.

Mounted vertically on the upper portion of the frame 4 is an electric motor 10 which is provided with a reversible switch 11. Above the electric motor 10 a reel 12 is journaled on the frame 4 on which conductor wires 13 from a suitable source of current supply are wound. Means including conductors 14 electrically connect the switch 11 with the conductors 13 on the reel 12.

At an intermediate point, the frame 4 is constructed to provide what will be referred to as a closed high pressure chamber 15 to which access may be had through the medium of a removable front plate 16. Journaled transversely in the lower portion of the high pressure chamber 15 is a cylinder 17 which is open at its outer end and in which a sleeve 18 is splined. If desired, two or more of the sleeves 18 may be provided. Splined in the sleeve 18 is a substantially cup-shaped piston providing a corer 19 the outer end of which is open and has formed thereon an annular bit 20. A removable packing gland 21 prevents leakage around the sleeve 18 and at the outer end of the cylinder 17. The cylinder 17 is journaled in a radial bearing 22 and the inner end of said cylinder is engageable with a thrust bearing 23. It will be observed that an opening 24 in the inner end of the cylinder 17 establishes

communication between said cylinder and the chamber 15.

Mounted vertically in the chamber 15 and rising thereabove is a shaft 25 having fixed thereon at intermediate points worm gears 26 and 27. Journaled in the lower portion of the chamber 15 is an inclined shaft 28 (see Figure 3) which is driven by the shaft 25 through bevelled gears 29 and 30. A worm gear 31 is fixed on the shaft 28 and drives a worm gear 32 which encircles the cylinder 17 and is fixed thereto. A packing box 33 is provided where the shaft 25 leaves the upper portion of the chamber 15.

Mounted on the upper end of the construction which forms the chamber 15 is a bracket 34 (see Figures 2a and 5) which carries a substantially U-shaped bearing member 35. The lower end portion of the motor shaft 36 is journaled in the member 35, as is also the upper end portion of the shaft 25. Also journaled in the member 35 is a vertical counter shaft 37. Reduction gears 38 connect the shaft 37 to the motor shaft 36 and reduction gears 39 connect the shaft 25 to said counter shaft 37 for actuation thereby.

Referring now to Figures 2b, 3 and 4 of the drawings, it will be seen that a winch 40 is journaled horizontally in the chamber 15 on which a cable 41 is windable. The cable 41 extends through the opening 24 into the cylinder 17 and has its free ends secured by a swivel connection 42 to the closed inner end of the corer 19. A worm gear 43 is loosely mounted on the shaft which carries the winch 40, said gear 43 being in mesh with the lower worm gear 27 on the shaft 25. A spring actuated clutch 44 (see Figure 4) connects the winch 40 to the gear 43 for actuation thereby in one direction only. The one way clutch 44 is splined on the shaft 45 on which the winch 40 is fixed.

Mounted in the upper portion of the chamber 15 is a pump 46 the intake side of which is connected by a conduit 47 with a low pressure fluid supply chamber 48 in the cylinder 5 above the piston 6. A crankshaft 49 drives the pump 46 through a connecting rod 50. Loosely mounted on the crankshaft 49 is a worm gear 51 which is driven by the upper worm gear 26 on the shaft 25. A one way clutch 52 of the pawl and ratchet type connects the crankshaft 49 to the gear 51 for actuation in one direction only thereby. It may be well to here state that the one way clutches 44 and 52 function when the shaft 25 is driven in opposite directions by the reversible electric motor 10. The discharge side of the pump 46 communicates with the chamber 15.

In the lower end of the chamber 15 is an adjustable fluid pressure regulator which is designated generally by the reference numeral 53. Referring to Figures 2b and 10 of the drawings, it will be seen that the regulator 53 comprises a horizontal cylinder 54 communicating, at one end, with the chamber 15 for receiving fluid therefrom through a vertical passage 55. A vertical port 56 establishes communication between the cylinder 54 and the chamber 48. Slidable in the cylinder 54 is a piston valve 57 which controls the port 56. The valve 57 is yieldingly urged toward closed or operative position by a coil spring 58 the tension of which is adjusted as desired through the medium of a screw 59.

Briefly, the operation of the machine is substantially as follows:—

The chambers 15 and 48 are filled with the hydraulic corer projecting fluid in which the shaft 25, the gears 26, 27, etc., and the clutches run. With the sleeve 18 and the corer 19 in retracted position, the device is lowered in the bore hole on the cable 2 until the desired level is reached. Then, the electric motor 10 is energized for driving the shaft 25 in a direction to actuate the pump 46 for projecting the corer into engagement with the formation while at the same time rotating said corer. During this operation the cable 41 is simply paid out by the winch 40, said winch being disconnected from the shaft 25 by the clutch 44. When the sample has been obtained the electric motor 10 is reversed thereby disconnecting the pump 46 but connecting the winch 40 to the shaft 25 for actuation thereby in a direction to wind the cable 41 thereon, thus retracting the corer 19 and the sleeve 18. The device may then be withdrawn from the bore hole.

Fluid from the bore hole enters the lower end of the device through the openings 9 and exerts upward pressure on the piston 6. In this way, the pressure of the fluid in the chambers 15 and 48, the pump 46, the conduit 47, the cylinder 17, etc., is brought up to substantially the pressure of the fluid in the bore hole. It will thus be seen that without the pump 46 in operation the outward pressure against the corer 19 will substantially balance the inward pressure exerted on said corer by the bore hole fluid and substantially the only work left for the pump 46 is to overcome friction and press the corer 19 against the formation. This constitutes an important and highly desirable feature of the invention. Excess pressure of the fluid in the cylinder 17 against the corer 19 is relieved by the valve 57 which, when actuated against the tension of the spring 58, uncovers the port 56 thereby allowing return of the fluid to the supply chamber 48. The fluid pressure built up in the machine by the pump 46 against the corer 19 may be regulated as desired by adjusting the tension of the spring 58. Of course, when the corer 19 is retracted by the cable 41 the bit 20 picks up and returns the sleeve 18 to retracted position.

It is believed that the many advantages of a sampling machine constructed in accordance with the present invention will be readily understood, and although a preferred embodiment of the device is as illustrated and described, it is to be understood that changes in the details of construction and in the combination and arrangement of parts may be resorted to which will fall within the scope of the invention as claimed.

What is claimed is:—

1. A sampling machine of the class described comprising a casing, a corer rotatably and slidably mounted in said casing, means for rotating said corer, and hydraulic means for slidably actuating said corer to operative position.

2. A sampling machine of the class described comprising a casing, a corer rotatably and slidably mounted in said casing, a motor mounted in the casing, means operatively connecting said motor to the corer for rotating said corer, and hydraulic means operable by the motor for sliding said corer to operative position.

3. A sampling machine of the class described comprising a casing, a cylinder rotatably mounted in said casing, a sleeve splined in the cylinder and adapted to project from the casing, a corer splined in said sleeve, a shaft journaled in the casing, means for rotating said shaft in opposite directions, means operatively connecting the shaft to the cylinder for rotating said cylinder, hydraulic means operatively connected to the shaft

for actuation thereby when said shaft is rotated in one direction for sliding the corer to operative position, and means connected to said shaft for operation thereby when said shaft is rotated in the opposite direction for retracting the corer.

4. A sampling machine of the class described comprising a casing, a corer rotatably and slidably mounted in said casing, a motor mounted in the casing, hydraulic means operable by the motor for sliding the corer to operative position, means operatively connecting the motor to the corer for rotating said corer, and means operable by the motor for retracting the corer.

ERNEST COMER CAREY.