April 29, 1952 M. W. KRIEGEL 2,595,084

FLUID SAMPLER FOR WELL BORES

Filed Sept. 16, 1947 2 SHEETS—SHEET 1

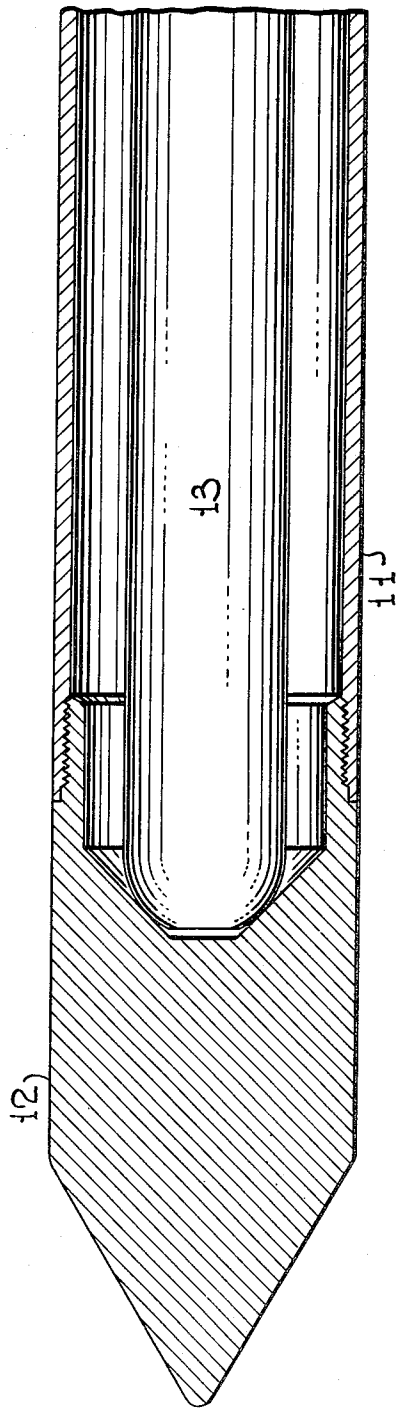


Fig. -1

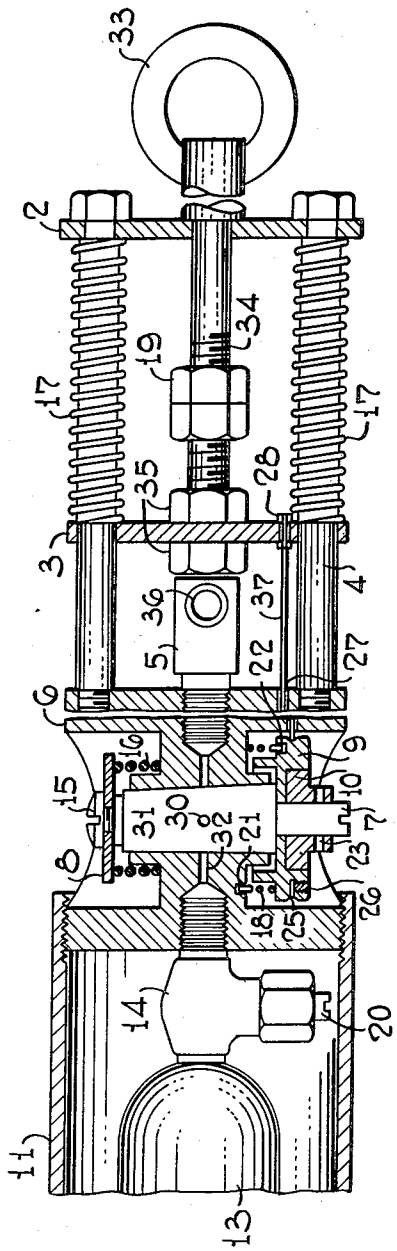


Fig. -1A

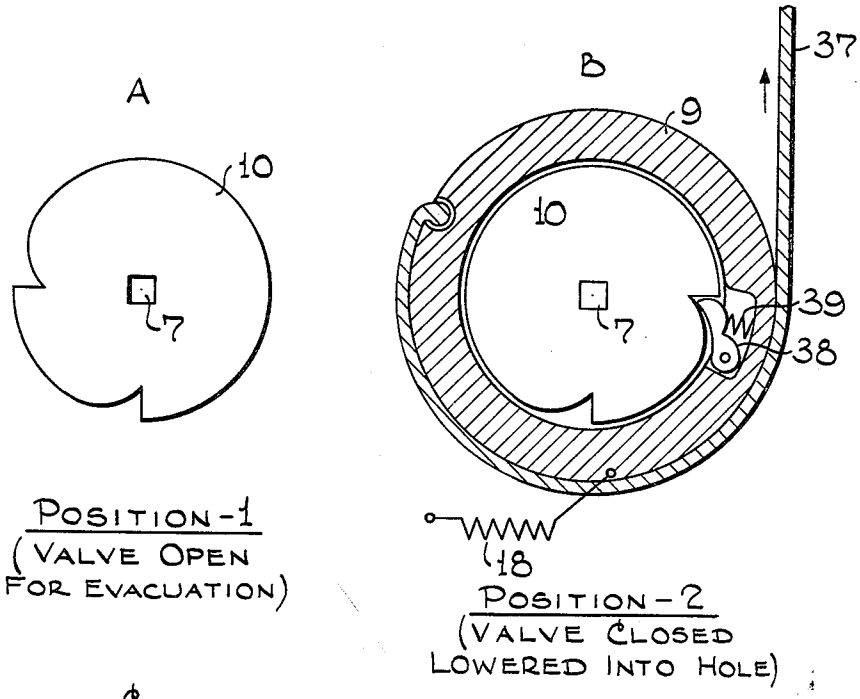
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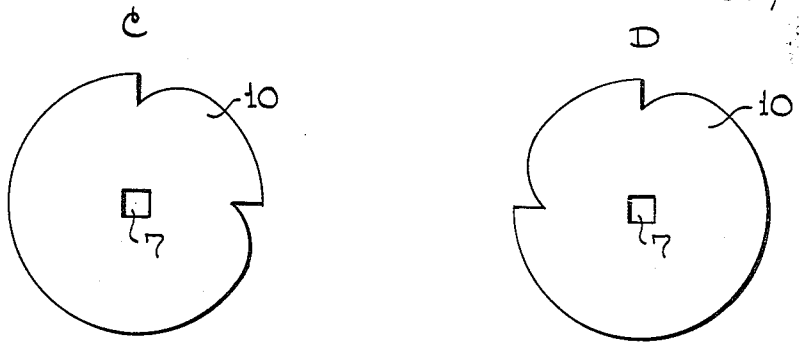
FLUID SAMPLER FOR WELL BORES

Filed Sept. 16, 1947 2 SHEETS—SHEET 2



POSITION-1
(VALVE OPEN FOR EVACUATION)

POSITION-2
(VALVE CLOSED LOWERED INTO HOLE)



POSITION-3
(VALVE OPENED AT BOTTOM OF HOLE)

POSITION-4
(VALVE CLOSED AT BOTTOM OF HOLE)

FIG.-2

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FLUID SAMPLER FOR WELL BORES

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2 Claims. (Cl. 166—1)

1

The present invention is concerned with an improved method and device for taking samples from the bottom-holes of wells and the like. The invention is more particularly concerned with a special device by which it is possible to take a sample at the bottom of a well hole and to transport this sample to the laboratory or desired destination point without exposing the sample between the point of taking the same and the point of destination. My invention comprises utilizing a particularly improved device which is characterized especially in that the sample container itself is detachable from the operating mechanism by which the valves are opened and closed at the appropriate time on the sample container.

In the petroleum industry, particularly in the refining and production of petroleum oils, it is very desirable and essential that samples be taken from the bottom of well holes, storage tanks and the like, in order to determine the characteristics of the fluid and thus govern subsequent drilling, producing or refining operations. For example, in the production of petroleum oils from relatively shallow or deep bore holes it is absolutely essential that samples of the subterranean fluid be secured. Various procedures have been directed toward securing representative samples in an economical manner. For instance one procedure is to lower into the bore hole a sample container comprising a rather complicated mechanism for the operation of the valves, which mechanism is an integral part of the sample container itself. It is thus necessary upon obtaining the sample to transport to the laboratory or other place of destination not only the sample container itself, but the mechanism which is designed to properly operate the necessary valves. This not only increases the cost of transportation, but in many instances the mechanism itself is damaged or impaired due to the excessive amount of transporting required. It is obvious that the cost of a particular sample container will be appreciably increased if it is necessary to design a valve operating mechanism as an integral part of each sample container. In order to overcome this disadvantage to some degree, whenever possible, it has been the practice to transfer the sample from the bottom-hole sampler utilized to less costly containers for transportation to the laboratory or place of destination. This transfer operation may impair the quality of the sample and in addition is costly and time consuming.

I have now discovered a method and device by

2

which these obstacles in bottom-hole sampling are substantially overcome. My device comprises a distinct and separate valve operating mechanism to which actual sample containers are readily and easily attached. The entire mechanism, comprising the valve operating device and the sample container itself, is lowered into the area in which it is desired to secure a sample. After the sample has been taken, the valve of the sample container itself is closed in the area in which the sample is taken and the entire mechanism then raised to the surface. The container containing the desired sample is detached from the valve operating mechanism and handled in any manner desired.

My invention and device may be readily understood by the drawings illustrating embodiments of the same. Figures 1 and 1*a* illustrate the device, showing both the valve operating mechanism and the detachable sample container, Figure 1*a* being an upper continuation of Figure 1. Figure 2 illustrates various positions of the plug valve designed to secure proper sampling.

Referring specifically to Figures 1 and 1*a*, 13 designates the sample container itself which is positioned in a supporting case 11. The supporting case is so designed as to give proper support to the sample container 13. It is preferred that the supporting case comprise a cylindrical element having a rather heavy nose section 12 into which the end of the sampling container snugly fits. Attached to the upper end of the sample container 13 is a valve 14, the position of which may be regulated by regulating element 20.

The upper end of valve 14 comprises a threaded element which is securely screwed into the head section 6 of supporting chamber 11. Head section 6 is detachably fastened to supporting case 11 by suitable threads to provide for removal of sample container 13 and to ensure adequate support for the same when it is in place within case 11. Supporting case 11 may be readily detached from head section 6 by unscrewing the same.

Sampling container 13 and valve 14 are also readily removable from the head section 6. Valve 31 is positioned in head section 6. The operation of valve 31, which comprises a plug valve or equivalent, will be hereinafter described. Valve 31 comprises a plug unit containing a suitable port 30 which will enable fluid to flow through valve 31, down conduit 32 in section plate 6, through valve 14 and into sample chamber 13. It will be seen that valve 31 is tapered

and that it is held in place by compression spring 16 and washer 8, the latter being attached to the smaller end of the plug by screw 15.

The position of the plug valve 31, which determines whether it is open or closed, is actuated by a rotating element 10, which action is also hereinafter described. Valve 31 can also be operated manually by turning shank 7. A pin 23 holds element 10 in place on shank 7. The top of the head section 6 is rigidly attached to guide rod elements 4. The guide rod elements 4 are rigidly attached to top plate 2.

Bolt 34 contains a ring segment 33 at the top by means of which the entire mechanism may be raised or lowered. Bolt 34 moves freely through fixed top plate 2 and is rigidly attached to movable plate 3 by means of nuts 35. Movable plate 3 moves freely along guide rods 4. Two spring elements 17 are positioned on the guide rods 4 between movable plate 3 and fixed top plate 2. Adjustable stop nuts 19 are attached to bolt element 34 as illustrated. A port assembly 5 having a sample port 36 is rigidly attached to the top of head section 6 through which fluids enter and flow through valve 31, conduit 32, valve 14 and into container 13.

The operation of my device is as follows. The sample container 13 is attached to the bottom of head section 6 and valve 14 opened by operating means 20. The supporting case 11 is then attached to the head section 6. At this point valve 31 is opened and sample container 13 evacuated through port 36. After evacuation of the sample container to the desired degree, valve 31 is closed by turning shank 7.

The device is then lowered to the area wherein it is desired to collect the fluid sample. At this point ring 33 is jerked by the lowering means. This jerking, due to the inertia of the device, will cause movable plate 3 to move upward along guide posts 4 against the action of springs 17. The extent to which the movable plate 3 moves along the guide posts is determined by the distance between nut 19 and fixed plate 2. The upward motion of plate 3 relative to valve 31 is utilized to operate valve 31 by means of valve operating element 10. This motion is transferred to element 10 through flexible line or wire 37 which is attached at one end to movable plate 3 by fastening means 28. Line 37 passes through opening 27 in head section 6 and around groove 25 in operating plate 9 to a fastening-set-screw 26. Motion of line 37 acts to rotate plate 9, element 10, and shank 7, as will be more fully explained in conjunction with the description of Figure 2. The rotation of plate 9 is opposed by coil spring 18 whose ends are bent and inserted in recesses 21 and 22 in head section 6 and control plate 9 respectively. The action of spring 18 will also be more fully understood from Figure 2. Upon opening of the valve 31, the fluid sample will flow through port 36, down through valve 31 into sample cylinder 13. After a sufficient time has elapsed in order to secure the desired quantity of sample, ring 33 is again jerked and valve 31 closed as described. The entire mechanism is raised to the surface, case 11 is removed, and valve 14 closed by operating means 20. The sample container is then removed from the head section 6.

The operation of valve 31 by operating means 10 is illustrated by sketches A, B, C, and D of Figure 2, showing four operating positions of the valve. As in Figure 1, shank 7 is attached to operating element 10 which comprises a notched plate having at least two notches as shown. Notched plate 10 is positioned to control plate 9 by lock means 38 as shown in sketch B, which also shows the manner in which the wire or flexible transmitting means 37 operates to rotate plate 9. Latching means 38 is pivotally attached to plate 9 and is designed to catch the notches of plate 10, which plate controls the rotational position of valve 31 and thus determines whether the valve is open or closed. Latch means 38 is urged into engagement with the notches in plate 10 by spring means 39. In the position shown by sketch B the valve 31 is closed. After the device has been lowered to the bottom of the hole and jerked as described, a force will be transmitted through means 37 to plate 9 causing it to rotate in a counterclockwise direction. Due to the fact that plate 9 is latched to plate 10 by means of latching means 38, this force is transmitted to plate 10 causing it to rotate in a counterclockwise direction. This in turn rotates plug valve 31 to an open position.

As this device comes into equilibrium, springs 17 positioned on guide post 4 react, forcing the movable plate 3 downwardly into its original position prior to the jerking action. At this point, transmitting means 37 becomes slack. Acting against the counterclockwise motion of plate 9 is a coil spring means 18, which as previously described is attached at its ends to plate 9 and head section 6. Thus as line 37 slackens, plate 9 will be rotated in a clockwise direction, and latching means 38 will be dropped back into the second notch of plate 10 which will be in the position illustrated by sketch C. After a sufficient time has been permitted to elapse so as to secure the desired amount of sample, ring means 33 is again jerked and the action is as described hereinbefore. The valve will be closed by the rotation of plate 10 which closes valve 31. The position of plate 10 upon the closure of the valve by the second jerking motion is as shown in sketch D.

It is to be understood that modifications within the general concept of my invention may be employed. For example, the device may be made up of any suitable material, and equivalent valves and the like may be employed. Although my invention is particularly directed toward securing samples in bore holes, it is to be understood that it may be readily adapted to securing fluid samples from any fluid body.

The invention is not to be limited by any theory as to mode of operation, but only in and by the following claims.

What is claimed is:

1. A device for taking fluid samples from a well bore comprising a head section, a first valve contained in said head section and provided with at least two fluid ports, a sample container detachably connected to said head section, said sample container having an opening fitting into one of said fluid ports in said head section valve, a second valve in said sample container adapted to close said opening, vertical guide rods attached to said head section, a fixed plate attached to the top of said guide rods and provided with a central opening, a bolt slidably fitted into said central opening, a movable plate attached to the bottom of said bolt, spring means placed between said fixed plate and said movable plate, means for attaching said bolt to a suspending cable, and means for communicating motion from said movable plate to said head section valve whereby said last-named valve will

be actuated upon the imparting of a jerking motion to a supporting cable to which said bolt is attached.

2. Device according to claim 1 in which said head section valve is a plug valve and in which said means for communicating motion from said movable plate to actuate said head section valve comprises a notched plate attached to the plug element of said plug valve, said notched plate having at least two notches in its periphery, a control plate disposed for rotation in a plane substantially perpendicular to the rotational axis of said plug element and having a central opening receiving said notched plate, latching means attached to said control plate adjacent its central opening and adapted to engage a notch on said notched plate, and means for communicating vertical motion of said movable plate into rotational motion of said control plate in its plane of rotation.

MONROE W. KRIEGEL.

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