July 12, 1927. 1,635,340

L. H. PERRY ET AL

FORMATION THIEF

Filed June 21, 1926

Fig. 1.

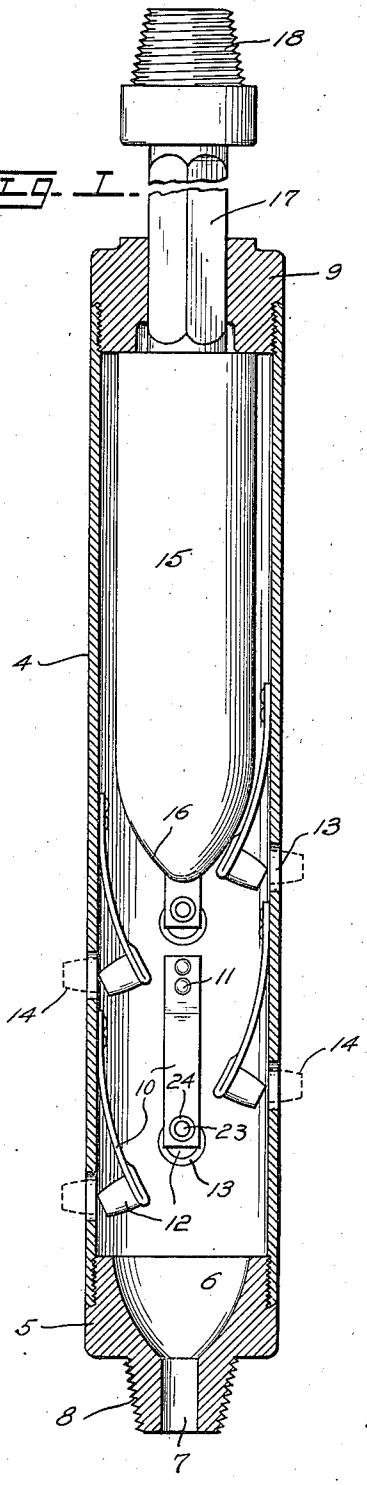


Fig. 2.

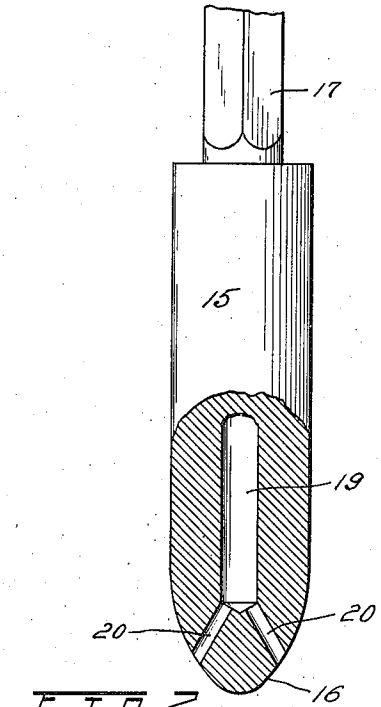
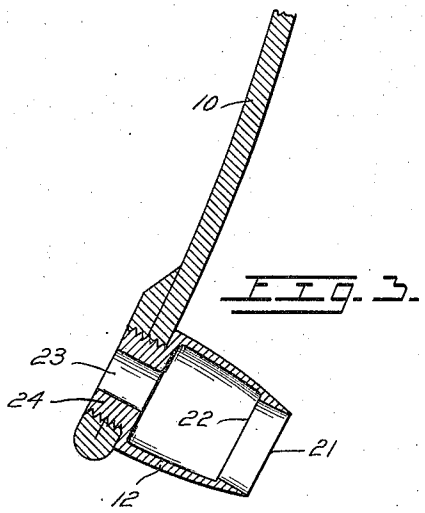


Fig. 3.



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UNITED STATES PATENT OFFICE.

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FORMATION THIEF.

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In this specification, and the accompanying drawing, we will describe and show a preferred form of our invention, and specifically mention certain of its more important objects. We do not limit ourselves to the forms disclosed, since various changes and adaptations may be made therein without departing from the essence of our invention as hereinafter claimed; and objects and advantages, other than those specifically mentioned, are included within its scope.

Our invention relates to means for obtaining samples of the penetrated formation in deep wells and the like. Its principal objects include; first, to provide a device adapted for obtaining samples of material from the walls of drilled wells at any desired depth; second, to provide positive means for taking said samples at a pre-determined distance above the bottom of the well; and, third, to accomplish the stated objects by means of a simple and relatively inexpensive device that is adapted for use with both rotary and standard drilling rigs.

Our objects are attained in the manner illustrated in the accompanying drawing, in which—

Figure 1 is an elevation of our invention in central longitudinal section;

Figure 2 is an elevation of the plunger of the tool with its lower end broken away to show its interior construction; and

Figure 3 is an enlarged elevation of one of the thieves of the device in central longitudinal section.

Similar reference numerals refer to similar parts throughout the several views.

In the drilling of deep wells it frequently is of the greatest importance to obtain an accurate knowledge of the formation that has been passed through. Thus, in plugging back a hole that has been drilled too deep, it is essential to know what formation the pipe is being cemented into. It often happens that in coring operations a full recovery of the core is not obtained, and the formation record is thus lost or is incomplete. Our device permits of sampling the formation in the walls of a drilled well at any desired depth, and of positively recovering such samples.

Our invention comprises a tubular housing 4 of slightly less diameter than the bore of the well. The lower end of the housing is fitted with a bushing 5 having a concaved upper surface 6, an axial circulation passage 7, and a screw pin 8 for attaching tool joints or pipe at its lower extremity. At the upper end of the housing is a somewhat similar bushing 9 which is removable for assembling and disassembling purposes, and which is provided with a co-axial seat for a square shaft adapted to reciprocate therethrough.

Within the housing are a plurality of curved bar springs 10 having their upper extremities attached to the housing wall, as at 11, and provided with sampling thieves 12 mounted at their free ends. The housing is pierced with holes 13 sufficiently large to allow the thieves to extend through the walls to positions shown dotted at 14, when the springs are pressed outwardly. The embodiment of our invention illustrated is provided with eight such thieves distributed helically upon the housing.

The thieves are adapted for being pressed outwardly by means of a plunger 15 having a convex nose 16, adapted for seating upon surface 6, and which may be reciprocated within the housing by means of the square shaft 17 which passes upwardly through bushing 9. A screw pin 18 at the top of the square shaft permits of suspending the whole device from a drill collar at the bottom of a tool string. The plunger and square shaft are axially bored for water circulation purposes, but bore 19 of the plunger terminates short of its lower extremity and has two or more lateral outlets 20 discharging at the convex surface of its nose near the point. The location of these outlets is such that they will be effectively closed when the plunger is seated upon surface 6.

The thieves 12 ordinarily are cup-shaped, with cutting edges 21 at their rims. There are one or more circumferential shoulders 22 on their inner surfaces for retaining the plugs of material that enter, and an axial hole 23 at the base of the cup permits water and mud to escape before the incoming material. The thieves are provided with screw-threaded shanks 24, and are screwed into correspondingly tapped holes in the free extremities of springs 10.

The method of operating our device may be illustrated as follows. The distance from the bottom of the well to the point where

samples are to be taken from the wall is first determined, and sufficient pipe is attached to pin 8 to permit of taking these samples when the pipe is bottomed in the well. The tool is then lowered in the well suspended from a tool string, and with the circulation pump running and discharging through passages 20. As soon as the pipe at the lower end of the device bottoms in the well, the plunger 15 will descend within the housing and force all of the thieves outwardly and into the formation of the side walls of the well. When the plunger seats itself upon surface 6 the circulation from the pumps through passages 20 is immediately shut off, and this will afford a positive indication that the thieves have been pressed outwardly at the proper point into the side wall formation. The tool string may then be pulled upwardly to raise plunger 15 until it engages bushing 9. The tool can then be withdrawn from the well since the thieves will have been retracted by their springs 10. When the thieves are examined after withdrawal it will be found that they contain plugs of material comprising the formation of the side walls of the well at the points sampled.

We desire to point out particularly that the pump circulation can not be shut off until plunger 15 has seated upon surface 6 and every thief has been forced outwardly into the formation. This gives the operator positive assurance that the device has functioned properly at the desired point in the well.

Having thus fully described our invention we claim:—

1. A device of the character described comprising; a tubular housing having lateral apertures; sampling thieves resiliently mounted within the housing; and means for pressing said thieves outwardly through said apertures.

2. A device of the character described comprising; a tubular housing having lateral apertures; sampling thieves resiliently mounted within the housing; and a reciprocal plunger within the housing adapted for pressing said thieves outwardly through said apertures.

3. A device of the character described comprising; a tubular housing having lateral apertures; arcuate springs terminally attached to the interior wall of the housing with free ends opposite said apertures; sampling thieves adapted for extending through the apertures mounted on the outer side of said free ends; and a reciprocal plunger within the housing adapted for pressing said free ends outwardly to cause the thieves to project beyond the housing.

4. A device of the character described comprising; a cylindrical housing having lateral apertures; a lower bushing in the housing having a central orifice therethrough and an inner seating surface surrounding the orifice; sampling thieves resiliently mounted within the housing; and a plunger reciprocally mounted within the housing adapted for pressing said thieves outwardly through said apertures, and for then becoming seated upon said surface; said plunger having a circulating passage therethrough having outlets at its seating surface only.

5. A device of the character described comprising; a cylindrical housing having lateral apertures and a head with an inner concave seating surface thereon; sampling thieves resiliently mounted within the housing; and a reciprocal plunger with a convex nose within the housing adapted for pressing said thieves outwardly through said apertures, and for then seating its nose upon said surface; said plunger having a stem extending through the other head of the housing; and said stem and plunger having communicating circulating passages therethrough terminating at the seating surface on the nose of the plunger.

6. A construction as set forth in claim 1 wherein the thieves consist of sharp rimmed cups having interior annular shoulders.

7. A construction as set forth in claim 1 wherein the thieves consist of sharp rimmed cups with outlets at the bottom and having interior annular shoulders.

8. The construction set forth in claim 2 in combination with means for determining at a remote point when the plunger has reached the end of its stroke for pressing the thieves outwardly.

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