July 21, 1953 H. E. HYLBAK 2,646,252

WELL CASING SOIL SAMPLER

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FIG. 1.

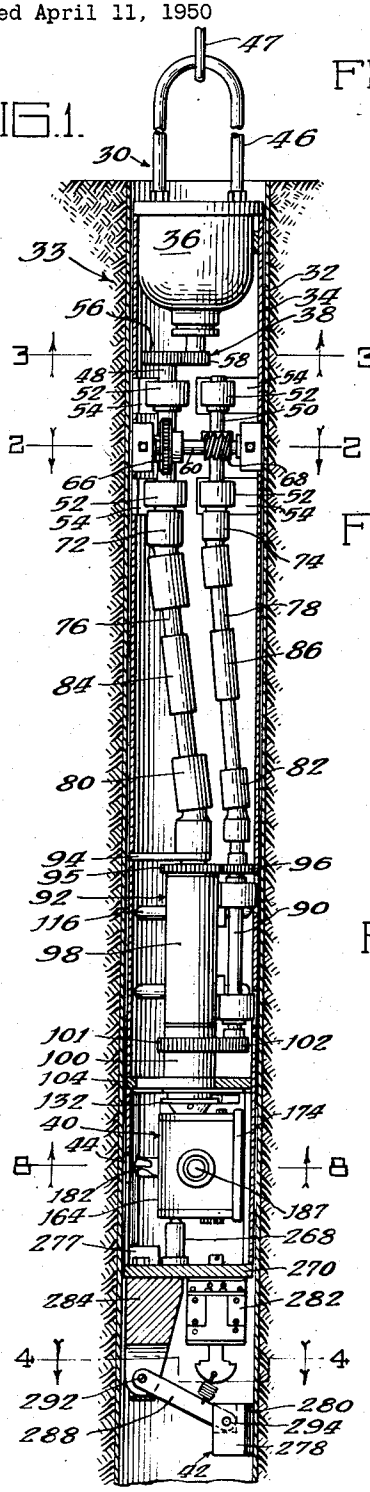


FIG. 2.

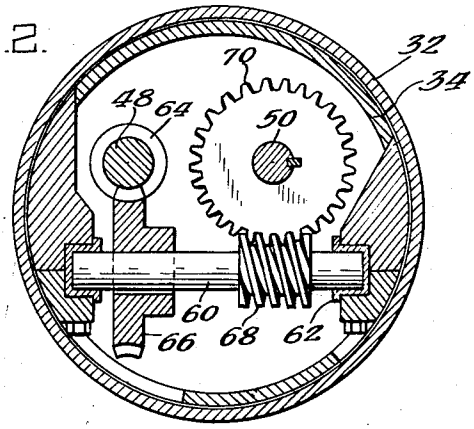


FIG. 3.

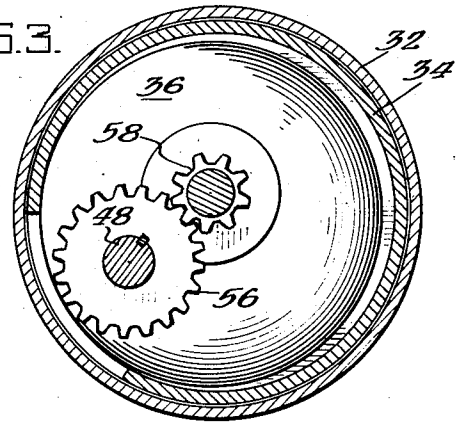
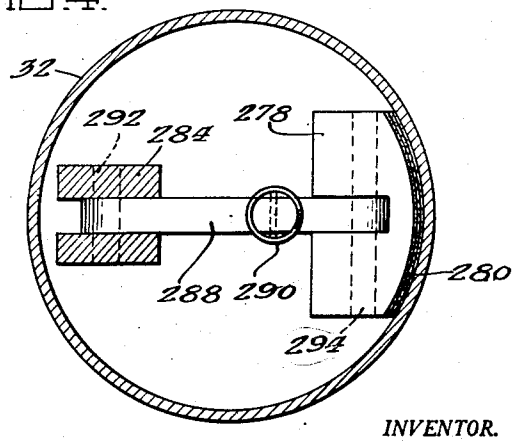


FIG. 4.



INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney.

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WELL CASING SOIL SAMPLER

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FIG. 5.

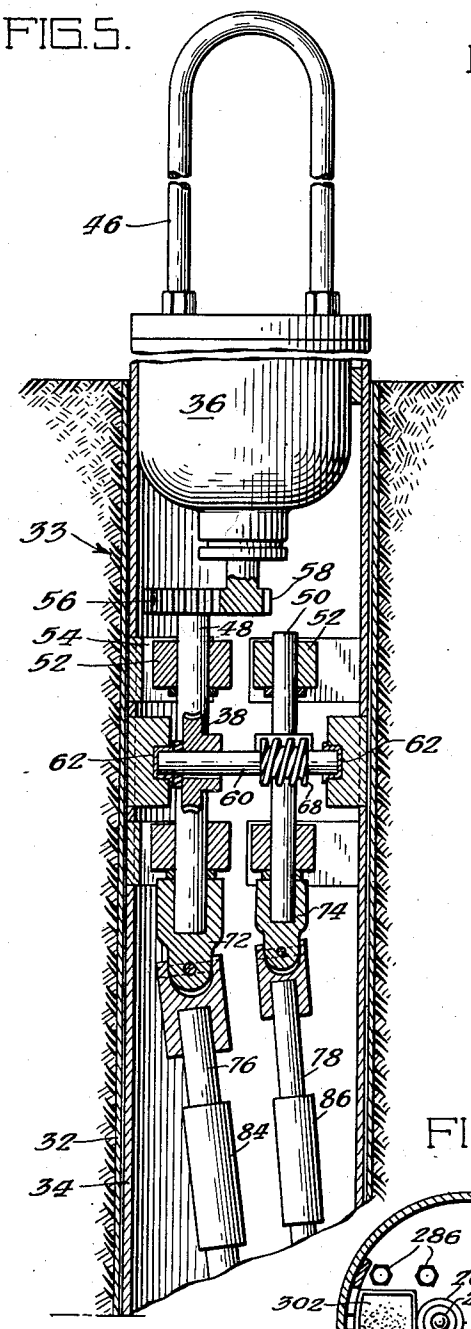


FIG. 6.

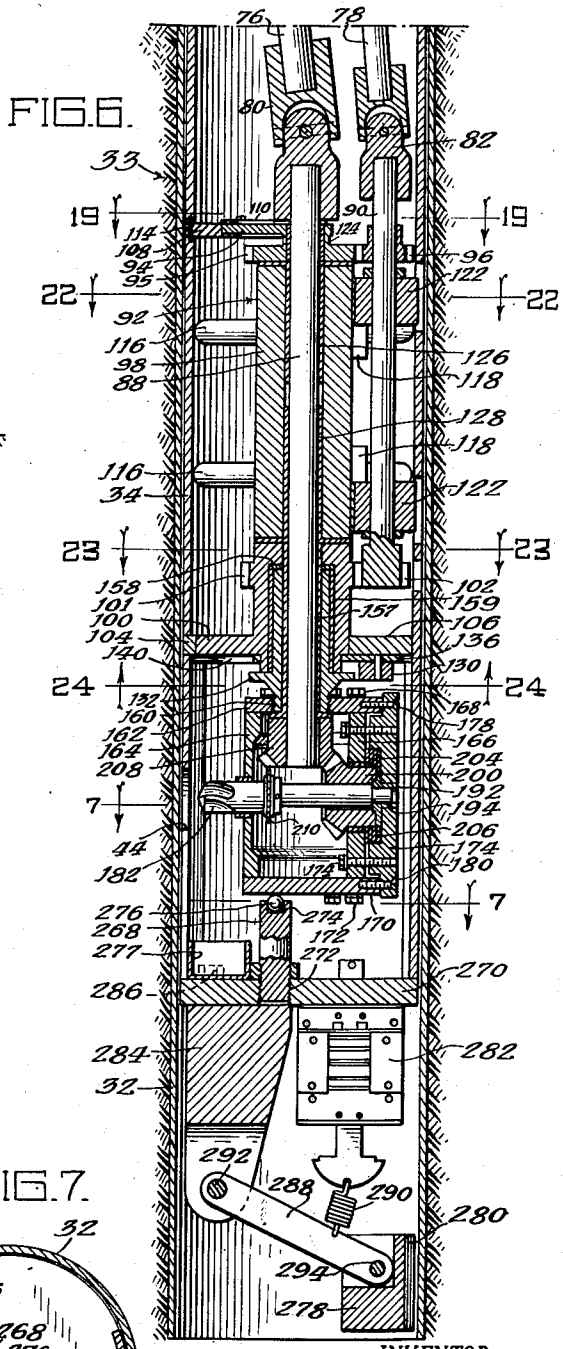
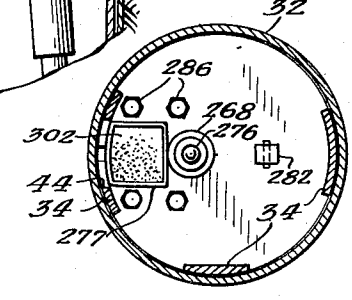


FIG. 7.



INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney

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FIG. 8.

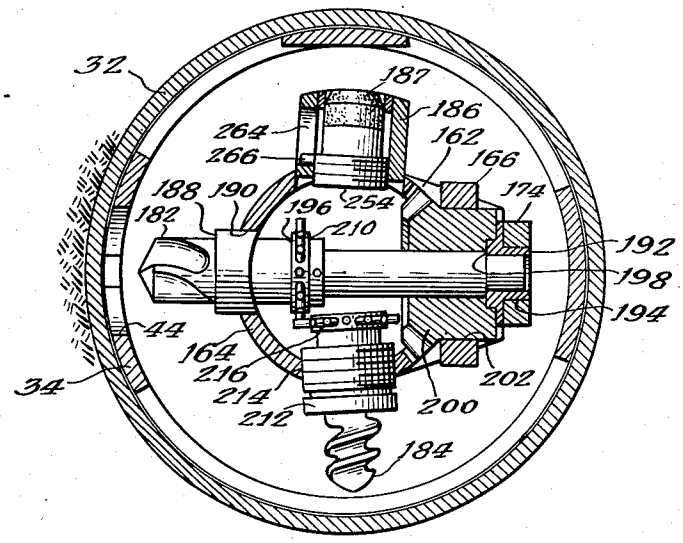
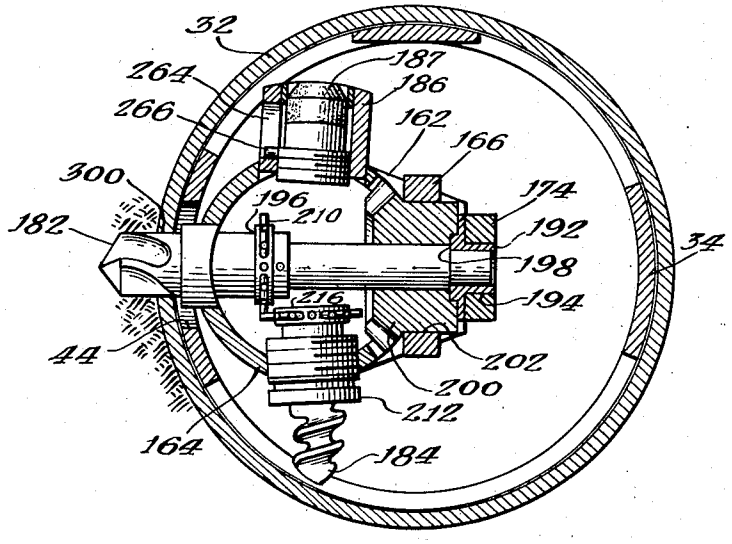


FIG. 9.



INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney

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FIG.10.

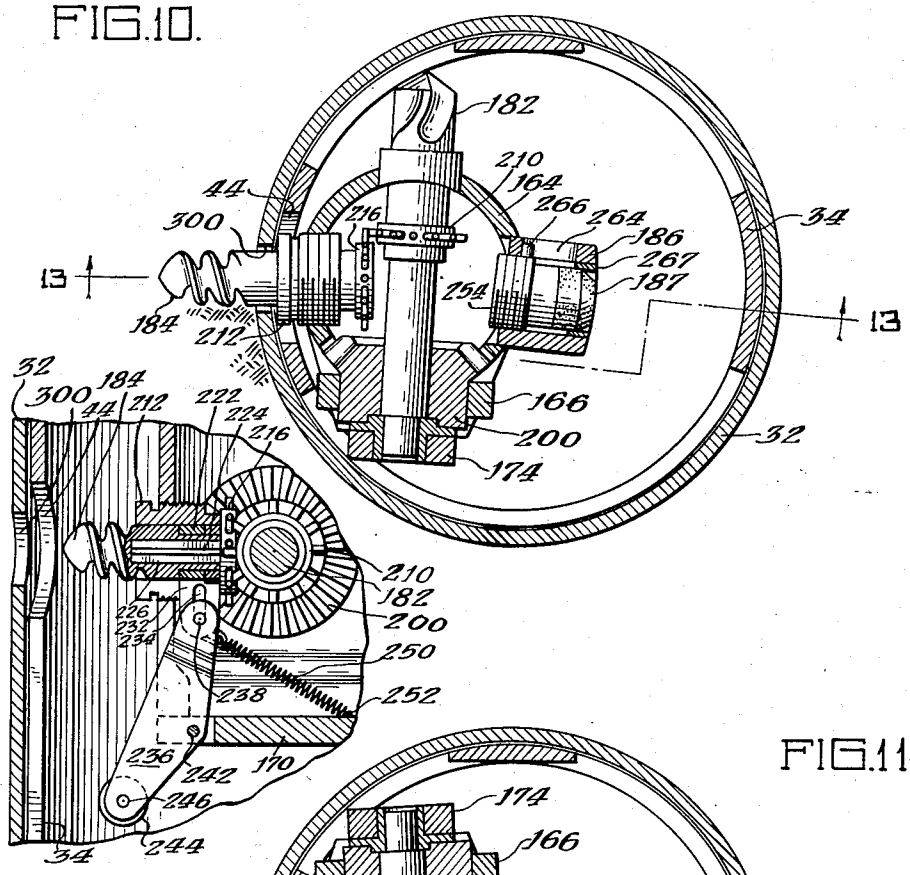


FIG.11.

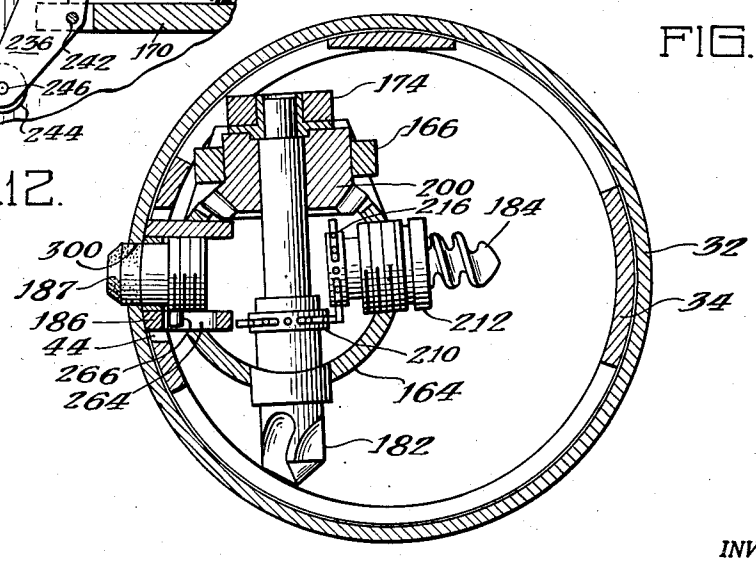


FIG.12.

INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney

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FIG. 13.

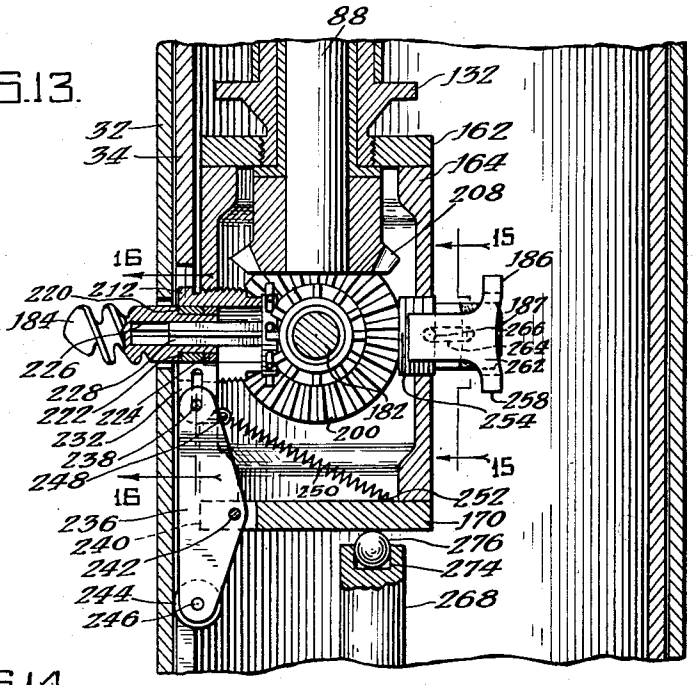


FIG. 18.

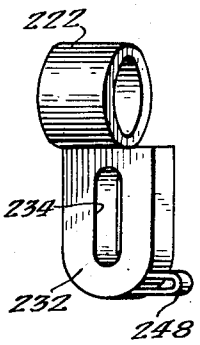


FIG. 14.

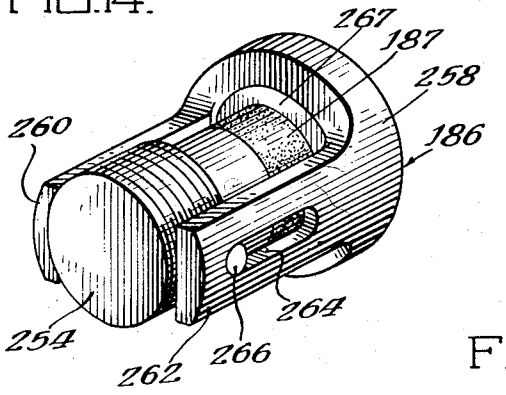


FIG. 15.

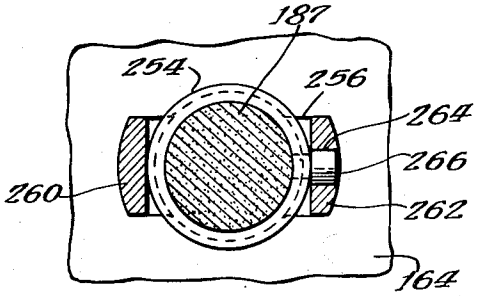


FIG. 17.

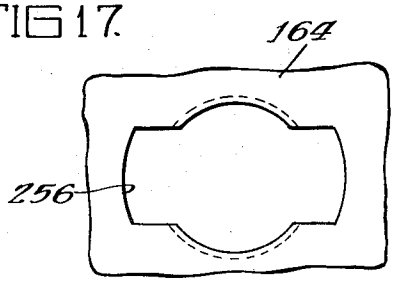
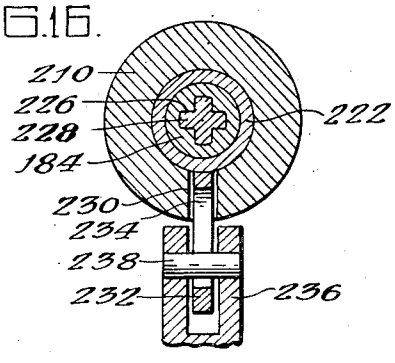


FIG. 16.



INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney.

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FIG. 19.

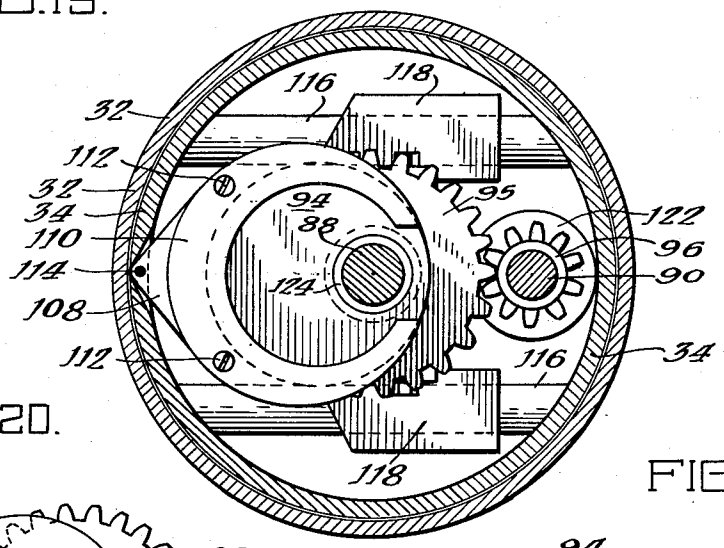


FIG. 20.

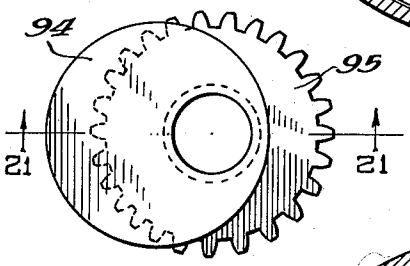


FIG 21.

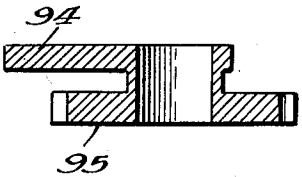
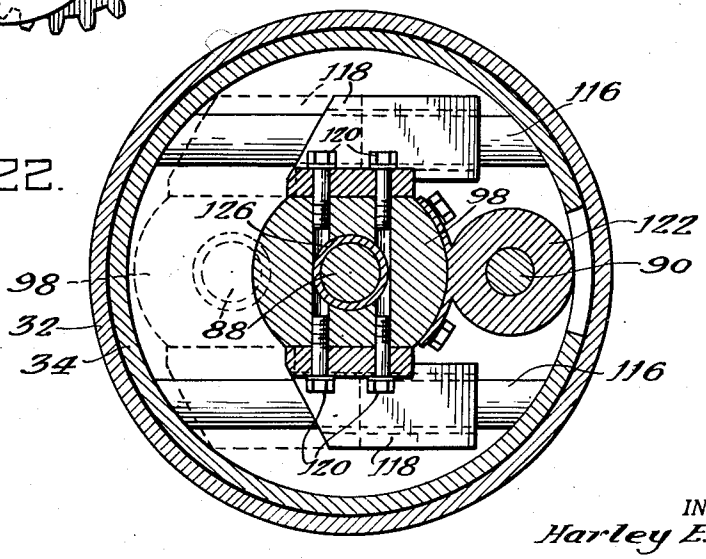


FIG. 22.



INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney

July 21, 1953 H. E. HYLBAK 2,646,252

WELL CASING SOIL SAMPLER

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FIG. 23.

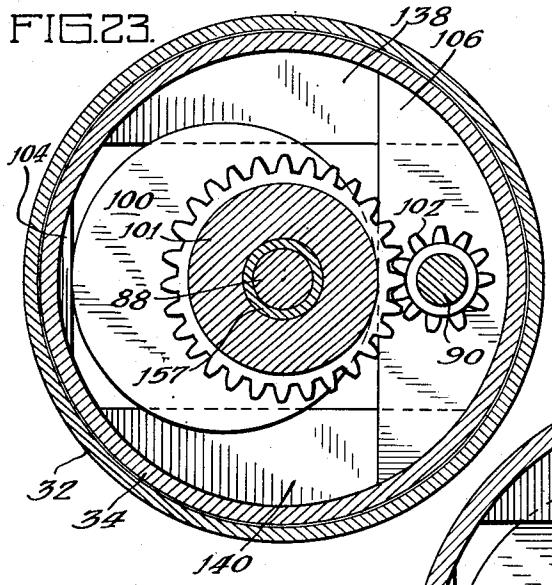
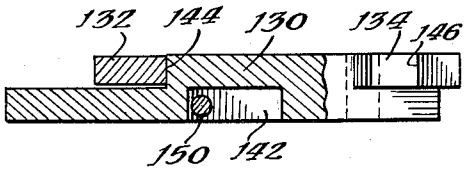


FIG. 26.



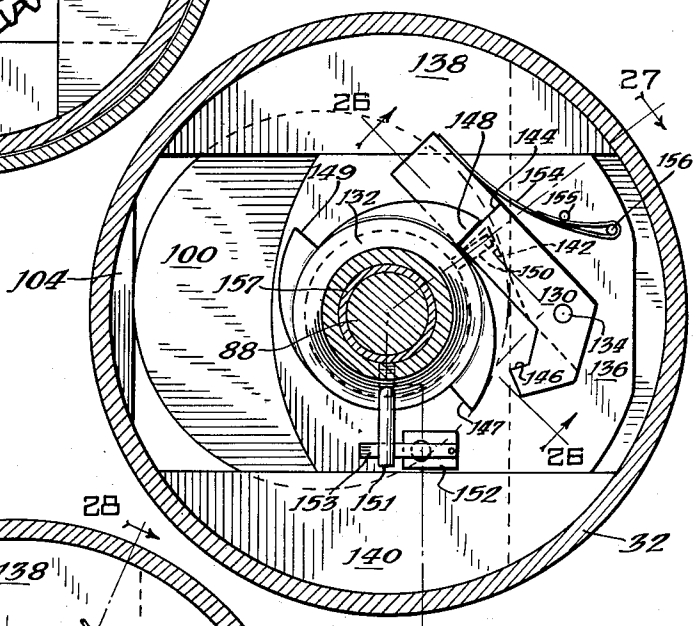
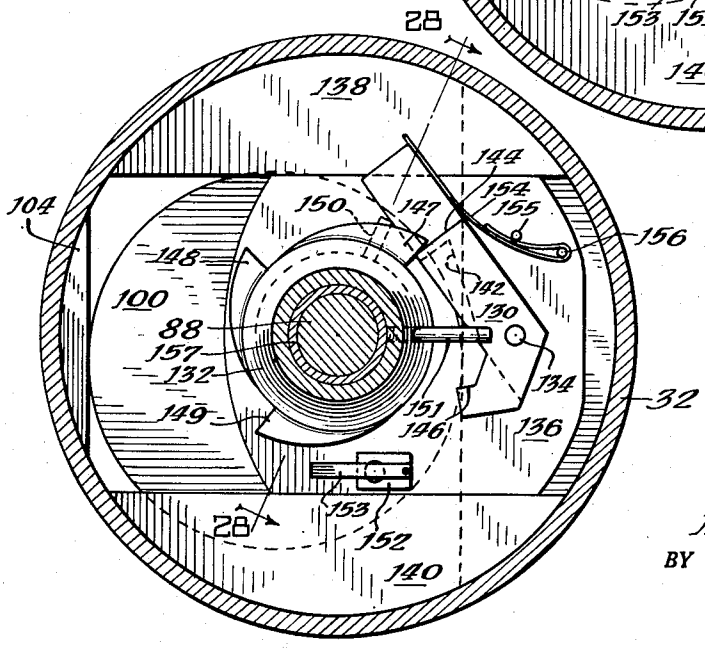


FIG. 24.



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FIG. 25.

INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney

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FIG. 27.

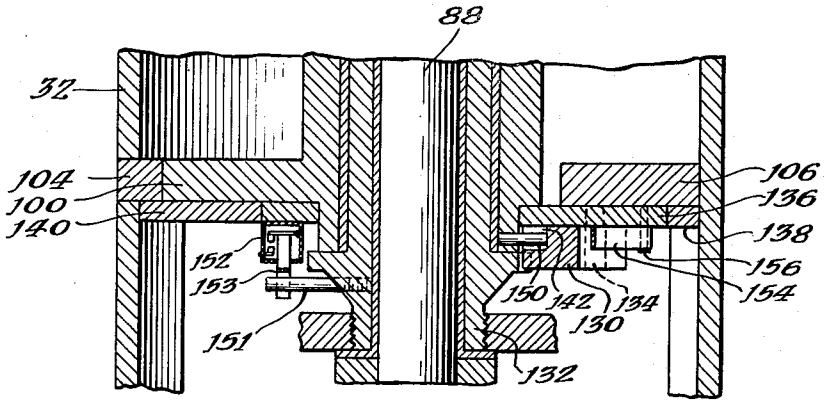


FIG. 29.

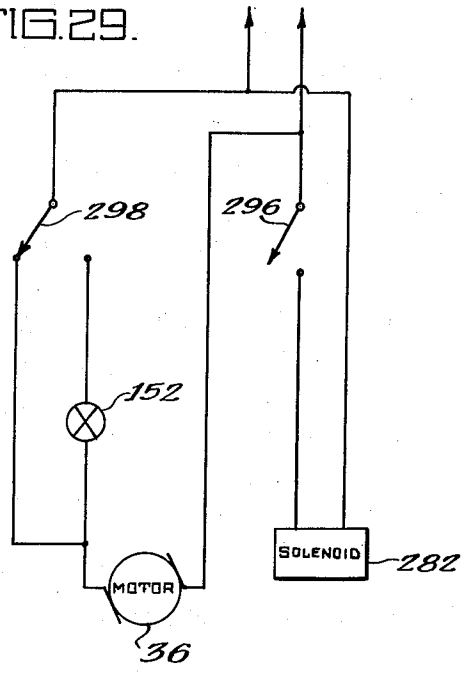
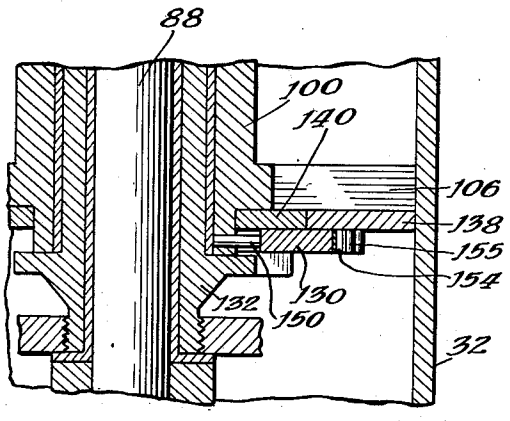


FIG. 28.



INVENTOR.
Harley E. Hylbak
BY
Roland A. Anderson
Attorney

Patented July 21, 1953 2,646,252

UNITED STATES PATENT OFFICE

2,646,252

WELL CASING SOIL SAMPLER

Harley E. Hylbak, Richland, Wash., assignor to the United States of America as represented by the United States Atomic Energy Commission

Application April 11, 1950, Serial No. 155,327

8 Claims. (Cl. 255—1.4)

1

This invention relates to an apparatus for taking samples from the sides of wells. The invention is particularly applicable to taking such samples in wells with metal pipe casings.

During the drilling and operation of wells or drill holes it is frequently desirable to know the composition of the various strata through which the well passes. This information can be acquired by taking samples at whatever levels are necessary. Where the well sides are not encased in metal pipe or other material, the problem of taking specimens is relatively simple when compared with encased wells. It is the primary purpose of this invention to provide apparatus for obtaining specimens from wells having such casings at whatever level is desired.

This invention provides fundamentally a drill bit, an auger bit, and a plugging ram which are mounted on a turret head. In turn the turret head is attached to a cam, the entire mechanism being enclosed in a housing adapted to be lowered into a well. Upon the first revolution of the cam, the turret head is moved from the center of the housing toward the well casing with the revolving drill bit in the advanced position. As the cam passes through its position of maximum advancement the drill bit completes the perforation of the casing and begins to retract into the housing. Upon complete retraction the cam has compelted one revolution and a pawl and ratchet are activated to rotate the turret to a second position with the auger bit poised for operation. As the cam moves through a second revolution the auger bit passes beyond the perforation of the casing into the soil from which a specimen is drawn into a receptacle in the housing. The completion of the second revolution has the auger bit fully retracted and the pawl and ratchet again cause the turret to rotate to a third position with the plugging ram set for operation. As the cam continues to rotate the ram comes into alignment with the perforation of the casing and forces a plug made of lead or other suitable material into the perforation. With complete retraction of the ram an automatic shut-off switch stops the motor operating the mechanism and then the apparatus may be raised from the well.

For better explanation, reference is made herein to the accompanying drawings, wherein:

Figure 1 is an elevational view partly in section of a machine constituting an embodiment of the invention showing the disposition of the machine in a well;

Figure 2 is a horizontal sectional view partly in elevation taken on the line 2—2 of Figure 1;

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Figure 3 is a horizontal sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a horizontal sectional view partly in elevation taken on the line 4—4 of Figure 1;

Figure 5 is an enlarged vertical sectional view partly in elevation of the upper portion of the machine;

Figure 6 is an enlarged vertical sectional view partly in elevation of the lower portion of the machine;

Figure 7 is a horizontal view partly in section of the sample cup taken on the line 7—7 of Figure 6;

Figure 8 is a horizontal view partly in elevation of the turret head in the retracted position, taken on the line 8—8 of Figure 1;

Figure 9 is a horizontal sectional view partly in elevation of the turret head with the drill bit in the advanced position;

Figure 10 is a horizontal sectional view partly in elevation of the turret head with the auger bit in the advanced position;

Figure 11 is a horizontal sectional view partly in elevation of the turret head with the plugging ram in the advanced position;

Figure 12 is a vertical sectional view partly in elevation of the auger bit in the retracted position;

Figure 13 is a vertical sectional view partly in elevation of the turret head with the auger bit in the advanced position taken on the line 13—13 of Figure 10;

Figure 14 is a perspective view of the plugging ram with the plug lodged therein;

Figure 15 is an enlarged sectional view of the plugging ram taken on the line 15—15 of Figure 13;

Figure 16 is an enlarged sectional view of the auger bit taken on the line 16—16 of Figure 13;

Figure 17 is an enlarged elevational view of the ram slot in the casing of the turret head;

Figure 18 is a perspective view of the sleeve for the auger bit;

Figure 19 is a horizontal sectional view partly in elevation of the cam mechanism taken on the line 19—19 of Figure 6;

Figure 20 is an enlarged plan view of the cam removed from the Figure 19;

Figure 21 is a vertical sectional view of the cam taken on the line 21—21 of Figure 20;

Figure 22 is a horizontal sectional view partly in elevation in the retracted position together with the advanced position shown in dotted lines taken on line 22—22 of Figure 6;

Figure 23 is a horizontal sectional view partly in elevation taken on the line 23—23 of Figure 6;

Figure 24 is a horizontal sectional view partly in elevation of the pawl and ratchet showing the means for actuating the pawl taken on the line 24—24 of Figure 6;

Figure 25 is a horizontal sectional view partly in elevation of the pawl and ratchet taken on the line 24—24 of Figure 6;

Figure 26 is a vertical sectional view partly in elevation of the pawl and ratchet taken on the line 26—26 of Figure 25;

Figure 27 is a vertical sectional view partly in elevation taken on the line 27—27 of Figure 25;

Figure 28 is a vertical sectional view partly in elevation taken on the lines 28—28 of Figure 24; and

Figure 29 is a schematic wiring diagram.

Attention is directed more particularly to Figure 1 in which a soil sampler is generally indicated at 30, located within a well casing 32. This embodiment of the invention comprises a supporting unit generally indicated at 33 including a cylindrical housing 34, an electric motor 36, a motive means generally indicated at 38, a turret head 40, and a lock brake 42. An aperture 44 is disposed in the housing 34 at the level of the turret head 40. At the top of the housing a bail 46 is suspended on the end of a chain or cable 47 of a hoist not shown in the drawing. Under the bail attachment is the electric motor 36 which operates the device. In Figure 5 the motive means 38 beneath the motor comprises a drill drive shaft 48 and a cam drive shaft 50, both of which are journaled in bearings 52 attached to support members 54 of the housing. A reduction gear 56, giving approximately a 2:1 ratio, meshes with a pinion 58 on the end of the motor shaft (see also Fig. 3). As shown in Figures 2 and 5, the shaft 50 is driven by a drive take-off shaft 60 mounted in the housing 34. Power is conveyed from the shaft 48 by means of a worm 64 and worm wheel 66 on the take-off shaft 60. Another worm 68 on the shaft 60 engages the worm wheel 70 on the shaft 50. By this gearing the speed of the shaft 50 is established at .78 R. P. M. Referring now to Figures 5 and 6, the shafts 48 and 50 are connected by means of universal joints 72 and 74 to elongated shafts 76 and 78, the lower ends of which are attached to universal joints 80 and 82, respectively. Centrally of the shafts 76 and 78 are slip joints 84 and 86, respectively. The lower portions of the universal joints 80 and 82 are affixed to shafts 88 and 90 which are journaled to a reciprocating mechanism generally indicated at 92.

The reciprocating mechanism 92 comprises a cam 94 integral with a spur gear 95 which engages a gear 96 on the shaft 90, a frame 98, a cam 100 integral with a spur gear 101 which engages a pinion 102 on the lower end of the shaft 90 (see also Fig. 23), and cam guides 104 and 106 attached to the housing. With respect to the design of the cam 94 and the spur gear 95, reference is made to Figures 20 and 21. As shown in Figure 19, the cam 94 is contained in a cam housing 108 and a housing plate 110 attached to said housing by means of screws 112. The cam housing 108 is pivoted to the housing 34 at a point 114 (see also Figure 6). In order to guide the direction of reciprocation, four slide bars 116 are welded parallel with each other to the housing 34 (see also Figures 6 and 22). In Figure 22 each slide bar 116 is provided with a slide-block 118 slidable thereon and which is attached by means of bolts 120 to the frame 98. The shaft 90 is journaled to two pillow blocks 122 which are bolted to the frame 98. In Figure 6, the shaft 88 is separated from the cam 94 and the spur gear 95 by means of a sleeve bearing 124, and from the frame 98 by a bearing 126 which also separates the frame from the spur gear 95. A bearing 128 separates the frame 98 from the shaft 88 and the spur gear 101.

In conjunction with the reciprocating mechanism 92, a pawl 130 and a ratchet 132 operate the turret head 40. Figure 24 shows that the pawl 130 is pivoted by a pin 134 to a sliding plate 136 which is adjacent the undersurface of the cam guide 106 and the cam 100 and which fits like a collar around the lower shank of the cam 100. In the same horizontal plane with the sliding plate 136, two plates 138 and 140 are welded to the housing 34. These serve as guides for the plate 136 in a direction parallel with the bars 116. The pawl 130 contains a triangular recess 142, a catch surface 144, and a safety catch 146. The ratchet 132 which is journaled about the shaft 88 and within the cam 100, as shown in Figure 27, contains three ratchet teeth 147, 148 and 149, spaced 93°, 93° and 174°, respectively, as shown in Figure 24. An indexing pin 150 is affixed to and extends perpendicularly from the shank of the cam 100 as shown in Figure 27. To the ratchet 132 is attached a switch pin 151 as shown in Figures 24 and 27. On the plate 136 there is disposed a switch 152 with a switch lever 153. Normally the switch is spring-biased in the closed position. The pawl is urged against the ratchet by means of a flat spring 154 which is fixed to the plate 136 by the pins 155 and 156. Within the ratchet 132 the shaft 88 is separated therefrom by a sleeve bearing 157 which also separates the shaft from the spur gear 101 above the ratchet. In Figure 6 at the top of the ratchet 132 a washer bearing 158 separates the cam 100. In addition, a sleeve bearing 159 separates the shank of cam 100 and the shank of the ratchet 132.

The turret head casing generally indicated at 40 in Figure 1, is shown in vertical cross-section in Figure 6. It is secured to the lower end of the ratchet 132 to which is screwed at 160 a cover-plate 162. Approximately three-quarters of the vertical surface of the side walls of the turret head is a cylindrical casing 164 and the remainder is a flat back plate 166 both of which are secured to the casing cover 162 by screws 168 and to an underplate 170 by the screws 172. A head brace 174 supporting the back plate 166 by the screws 176 is attached to the cover-plate 162 by two screws 178 and to the underplate 170 by two screws 180.

About the periphery of the casing 164 are the operating parts of the turret head (Figure 8). They comprise a drill bit 182, an auger bit 184, and a plugging ram 186 with a lead plug 187 lodged therein. The drill bit 182 is journaled both at the shank in an annular bearing 188 provided in an aperture 190 in a casing 164 and at the end opposite of said bit in an annular bearing 192 contained in an aperture 194 in the head brace 174. Along the shank of the drill bit are two shoulders 196 and 198 which reduce the outside diameter from that of the working end of the bit to the end which is journaled in the head brace 174. The drill bit 182 is driven by a bevel gear 200 attached thereto and journaled

within an aperture 202 in the back plate 166. In Figure 6 two clutch members 204 and 206 between plate 166 and head brace 174 cover upper and lower portions, respectively, of the periphery of the gear 200. This gear meshes with a bevel gear 208 on the lower end of the shaft 88. A peg gear 210 is secured to the shank of the drill bit 182 adjacent the shoulder 196.

In the same horizontal plane the auger bit 184 is disposed 93° from the drill bit 182 and 174° from the ramming plug 186 corresponding to the distances between the teeth in the ratchet 132. In Figure 8, the auger bit 184 is journaled to a bushing 212 which is screwed into a threaded aperture 214 in the casing 164. A peg gear 216 transmits power to the auger bit 184 from the peg gear 210. As indicated in Figure 13 the shank of the auger bit 184 contains a shoulder 220 which reduces the outside diameter thereof to a smaller dimension, the greater diameter being equal to the inside diameter of the bushing 212. Between the smaller dimension of the shank of the auger bit 184 and the inner surface of the bushing 212 is located a thrust bearing 222 (Figure 18) which is secured against the shoulder 220 on the shank by an annular screw cap 224. In this manner a uniform surface is presented by the outer diameters of the shank, the thrust bearing 222 and the screw cap 224 to the inner diameter of the bushing 212. Within the shank of the auger bit 184 is a longitudinal keyway 226 which is open to the end opposite the auger. Into the keyway fits a key shaft 228 which is slidably disposed therein and which has an outer end integral with the peg gear 216. The bushing 212 is designed with a longitudinal slit 230 at the bottom (Figure 16). A support member 232 of the thrust bearing 222 fits the slit 230 (Figure 18). A slot 234 extends vertically in the member 232 and member 232 is attached to a lever 236 (Figure 13) by a pin 238 traveling in slot 234 and secured to the lever. The lever 236 fits into a slot 240 in the plate 170 and the casing 164 and is pivoted to plate 170 by a pin 242. At the lower end of the lever 236 is a roller 244 attached to the lever by a pin 246. A wire clip 248 is provided at the lower end of the support member 232 to which is attached a tension spring 250, the other end of which is affixed to the underplate 170 at 252.

The plugging ram generally indicated at 186 as shown in Figure 13 is journaled in a bearing 254 which is screwed into a slot 256 (Figure 17) in the casing 164. The slot is situated on the same horizontal plane as the drill bit 182 and the auger bit 184. As shown in Figure 14, the ram comprises an annular member 258 with two support members 260 and 262. The member 262 contains a slot 264 in which fits a set pin 266 attached to the bearing 254. Around the lead plug 187 is an annular bushing 267 which is disposed within the annular member 258. The members 260 and 262 on either side of the bearing 254 are designed to fit the slot 256 (Figure 15).

Referring to Figure 6, the turret head is supported by a supporting member 268 which is screwed into an underplate 270 at 272. At the top of the support member 268 is a socket 274 in which a ball bearing 276 is lodged and which contacts the bottom surface of the turret underplate 170. Above the underplate 270 is a sample cup 277 which is situated adjacent the housing 34 and directly below the aperture 44 (Figure 7). Below the underplate 270 is the lock brake generally indicated at 42, which comprises a brake shoe 278 faced with a brake lining 280, a solenoid 282, and a support member 284. The support member 284 is secured to the underplate 270 by bolts 286. Between the support member 284 and the brake shoe 278 is a lever 288 to which is secured a tension spring 290 on the lower end of the solenoid 282. The lever is attached to the support member 284 by a pin 292 and to the brake shoe 278 by a pin 294 (Figure 4).

The invention is wired according to the schematic diagram in Figure 29. The solenoid 282 and the motor 36 are connected to a knife switch 296 and a two-way knife switch 298, respectively, at the well surface. In one position of the switch 298, the switch 152 is used to automatically shut off the motor 36 at the completion of the sampling cycle. In the second position of the switch 298 the switch 152 is by-passed. Between these positions the switch is off.

Operation

Operation of the invention begins with lowering the sampler into a well by the cable 47 of the hoist at the top of the well. When the sampler has been lowered to the desired position, the switch 296 is closed to actuate the solenoid 282 which locks the brake 42 against the well casing 32. The switch 298 is then closed in the manual position to by-pass the automatic switch 152. As shown in Figure 1, the motor 36 operates the entire mechanism. The mechanical power from the motor is transmitted through the motive means generally indicated at 38 to the turret head 40 and to the cams 94 and 100. The shaft 76 directly drives the drills 182 and 184 in the turret head 40. When the sampler is in operation the drills rotate continuously though they are used separately in the operation. The shaft 76 also rotates the turret head 40 intermittently by the thrust created upon the gear 200 and by the gear 208, the direction of rotation being the same as that of the shaft. The clutch members 204 and 206 prevent the turret head from rotating too rapidly. This will be discussed below in greater detail in relation to the action of the pawl and ratchet.

The shaft 78, which operates the cams 94 and 100, derives its power from the shaft 48 by means of the take-off shaft 60 together with the set of worms and gears concomitant therewith as shown in Figure 2. Referring to Figure 6 in which the cam mechanism generally indicated at 92 is shown in greater detail, it is evident that the drive from the shaft 90 is transmitted simultaneously through the spur gear 96 and the pinion 102, respectively, to the gear 95 of the cam 94 and to the gear 101 of the cam 100. Since the gears 95 and 101 rotate at the same speed and since the cams 94 and 100 are set in phase with each other, the reciprocating mechanism 92 is forced to move backward and forward alternately between the limits of the cams, causing the drill bit 182 or the auger bit 184 or the plugging ram 186, whichever is in the working position, to advance and retract from the well casing 32. The direction of reciprocation is maintained by the four slide bars 116 on which the reciprocating mechanism 92 is mounted as shown in Figure 22. In this figure the advanced position of the mechanism is indicated by the dotted lines. The cam 94 rotates within the cam housing 108 and the housing plate 110. The cam housing 108 is pivoted to the housing 34 at 114 (see also Figure 6). Thus, the housing glides horizontally as the cam

rotates permitting the shaft 88 to reciprocate forward and backward alternately in a straight line. Because the action of reciprocation shortens and lengthens the shafts 76 and 78, the slip joints 84 and 86, respectively, are provided for compensation. As it rotates between the cam guides 104 and 106, as shown in Figure 23, the cam 100 forces the shaft 88 to reciprocate in the same manner that the cam 94 acted upon it, namely, in a straight line.

Closely associated with the reciprocating action of the cams is the action of the pawl 130 and the ratchet 132. Referring first to Figure 24, these parts are shown in the surroundings in which they function. As the cam 100 travels in a clockwise direction, the indexing pin 150 attached to the shank of the cam is brought in contact with the pawl 130 and forces it away from the ratchet. This action disengages the pawl catch 144 with the ratchet tooth 147 and permits the ratchet 132 to rotate 93° until the ratchet tooth 148 contacts the pawl catch 144. The reason that the pawl is able to catch the oncoming ratchet tooth 146 is that the indexing pin 150, continuing to move clockwise after releasing the ratchet tooth 147, confronts the recess 142 in the pawl, which permits the tension spring 154 to urge the pawl against the ratchet. The new position is shown in Figure 25 and the cross-sectional view in Figure 26. As mentioned above the ratchet movement is intermittent, consisting of three relatively fast travels between the ratchet teeth. Since it is not feasible to have the ratchet turning continuously, it is not geared directly to either shaft 88 or 90. Rather the ratchet movement is dependent upon the continuously rotating gear 208 which provides a thrust upon the turret head housing through the bevel gear 200. With the thrust acting upon the housing continuously, it is evident that only when the pawl 130 is disengaged from a ratchet tooth are the turret head and ratchet permitted to rotate. It should be pointed out that in the event the spring 154 fails, the safety catch 146 is provided. This is situated so as to confront a rotating tooth and be urged by it out of the path of its travel, causing the pawl catch 144 to return in time to catch the oncoming ratchet tooth. Thus, in Figure 25 it is evident that the ratchet tooth 147 would have confronted the safety catch 146 before the ratchet tooth 148 traveled past the pawl catch 144 had the spring 154 failed.

Due to the fact that the ratchet 132 makes one complete turn or cycle per sample, it is possible to shut off the motor automatically at the end of the cycle. Referring to Figures 24 and 27 the location of the switch pin 151 with regard to the ratchet 132 and the switch 152 can be fixed in mind. In Figures 24 and 28 the indexing pin 150 is shown moving the cam away from the ratchet tooth 144 and it is evident that the switch pin 151 is removed from the switch 152. Figures 25 and 27 represent the situation immediately after the pawl has released the ratchet 132 permitting it to travel through 93°. Not only has the ratchet tooth 148 confronted the pawl catch 144, but the switch pin 151 has actuated the switch lever 153 thereby opening the circuit to the motor. In order to start the motor 36 again it is necessary to throw the knife switch 298 to the manual position thereby by-passing the switch 152 (see Figure 29). As the sampler continues to operate with the switch 298 in this position, the cam 100 makes a complete revolution, thereby actuating the pawl 130 again, and permitting the ratchet 132 to rotate another 93°. At the same time a switch pin 151 moves off the switch lever 153, closing the switch 152 at which time the knife switch 298 may be returned to the automatic position (see Figure 29).

When the sampler is lowered into the well, the turret head generally indicated at 40 is in the position shown in Figure 6; that is, the drill bit 182 is retracted and addressing the aperture 44 in the housing 34. As the cams 94 and 100 move the mechanism from the retracted position, the revolving drill bit 182 advances through the aperture 187 and drills an aperture 300 in the well casing 32. By the time the drilling is completed, the cams have moved the turret head to the point of farthest advancement, as shown in Figure 9. During this movement the underplate 170 has glided over the ball bearing 276 which is situated at the top of the support member 268. The operation continues without pause and the mechanism retracts to the center of the housing. This position is again shown by the Figure 8. At the same time the pawl 130 has been actuated by the indexing pin 150 on the cam 100 and the ratchet tooth 149 has moved through 93° to confront the pawl catch 144 (see Figure 25), presenting the auger drill 184 for operation as shown in Figure 12. As the cams again advance the mechanism, the auger bit 184 passes through the aperture 44 in the housing 34 and into the aperture 300 in the well casing. In order to extend the auger bit beyond the well casing 32, the lever 236 is actuated by the well casing, forcing the auger bit further into the earth, as shown in Figures 10 and 13. At this point the cams have advanced the mechanism to the limit and begin to retract. This releases the pressure on the lower end of the lever 236 and permits the tension spring 250 to draw the auger bit back into the bushing 216. At the same time a sample of soil 302 is drawn into the housing and drops into the sample cup 277. As the position of full retraction is approached the indexing pin 150 again actuates the pawl 130 permitting the ratchet 132 to rotate through 174° until the ratchet tooth 147 confronts the pawl catch 144 (Figures 24 and 25). The turret head now advances with the plugging ram 186 addressing the apertures 44 and 300. When the annular member 258 confronts the well casing around the aperture 300 it remains fixed and the bearing 254 together with the set pin 256 continue to advance between the support members 260 and 268, thereby forcing the plug 187 into the aperture 300 of the casing (Figure 11). Upon full retraction of the mechanism the indexing pin 150 again trips the pawl 130 (Figure 24) and the ratchet tooth 149 travels through 93° to meet the pawl catch 144. Meanwhile the switch pin 151 breaks the circuit through the motor as it contacts the switch lever 153 of switch 152. The mechanism stops operating and the turret head is positioned as represented by the Figure 8. By opening the switch 296, the brake 42 is released and the sampler may be raised out of the well, and the sample 302 removed from the sample cup 277.

It is to be pointed out that there are three phases of motion within the mechanism itself. Referring to Figure 1, the vertical section between the support member 268 and the upper universal joints 72 and 74 have a continual reciprocating motion between the points of farthest advancement and retraction. The vertical section between the ratchet 132 and the upper cam

94 is both rotating and reciprocating continually. Finally, within the turret head the drills not only revolve and reciprocate continually, but they rotate intermittently between each operation.

It will be apparent to those skilled in the art that these and other modifications may be made without departing from the scope of the invention as set forth in the appended claims.

What is claimed is:

1. A device for obtaining soil samples from the side walls of wells encased in pipe comprising a drill bit for boring a hole in the pipe, an auger bit for extracting soil specimens through the hole, a ram for plugging the hole, mounting means including a turret on which said bits and ram are mounted radially thereon, a supporting unit including a housing having an aperture at the level of turret and motive means operatively connected to the bits for rotating them about their respective axes, motive means operatively connected to the turret for reciprocating it to and from the aperture, and motive means operatively connected to the turret for successively actuating the drill bit, the auger bit and the ram in alignment with the aperture.

2. A device for obtaining soil samples from the side walls of wells encased in pipe comprising a drill bit for drilling a hole in the pipe, an auger bit for extracting a soil specimen through the hole, a ram for plugging the hole, a turret on which the bits and ram are mounted radially in a plane normal to the axis of rotation of said turret, a supporting unit including a cylindrical housing containing the turret therein, said housing having an aperture at the level of the turret, motive means operatively connected to the bits for rotating them about their respective axes, a cam connected to said means for reciprocating the turret to and from the aperture, said means being operatively connected to the turret for successively actuating the drill bit, the auger bit and the ram at the aperture.

3. A device for obtaining soil samples from the side walls of wells encased in pipe comprising a supporting unit including a housing adapted to be inserted into a pipe, a turret head in the housing, said housing having an aperture at the level of the turret head, bore means for perforating the pipe, sampler means for extracting soil specimens from the exterior of the pipe, the bore means and the sampler being mounted on the turret head, motive means operatively connected to the turret for reciprocating it to and from the aperture in said housing, and motive means operatively connected to the bore means and the sampler means for successively actuating them through the aperture in said housing.

4. A device for obtaining soil samples from the side walls of wells encased in pipe comprising a supporting unit including a housing, a turret head in the housing, said housing having an aperture at the level of the turret head, bore means for perforating the pipe, sampler means for extracting soil specimens from the exterior of the pipe, plugging means for filling the perforation in the pipe, all of said means being mounted on the turret head, motive means operatively connected to the turret for reciprocating it to and from the aperture, and motive means operatively connected to said bore, sampler, and plugging means for successively actuating them to the aperture in the order named.

5. A device for obtaining soil samples from the side walls of wells encased in pipe, comprising a drill bit for drilling a hole in the pipe, an auger bit for extracting a soil specimen through the hole, a ram for plugging the hole, a turret on which the bits and ram are mounted radially in a plane normal to the axis of the turret, a supporting unit including a cylindrical housing containing the turret therein, said housing having an aperture at the level of the turret, motive means operatively connected to the bits for rotating them about their respective axes, means including a revolvable cam and being connected to said motive means for reciprocating the turret to and from the aperture, and means including a pawl and a revolvable ratchet cooperating therewith and being connected to said cam and to said turret for successively presenting the drill bit, the auger, and the ram in alignment with the aperture upon successive revolutions of the cam.

6. A device for obtaining soil samples from the side walls of wells encased in pipe, comprising a drill bit for drilling a hole in the pipe, an auger bit for extracting a soil specimen through the hole, a ram for plugging the hole, a turret on which the bits and ram are mounted radially in a plane normal to the axis of the turret, a supporting unit including a cylindrical housing containing the turret therein, said housing having an aperture at the level of the turret, a motor operatively connected to the bits for rotating them about their respective axes, means including a revolvable cam and being connected to said motor for reciprocating the turret to and from the aperture at a rate of speed slower than that of the rotating bits, and means including a pawl and a revolvable ratchet cooperating therewith and being connected to said cam and to said turret for successively presenting the drill bit, the auger, and the ram in alignment with the aperture upon successive revolutions of the cam.

7. A device for obtaining soil samples from the side walls of wells encased in pipe, comprising a drill bit for drilling a hole in the pipe, an auger bit for extracting a soil specimen through the hole, a ram for plugging the hole, a turret on which the bits and ram are mounted radially in a plane normal to the axis of the turret, a supporting unit including a cylindrical housing containing the turret therein, said housing having an aperture at the level of the turret, a motor operatively connected to the bits for rotating them about their respective axes, means including a revolvable cam and being connected to said motor for reciprocating the turret to and from the aperture at a rate of speed slower than that of the rotating bits, means including a pawl and a revolvable ratchet cooperating therewith and being connected to said cam and to said turret for successively presenting the drill bit, the auger, and the ram in alignment with the aperture upon successive revolutions of the cam, and means adjacent the ratchet and actuated thereby for automatically stopping the motor upon one revolution of the ratchet.

8. A device for obtaining soil samples from the side walls of wells encased in pipe, comprising a drill bit for drilling a hole in the pipe, an auger bit for extracting a soil specimen through the hole, a ram for plugging the hole, a turret rotatable about its vertical axis on which turret the bits and ram are mounted radially in a plane normal to the axis of the turret, a supporting unit including a cylindrical housing containing the turret therein, said housing having an aperture at the level of the turret, an electrical motor operatively connected to the bits for rotating them about their respective axes, means for re-

ciprocating the turret to and from the aperture at a rate of speed slower than that of the rotating bits, said means comprising a revolvable cam, cam guides, and parallel guides attaching to the housing to align the direction of reciprocation of the turret, and means including a pawl and a revolvable ratchet cooperating therewith and operatively connected to the motor and to the cam for successively presenting the drill bit, the auger bit, and the ram for operation in alignment with the aperture after successive revolutions of the cam, an electrical means including a switch adjacent the ratchet and actuated

thereby for automatically stopping the motor upon one revolution of the ratchet, and a lock brake including a brake shoe and solenoid so attached to the housing as to secure the device at a given location within the casing.

HARLEY E. HYLBAK.

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