

April 22, 1958

J. E. YANCEY

2,831,347

APPARATUS FOR RECORDING DRILLING OPERATIONS

Filed Aug. 23, 1954

5 Sheets-Sheet 1

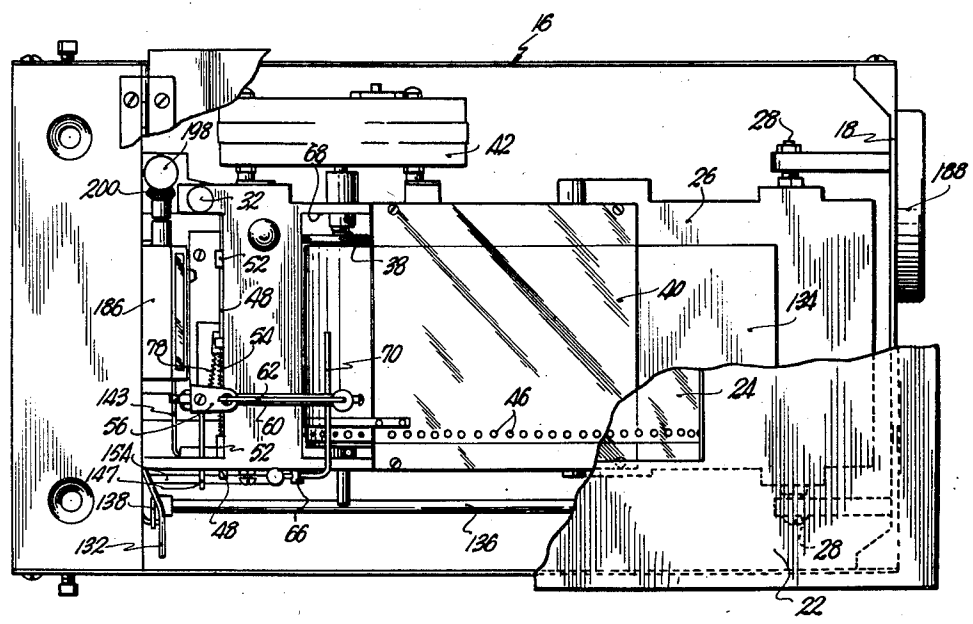


Fig. 1.

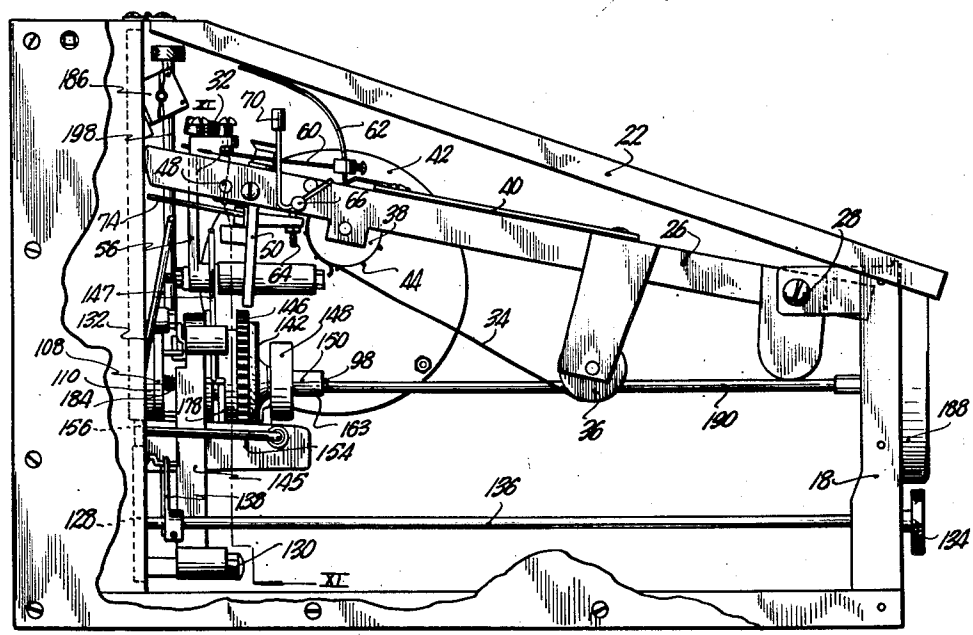


Fig. 2.

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5 Sheets-Sheet 2

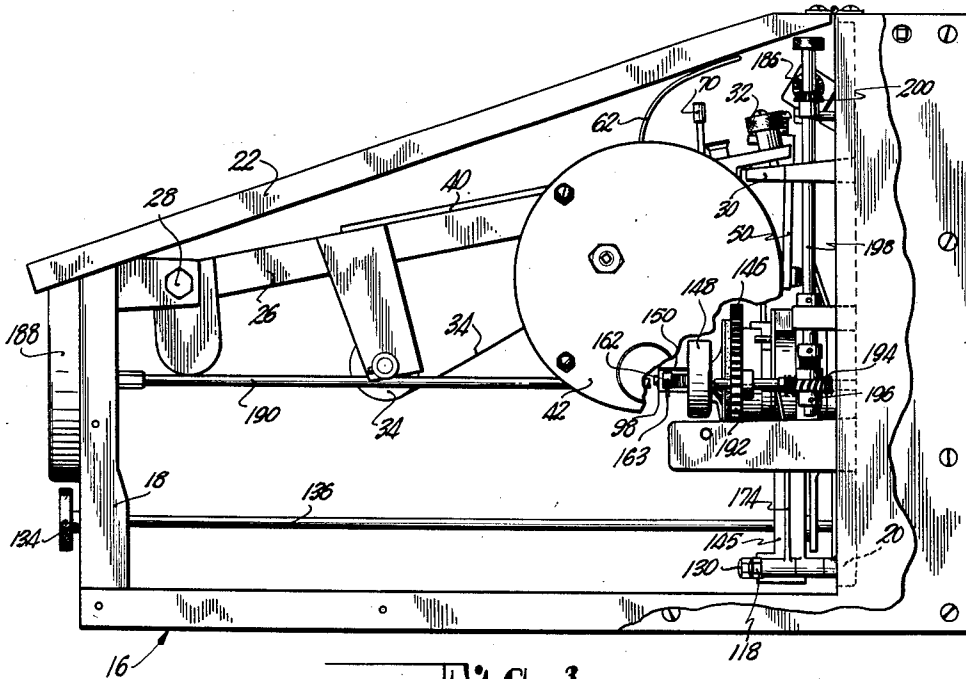


Fig. 3.

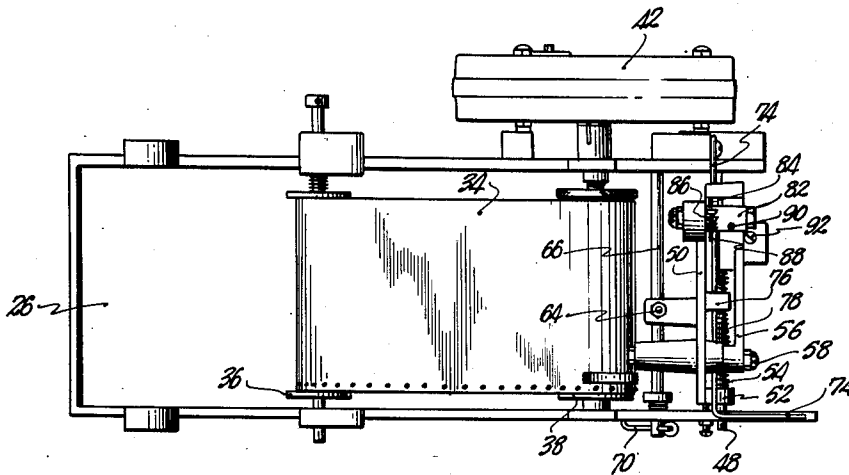


Fig. 4.

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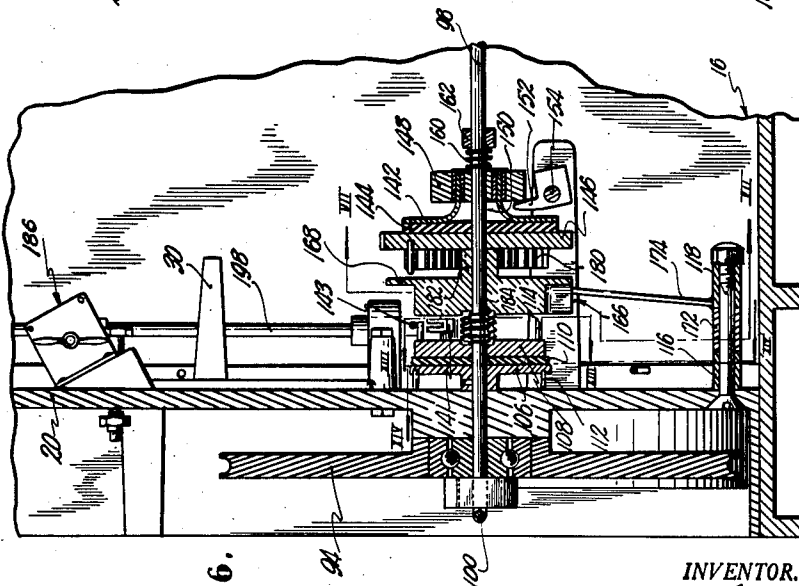
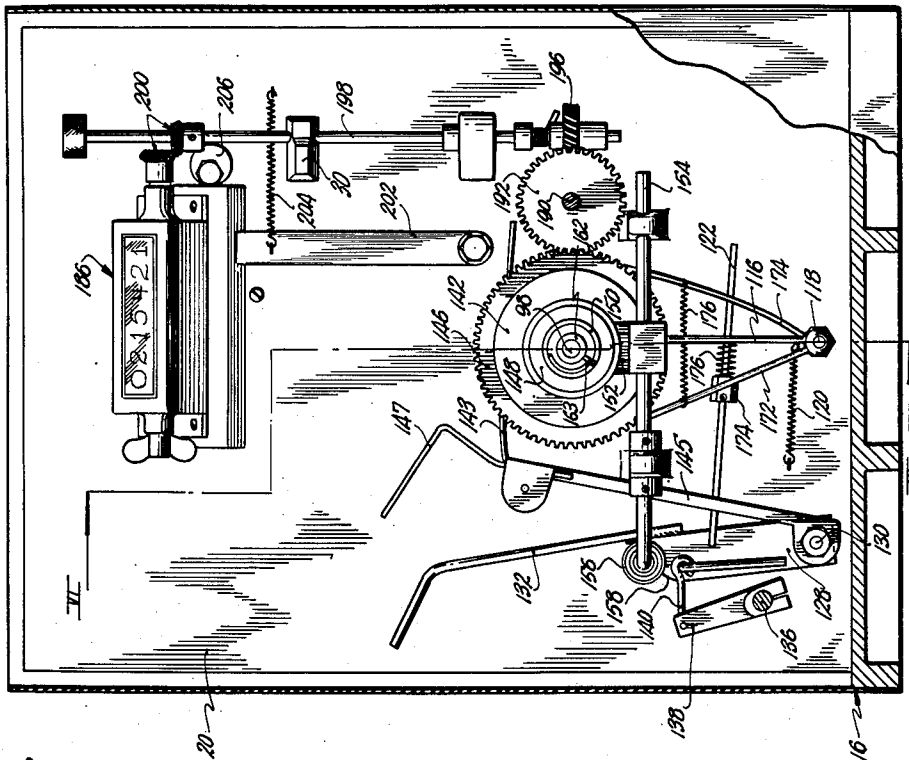
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5 Sheets-Sheet 3



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2,831,347

APPARATUS FOR RECORDING DRILLING OPERATIONS

Filed Aug. 23, 1954

5 Sheets-Sheet 4

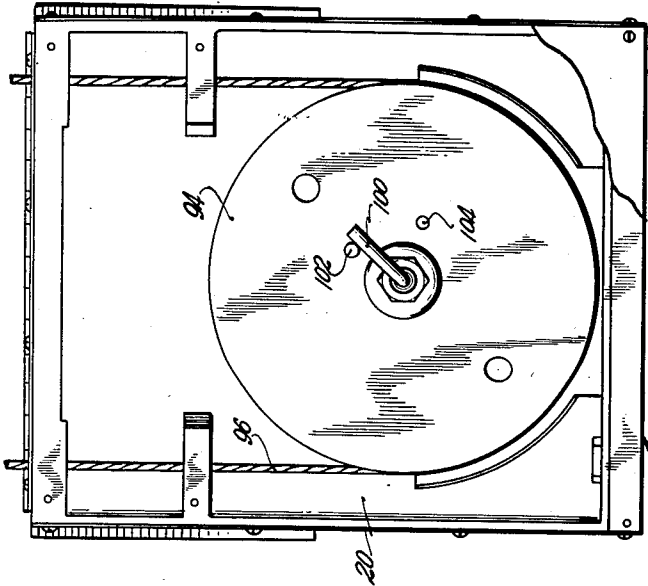


Fig. 8.

Fig. 9.

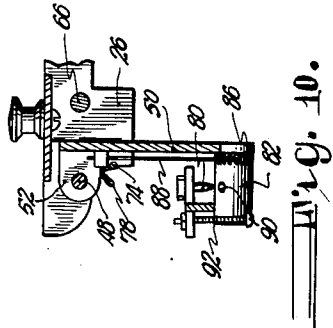


Fig. 10.

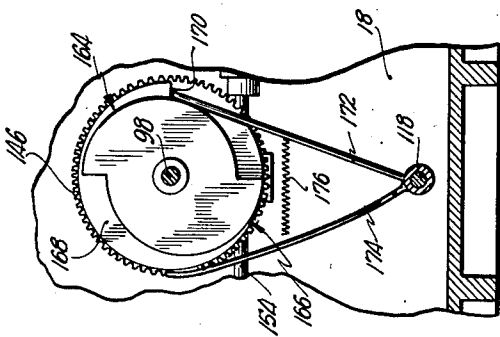
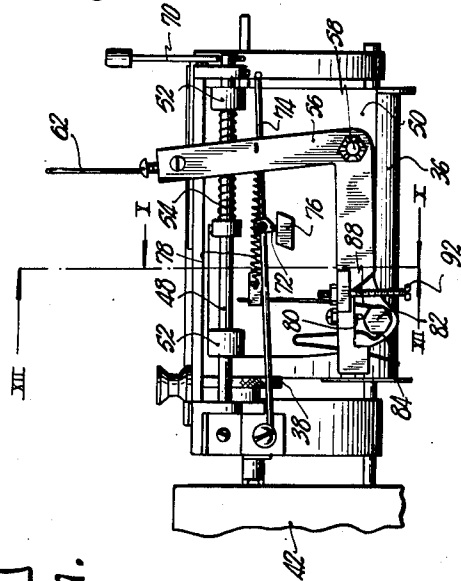


Fig. 7.

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April 22, 1958

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2,831,347

APPARATUS FOR RECORDING DRILLING OPERATIONS

Filed Aug. 23, 1954

5 Sheets-Sheet 5

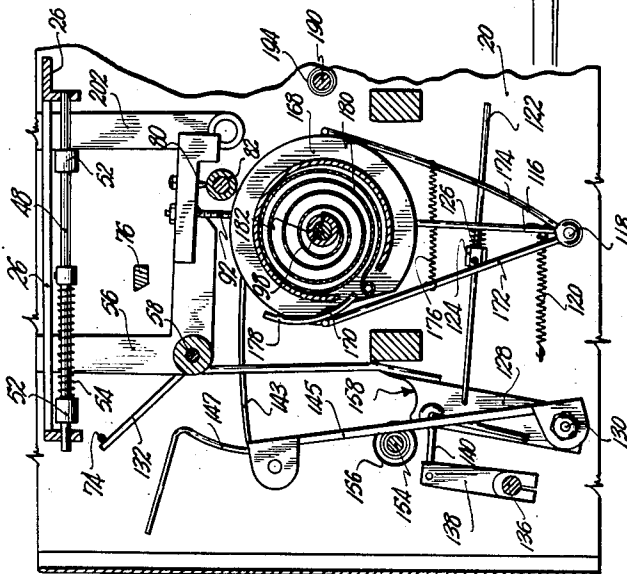


Fig. 11.

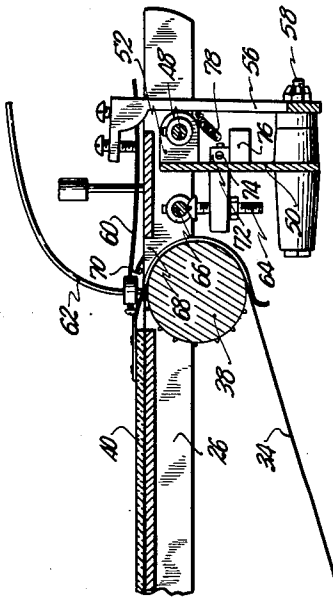


Fig. 12.

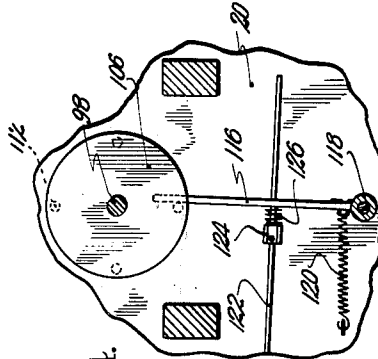


Fig. 14.

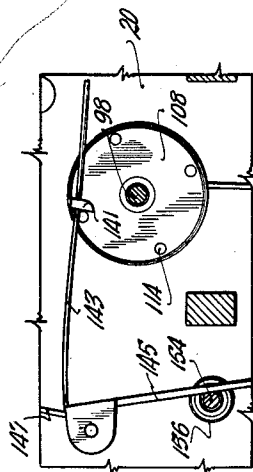


Fig. 13.

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1

2,831,347

APPARATUS FOR RECORDING DRILLING OPERATIONS

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Application August 23, 1954, Serial No. 451,622

15 Claims. (Cl. 73—151.5)

This invention relates to apparatus for recording drilling operations in the nature of the depth progress recording apparatus disclosed in my U. S. Letters Patent No. 2,679,161, dated May 25, 1954.

In the apparatus of my said prior disclosure, there is provided mechanism that includes a constantly moving recording tape, together with a stylus in marking engagement therewith, the latter of which is provided with a control that is in turn operably coupled with the well drilling assembly with which the recorder is adapted to be used.

The stylus control mechanism included means to cause a mark to be placed on the tape for each foot of progress of the drilling bit. Additionally, an accurate record is marked on the tape each time the drilling string is retracted for any reason such as repair and the operation of the apparatus of my prior disclosure is such as to indicate in a readily readable manner the length of time of inoperation of the drilling assembly with which the recorder is operably coupled. The said prior apparatus has proved successful in all respects in operation, as set forth in said patent, but the various controls therein disclosed include many electrical components not always completely satisfactory in many adaptations.

It is the primary object of the present invention therefore, to provide a recorder capable of functioning in the manner of the apparatus of my said patent and equally as efficiently with the same good results, but eliminating entirely all of the said electrical components of my prior disclosure.

Another important object of the present invention is to provide recording apparatus adapted for operable coupling with drilling equipment in the same manner as previously disclosed but comprising mechanical parts alone and operable to accurately record all of the information in the same easily readable manner as set forth in my prior patent.

Additional objects include the many important features and novel details of construction that have been included in the mechanical apparatus about to be described to render the same as efficient in all respects as the recorder of my prior patent, such further aims and objects to be made clear as the following specification progresses and said Patent No. 2,679,161, being incorporated herein by reference for an easier understanding of the principles hereinafter set forth.

In the drawings:

Figure 1 is a top plan view of apparatus for recording drilling operations made according to the present invention, the cover of the case thereof being partially broken away for clearness.

Fig. 2 is a side elevational view thereof, the proximal side wall being partially broken away for clearness.

Fig. 3 is an elevational view showing the opposite side of the apparatus with the proximal side wall being partially broken away.

Fig. 4 is an inverted view of the swingable, inclined shelf shown in Figs. 1 to 3 inclusive within the hollow

2

case and illustrated in Fig. 4 entirely removed from said case.

Fig. 5 is a view partially in front elevation and substantially in vertical cross-section transversely of the case looking toward the innermost face of the rear wall of the case and showing the components mounted thereon, the said shelf and its associated parts as shown in Fig. 4, being entirely removed.

Fig. 6 is a fragmentary, cross-sectional view taken on irregular line VI—VI of Fig. 5 and again with the assembly illustrated by Fig. 4 entirely removed.

Fig. 7 is a fragmentary, detailed, cross-sectional view taken on irregular line VII—VII of Fig. 6.

Fig. 8 is a rear elevational view with the rear cover plate substantially broken away.

Fig. 9 is a view showing that end of the assembly of Fig. 4 normally adjacent the rear end wall of the case and illustrating the normal position of the component parts when the shelf is in place in the manner shown best by Figs. 2 and 3.

Fig. 10 is a vertical, cross-sectional view taken on line X—X of Fig. 9.

Fig. 11 is a fragmentary, cross-sectional view taken on irregular line XI—XI of Fig. 2.

Fig. 12 is an enlarged, detailed, cross-sectional view taken on line XII—XII of Fig. 9.

Fig. 13 is a fragmentary, detailed, cross-sectional view taken on line XIII—XIII of Fig. 6; and

Fig. 14 is a fragmentary, detailed, cross-sectional view taken on line XIV—XIV of Fig. 6.

All of the component parts of the improved recorder shown in the drawings are preferably mounted within a rather rigid hollow case broadly designated by the numeral 16 and including a front wall 18, a rear wall 20 and an inclined cover 22 hingedly mounted for swinging movement to and from a closed position and provided with a transparent window 24.

An inclined, rectangular shelf 26 immediately beneath the window 24 within the case 16, is swingably mounted adjacent its lowermost end on the inner face of front wall 18 by means of opposed trunnions 28 and rests at its uppermost end upon a projection 30 on the innermost face of the rear wall 20. Shelf 26 and all of its component parts may be swung upwardly and rearwardly to a position resting upon the uppermost edge of the front wall 18 upon opening of the cover 22 and upon removal of a fastener 32 that secures the same to the projection 30.

An elongated tape 34 emanating from a supply reel 36, rotatably carried by the shelf 26 therebelow, passes around a drum 38 rotatably mounted on the shelf 26, thence rearwardly and downwardly along the upper surface of shelf 26 beneath a transparent hold-down plate 40. Tape 34 may move between wall 18 and the lowermost end of shelf 26 for collection within the case 16 below shelf 26. Drum 38 is operably coupled with clock mechanism 42 mounted on shelf 26 and is provided with sprocket teeth 44 engaging within perforations 46 along one marginal edge of the tape 34 so that during operation of the mechanism 42, tape 34 is constantly advanced downwardly and forwardly along the shelf 26 at a uniform speed.

A transverse guide 48 rigid to the shelf 26 at its uppermost end, reciprocally and rotatably mounts a carriage 50 through the medium of bearings 52 rigid to the carriage 50. A spring 54 on the guide 48 yieldably holds the carriage 50 biased toward one end of its reciprocable path of travel away from clock mechanism 42. Carriage 50 depends from the shelf 26 when the latter is in its normal position resting upon the projection 30 and in turn mounts an L-shaped crank 56 for swinging move-

ment on a substantially horizontal axis designated by the numeral 58.

The upright leg of the crank 56 has a laterally extending leaf spring 60 secured thereto, which in turn, supports a stylus 62 in marking engagement with the tape 34 as best seen in Fig. 12. The extent of swinging movement of carriage 50 clockwise, viewing Fig. 12, under influence of spring 60, is limited by an adjustable pin 64 in sliding engagement with a cross member 66 carried by the shelf 26 therebeneath. It is to be noted that shelf 26 is provided with a clearance opening 68 through which the tape 34 extends from the drum 38 to beneath the plate 40. The stylus 62 may be raised out of engagement with the tape 34 if desired, by swinging a rod 70 upwardly into engagement with the spring 60 and which rod 70 is mounted on rotatable cross member 66 as best seen in Figs. 1, 2, 4 and 9.

Upon movement of the carriage 50 toward the clock mechanism 42 in a manner hereinafter to be set forth, and against the action of spring 54, a dog 72 adjustable on L-shaped rod 74, drops by gravity into the path of travel of a lug 76 on that face of carriage 50 proximal to rear wall 20, thereby preventing full return movement of the carriage 50 to the normal position shown in the drawings, rod 74 being swingably mounted upon the uppermost end of shelf 26 adjacent clock mechanism 42.

A spring 78 interconnecting the upright leg of crank 56 and the rearmost face of carriage 50, yieldably holds a small pin 80 biased downwardly against a small rotatable ratchet drum 82. The pin 80 is secured to the horizontal leg of crank 56, whereas the small ratchet drum 82 projects rearwardly from the carriage 50 and rotates on a substantially horizontal axis. Each time the horizontal leg of the crank 56 is swung upwardly away from the ratchet drum 82, the latter is rotated one step by means of a spring pawl 84 on the horizontal leg of crank 56 and engaging ratchet teeth 86 of the drum 82.

A spring pawl 88 also engaging the teeth 86 holds the drum 82 against retrograde movement, the last-mentioned spring pawl 88 being mounted on the rearmost face of the carriage 50. There are ten ratchet teeth 86 and a single perforation 90 in the drum 82 disposed to receive the pin 80 once during each complete cycle of revolution of the drum 82, or once each time the drum 82 has been advanced ten steps by the action of the pawl 84. An adjustable screw 92 depends from the horizontal leg of crank 56 adjacent the drum 82 for purposes hereinafter to be set forth. All of the essential component parts that are mounted on shelf 26 for swinging movement therewith upon release of fastener 32, have been above-described.

Substantially all of the mechanism that cooperates with the structure on shelf 26 is carried by the rear wall 20 of case 16. A sheave 94 (Figs. 6 and 8) at the outermost face of wall 20 is operably coupled with the well drilling assembly (not shown) in the same manner as described in my patent aforementioned through use of a cable 96 trained around the sheave 94. Sheave 94 is rotatable on a drive shaft 98 that extends through the wall 20 as best seen in Fig. 6, and is provided with a lateral extension 100 disposed between a pair of rearwardly extending studs 102 and 104 on the sheave 94.

A pair of clutches are mounted on the shaft 98 within the case 16, one of which includes a plate 106 rigidly secured to shaft 98, a second plate 108 loosely mounted on shaft 98, and a friction disc 110 between the plates 106 and 108 and secured to the latter.

Plate 106 is provided with a plurality of rearwardly extending pins 112 arranged as shown in Fig. 14 and plate 108 has a number of forwardly-extending pins 114 arranged as seen in Fig. 13.

Pins 112 engage a pallet 116 swingable on rear wall 20 by means of pintle 118 and biased in one direction by a spring 120 interconnecting pallet 116 and wall 20. An elongated rod 122 extends loosely through the pallet 116

and is provided with a set collar 124, there being a spring 126 interposed between collar 124 and pallet 116. Rod 122 extends horizontally along the rear wall 20 adjacent the lower end thereof and pivotally connects with an upstanding arm 128 swingable on pivot 130 extending inwardly from rear wall 20. Arm 128 has an upwardly extending release rod 132 thereon and is in turn released by means of a manual control knob 134 adjacent front wall 18 and secured to release shaft 136. Rotatable shaft 136 interconnects the walls 18 and 20 and is provided with a lateral extension 138 pivotally connected with the arm 128 by a link 140.

The pins 114 on plate 108 engage a catch 141 on a rod 143 pivotally secured to the uppermost end of a lever 145. Lever 145 is swingable on the pivot 130 and is provided with a pusher rod 147 at its uppermost end. Rod 147 is in alignment with, and adapted to engage, the crank 56 adjacent its pivot 58.

The other of the aforementioned clutches on shaft 98 consists of a plate 142 free on the shaft 98 and having a friction disc 144 normally engaging the proximal face of a gear 146 loose on shaft 98. A ring 148 rotatable on hub 150 of plate 142 but fixed axially with respect to hub 150, forms a part of a clutch release that includes additionally a release ear 152 on a crank 154 carried by rear wall 20 for rotation on a horizontal axis. A small roller 156 on the short leg of crank 154 is adapted to fit within a concavity 158 at the upper end of arm 128. A spring 160 on shaft 98 is interposed between a set collar 162 and the hub 150. As seen in Figs. 2, 3 and 5, hub 150 extends outwardly beyond ring 148 in overlapping relationship to the set collar 162 and has substantially half of its circumference cut away to clear a radial pin 163 on collar 162 and which pin 163 engages the hub 150 during operation of the machine.

Shaft 98 also carries a combined cam unit and latching assembly between the two clutches above described and, more particularly, between the plate 108 and the gear 146. This cam-latch unit is provided with a pair of peripheral cam surfaces 164 and 166 as best seen in Fig. 7, one of which is spaced a slightly greater distance away from the axis of shaft 98 than the other.

The head of screw 92 is engaged alternately by the cams 164 and 166 during rotation of the cam-latch unit. Such unit includes additionally an integral disc 168 having a notch therein presenting a radial shoulder 170 as best seen in Figs. 7 and 11. Shoulder 170 alternately engages L-shaped latch rods 172 and 174 swingable on pintle 118 and interconnected by a spring 176, the rods 172 and 174 riding on the peripheral edge of the disc 168 during rotation of the latter clockwise viewing Fig. 7. The latch rods 172 and 174 are released alternately by an arcuate extension 178 rigid to that face of the gear 146 opposite to the friction disc 144.

A leaf spring 180 between disc 168 and gear 146 is coiled about a hub 182 on disc 168 and has its innermost end connected to the hub 182 while its outermost end is fastened to the gear 146. Hub 182 and gear 146 are yieldably biased toward the friction disc 144 and the plate 108, together with its friction disc 110, are yieldably biased toward the plate 106 by a spring 184 coiled about the shaft 98 between the plate 108 and the cam-latch unit.

Gear 146 not only operates a counter 186, but an indicator 188 on walls 20 and 18 respectively. The details of the indicator 188 are not shown, but it may be pointed out that the same is provided with a clock face, together with a rotatable hand, which hand is secured to and rotated by an indicator shaft 190 rotatably carried by the walls 18 and 20. Shaft 190 is rotated through a pinion 192 in mesh with the gear 146.

Shaft 190 is also provided with a worm 194 in mesh with a worm gear 196, the latter of which is secured to a vertical shaft 198 rotatably carried by the wall 20. Intermeshing bevel gears 200 operably interconnect the counter shaft 198 with the counter 186. Counter 186 is

swingably mounted on the wall 20 by means of an arm 202 and a spring 204 joining arm 202 with wall 20, yieldably holds the counter unit 186 against an adjustable stop 206 set to provide proper intermeshing relationship between the bevel gears 200.

Operation

After operably coupling cable 96 with the well drilling assembly, clock mechanism 42 is wound to cause continuous and uniform advance of the tape 34 at a predetermined constant speed. The pattern of indicating lines marked on the tape 34 by the stylus 62 will, under normal drilling operations, be the same as shown and described in my patent No. 2,679,161. If, after drilling commences, no downward progress of the drilling bit occurs, the sheave 94 will not be rotated and, accordingly, the stylus 62 will remain in the normal position shown in Fig. 1 with respect to the advancing tape 34.

However, as the bit descends, sheave 94 will be rotated clockwise, viewing Fig. 8, moving the stud 102 against the extension 100 of shaft 98. Pin 163 acting on hub 150 will rotate plate 142 and its friction disc 144. When the ear 152 is released, friction disc 144 will bear against the proximal face of gear 146, causing rotation of the latter and, consequent winding of spring 180. As gear 146 rotates, the extension 178 thereon will release the latch rod 172—174, then hold the disc 168 by engagement with the shoulder 170 of the latter. When disc 168 is released, a snap, rotative action will be imparted thereto by the energy in spring 180 until the other latch rod 172 or 174, as the case may be, catches the shoulder 170.

The substantially 180° rotation of the disc 168 and, therefore, the cams 164 and 166, will impart upward movement to the screw 92 by virtue of one of the cams 164—166 moving into contact therewith.

Upward movement of the screw 92 swings the crank 56 on its axis 58 and thereby shifts the stylus 62 with respect to the tape 34 and transversely thereof, producing a short mark on the tape 34.

As to be noted in my aforementioned patent, when no upward or downward movement of the bit is occurring, and during such intervals of descent between the tripping of disc 168, the stylus 62 produces a straight longitudinal reference line on the tape 34. The lateral or transverse mark made by the stylus 62 in the manner just above outlined will, therefore, be to one side of such reference line. If the cam 166 actuates the screw 92, a relatively long line will be marked on the tape 34, whereas, when the cam 164, which is closer to the shaft 98, actuates the screw 92, a shorter marking line will be produced on the tape 34. It is to be contemplated that each line or marking produced by the action of the cams 164 and 166 will indicate a one foot progress in descent of the drilling bit and, therefore, since the markings are alternately long and short, both one foot and two foot markings can be readily observed on the tape 34 through the transparent plate 40.

Such operation continues in an uninterrupted manner as long as the drilling equipment is in operation and, since the tape 34 travels at a constant speed, the distance between the foot and two foot markings will depend upon the rate of descent of the drilling bit. Consequently, if drilling ceases and the bit is not retracted, there will merely be a continuous straight reference line marked on the tape 34 longitudinally thereof by the stylus 62.

During this normal operation, the arm 128 is swung to the right as seen in Fig. 11, and the lever 145 is swung to the left as shown in Fig. 11.

Each time the crank 56 is actuated by cams 164 and 166 through the screw 92, the ratchet drum 82 is advanced one step by the action of pawl 84 which is secured to the crank 56 for movement therewith. Consequently, after the ratchet drum 82 has been advanced ten times or has made a complete revolution, the small hole 90 of the drum 82, will move into alignment with the pin 80 that

is secured to the crank 56. Thus, after the cams 164 or 166 raise the screw 92 and move from beneath the latter, the horizontal leg of crank 56 is free to drop a slightly greater distance because the pin 80 enters the hole 90. This causes the stylus to move to the opposite side of the said reference line, thereby indicating a ten foot descent and facilitating the reading of the record made on tape 34.

The descent of the drilling bit can also be observed exteriorly of the case 16 by watching the movement of the indicating hand of indicator 188. Such hand is obviously rotated through shaft 190 that is in turn rotated from gear 146 through pinion 192. Still further, the total footage may be observed on the counter 186, the latter of which is similarly controlled from gear 146, through pinion 192, shaft 190, worm 194, worm gear 196, shaft 198 and gears 200.

As explained in my patent, the drilling bit is oftentimes elevated partially or fully for various reasons. In that event, sheave 94 is rotated anti-clockwise viewing Fig. 8, moving the stud 104 against the extension 100 of shaft 98. This immediately causes arm 128 and lever 145 to swing from the positions shown in Fig. 11 to the position shown by Fig. 5 of the drawings.

Viewing Fig. 13, when the plate 108 rotates anti-clockwise, the pins 114 clear the catch 141 as the rod 143 swings freely with respect to the lever 145. However, when the plate 108 rotates clockwise, as when the drilling bit is ascending, one of the pins 114 will immediately engage the catch 141, producing a pull on the rod 143 and swinging the lever 145 to the position shown in Fig. 5.

The pusher rod 147 moves into engagement with the crank 56 adjacent its pivot 58 (Fig. 11) and causes the carriage 50 to move to the left, viewing Fig. 9, against the action of spring 54. Throughout the time the bit is ascending, the crank 56 and the carriage 50, will be held toward that end of the reciprocable travel thereof on the guide 48 and toward the clock mechanism 42 by plate 108 exerting a pull on rod 143. However, the shaft 98 and the plate 106 attached thereto, are free to rotate anti-clockwise, viewing Fig. 8, because of the fact that plate 106 can slip with respect to the friction disc 110.

Similarly, when the plate 106 rotates anti-clockwise viewing Fig. 14, during descent of the drilling bit, pins 112 of plate 106 clear the pallet 116 against the action of spring 120. However, upon ascent of the drilling string and therefore, upon clockwise rotation of plate 106, viewing Fig. 14, one of the pins 112 will immediately engage pallet 116 causing the latter to push upon the rod 122, swinging arm 128 to the position shown in Fig. 5. When arm 128 moves beneath the roller 156, and as the latter becomes seated in the concavity 158, the crank 154 is rotated such as to swing the ear 152 outwardly against the ring 148, thereby releasing the grip of friction disc 144 upon the gear 146.

As soon as the ascent of the drilling bit is discontinued and the moment that it again is caused to descend, the force of clockwise rotation of plate 108 (viewing Fig. 13) is released, thereby releasing the pressure of pusher rod 147 on the crank 56 and, therefore, on the carriage 50. Spring 54 will thereupon act to return the carriage 50 toward its normal position shown in Fig. 9. However, in the interim, the dog 72 will have gravitated to within the path of travel of lug 76, thereby preventing full return movement of the carriage 50.

After the bit has been returned to the bottom of the hole and drilling operations are to be resumed, the operator should actuate knob 134, thereby rotating shaft 136 and swinging arm 128, together with release rod 132, rod 122 and pallet 116, to the position shown in Fig. 11 of the drawings. This, of course, releases the ear 152 and the friction disc 144 re-engages the gear

146. Such manual operation also releases the dog 72 by virtue of the release rod 132 moving into engagement with the rod 74 (Fig. 11).

The record produced on the tape 34 by stylus 62 of the pulling of the drilling bit from the hole or off the bottom thereof, is on the same side of the aforementioned reference line as the ten foot markings precisely as shown and described in my patent.

It is now clear that when the sheave 94 rotates anti-clockwise viewing Fig. 8, to cause rod 147 to move against crank 56, and as the carriage 50 is thus shifted along the guide 48 longitudinally thereof toward the clock mechanism 42, the stylus 62 will be moved therewith and with respect to the tape 34 in a direction opposite to the normal direction of movement of the stylus 62 when it produces one foot and two foot markings on the tape 34 in response to the operation of cams 164 and 166. Reference may be had to my patent for an understanding of the precise nature of the markings on the tape when carriage 50 is first shifted to the left, viewing Fig. 9, is held in such position for a predetermined time, returns to the right, viewing Fig. 9, until restrained by dog 72, and is thereupon either released to reassume the position shown in Fig. 9 or again shifted to the left as a consequence of continued upward movement of the drilling bit.

It is to be noted that during the ascent of the bit, and during such times as disc 144 is held out of engagement with gear 146 by arm 128, there is no rotation of gear 146 and consequently, of cams 164 and 166. The crank 56 therefore, will not be swung nor will the shaft 190 be rotated to operate indicator 18 or counter 186 until the operator actuates the knob 134 to release the roller 156 from within concavity 158.

It is to be noted further that there is a delayed action between studs 102 and 104, as well as between the edges of hub 150 contacted by pin 163. This construction is provided to avoid any inaccuracies of counting, indicating, or marking of tape 34 caused by upward and downward fluctuations of the drilling bit during drilling operations. Because of the delay or lost motion thus provided, the recording mechanism will not respond to such minor fluctuations of the drilling bit.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a recorder for well drilling equipment having rotatable sheave means coupled with said equipment, and a stylus in engagement with a tape for making a reference line on the tape as the latter is continuously advanced in one direction at a constant speed, structure for swinging the stylus to one side of the reference line each time the sheave means is rotated in one direction a predetermined amount to produce lateral markings on the tape, said structure including a swingable crank supporting the stylus; a tripping device including rotatable cam means engageable with said crank, releasable latch means normally holding the cam means against rotation, and spring means coupled with said cam means; and mechanism interconnecting the sheave means and said spring means for winding the spring means as the sheave means is rotated in said one direction by said equipment; said mechanism being provided with an extension periodically engageable with the latch means to release the latter, whereby tension in the spring means rotates the cam means.

2. In a recorder for well drilling equipment having rotatable sheave means coupled with said equipment, and a stylus in engagement with a tape for marking a reference line on the tape as the latter is continuously advanced in one direction at a constant speed, structure for swinging the stylus to one side of the reference line each time the sheave means is rotated in one direction a predetermined amount to produce lateral markings on the tape, said structure including a swingable crank support-

ing the stylus; a tripping device including rotatable cam means engageable with said crank, releasable latch means normally holding the cam means against rotation, and spring means coupled with said cam means; mechanism for winding the spring means as the sheave means is rotated in said one direction by said equipment; and means including a clutch operably coupling the sheave means and said mechanism, said mechanism being provided with an extension periodically engageable with the latch means to release the latter, whereby tension in the spring means rotates the cam means.

3. In a recorder as set forth in claim 2 wherein is provided a clutch release, an arm swingable to and from a position actuating the clutch release, and an assembly coupled with the arm for swinging the latter upon rotation of the sheave means in the opposite direction.

4. In a recorder as set forth in claim 3 wherein is provided a manual control coupled with said arm for swinging the latter to actuate the clutch release and thereby render the mechanism operable as the sheave means again rotates in said one direction.

5. In a recorder for well drilling equipment having rotatable sheave means coupled with said equipment, and a stylus in engagement with a tape for marking a reference line on the tape as the latter is continuously advanced in one direction at a constant speed, structure for swinging the stylus to one side of the reference line each time the sheave means is rotated in one direction a predetermined amount, and to the opposite side of the reference line each time the sheave means is rotated in the opposite direction a predetermined amount to produce markings on the tape extending laterally from said reference line in both directions, said structure including a reciprocable carriage; a crank supporting the stylus and swingably mounted on the carriage; a tripping device including rotatable cam means engageable with said crank, releasable latch means normally holding the cam means against rotation, and spring means coupled with said cam means; mechanism interconnecting the sheave means and said spring means for winding the spring means as the sheave means is rotated in said one direction by said equipment, said mechanism being provided with an extension periodically engageable with the latch means to release the latter, whereby tension in the spring means rotates the cam means; and a pusher coupled with said sheave means for moving the carriage to one end of its path of travel as the sheave is moved in the opposite direction.

6. In a recorder for well drilling equipment having rotatable sheave means coupled with said equipment, and a stylus in engagement with a tape for marking a reference line on the tape as the latter is continuously advanced in one direction at a constant speed, structure for swinging the stylus to one side of the reference line each time the sheave means is rotated in one direction a predetermined amount, and to the opposite side of the reference line each time the sheave means is rotated in the opposite direction a predetermined amount to produce markings on the tape extending laterally from said reference line in both directions, said structure including a reciprocable carriage; a crank supporting the stylus and swingably mounted on the carriage; a tripping device including rotatable cam means engageable with said crank, releasable latch means normally holding the cam means against rotation, and spring means coupled with said cam means; mechanism for winding the spring means as the sheave means is rotated in said one direction by said equipment; means including a clutch operably coupling the sheave means and said mechanism, said mechanism being provided with an extension periodically engageable with the latch means to release the latter, whereby tension in the spring means rotates the cam means; and a pusher coupled with said sheave means for moving the carriage to one end of its path of travel as the sheave is moved in the opposite direction.

7. In a recorder as set forth in claim 6 wherein is provided a clutch release, an arm swingable to and from a position actuating the clutch release, and an assembly coupled with the arm for swinging the latter upon rotation of the sheave means in the opposite direction.

8. In a recorder as set forth in claim 7 wherein is provided a second clutch adapted to slip as the sheave means rotates in said opposite direction and as the carriage is held at said one end of its path of travel.

9. In a recorder as set forth in claim 8 wherein said second clutch is operably coupled with said pusher and with said assembly.

10. In a recorder for well drilling equipment having a movable member operably coupled with said equipment, and a stylus in engagement with a tape for marking a reference line on the tape as the latter is continuously advanced in one direction at a constant speed, structure for shifting the stylus to one side of the reference line each time the member is moved in one direction a predetermined amount to produce lateral markings on the tape, said structure including a reciprocable carriage, releasable parts on the recorder for maintaining the carriage at one end of its path of travel as the member moves in said one direction, an element supporting the stylus and shiftably mounted on the carriage, the stylus being moved to said one side of the reference line upon shifting of the element, a tripping device having cam means thereon engageable with said element to periodically shift the latter each time the device is tripped, and mechanism interconnecting the member and the device for tripping the latter periodically as the member is moved in said one direction by the equipment; and means on the recorder responsive to movement of the member in the opposite direction for releasing said parts to thereby permit movement of the carriage to the opposite end of its path of travel and thus cause shifting of the stylus to the opposite side of the reference line.

11. In a recorder as set forth in claim 10 wherein is provided holding means movable into the path of travel of the carriage for limiting the extent of movement thereof toward said one end of its path of travel as the member again moves in said one direction.

12. In a recorder for well drilling equipment having a movable member operably coupled with said equipment, and a stylus in engagement with a tape for marking a reference line on the tape as the latter is continuously advanced in one direction at a constant speed, structure for shifting the stylus to one side of the reference line

each time the member is moved in one direction a predetermined amount to produce lateral markings on the tape, said structure including a reciprocable carriage, releasable parts on the recorder for maintaining the carriage at one end of its path of travel as the member moves in said one direction, an element supporting the stylus and shiftably mounted on the carriage, the stylus being moved to said one side of the reference line upon shifting of the element, a tripping device having cam means thereon engageable with said element to periodically shift the latter each time the device is tripped, releasable mechanism interconnecting the member and the device for tripping the latter periodically as the member is moved in said one direction by the equipment, and apparatus coupled with said member for releasing the mechanism upon movement of the member in the opposite direction; and means on the recorder responsive to movement of the member in the opposite direction for releasing said parts to thereby permit movement of the carriage to the opposite end of its path of travel and thus cause shifting of the stylus to the opposite side of the reference line.

13. In a recorder as set forth in claim 12 wherein is provided locking means engageable with said apparatus for holding said mechanism released as the member moves in said opposite direction.

14. In a recorder as set forth in claim 12 wherein is provided holding means movable into the path of travel of the carriage for limiting the extent of movement thereof toward said one end of its path of travel as the member again moves in said one direction.

15. In a recorder as set forth in claim 14 wherein is provided a manual control engageable with said holding means and coupled with said locking means for unlocking the latter and releasing the carriage to render the tripping device operable as the member again moves in said one direction.

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