Aug. 19, 1952 G. H. CONNORS 2,607,834

ELECTRICALLY CONTROLLED DEPTH INDICATOR FOR BORING MACHINES

Filed March 1, 1948 2 SHEETS—SHEET 1

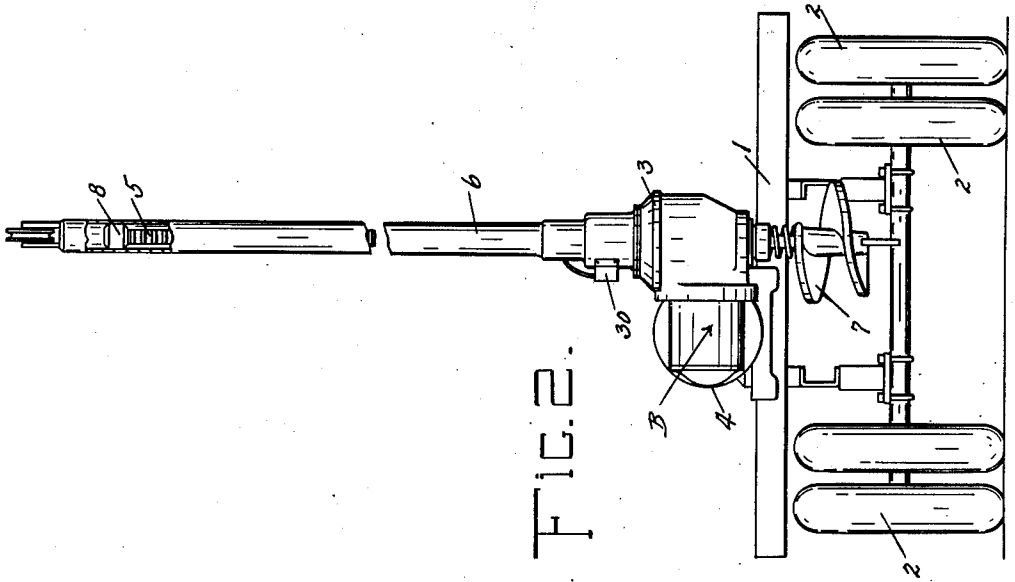


FIG. 2.

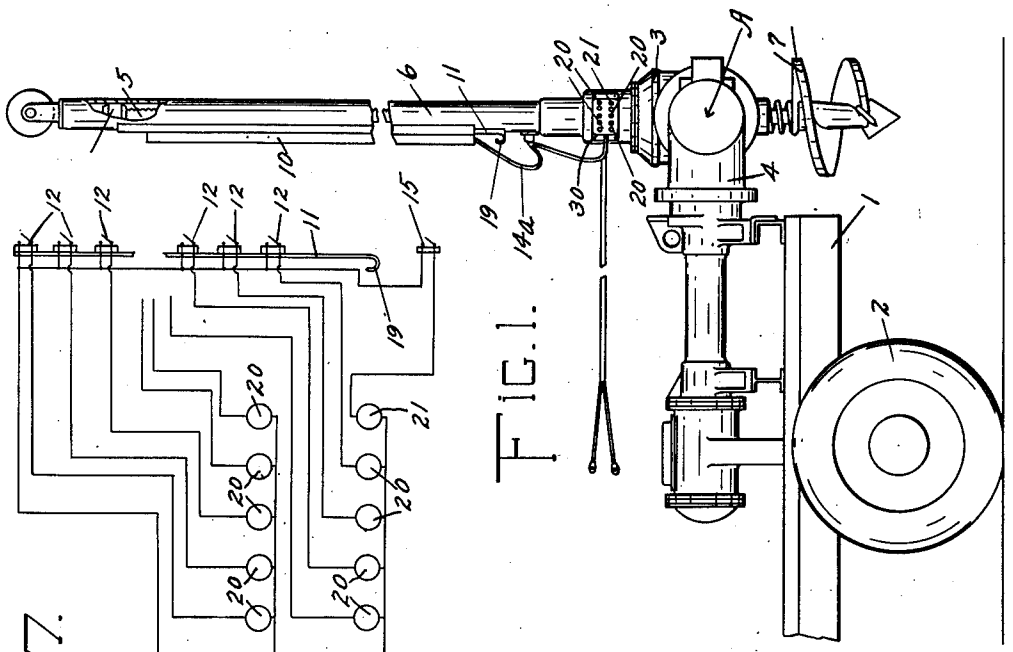


FIG. 1.

FIG. 7.

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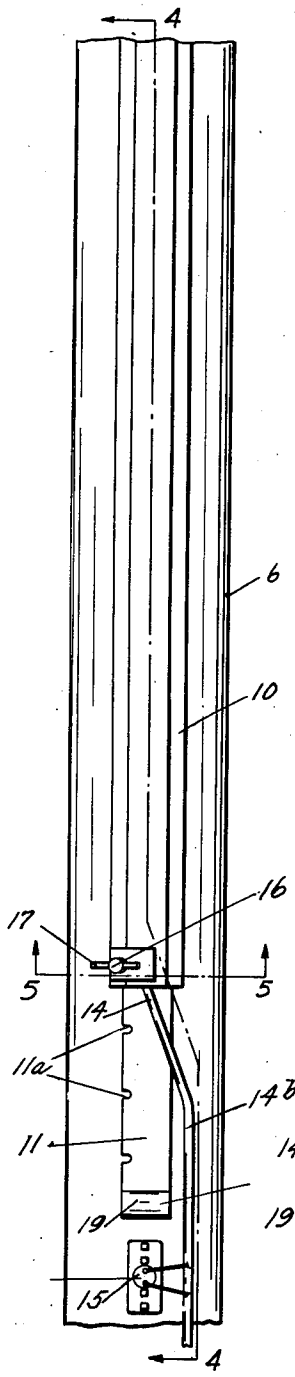


FIG. 3.

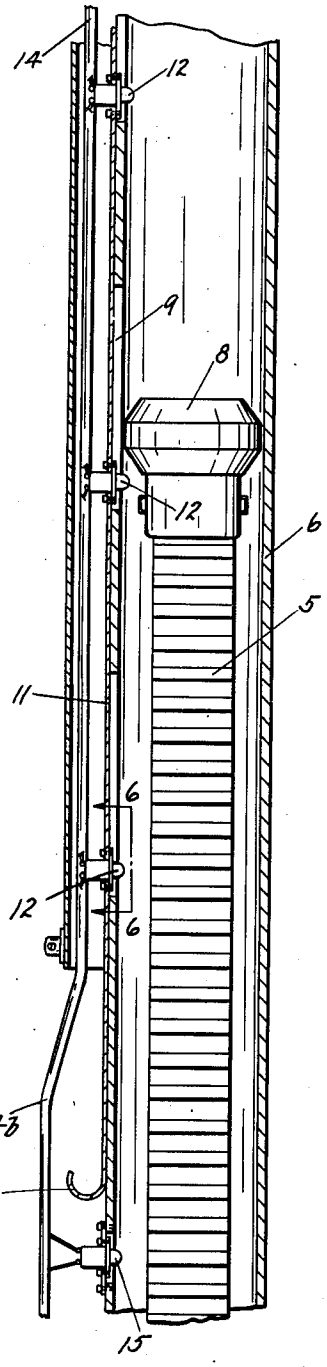


FIG. 4.

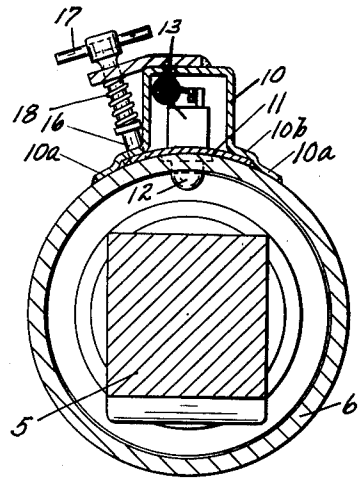


FIG. 5.

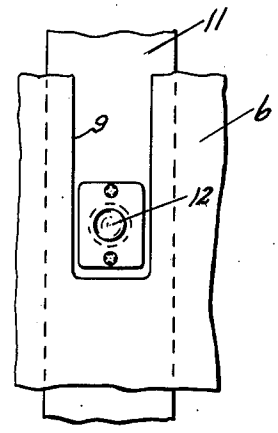


FIG. 6.

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2,607,834

UNITED STATES PATENT OFFICE

2,607,834

ELECTRICALLY CONTROLLED DEPTH INDICATOR FOR BORING MACHINES

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Application March 1, 1948, Serial No. 12,394

3 Claims. (Cl. 177—311)

1

My present invention relates to the art of machines of the class designed for boring holes in the earth in which holes, telegraph, electric light, and similar poles or posts to be employed.

My invention comprises improved depth indicating means for use in conjunction with machines of the above type, to enable the operator of the machines to determine relatively closely the depth of the hole being bored, so as to stop the boring operation when a predetermined depth has been obtained.

Boring machines of the class in connection with which my invention is susceptible of use are disclosed in patents of the prior art such as that of Spowart, No. 1,511,433, granted October 14, 1924, and the patent of Erdahl, No. 1,921,812, granted August 8, 1933. The construction of the machine of these patents embodies generally a boring head which is swingably mounted upon a truck or suitable vehicle body so that it may be adjusted angularly longitudinally of the axis of the supporting vehicle and transversely of such axis. This boring head carries a boring bar at the lower end of which is mounted the auger which does the digging, said boring bar being supported in the head for longitudinal movement to advance the same and withdraw it in relation to the hole being bored in the earth and also support it in rotation in order to drive the auger in its boring action. The boring bar of said head is housed by a guide tube which extends upwardly from the head so that ordinarily during the boring operation and advancing of the auger into the earth it is not possible to determine visually the extent of the boring action of the auger as it penetrates the earth.

The primary object of my present invention, therefore, is to provide suitable reliable indicating means to enable the operator of the boring machine to be advised as to the extent of the earth penetrating movement of the auger of the machine so that he may discontinue the boring operation when a hole of predetermined depth has been bored. The present invention further involves improvements upon a similar type of invention for a like purpose which is embodied in my application for patent Serial No. 2,304, filed January 14, 1948, now Patent No. 2,573,640.

In carrying out my invention, I avail of electrically controlled indicating means preferably mounted, though not necessarily so, upon the boring head, whereby to visually indicate the depth of the hole which is being produced by the action of the boring tool or auger. My invention further involves certain novel provisions as to detail phases of the construction of electrical indicating means, as will appear more fully hereinafter.

A full understanding of the present invention

2

will be had upon reference to the following detail description in conjunction with the annexed drawings, in which—

Figure 1 is a side view of the main instrumentalities of a boring machine such as hereinbefore referred to and intended to be improved by the present invention, the view illustrating the rear end portion of a truck or vehicle which supports the parts of the boring machine that are illustrated in order to bring out the mode of application of my present invention thereto.

Figure 2 is a rear end elevation of the vehicle showing substantially the same features of its construction, as well as the boring machine referred to, as are shown in Figure 1.

Figure 3 is a fragmentary view disclosing primarily the tubular guide for the boring bar and the mounting thereon of the adjustable electric switch slide or panel means for holding the latter in adjusted position.

Figure 4 is a vertical sectional view taken primarily through the tubular guide for the boring bar, showing the latter mounted therein, with the guide head at the top thereof disposed in proper relation to the indicator operating switches which are actuated by said boring bar as the latter is caused to descend in boring the hole, and as it is retracted from the hole to a normal inoperative position, the view taken on line 4—4 of Figure 3.

Figure 5 is a horizontal sectional view taken about on the line 5—5 of Figure 3.

Figure 6 is a fragmentary view showing portions of the guide tube and switch slide, and bringing out more clearly the formation of the slots in the guide tube through which the switches on the switch slide or panel extend so as to project slightly into the tube for operation by the guide head on the boring bar, this view being taken about on the line 6—6 of Figure 4, looking in the direction of the arrows.

Figure 7 is a diagrammatic view of the electrical circuit connections employed for the indicating and signal lights or devices, certain conductors broken away and not leading to indicating lights due to lack of space.

First referring to Figures 1 and 2 of the drawings generally depicating the boring machine and vehicle structure supporting the same, it is noted that the vehicle illustrated comprises a chassis or frame 1 partly shown only at the rear end thereof as supported upon the ground wheels 2. Carried at the rear end of the frame 1 usually is the hole digging or boring mechanism which includes primarily the boring head 3 supported by suitable mounting means 4 and containing the drive gearing by which the boring bar 5, a portion of which is shown at the top of Figures 1 and 2, is operated. The boring bar or shaft 5 is adapted to move downwardly and up-

wardly in the tubular guide 6 which is suitably attached to the upper portion of the boring head 3, as well known in the art, and as the bar 5 is driven in a downward direction rotation is imparted thereto by suitable gear mechanism within the head 3, all as readily to be understood by those versed in the art in conjunction with the knowledge of machines of the type of the Spowart and Erdahl patents hereinbefore identified.

The boring head 3 is of course adapted to be turned or partly rotated about an axis transverse to the longitudinal axis of the machine or chassis 1, an axis designated as A in the drawings, in order that the auger 7 carried by the lower end of the boring bar 5 may be shifted outwardly and inwardly relatively to its vertical position as seen in Figure 1.

The boring 3 is capable of being rotated to different angles laterally relatively to the chassis or frame 1, as viewed in Figure 2, for boring holes at lateral angles in the earth, under which conditions the head operates about the longitudinal axis B indicated in Figure 2. The foregoing is the conventional mode of adjusting the boring head 3, the adjustments being obtained by certain well known mechanism as disclosed in the prior patents previously mentioned.

The boring bar 5 which, as stated, operates within and longitudinally of the guide tube 6, is equipped, as usual, with the guide head 8 which slides in contact with the inner wall of the tube 6 and prevents whipping of the boring bar shaft during its rotation and longitudinal movement as the auger 7 is driven into the earth for producing the hole which is to be excavated.

I now refer to the indicating means which I have invented and which is presented in this application, whereby to advise the operator of the machine in regard to the depth of digging action of the boring tool 7, incident to the progressive feeding downwardly or at suitable angles into the earth the said auger 7 in the boring operation.

At the inner side thereof, or the side facing toward the vehicle frame 1, the guide tube 6 is cut away to provide a series of vertically disposed and aligned slots designated 9. Extending longitudinally of the guide tube 6, as do the slots 9, I provide a switch casing 10 in the form of a long housing member running or attached longitudinally by welding or otherwise to the tube 6. The switch casing is formed with attachment flanges at 10*a* as seen best in Figure 5, and, as indicated, these may be welded directly or otherwise secured to the guide tube 6. The flanges 10*a* at the points immediately adjacent the sides of the switch casing 10 are slightly upraised or spaced away from the outer wall of the tube 6 to provide guide members designated 10*b* for a switch slide or panel 11 that is mounted within the casing 10 and carries a series of oppositely acting conventional type of electrical switches designated 12. These switches 12 are supported on the switch panel 11 at predetermined intervals of space from one another. Preferably the switches 12 will be so positioned that one switch is spaced from the next switch a distance of one foot. The switches 12 are connected with a conductor 13 which preferably consists of a flexible electric wire or cable of conductive material surrounded by a protective tubing 14 as customary. The conductor 14 is included in a main electric circuit which is more clearly shown in Figure 7 of the drawings. The switches 12 extend through the slots 9.

Various switches 12 previously referred to are movably mounted upon the tube 6 by means of the slide 11, and adjacent to the lower end of the tube 6 there is mounted a stationary switch 15 similar to the switches 12, with which switch 15 the conductor 13 also connects.

The switch slide 11 is adapted to be held at different adjustments vertically of the tube 6 by means of a spring actuated plunger 16 which is mounted at one side of and near the lower end of the switch casing 10, said plunger having a handle 17 at its outer end by which to pull the same outwardly against the tension of the spring 18 surrounding the plunger. At its inner end the plunger 16 is adapted to engage a selected one of a series of notches 11*a* formed in one edge of the slide 11 near the lower end of the latter. Also, the lower end of the slide 11 is provided with a handle 19 by which it may be readily moved upwardly or downwardly, as desired.

As seen in Figure 1, on the upper portion of the head 3 there is mounted a light panel which, according to the construction shown, provides a series of nine indicating lights 20 in upper and lower rows, and in the lower row one of the lights designated at 21 is a special signalling light. The lights 20, nine in number, are adapted to be lighted by reason of the connection of each of them with one of the switches 12, see diagram in Figure 7, in which, however, the connections of certain lights with the switches 12 are omitted for lack of space. The light 21 which is a special signalling light, is connected with the stationary switch 15 previously described and seen well in Figures 3 and 4.

It is contemplated that some general circuit having the electrical conductor features shown diagrammatically in Figure 7 shall be employed, the electric energy for operating the indicating lights 20 and the signal light 21 being supplied by the battery 22 usually provided on the motor vehicle partly illustrated as to its members at 1 and 2, said vehicle of course carrying the boring machine to which my invention particularly relates.

Since the circuit arrangements in Figure 7 are largely conventional, they are not described in detail, though the parts included in the circuit which have been hereinbefore identified, are designated by the previously used identifying numerals.

The operation of my invention is comparatively simple and may now be described. Assuming that a hole is to be bored with the machine parts arranged substantially as in Figures 1 and 2, and further assuming that the bit of the auger 7 is say two feet from the surface level of the ground in which the hole is to be bored, it will be apparent that when the operator of the machine throws in the operating gearing for driving the boring bar 5 downwardly, the head 8 of the bar 5 will engage the switches 12 in its downward progress in the tube 6. As the head 8 descends, it operates each switch 12 to close the same and light the indicating light 20 controlled by the switch. Therefore, when the bit of the auger 7 reaches the ground, the head 8 will have operated the two uppermost switches 12, the first one being actuated to close the same after the bar 5 has moved one foot downwardly and the second one being actuated when the bar 5 has been moved two feet so that its bit is about to enter the ground. The operator notes of course that two of the indicating lights 20 are operated when the boring tool reaches the ground, and then, if the

hole which is to be bored is to be five feet deep, the seventh one of the indicating electrical devices 20 will be operated when the five foot depth has been reached. At this time the operator will discontinue the drive of the mechanism in the head 3 so as to stop the downward movement of the boring bar 5 and its auger 7, and the hole will be dug to the predetermined depth. Let it be supposed again that the driving head 3 has been tilted about the axis A so that the head and the tube 6 are inclined rearwardly toward the frame 1 and the auger is inclined with the boring bar in an outward direction. Under these conditions of course, the bit of the auger 7 will be more than two feet from the ground. It may be, say, three or four feet from the ground, but if it is four feet from the ground it will have to advance four feet before the bit of the auger 7 reaches the ground level, and the operator will note when the fourth indicating light 20 is on which will show that the bar 5 has advanced four feet as the auger 7 begins to penetrate the ground. Therefore, to obtain a five foot hole, the operator will note when the ninth light goes on, referring to the lights 20, and this will indicate that a five foot depth of hole has been obtained, whereupon the driving of the boring bar 5 will be discontinued. The same principle of operation of the indicating light 20 will obtain when the boring head 3 and the guide tube 6 are disposed at other angles than the vertical, and also when the vehicle 1—2 is backed to a position wherein the boring mechanism is disposed above a trench or any other lower ground level than that carrying the machine 1—2.

Now in reference to the light 21, it will be recalled that the stationary switch 15 is located below the sliding switch panel 11 and adjacent to a point on the drill head at which the boring shaft or bar 5 reaches the lower limit of its travel. The switch 15 is therefore used as a safety device and may operate either the signal light 21, which might be of the color red as distinguished from the indicating light 20 which might be white, so that when the boring bar reaches the limit of its lower movement, the head 8 will strike the switch 15 and put on the warning light 21 to make sure the operator will stop the downward or outward movement of the boring bar in a digging operation when such limit of movement has been reached.

The reason for providing the flexible conductor 13—14 is to enable a certain amount of slack to be provided at the point 14*a* in the length of said conductor, see Figure 1, enabling the movement of the switch slide 11 to different positions where it will be held by the locking plunger 16. The switches 12 are mounted on the sliding panel 11 for adjustment purposes for compensating for variation in the height of the frame of the machine in relation to the ground surface on which the vehicle travels. That is to say some vehicles on which the boring machinery will be mounted have a frame at a higher point from the ground than other machines, and it is desirable that the slide 11 be adjusted so that the various switches 12 may be positioned to enable the boring bar 8 to operate the switches when they are located approximately accurately a definite number of feet from the ground, the footage readings of course being supplied by reference to the indicating light 20 in the manner previously set forth.

As the boring bar 5 re-enters the guide member during retraction from the hole, or reverse movement from that of digging, it operates the switches 15 and 12 to break the electric circuit connections to the lights 20 and 21 so the latter will be rendered inactive.

Obviously, the signal 21 may be a light, as shown, or an audible signal which would be equally useful.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination, a hole boring machine comprising a boring head, a guide member extending from the head, a boring bar operable to be projected from the head in its boring operation, an auger carried by the lower end of the boring bar, cooperating means intermediate the guide and bar to prevent the bar from whipping during its hole boring action, and indicating mechanism comprising digging depth indicators coacting with the boring machine, operating devices for the indicators located at predetermined distances apart on the said guide member and operable by the boring bar in its boring movement to render the indicators active for indicating the amount of movement of the bar, and means to adjust the positions of the various operating devices simultaneously relatively to the guide member.

2. In combination, a hole boring machine comprising a boring head, a guide member extending from the head, a boring bar operable to be projected from the head in its boring operation, an auger carried by the lower end of the boring bar, cooperating means intermediate the guide and bar to prevent the bar from whipping during its hole boring action, and indicating mechanism comprising digging depth indicators coacting with the boring machine, operating devices for the indicators located at predetermined distances apart on the said guide member and operable by the boring bar in its boring movement to render the indicators active for indicating the amount of movement of the bar, and a panel member adjustable on the guide member and supporting said operating devices carried by the guide member.

3. In combination, a hole boring machine comprising a boring head, a guide member extending from the head, a boring bar operable to be projected from the head in its boring operation, an auger carried by the lower end of the boring bar, cooperating means intermediate the guide and bar to prevent the bar from whipping during its hole boring action, and indicating mechanism comprising digging depth indicators coacting with the boring machine, operating devices for the indicators located at predetermined distances apart on the said guide member and operable by the boring bar in its boring movement to render the indicators active for indicating the amount of movement of the bar, and a slide adjustably supporting the members operable by the guide head.

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