G. RATTRAY.

SOUNDING APPARATUS.

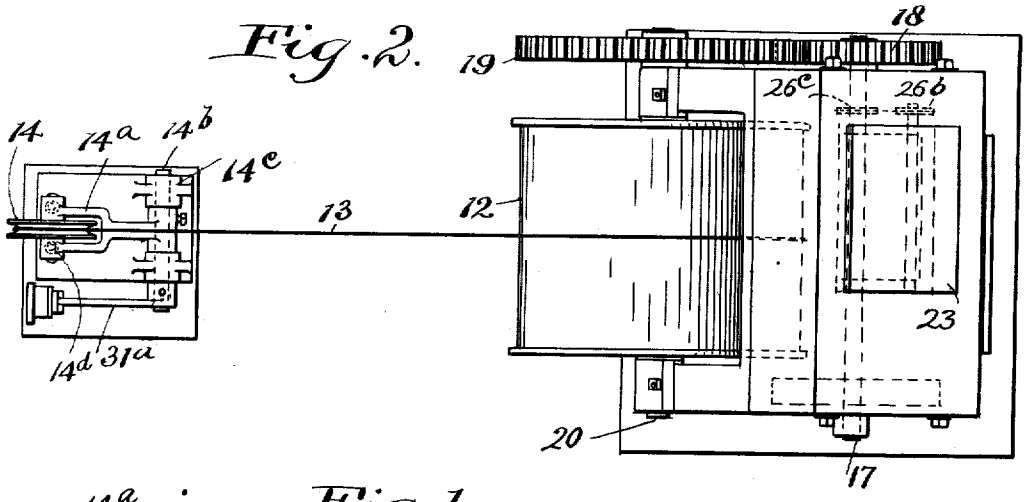
APPLICATION FILED FEB. 2, 1911.

1,009,856.

Patented Nov. 28, 1911.

2 SHEETS—SHEET 1.

Fig. 2.



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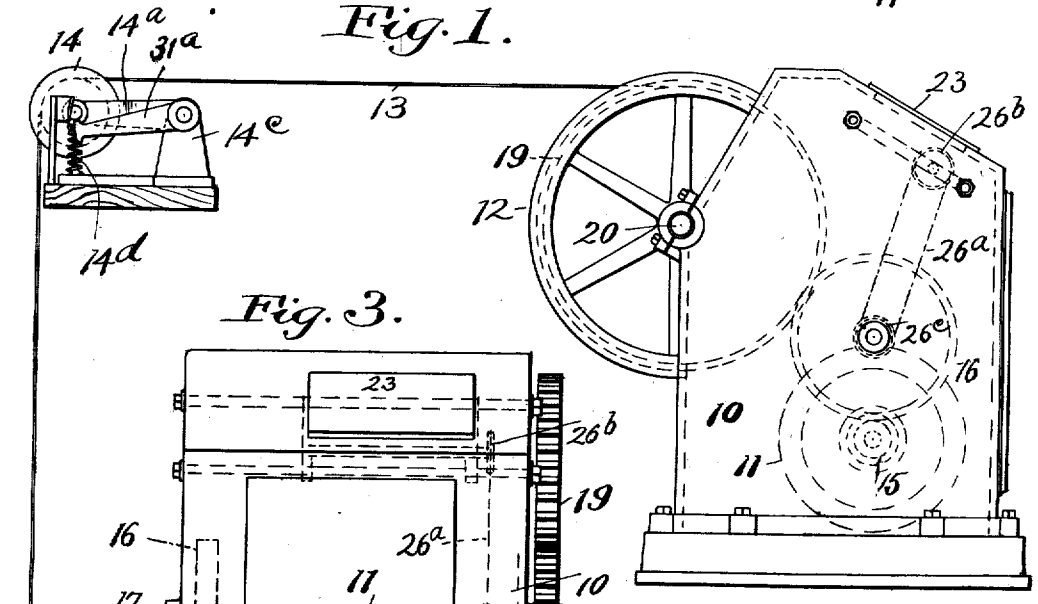
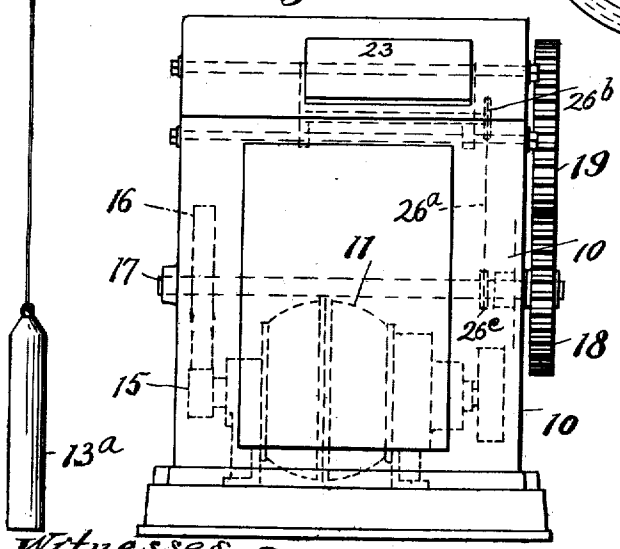


Fig. 3.



Witnesses.
E. B. Gilchrist.
H. R. Sullivan.

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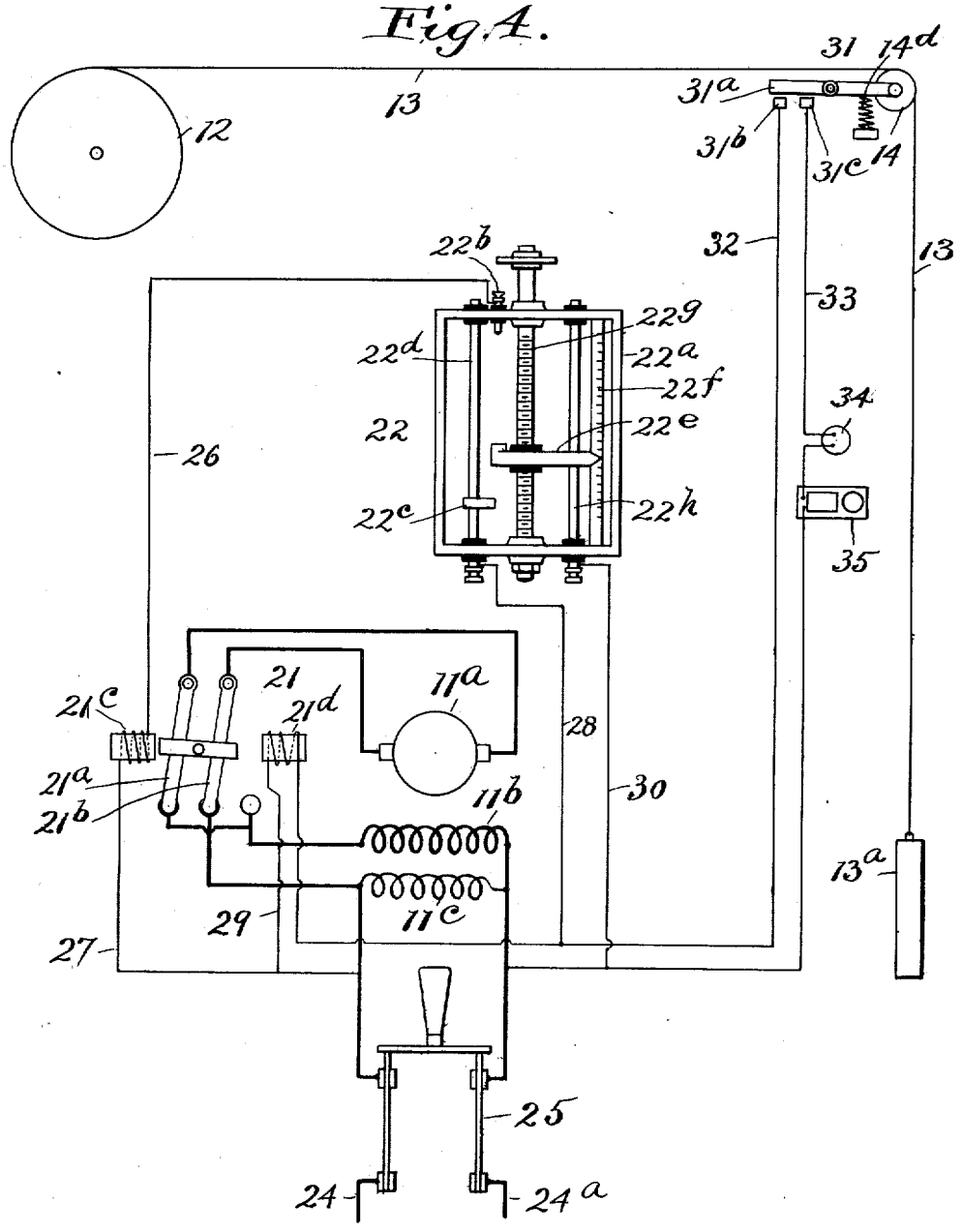
Fig. 4.



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UNITED STATES PATENT OFFICE.

GORDON RATTRAY, OF CLEVELAND, OHIO, ASSIGNOR TO THE AUTOMATIC SOUNDING MACHINE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

SOUNDING APPARATUS.

1,009,856. Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed February 2, 1911. Serial No. 606,120.

To all whom it may concern:

Be it known that I, GORDON RATTRAY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Sounding Apparatus, of which the following is a full, clear, and exact description.

This invention relates to improvements in ships' lead or sounding apparatus.

The best types of sounding apparatus in use at the present time are more or less crude and unsatisfactory, and are in fact of very little value and afford practically no protection when a vessel is sailing in dangerous waters, under foggy or otherwise unfavorable weather conditions. These serious, if not fatal, objections are due largely to the labor and great length of time required to make a reading or sounding and to the unreliable and unsatisfactory methods of operation or manner in which the apparatus is used. The result is, that when a vessel is in dangerous waters and weather conditions are unfavorable, the officers of the vessel are in constant fear of grounding, and it is often the case that safety demands that a vessel be anchored for a considerable period, entailing a considerable loss of time and money which might be avoided if the vessel were equipped with a better and more reliable sounding apparatus.

The object of the present invention is to provide a sounding apparatus which is more efficient than the apparatus used heretofore; which gives the officers of a vessel, at exceedingly short intervals, reliable and accurate information regarding the depth of the water through which the vessel is passing at any time; and which is automatic in character, requiring absolutely no manual labor in its operation.

The sounding apparatus constructed in accordance with my invention includes a hoisting apparatus for repeatedly raising and lowering a ship's lead, and preferably the hoisting apparatus is so constructed and operated that the raising and lowering of the lead is done automatically, the drum upon which the lead line is wound being under normal conditions reversed in its direction of rotation, both when a predetermined amount of line has been paid out and wound in. In connection with this apparatus, I provide means whereby, when the lead strikes bottom before the predetermined length of line has been paid out, a signal of some kind, such as an audible or a visual signal (or both), is operated, and at the same time the rotation of the drum is automatically reversed, so as to wind in the line. When the lead is raised to the desired height with reference to the surface of the water, it will be lowered by the reversal of the drum, and when the lead again strikes bottom, the signal will be operated and the rotation of the drum again will be reversed. This raising and lowering of the lead takes place repeatedly and rapidly, the signal being operated and the rotation of the drum being reversed each time the lead strikes bottom.

In the preferred embodiment of my invention, I employ a reversing motor which is geared to the drum and is reversed under normal conditions by a reversing switch, together with what I term a limit switch which controls the reversing switch and causes it to be actuated when a predetermined length of line has been wound in, and when a predetermined length of line has been paid out or when the lead reaches a predetermined depth. The depth that the lead is lowered before the motor is reversed is controlled by means of an adjustable contact of the limit switch, and by the engagement of this adjustable contact with a combined traveling contact and indicator.

In order that the motor may be reversed and the signal or signals may be operated when the lead strikes bottom before the predetermined lenth of line is paid out, I employ a third switch which is preferably actuated by a sheave over which the line passes, the sheave being supported in a manner such that when the lead strikes bottom and the cable is slackened, the switch will be closed so as to operate the signal and cause the actuation of the reversing switch, the actuation of the reversing switch at this time being independent of the limit switch.

My invention may be further briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings, Figure 1 is a side elevation of the sounding apparatus embodying the preferred form

of my invention; Fig. 2 is a top plan view of the same; Fig. 3 is a rear view of a portion of the hoisting apparatus; and Fig. 4 is a diagrammatic view showing the various motor, switch and signal circuits.

Referring now to the drawing, 10 represents a housing which incloses the main parts of the hoisting apparatus and some of the other parts which will be referred to presently. Within the housing 10, is a motive device, preferably a direct-current reversing motor 11 which drives a drum 12 adapted to receive a lead line 13, which passes over a sheave 14 and has connected to the end thereof a suitable lead or weight 13^a. In this case, the shaft of the motor is provided with a pinion 15 which drives a gear 16 mounted on a shaft 17 rotatably supported in the sides of the housing 10. One end of the shaft 17 projects through and beyond the side of the housing and has attached thereto, a gear 18 which drives a larger gear 19 secured to a shaft 20 to which the drum 12 is secured.

In accordance with my invention, the hoisting apparatus so far described is for the purpose of repeatedly raising and lowering the lead, and for reversing the direction of rotation of the drum when a predetermined length of line has been paid out or when the lead reaches a predetermined depth (which may be varied to suit conditions or requirements) and when a predetermined length of line has been wound in or when the lead has been raised to or within a suitable distance of the surface of the water.

To reverse the rotation of the drum in the manner above stated, I prefer to reverse the motor, and this is accomplished by means of a reversing switch 21 and a limit switch 22, both of which may be arranged in the housing 12, the limit switch being supported at the top of the housing beneath a suitable glass cover 23.

Referring now to Fig. 4, it will be seen that current is supplied to the motor and other devices, to be explained, by main current supplying conductors 24 and 24^a provided in their circuit with a master-switch 25 by means of which the sounding apparatus as a whole may be thrown into or out of operation. As here shown, the motor 11 includes an armature 11^a, a series field winding 11^b and a shunt field winding 11^c. The reversing switch 21 which is arranged between the armature and field windings in the usual manner, may be of any suitable construction, and in this case, it is of the double-throw type and is provided with a pair of switch arms 21^a and 21^b which in either position are adapted to engage suitable stationary contacts. These switch arms are adapted to be thrown to one position to cause the motor to rotate in one direction by means of a solenoid 21^c and to be thrown to the opposite position so as to cause the motor to reverse by a second solenoid 21^d. The circuits of the coils of these two solenoids will be traced after the construction of the limit switch 22 has been explained. This limit switch 22 which, as before stated, is arranged near the top of the housing, may include a suitable frame or frame work 22^a and includes also three main contact members as follows: a fixed contact 22^b, a normally fixed but adjustable contact 22^c, which is supported on a rod 22^d mounted in the frame 22^a, and a traveling contact 22^e, which is adapted to be moved back and forth between the contacts 22^b and 22^c, and at the end of its movement in one direction to engage the fixed contact 22^b, and at the end of its movement in the opposite direction to engage the normally fixed but adjustable contact 22^c. The contact 22^e which may serve also as an indicator and which may coöperate with a scale (indicated conventionally at 22^f), is mounted on and is adapted to be shifted back and forth by a screw or threaded shaft 22^g which is supported in the frame 22^a, and which is adapted to be rotated from the motor by a chain and sprocket driving gear, including a sprocket chain 26^a and sprocket wheels 26^b and 26^c which are mounted respectively on the shaft 17 and on the threaded shaft 22^g, and over which the sprocket chain 26^a passes. The traveling contact 22^e is in electrical engagement with a fixed rod 22^h which is mounted in the frame 22^a parallel with the threaded shaft 22^g.

As clearly shown in Fig. 4, one terminal of the coil of solenoid 21^c of the reversing switch is connected by conductor 26 to the fixed contact 22^b of the limit switch 22, and the other terminal of this coil is connected by conductor 27 to one of the main conductors 24. Also one of the terminals of the coil of solenoid 21^d is connected by conductor 28 to the fixed rod 22^d which supports the adjustable contact 22^c, while the other terminal of this coil is connected by conductor 29 to the main conductor 24. The other main conductor 24^a is connected by a conductor 30 to the fixed rod 22^h with which the traveling contact 22^e is in electrical engagement, as above explained.

Assuming that the motor is properly wound and that the current is in the proper direction, it will be seen from the above described apparatus and electrical connections, that when the master switch 25 is closed, and when the reversing switch 21 is in the position shown, the motor will be rotated in one direction (in a direction to rotate the drum so as to pay out the line), and will rotate the threaded shaft 22^g of the limit switch in a direction such as to cause the traveling contact 22^e to move toward the contact 22^c. The motor will continue to

rotate in this direction and the drum will continue to pay out the line until a predetermined length of line has been paid out or until the lead has been lowered to a predetermined depth, the amount of which depends upon the position of the contact 22^c, which, as before stated, is adjustable along the rod 22^d. As soon as the contact 22^e engages the contact 22^c, the circuit is completed through the coil of solenoid 21^d, which on being energized, throws the reversing switch 21 to position opposite to that shown, so as to reverse the direction of current through the motor armature and cause the motor to be reversed. Immediately the drum winds in the line which had previously been paid out, raising the lead toward the surface and the traveling contact 22^e is now moved toward the fixed contact 22^b. As soon as the contact 22^e engages the contact 22^b which takes place when the lead has been raised a predetermined amount, the circuit is completed through the coil of solenoid 21^c, and as soon as this solenoid is energized, the reversing switch is actuated so as to again reverse the motor so that the line will again be paid out and the lead lowered. This winding in and paying out of the line and the consequent raising and lowering of the lead continues in the manner above stated, the motor being automatically reversed as the lead reaches its predetermined limit of movement in each direction.

As before stated, I have provided means for sounding an alarm or for actuating a signal and also for causing the reversal of the motor when the lead strikes bottom, and the preferred mechanism for accomplishing this result will now be explained. As stated previously, the line 13 passes over a sheave 14. This sheave is yieldingly supported, being in this case pivotally supported, by means of an arm 14^a which is fixed to a rock shaft 14^b mounted in suitable bearings of a casting 14^c which may be arranged at a suitable distance from the housing and other parts of the hoisting apparatus. A pair of coil compression springs 14^d are arranged beneath suitable projecting portions of the arm 14^a and the base of the casting 14^c. These springs are compressed when the weight of the lead is on the sheave, but when the lead strikes bottom and the line is slackened, said springs will raise the sheave. Connected in any suitable manner with this sheave is a switch 31 which is designed to be closed when the sheave is raised by the springs so as to cause the reversal of the motor and also to sound an alarm or actuate one or more signals. In this case, this switch includes an arm 31^a which is fixed to one end of the rock shaft 14^b upon which the sheave 14 is supported, and this switch arm is adapted to coöperate with a suitable number of fixed contacts, there being here shown two contacts 31^b and 31^c which are engaged by the switch arm 31^a when the sheave is moved upward by the springs. One of these contacts, namely, 31^b, is connected by a conductor 32 to the conductor 28 leading to the coil of solenoid 21^d and to the main current supplying conductor 24, and the other contact 31^c is connected by a conductor 33 to conductor 30 leading to the other main current supplying conductor 24^a. The conductor 33 has in its circuit two signals, namely, a lamp 34, and an electric bell 35. It will be seen, therefore, that when the lead strikes bottom and the cable is slackened, the switch 31 is closed by the upward movement of the sheave, and, as a result, the signals are operated so as to call the officers' attention to the fact that the lead has struck bottom, and at the same time the solenoid coil 21^d is energized so as to cause the motor to reverse and wind in the line, and this is done independently of the limit switch. The line is then wound in until the traveling contact 22^e engages the contact 22^b, when the motor will again be reversed, and the lead lowered. If the lead again strikes bottom, the motor is reversed by the switch 31 and reversing switch 21 and the signals are again actuated. In this manner, by employing a hoisting apparatus and particularly a motor which will operate at the required speed, and may be reversed automatically, the lead will be raised and lowered very quickly and the officer of the vessel will be given repeated warnings and will be kept constantly informed of the depth of the water, the signals being actuated at very short time intervals. As before stated, the traveling contact 22^e preferably serves as an indicator and coöperates with a suitable scale 22^f which is so graduated and designed that the position of the traveling contact and indicator 22^e at the instant the signal or signals are actuated, will show the actual depth of water through which the vessel is passing.

I wish it to be understood that while I have shown only the preferred form of my invention, some of the parts may be considerably modified, both in their construction and operation, and I do not wish therefore to be confined in my claims to any of the specific details shown and described, except those to which I limit myself in the claims.

Having described my invention, I claim:

1. In a sounding apparatus, hoisting apparatus for raising and lowering a sounding-lead, including a motive device, a drum geared to the motive device and adapted to have a lead line wound thereon and unwound therefrom, mechanism for causing the motive device to reverse the direction of rotation of the drum, and means for automatically causing the actuation of the re-

versing mechanism when the lead strikes bottom.

2. In a sounding apparatus, hoisting apparatus for raising and lowering a sounding-lead including a motive device, a drum geared to the motive device and adapted to have a lead line wound thereon and unwound therefrom, mechanism for causing the motive device to reverse the direction of rotation of the drum, a signal, and means for causing the actuation of said signal and the actuation of the reversing mechanism when the lead strikes bottom.

3. In a sounding apparatus, mechanism for hoisting and lowering a sounding-lead, including a motive device, a drum driven by the motive device and adapted to have a lead line wound thereon and unwound therefrom, a reversing mechanism for causing the motive device to automatically reverse the direction of rotation of the drum when the lead has been raised or lowered a predetermined amount or when the lead strikes bottom.

4. In a sounding apparatus, hoisting mechanism for automatically and repeatedly raising and lowering a sounding-lead, including a motive device, a drum driven by said motive device and adapted to have a lead line wound thereon and unwound therefrom, a reversing mechanism for causing the motive device to automatically reverse the direction of rotation of the drum when the lead has been raised or lowered a predetermined amount, and means for causing the actuation of the reversing mechanism when the lead strikes bottom.

5. In a sounding apparatus, hoisting mechanism for automatically and repeatedly raising and lowering a sounding-lead, comprising a motor, a drum geared to the motor and adapted to have a lead line wound thereon and unwound therefrom, a reversing mechanism comprising a reversing switch for automatically reversing the motor when a predetermined length of line has been paid out or wound in, and means for causing the actuation of said reversing switch so as to cause the motor to wind in the line when the lead strikes bottom.

6. In a sounding apparatus, hoisting mechanism for raising and lowering a sounding-lead, and comprising a drum adapted to have a lead line wound thereon and unwound therefrom, a yieldingly supported sheave over which the line is adapted to pass, a signal, and means, operated by the movement of the sheave when the lead strikes bottom and the line is slackened for causing the actuation of the signal.

7. In a sounding apparatus, hoisting mechanism for automatically and repeatedly raising and lowering a sounding lead, said mechanism comprising a motive device, a drum geared to said motive device and adapted to have a lead line wound thereon and unwound therefrom, mechanism for causing the motive device to reverse the direction of rotation of the drum when a predetermined length of line has been paid out or wound in, a yieldingly supported sheave over which the lead line is adapted to pass, and means controlled by the movement of said sheave when the lead strikes bottom and the line is slackened, for causing the actuation of the reversing mechanism.

8. In a sounding apparatus, hoisting mechanism for repeatedly raising and lowering a sounding lead, said mechanism comprising a motive device, a drum geared to said motive device and adapted to have a lead line wound thereon and unwound therefrom, mechanism for causing the motive device to automatically reverse the direction of rotation of the drum when a predetermined length of line has been paid out or wound in, a yieldingly supported sheave over which the lead line is adapted to pass, a signal, and means controlled by the movement of said sheave when the lead strikes bottom and the line is slackened, for operating said signal.

9. In a sounding apparatus, hoisting mechanism for repeatedly raising and lowering a sounding lead, said mechanism comprising a motive device, a drum geared to said motive device and adapted to have a lead line wound thereon and unwound therefrom, mechanism for causing the motive device to automatically reverse the direction of rotation of the drum when a predetermined length of line has been paid out or wound in, a yieldingly supported sheave over which the lead line is adapted to pass, a signal, and means, controlled by the movement of said sheave when the lead strikes bottom and the line is slackened, for causing the actuation of said signal and the actuation of the reversing mechanism.

10. In a sounding apparatus, mechanism for repeatedly raising and lowering a sounding lead, including a motor, a drum geared to the motor and adapted to have a lead line wound thereon and unwound therefrom, a reversing switch for automatically causing the reversal of the motor when a predetermined length of line has been paid out or wound in, a yieldingly supported sheave over which the line is adapted to pass, a switch, operated by the movement of said sheave when the lead strikes bottom and the line is slackened and connections extending from said switch, for causing the actuation of the reversing switch.

11. In a sounding apparatus, mechanism for automatically and repeatedly raising and lowering a sounding lead, including a motor, a drum geared to the motor and adapted to have a lead line wound thereon and unwound therefrom, a reversing switch

for automatically causing the reversal of the motor when a predetermined length of line has been paid out or wound in, a yieldingly supported sheave over which the line is adapted to pass, an electric signal, a switch, connected to said sheave and adapted to be closed by the movement of the sheave when the lead strikes bottom and the line is slackened, and connections controlled by said last mentioned switch for causing the operation of the signal and the actuation of the reversing switch.

12. In a sounding apparatus, hoisting mechanism for automatically and repeatedly raising and lowering a sounding lead including a motor, a drum geared to the motor and adapted to have a lead line wound thereon and unwound therefrom, a reversing switch, a limit switch and connections between the limit switch and reversing switch for causing the actuation of the reversing switch when a predetermined length of line has been wound in or paid out, a yieldingly supported sheave over which the line is adapted to pass, a switch, controlled by the movement of the sheave when the lead strikes bottom and connections controlled by said last mentioned switch for causing the actuation of the reversing switch.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

GORDON RATTRAY.

Witnesses:

WALTER G. STEPHAN,

A. F. KWIS.