

J. E. FUNK.
 GRADE INDICATING DEVICE FOR DITCHING MACHINES.
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1,369,235.

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Fig. 1

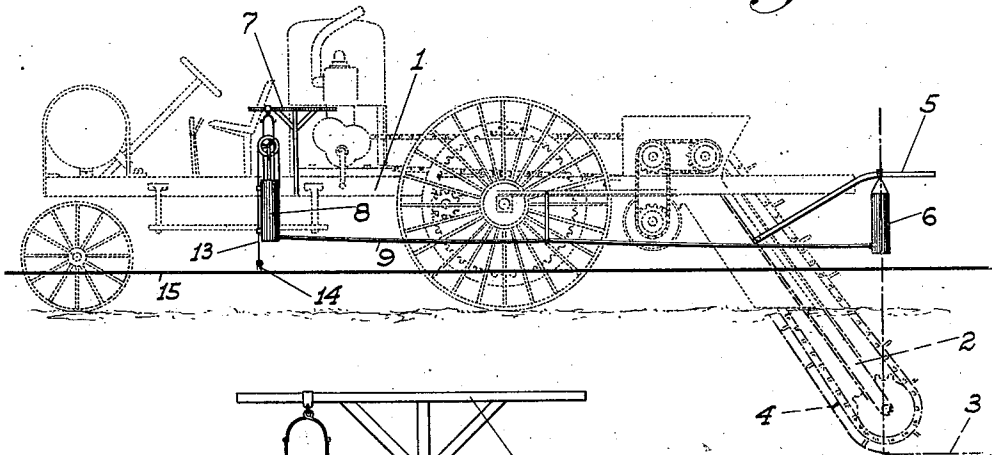


Fig. 2

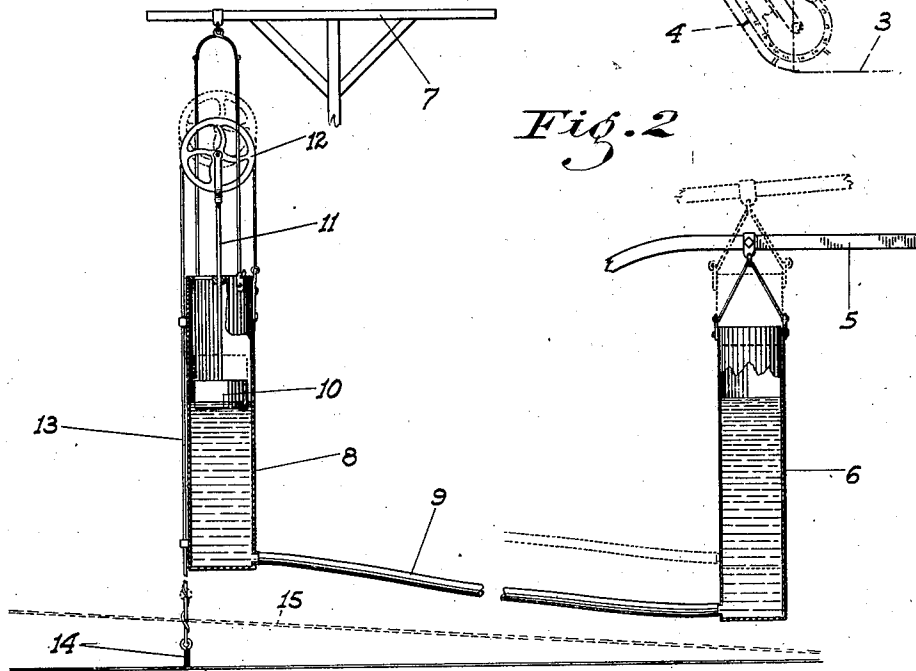
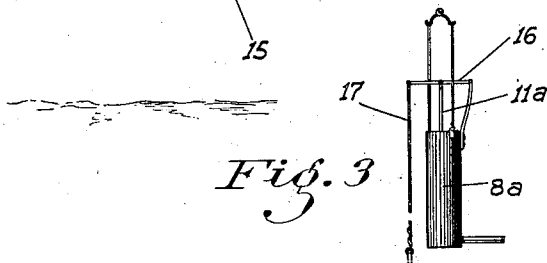


Fig. 3



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GRADE-INDICATING DEVICE FOR DITCHING-MACHINES.

1,369,235.

Specification of Letters Patent.

Patented Feb. 22, 1921.

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To all whom it may concern:

Be it known that I, JOHN E. FUNK, a citizen of the United States, residing at Stockton, in the county of San Joaquin, State of California, have invented certain new and useful Improvements in Grade-Indicating Devices for Ditching-Machines; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this application.

This invention relates to improvements in means for indicating the grade of the ditch being dug relative to the surface of the ground, so that the operator of the machine may tell at a glance whether the ditch is being kept to grade or not.

The principal object of the invention is to provide a device which will be carried on the machine and which will correctly indicate the grade of the ditch regardless of any temporary change of elevation of the machine itself due to elevations or depressions of the ground level.

This is especially valuable when digging ditches for tile drains, etc., the grade of which must be reasonably accurate.

A further object of the invention is to produce a simple and inexpensive device, and yet one which will be exceedingly effective for the purposes for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views.

Figure 1 is a side outline of a ditching machine, showing the indicating device in connection therewith.

Fig. 2 is an enlarged detached view of the device itself.

Fig. 3 is a detached view of a modified form of indicator mechanism.

Referring now more particularly to the characters of reference on the drawings, the numeral 1 denotes the chassis of the ditch digger which has a digger boom 2 pivotally mounted thereto and adapted for movement about its pivotal point to adapt it to be lowered to a suitable depth to dig a ditch 3 by means of the digging members 4 operatively mounted to said boom.

Fastened to the boom above ground is a

rigid post 5 extending rearwardly beyond the lowest point of digging of the member 4.

This post supports a liquid holding receptacle or tank 6, open to the atmosphere, which is preferably slidable on the post, so that it may be positioned directly above the lowest digging point of the digger regardless of its angle of setting.

Supported from the chassis 1 to one side thereof as by a frame 7 positioned at any suitable point is another liquid retaining tank 8 slidable along the frame, of exactly the same cross sectional area as the tank 6. A flexible tube or hose 9 connects the two tanks adjacent the bottom thereof.

The tank 8 has a float 10 therein to which is connected a rod 11 projecting upwardly from the tank and guided therein, being held against rotation. On the top of the rod is mounted a grooved pulley 12, on which is a flexible cord or wire 13, one end of which is fastened to the tank, while the other end depends downwardly outside the tank and has a marker weight or plumb bob 14 adjustably fastened to its lower end.

This bob is adapted to be positioned adjacent a grade wire 15 supported from the ground and which indicates the grade of the ditch being dug.

The length of the tanks 6 and 8 depends on the range of indicating desired at one setting, while the diameters thereof may be as small as desired while insuring a float of sufficient buoyant power to carry the weight of the rod, pulley and bob without being submerged.

In operation, suppose a ditch is being dug at a normal depth and it is desired to maintain such depth, or raise or lower the grade gradually.

The grade wire 15 is set according to the grade desired, and the receptacles 6 and 8 hung in their respective positions and substantially on the same level, being then about half filled with water, and the plumb bob 14 adjusted relative to the wire 15.

The two receptacles being connected, the water in both will always be at the same actual level.

The actual level of the rear tank 6 is of course constant relative to the boom 2.

The forward tank, 8 however, due to inevitable unevenness of the ground, is always shifting its level. Whenever this occurs, the water flows from one to the other, depending on their relative levels, and the float raises

and lowers accordingly. This causes a corresponding but opposite relative movement of the bob 14, so that when the tank 8 raises, and the water therein is lowered, the bob 5 will be lowered also, and will actually stay at the same level.

The movement of the bob is twice that of the float, since the change of level of the water due to a change in elevation of either 10 receptacle is distributed equally between both of them.

When it is desired to raise the boom to alter the grade of the ditch as indicated by the grade of the wire 15 as shown in 15 dotted lines in Fig. 2, any raising of the boom of course raises the tank 6 also, which causes the level of the water in the tank 8 to be relatively and proportionately raised, raising the bob 14 also so that it follows 20 along the wire 15.

By this means the operator can accurately judge as to the proper speed of raising the boom.

The tank 8 is preferably slidable along its 25 support so that it may follow up any adjustment of the tank 6 without the necessity of having a coiled or very slack hose.

In the modification shown in Fig. 3, the float at the tank 8^a is provided with a flexibly connected rod 11^a, the top of which is 30 similarly connected to the center of a lever arm 16, one end of which is connected to the tank, the other end having the marker cord 17 depending therefrom.

35 This arrangement of course also gives a 2 to 1 ratio of the marker relative to the float.

From the foregoing description it will be readily seen that I have produced such a 40 device as substantially fulfils the object of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device still in practice such deviations 45 from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention what I claim as new and useful and desire to se- 50 cure by Letters Patent is:—

1. A grade indicator for ditching machines comprising a pair of tanks communicating with each other at their bottoms, and adapted to be partially filled with liquid the tanks being of equal cross sectional 55 area, a float in one tank and a marker-weight

operatively connected with said float and positioned outside the tank and adapted for vertical movement relative to the tanks with a change of level of the liquid therein at 60 a ratio of 2 to 1 relative thereto.

2. The combination with a ditching machine having a digger boom of a grade indicator comprising a pair of tanks communicating with each other at their bottoms, 65 and adapted to be partially filled with liquid, one of said tanks being supported from the digger boom of the digging machine in a predetermined vertical position relative thereto and the other tank being mounted to 70 the chassis, a float in the latter tank, and a marker-weight operatively connected to the float for vertical movement therewith in a predetermined ratio, the weight projecting down outside the tank and being fixed adjacent the grade indicating line of a ditch. 75

3. The combination with a ditching machine having a digger boom of a grade indicator comprising a pair of tanks communicating with each other at their bottoms, and 80 adapted to be partially filled with liquid, one of said tanks being supported from the digger boom of the digging machine in a predetermined vertical position relative thereto and the other tank being mounted 85 to the chassis, a float in the latter tank, and a marker-weight operatively connected to the float for vertical movement therewith, and adapted to be fixed adjacent the grade indicating line of ditch, the tanks being of 90 equal cross sectional area and the weight being arranged for relative vertical movement equal to the movement of either of the tanks.

4. The combination with a ditching machine having a digger boom of a grade indi- 95 cator comprising a pair of tanks communicating with each other at their bottoms, and adapted to be partially filled with liquid, the tanks being of equal cross sectional area, a float in one tank and a marker-weight op- 100 eratively connected with said float and positioned outside the tank and adapted for vertical movement relative to the tanks with a change of level of the liquid therein at a ratio of 2 to 1 relative thereto, the last named 105 tank being supported from the chassis and the former being supported from the digger boom and adapted to be positioned directly above the point of greatest depth of digging thereof. 110

In testimony whereof I affix my signature.
JOHN E. FUNK.