Aug. 25, 1936. W. H. MILLER 2,052,481

HYDRAULIC DREDGE APPARATUS

Filed April 11, 1932

Fig. 1.

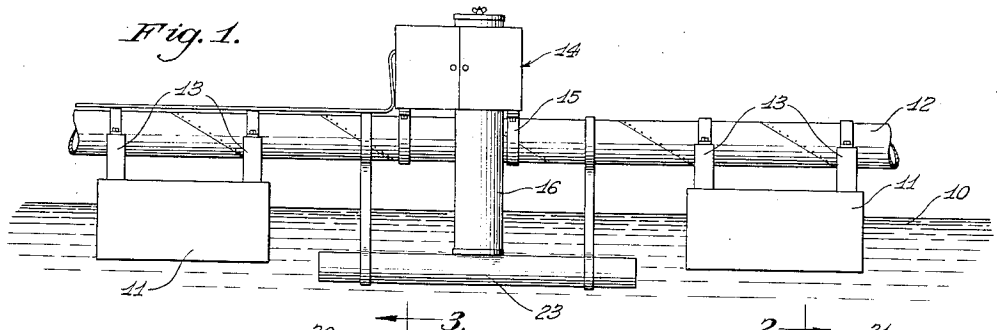


Fig. 2.

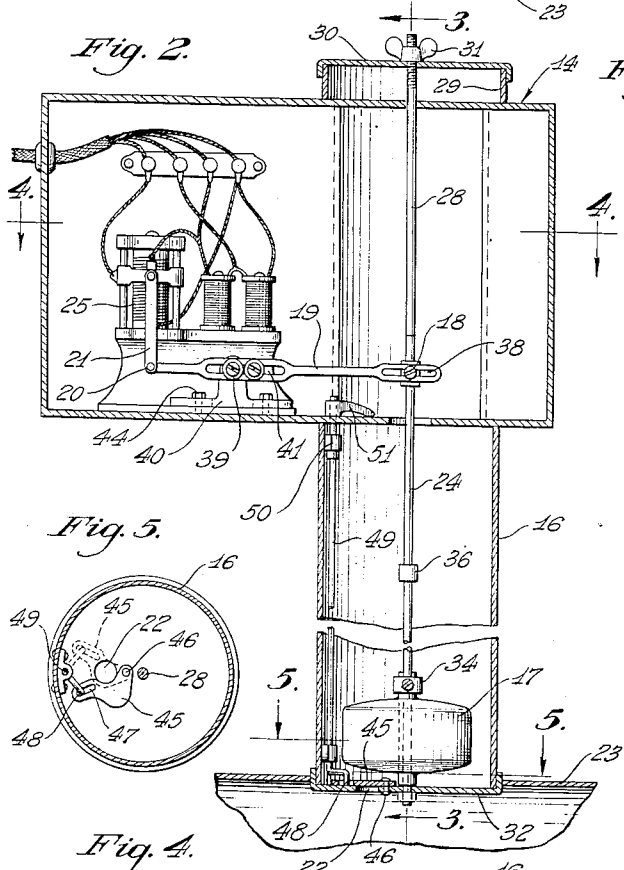


Fig. 3.

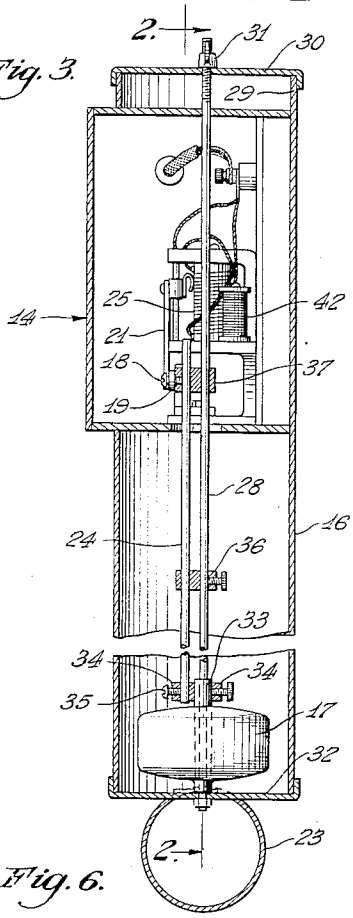


Fig. 5.

Fig. 4.

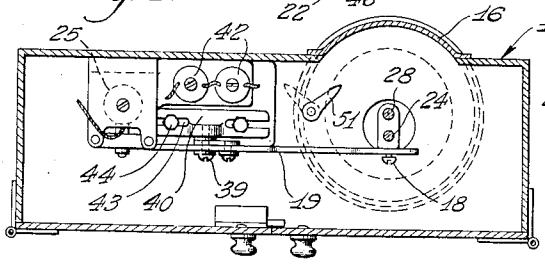
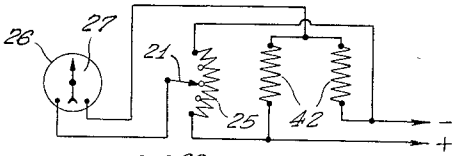


Fig. 6.



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HYDRAULIC DREDGE APPARATUS

Willis H. Miller, Shawano, Wis.

Application April 11, 1932, Serial No. 604,612

6 Claims. (Cl. 177—351)

This invention relates to certain novel improvements in a hydraulic dredge apparatus, and has for its principal object the provision of an improved construction of this character which will be highly efficient in use and economical in manufacture.

In hydraulic dredging the customary practice of determining the cubic yardage dredged is to survey the dredged area before and after the dredging operation and to calculate the cubic yardage of solids moved according to known methods of calculation. This method is not altogether satisfactory because, for example, it does not provide for accurate determination of the cubic yardage moved; it is expensive in time and labor; and it does not enable the dredge operator to determine the amount of and percentage of solids in water and solid mixture being moved through the pipeline in or at any given time.

It is therefore an object of this invention to provide a new method and new and efficient apparatus for determining the amount or percentage of solid material in a mixture of solids and water moving through an hydraulic dredge pipeline or conduit of a given cross-sectional area in any given unit of time.

Another object of the invention is to provide means associated with said apparatus to prevent error in the readings of the apparatus when the body of water being dredged is disturbed by waves, operation of the dredge, or other causes.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawing, showing the preferred form of construction and in which:

Fig. 1 is an elevational view of the invention assembled for use on a conventional hydraulic dredge or section line;

Fig. 2 is a vertical sectional view on line 2—2 of Fig. 3;

Fig. 3 is a vertical sectional view on line 3—3 of Fig. 2;

Fig. 4 is a horizontal sectional view on line 4—4 of Fig. 2;

Fig. 5 is a view on line 5—5 in Fig. 2, partly in section and partly in top plan; and

Fig. 6 is a schematic diagram of a wiring circuit embodied in the invention.

Referring now to the drawing, which illustrates a preferred and practical embodiment of the invention, indicated at 10 is a body of water above which, on pontoons or floats 11, is supported a conductor hydraulic dredge pipeline 12; the means for fastening the sections of the pipeline or conduit 12 to the pontoons or floats 11 being conventional and indicated generally at 13. Before proceeding with the detailed description of the invention, however, a general outline thereof will be given. In practicing my invention I mount on the pipeline 12, by suitable fastening means 15, a casing generally indicated at 14. Suspended below the casing 14 is a float chamber 16 in which is arranged a float 17. The float 17 is attached to a vertically slidable rod 24, and the rod 24 is pivotally connected at 18, to a pivotal rocker arm 19. The rocker arm 19 is pivotally connected, at 20, to a sliding contact arm 21. The float chamber 16 has communication at 22 with a tube 23 that is submerged in the body of water 10. The sliding contact arm 21 is associated with a rheostat 25 that is connected in series with resistance coils 42. Clear water, that is, water unmixed with any dredged solid content is moved through the line 12 and the roller arm 19 is made fast to rod 24 by screw 18. Water from the body 10 then enters the tube 23, flows into the chamber 16, raises the float 17 to its normal level relative to the surface of the body 10, the float 17 raises rod 24, and rod 24 pivots arm 19 which moves contact arm 21 into a position relative to rheostat 25 corresponding to the specific gravity of the water in line 12, whereby a zero reading is indicated on the dial 27 of an indicating device, such as galvanometer 26, connected in series with rheostat 25 and resistance coils 42.

When, therefore, the dredging operation is begun and solids mixed with water are moved through the line 12, the specific gravity of the water and solid mixture moving through line 12, being greater than that of water alone, causes the pipeline 12 and casing 14 to fall and the pontoons 11 to sink in the body of water 10. The float is, however, buoyed up by a force equal to the weight of water it displaces in chamber 16. When therefore the pipeline 12 and casing 14 fall, the float 17 being buoyed up remains stationary relative to conduit 12 and rocker arm 19 which pivots at 39. This movement of rocker arm 19 slides contact arm 21 on rheostat 25 whereby a reading is shown on the dial 27 of indicating device 26 corresponding to the specific gravity of the solid and water mixture moving through the pipeline 12. This reading of the dial 27 of indicating device 26 may then be translated for any cross sectional area of pipeline 12. into the percentage of solid material in the mix-

ture of solids and water passing through pipeline 12 at any given time. From this may readily be calculated the number of cubic yards of solids passing through line 12 in a given unit of time.

Reverting now to the detailed description of the invention: Extending through the casing 14 and through float chamber 16 is a rod 28 that is stationary relative to rod 24. The float 17 is slidable on the rod 28. For inserting the float 17 and rod 28 into, and for removing the same from, the chamber 16, a throat 29 is provided on the casing 14. Over this throat 29 is a closure member 30. The upper end of rod 28 is detachably attached to the closure member 30, as at 31, and the lower end of the rod 28 is detachably attached to the bottom well 32 of the float chamber 16.

Attached to the float 17 is a sleeve 33 that is slidable on the rod 28 and attached to this sleeve 33 is a clamping collar 34. The lower end of rod 24 is attached to the collar 34 as at 35. The rod 24 is slidable in guides 36 and 37 attached to rod 28. Provided in the rocker arm 19 is a slot 38 and adjustably connecting the rocker arm 19 to the rod 24 is a screw 18 that is extended through slot 38 and screwed into collar 37 so as to have its inner end adapted to bear against rod 24.

The rocker arm 19 is fulcrumed between its ends on an adjustable screw 39 which is mounted on a supporting base 40 arranged in the casing 14. Provided in the rocker arm 19 is a slot so that the rocker arm 19 is adjustable relative to its fulcrum 39 to vary the lengths of the lever arms on opposite sides of the fulcrum. To provide further adjustment of the rocker arm 19 the base 40 is provided with slots and attaching the base 40 to casing 14 are bolts 44 which are extended through slots 43.

This invention includes means for preventing momentary depth changes, such as are due to waves, working of the dredge, or other causes, from interfering with the accuracy of the reading of dial 27 of indicating device 26. To this end the bottom wall 32 of the chamber 16 is provided with a relatively small inlet 22 and to control water flow from the tube 23 to the chamber 16 through inlet 22 a valve plate or damper 45 is pivotally mounted on the bottom wall 32 of chamber 16 as at 46. A slot 47 is provided in the plate 45 and disposed in this slot 47 is an end portion 48 of a rod 49. The rod 49 is rotatably mounted in brackets 50 attached to the wall of chamber 16 and the upper end of rod 49 extends into the casing 14 wherein it is provided with a handle 51. By manipulating the handle 51 the rod 49 may be turned to move the plate 45 so as to vary the size of chamber inlet 22.

The tube 23 may be open at both ends or it may be provided at various points with openings for the admission of water from the body 10. When, therefore, the parts are arranged as shown in Fig. 1 and tube 23 is submerged, the valve plate 45 is moved to open inlet 22 so that water will flow into tube 23, through inlet 22 into float chamber 16 to raise the float 17 to its normal level relative to the surface of body 10. Momentary depth changes in the body 10, such as may be caused by waves, operation of the dredge, or other causes, do not however affect the level of the float 17, since water from the body 10 cannot enter directly into the float chamber 16, nor exert a force directly on float 17, but must first flow through tube 23. Disturbances in the body of water 10 cannot, therefore, affect the float 17 nor operate rod 24, rocker arm 19, and contact arm 21 to affect the reading of dial 27, since all the water entering chambers 16 must come through tube 23 and inlet 22 and the pressure of the water flowing into tube 23 and through inlet 22 remains constant for any given depth of tube 23 irrespective of disturbances in the body of water 10.

A zero reading, corresponding to the specific gravity of water 10, is obtained on dial 27 by loosening screw 18 and passing water, unmixed with solids, through pipeline 10. The screw 18 is then tightened to fixedly connect rocker arm 19 and rod 24. The dredging is then begun and the heavier specific gravity of the mixture of solids and water passing through pipeline 12 causes the pipeline 12 and casing 14 to settle, and the float chamber 16, and tube 23, as well as portions 11 to sink in body 10, while the float 17 is buoyed up by the weight of water it displaces; whereby the rocker arm 19 is pivoted about its fulcrum 39. Rocker arm 19 therefore moves the sliding contact arm 21 on rheostat 25 to actuate the galvanometer or indicating device 26. A reading is therefore shown on the dial 27 corresponding to the specific gravity of the mixture of water and solids passing through the pipeline 12 at any given time. From this may be calculated, for any given cross sectional area of pipeline 12, the percentage of solids in the mixture of solids and water passing through pipeline 12 in a given unit of time.

For most efficient operation the apparatus should be placed in the second or third length of section of pipeline 12 from the dredge as the length of pipeline 12 supporting the apparatus must have sufficient freedom of movement to afford unhindered operation.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification, without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention what I claim as new and desire to protect by Letters Patent is:

1. An apparatus for determining the amount or percentage of solid material passing through a hydraulic dredge pipeline in a given unit of time, comprising the combination of a hydraulic dredge pipeline including float means for supporting the pipeline on a liquid body; a vertically extending float chamber supported by and suspended below the pipeline and extending into the liquid body; a horizontally extending open ended tube supported by and suspended below the pipeline and float chamber for submergence therebelow; said tube having communication between its ends with the said float chamber; a float in the chamber and extending into the liquid body; electrical registering apparatus; and devices associated with and operable by said last-named float for operating the said electrical registering apparatus.

2. An apparatus for determining the amount or percentage of solid material passing through a hydraulic dredge pipeline in a given unit of time, comprising the combination of a hydraulic dredge pipeline including float means for supporting the pipeline on a liquid body; a vertically extending float chamber supported by and

suspended below the pipeline and extending into the liquid body; a horizontally extending open ended tube supported by and suspended below the pipeline and float chamber for submergence therebelow; said tube having communication between its ends with the said float chamber; a float in the chamber and extending into the liquid body; electrical registering apparatus; devices associated with and operable by said float for operating the said electrical registering apparatus; means for controlling communication between the said float chamber and tube; and means for operating the said last named means.

3. The combination with a dredge pipe line, of a float connected with the pipeline for supporting the same upon a liquid body, an indicator carried by said pipe line for indicating load variations of the pipe line and its contents, a float connected with said indicator and extending into said liquid body for operating said indicator, and means carried by said pipe line for protecting the second-named float from the forces of surface irregularities on said liquid body, said means comprising a compensating valve and a normally horizontal tube positioned below said second named float and below the surface of said liquid body, each end of the tube comprising an inlet, said tube having communication with the said means.

4. The combination with a dredge pipe line, of a float connected with the pipe line for supporting the same upon a liquid body, a float chamber mounted upon the pipe line and extending downwardly therefrom to submerge one end in the liquid body, a float arranged within said float chamber, an electrically sensitive gauge, a mechanical and electrical connection between the gauge and said second-named float, and a guard chamber associated with the float chamber and having openings for the inlet of liquid, said float chamber and the guard chamber having communication for the inlet of liquid.

5. The combination with a dredge pipe line, of a float connected with the pipe line for supporting the same upon a liquid body, a float chamber mounted upon the pipe line and extending downwardly therefrom to submerge one end in the liquid body, a float arranged within said float chamber, a gauge, an operating connection between the gauge and said second-named float, and a normally horizontal tubular member associated with the float chamber and being submerged in the liquid body, and said tubular member having communication with the float chamber.

6. The combination with a dredge pipe line, of a float connected with the pipe line for supporting the same upon a liquid body, a float chamber mounted upon the pipe line and extending downwardly therefrom to submerge one end in the liquid body, a float arranged within said float chamber, a gauge, an operating connection between the gauge and said second-named float, a normally horizontal tubular member associated with the float chamber beneath the same and being submerged in the liquid body, and a valve for establishing communication between the tubular member and the float chamber.

WILLIS H. MILLER.