

Oct. 17, 1933.

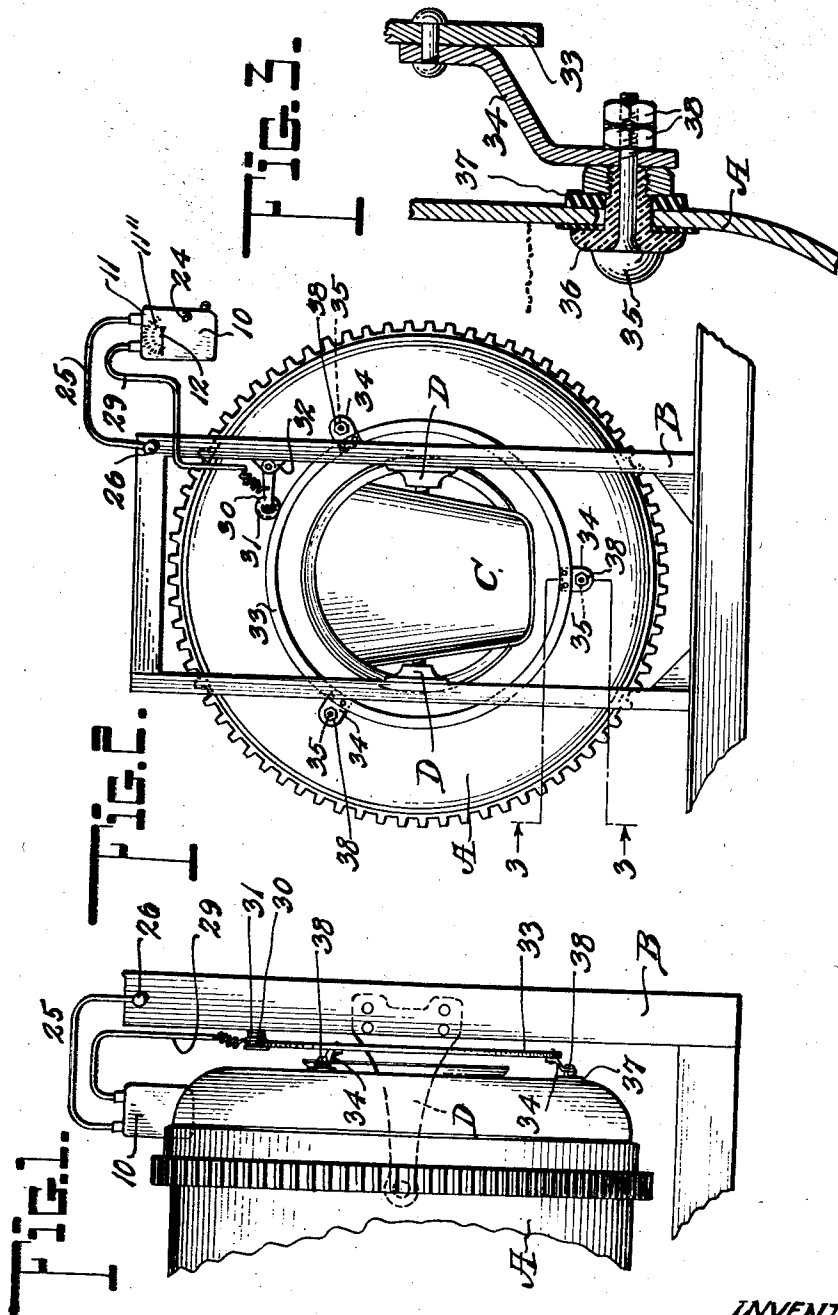
G. E. WEBB

1,930,831

MOISTURE OR CONSISTENCY INDICATOR

Filed March 13, 1929

3 Sheets-Sheet 1



BY

Roberts Cobb

INVENTOR
G.E. Webb

ATTORNEYS

Oct. 17, 1933.

G. E. WEBB

1,930,831

MOISTURE OR CONSISTENCY INDICATOR

Filed March 13, 1929

3 Sheets-Sheet 2

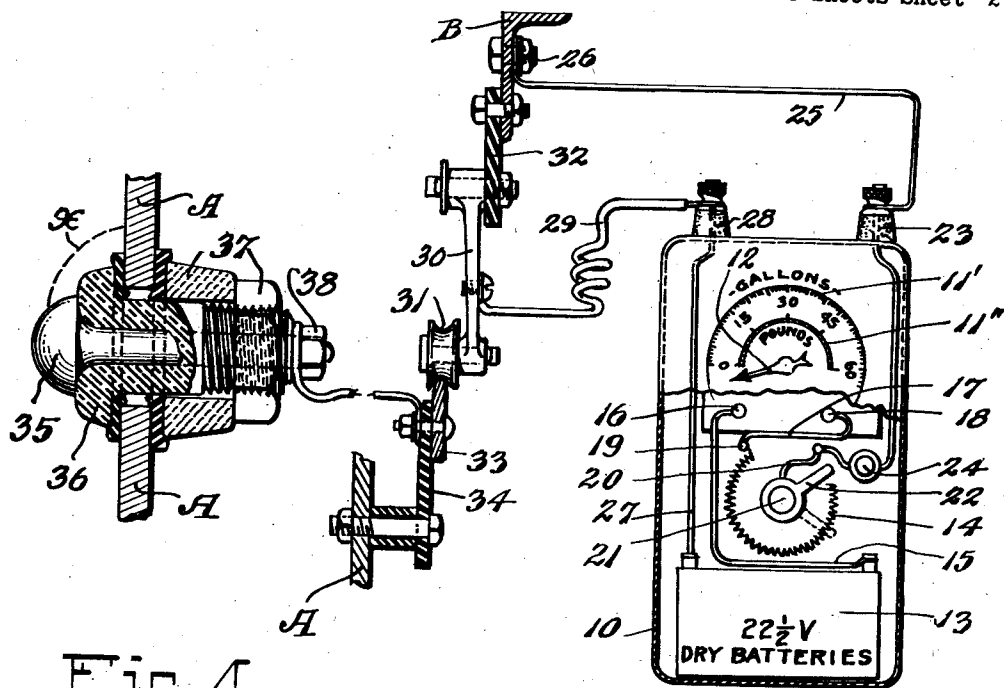


Fig. 4.

INVENTOR
G.E. Webb

BY

Robert Robb

ATTORNEYS

Oct. 17, 1933.

G. E. WEBB

1,930,831

MOISTURE OR CONSISTENCY INDICATOR

Filed March 13, 1929

3 Sheets-Sheet 3

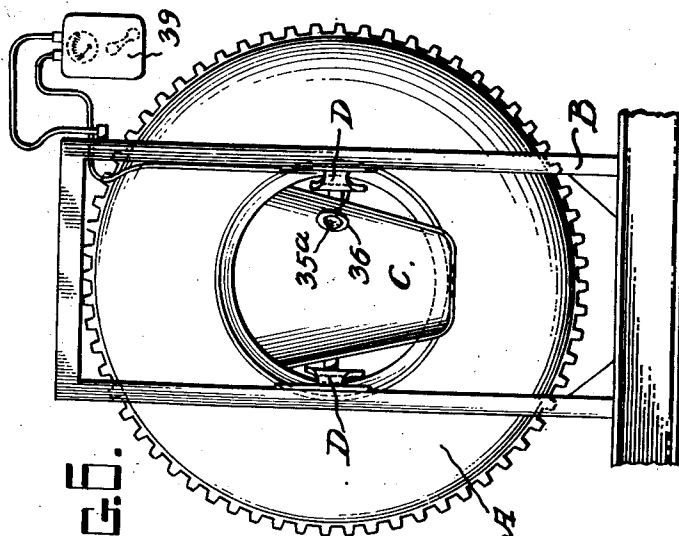


FIG. 6.

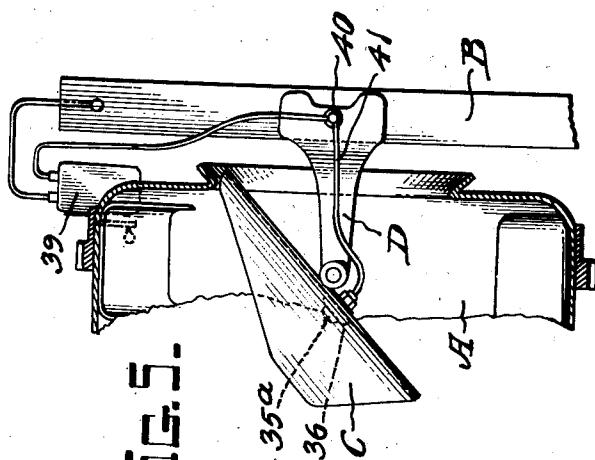


FIG. 5.

BY

Robert Cobb

INVENTOR
G. E. Webb

ATTORNEYS

UNITED STATES PATENT OFFICE

1,930,831

MOISTURE OR CONSISTENCY INDICATOR

George E. Webb, Milwaukee, Wis., assignor to
Koehring Company, Milwaukee, Wis., a corporation

Application March 13, 1929. Serial No. 346,776

4 Claims. (Cl. 175—183)

The present invention has for its objective the determination of the moisture content of such materials as concrete aggregates and the like, and particularly at the time of, or during, the mixing operation, whereby the strength of the admixture may be adequately controlled with relation to the special uses for the materials.

It is well settled at this time that the strength of concrete mixes is more or less dependent upon the moisture content, but there is ever present the problem of a practical test for determining when this factor has been satisfied according to known ratios during mixing, or indeed after mixing, as far as that is concerned. The nature of the materials involved, and the special methods of handling them, make for complicacy, so that up to now in this art resort is mainly had to what is known as the "slump" test. Since this test cannot be effectively made until after the mix is completed, so to speak, it is unsatisfactory from many standpoints which do not need to be explained herein.

I have met this problem by applying to this art the principle of measuring the electrical conductivity of the material during the stages of mixing. In other words, I have found by experimentation that the electrical resistance of the concrete mix changes at a substantially uniform rate with variations of the water content and with this as a basis my present invention embodies a novel indicating means, including an electrical circuit in which the admixture acts to a greater or lesser degree as a resistance to the flow of current from a suitable source of electrical supply. By establishing an arbitrary scale based upon the variations of the resistance as influenced by the water content, the amount of water incorporated in the mix is readily determinable by a reading of the indicator which may be suitably calibrated in terms of gallons and pounds of water per cubic foot of dry aggregate.

In carrying out the invention I have provided an indicator arrangement, the instrumentalities of which form an attachment preferably of a standard mixing apparatus for concrete or like materials, and one of the important features of my invention resides in the arrangement of these instrumentalities so that a test of the moisture content may be made at will at any time during the mixing operation. It is to be understood, however, that I do not wish to restrict my invention to the testing of the materials while the mixing operation is going on, as it is just as feasible to make such test with the apparatus hereinafter set forth when the materials are in a static condition.

Other and further objects and advantages of the invention will be hereinafter set forth and the novel features thereof defined by the appended claims.

In the drawings:—

Fig. 1 is a fragmentary front elevation of a mixer device with which the moisture indicator means of this invention is associated;

Fig. 2 is an end elevation of the apparatus showing more clearly the collector ring and its electrodes or contact members, the disclosure in reference to the mixer device being more or less diagrammatically shown;

Fig. 3 is a detail view of a contact or electrode cooperating with the mixer drum;

Fig. 4 is a detail view of the indicator means forming the subject matter of this application;

Fig. 5 is a modified form of the invention in which the electrode is attached to the discharge chute and the source of electrical supply is in the form of a hand generator; and

Fig. 6 is a view at right angles to the view shown in Fig. 5.

In the drawings A designates a mixer drum of conventional form used for concrete mixing, B the supporting frame therefor, and C the discharge chute mounted upon the bracket D at the discharge opening of the mixer drum. This chute is of the tiltable type and in one position acts as a mixing element and in its other tilted position as a discharge chute for the contents of the drum when mixed. The means for charging such drum or for rotating the same are not herein set forth as they form no part of the invention which resides primarily in the combination with such apparatus broadly of means for determining the moisture content of the materials operated upon by the mixer.

Referring to Figures 2 and 4, the numeral 10 designates a casing in which is mounted a galvanometric instrument or indicator device 11. This device embodying the indicator pointer 12 is included in an electric circuit having as its source of supply a dry battery 13 of suitable capacity. Where this type of electrical supply source is employed, it is desirable to include in the apparatus a means for compensating for the deterioration of the battery, and in the present arrangement such means is in the form of a variable rheostat 14 which is included in the circuit from the battery. Preferably the conductor 15 from one terminal of the battery is connected to the terminal 16 of the indicator device. A conductor 17 is connected at one end to the other terminal 18 of said indicator and to the terminal 19 of the

rheostat. The conductor 20 is connected to the post 21 of the adjustable arm 22 and to the case terminal post 23. Preferably in this connection 20 a button or test switch 24 is incorporated. From the post 23 a conductor 25 leads to the mixer frame on which it is grounded, as indicated at 26.

From the other battery post a conductor 27 leads to the case terminal post 28 which is in turn connected by the wire 29 to a spring actuated contact member 30, having mounted at the end thereof the grooved roller contact 31. This arm is pivotally secured to the frame, as shown clearly in Fig. 2, with an interposed insulation 32. The contact member 30, or rather its roller 31, coacts with a collector ring 33 which is attached to the mixing drum about the discharge outlet, through the bracket arms 34 and the clamping bolts 35. The bolt members 35 are in reality terminal electrodes, the headed ends of which project into the interior of the drum. These bolts pass through insulator bushings 36 which are secured in place by insulating washers and nuts 37 screwed upon the threaded ends of the bushings. The bracket members 34 are clamped against these washers by nuts 38 connected to the bolts 35 so that the ring is fixed to the drum by a plurality of fastening means which will be referred to herein as contact members or electrodes. These contact members are spaced apart, as shown in Fig. 2, so that at least one of them will always occupy a position in contact with the materials within the drum. Since the contact member which is in contact with the material is insulated from the drum, the circuit to the indicator device is normally open until such material becomes electrically conductive, whereupon the circuit is closed, assuming that the test switch 24, hereinbefore referred to, is operated.

The operation of the testing means which has just been described, is as follows: When the materials, the usual concrete aggregates, for example, are introduced into the drum, this drum is usually rotated to effect the mixing action. Water is supplied to the drum in the customary manner, not illustrated, until the desired amount is incorporated for producing a satisfactory mix of the character desired. Since the moisture content is usually varied for different uses or batches, the proper ratio of the water content is usually prescribed, and it is to be understood that the galvanometric device 11 is provided with suitable scale indicia in terms of gallons and pounds per cubic foot of dry aggregate. As indicated in Figure 4, the outer scale calibration 11' is in terms of gallons, and the inner concentric calibration 11'' is in terms of pounds. To make a test of the water content of the mix above referred to, the button or test switch 24 is operated, closing the circuit from the battery through the rheostat to the indicator and through the respective conductors to the terminal post or contact 35 which happens to be at the bottom of the drum in contact with the mix at the time the switch is closed. The circuit is therefore, passed through the material, following the path indicated by the line X in Fig. 4. The resistance to the flow of the current from the electrical source will manifest itself at the indicator. As the water content increases, the resistance to the flow decreases until the point is reached of the proper moisture content for the particular mix, as indicated upon the dial or dials of the indicator device. In other words, the deflection of the galvanometer needle 12 will be directly pro-

portional to the rate of current flow, and this is determined by the resistance of the circuit. Since this resistance is that of the concrete or materials being mixed, other resistances being negligible, and since the said resistance varies with the water content, the reading of the indicator taken at will, will enable the operator of the apparatus to determine definitely the amount of water which is incorporated.

As hereinbefore suggested, the use of a source of electrical supply, such as a dry battery, usually is accompanied by a deterioration of the battery after long use. The rheostat 14 is incorporated in the circuit so as to afford an adjustment for the indicator device which will remain constant as the voltage of the battery reduces. To make the adjustment it is only necessary to connect a pair of spare electrodes to the two terminal posts 23 and 28 of the indicator device or instrument box and partially immerse the said electrodes in water. By means of the rheostat resistance is cut out until a maximum deflection shows on the dial. Such a test or adjustment requires only a few minutes of time and may be made once a day to assure of uniform results.

Referring now to that form of the device shown in Figs. 5 and 6, which, owing to its simplicity, is the preferred form, I here substitute for the battery a hand generator 39 of conventional type with constant voltage. One side of the instrument is grounded, as before, on the frame, while the other side is connected to the insulated terminal post 40 on the bracket D for supporting the discharge chute C. A conductor 41 extends to the electrode or contact member 35a secured to one side of and insulated from the chute, as shown most clearly in Fig. 6 of the drawings. At this point the contact is made with and through the material as it falls upon the chute during the mixing action, and the testing device is capable of being operated in exactly the same manner as set forth in the description of the preceding form. The advantage resides in the simplicity of the attachment of the contact member to the mixing apparatus.

While I have herein set forth the application of the moisture content determining means to a concrete mixing apparatus, it is to be understood that I do not wish to be restricted in respect to the form of apparatus with which it is capable of being associated and changes may readily be made in the details of construction and arrangement of the instrumentalities embodied in the testing means without departing from the spirit of the invention and within the scope of the claims hereto appended.

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

1. The combination with a mixer including a receptacle for receiving aggregates containing moisture, of an electrical responsive means for indicating the amount of moisture in said aggregates, said means comprising an electrode adapted to contact with said aggregates in the receptacle, a collector ring secured to said receptacle and having electrical connection with said electrode, a contact member cooperating with said collector ring, a source of potential having electrical connection with said contact member, a galvanometric indicator connected to said source of potential, and circuit connections to complete the circuit through the aggregates to establish a current flow therethrough, said

current flow being variable incident to variation in the moisture content of the aggregates.

2. The combination with a mixer including a revolvable receptacle for receiving moisture containing aggregates, of an indicator device responsive to variations in electrical conductivity of the aggregates incident to variation of the moisture content, said device comprising an electrode associated with said receptacle and insulated therefrom, a collector ring secured to said receptacle, a contact roller cooperating with said collector ring, a galvanometric indicator, circuit connections for connecting the aforementioned elements in series with a source of potential to establish a current flow through the aggregates, means for maintaining the source of potential constant incident to depletion by deterioration of the same, and circuit interrupting means operable at will to interrupt the current flow through the aggregates.

3. An attachment for concrete mixers or the like, comprising a plurality of electrodes associated with the mixing drum and arranged so as to dispose at least one of said electrodes in contact with the aggregates in the drum at all times

during the mixing operation, means for connecting a source of potential with said electrodes to establish a current flow through the aggregates in the drum, a galvanometric indicator interposed in circuit with the electrodes and source of potential and calibrated to indicate the moisture content of the aggregates, and means for interrupting the current flow through the aggregates.

4. An attachment for concrete mixers or the like comprising a plurality of electrodes associated with the mixing drum to alternately pass through the aggregates in the drum, said electrodes being arranged so as to dispose at least one of the same in contact with the said aggregates at all times during the mixing operation, means for connecting a source of potential with said electrodes to establish a current flow through the aggregates in the drum, a galvanometric indicator interposed in circuit with said electrodes and source of potential and calibrated to indicate the moisture content of the aggregates, and means for interrupting the current flow in the aggregates.

GEORGE E. WEBB.

30

105

35

110

40

115

45

120

50

125

55

130

60

135

65

140

70

145

75

150