1,621,535

March 22, 1927. H. E. T. HAULTAIN

APPARATUS FOR DETERMINING THE SPECIFIC GRAVITY OF ORE PULPS AND THE LIKE

Filed Sept. 12, 1922

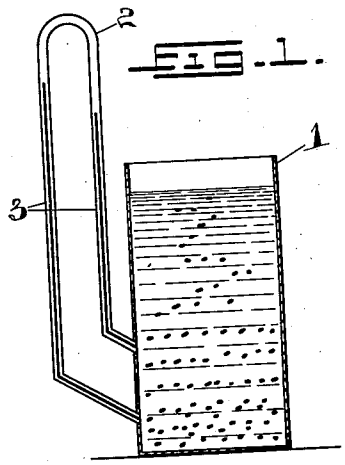


FIG. 1.

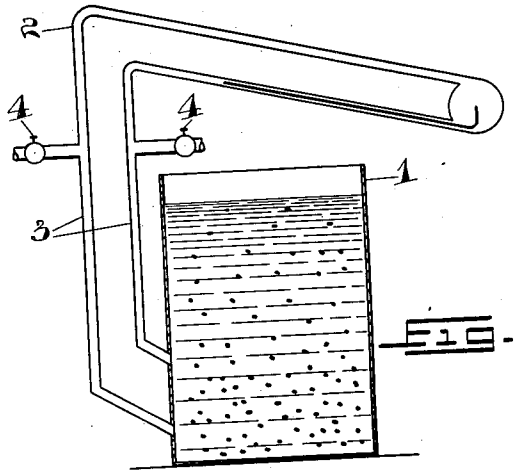


FIG. 2.

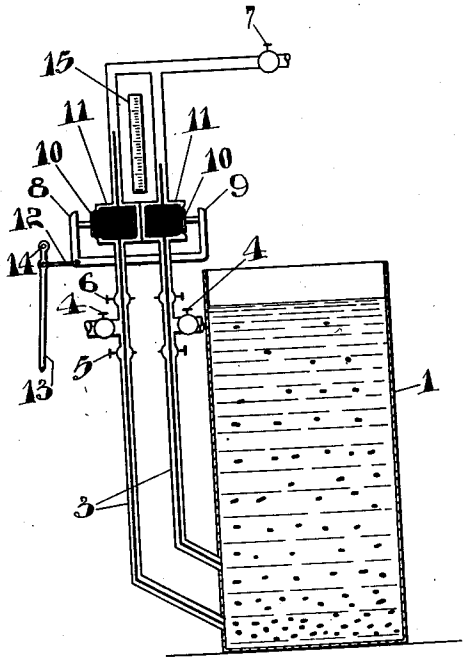


FIG. 3.

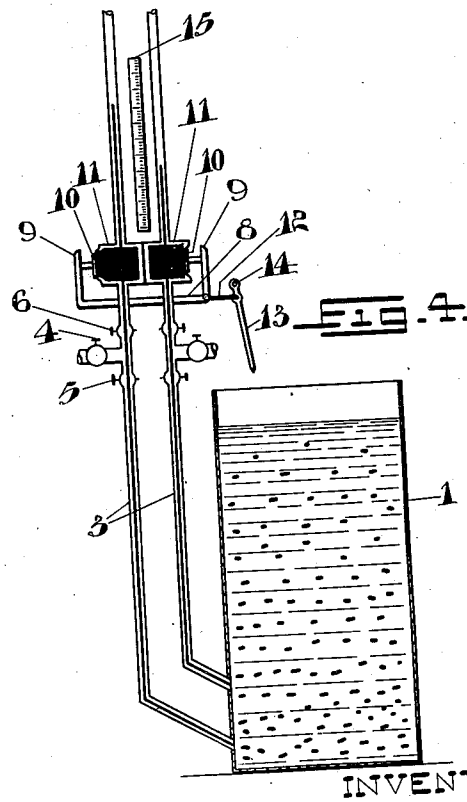


FIG. 4.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR DETERMINING THE SPECIFIC GRAVITY OF ORE PULPS AND THE LIKE.

Application filed September 12, 1922. Serial No. 587,764.

In mining practice a mixture of ground ore and water is known as "pulp" and this pulp acts as a liquid of higher specific gravity than water, but owing to the tendency of the solid particles to settle, the pulp unless constantly agitated is not of uniform specific gravity from top to bottom of the container, or at different parts of conduits in which it may be flowing. It is therefore desirable to be able to ascertain the specific gravity of a stratum of liquid at any desired depth in a tank or in a conduit, and my object is to devise apparatus which will indicate and record the specific gravity of such strata and the changes which take place therein.

I attain my object by means of the constructions hereinafter described and illustrated in the accompanying drawings, in which

Fig. 1 is a side elevation partly in section of the apparatus in its simplest form;

Fig. 2 a side elevation partly in section of a modification of the same;

Fig. 3 a side elevation partly in section of an elaborated form of the same; and

Fig. 4 is a modification of the form shown in Fig. 3.

In the drawings like numerals of reference indicate corresponding parts in the different figures.

1 is the tank or other container in which an ore pulp is retained or through which it is flowing. 2 is an inverted U-tube formed with legs 3 of unequal length. These legs each contain a fluid, while the bend of the tube contains a different fluid which is not miscible with the fluid in the legs. In the case of the construction shown in Fig. 1, the fluid in the legs will usually be water and the fluid in the bend air or oil.

In the construction shown in Fig. 2 air may be employed in the legs of the tube, valve controlled air inlets 4 being provided in the legs for this purpose. Air is passed into each leg until it flows out at the lower ends. In this case as a liquid must be employed in the bend of the tube, the upper end of the tube is bent laterally and downwardly to contain a liquid such as water or mercury.

In either form of the construction shown, differences in the level of the fluids employed form measures of the specific gravity of the stratum of pulp in the container between the lower ends of the legs of the U-tube.

It is desirable to provide means for introducing fluid into the bend of the tube and also to provide means for flushing the parts of the tube. For this purpose the device may be arranged as shown in Fig. 3, 4 being inlets which may be used for either the introduction of air or water, as may be desired. A valve 5 is provided in each leg below the inlet 4 and a valve 6 in each leg above the inlet 4. Valve controlled inlet 7 is provided for the bend of the tube. By a suitable manipulation of the valves a flow of water for flushing purposes may be directed through any part of the tube system or suitable fluids admitted into the tube may be necessary to adjust the device for operation.

It is also desirable to provide means for recording any changes which may take place in the specific gravity of the stratum of pulp between the lower ends of the legs of the U-tube. For this purpose I provide a movable part 8 and means whereby the pressure existing in the legs of the U-tube may be applied to this part tending to move it in opposite directions, whereby the position of the said part is a measure of the difference in pressure of the two legs. For this purpose the part 8 is made of the yoke-shaped form shown and the ends 9 are connected with diaphragms 10 of a known type forming the outer ends of the chambers 11 formed in the legs of the U-tube. This part 8, by means of a pivoted link 12, actuates the member 13 fulcrumed at 14 on some stationary part. This member 13 may be a pen or stylus adapted to make a record on a movable web of paper in the manner commonly employed with recording measuring instruments.

Various other modifications of the invention are possible which would fall within the scope of my invention.

The form of my invention shown in Fig. 3 of the drawings may be modified as shown in Fig. 4 by entirely disconnecting the legs 3 of the tube and extending each of them upwardly sufficiently to contain enough liquid (usually water) to balance the pressure due to the head of pulp in the tank above the lower end of the leg.

A scale 15 is provided adjacent the upper

ends of the legs by means of which differences of level of the liquid in the legs may be read.

What I claim as my invention is:—

1. The combination with a container containing ore pulp the specific gravity of which increases from the top towards the bottom, of means for determining the mean specific gravity of a stratum of the pulp between two points at different distances from the bottom of the container, comprising an inverted U-tube having its legs communicating respectively with the interior of the container at the top and bottom of the stratum whose mean specific gravity is to be determined, and valve controlled means for admitting fluid to the U-tube below its upper end.

2. The combination with a container containing ore pulp the specific gravity of which increases from the top towards the bottom, of means for determining the mean specific gravity of a stratum of the pulp between two points at different distances from the bottom of the container, comprising an inverted U-tube having its legs communicating respectively with the interior of the container at the top and bottom of the stratum whose mean specific gravity is to be determined; valve controlled means for admitting fluid to the U-tube below its upper end; and valve controlled means for admitting fluid to the upper part of the tube.

3. The combination with a container containing ore pulp the specific gravity of which increases from the top towards the bottom, of means for determining the mean specific gravity of a stratum of the pulp between two points at different distances from the bottom of the container, comprising an inverted U-tube having its legs communicating respectively with the interior of the container at the top and bottom of the stratum whose mean specific gravity is to be determined; a movable part for actuating indicating mechanism and the like; fluid pressure means for moving said part in one direction communicating with one leg of the tube; and fluid pressure means for moving said part in the reverse direction communicating with the other leg of the tube.

4. The combination with a container containing ore pulp the specific gravity of which increases from the top towards the bottom, of means for determining the mean specific gravity of a stratum of the pulp between two points at different distances from the bottom of the container, comprising an inverted U-tube having its legs communicating respectively with the interior of the container at the top and bottom of the stratum whose mean specific gravity is to be determined; valve controlled means for admitting fluid into each leg of the tube below its upper end; and valves in each leg above and below the said means.

5. The combination with a container containing ore pulp the specific gravity of which increases from the top towards the bottom, of means for determining the mean specific gravity of a stratum of the pulp between two points at different distances from the bottom, comprising an inverted U-tube; communicating means between the interior of the container and each end of the U-tube; a fluid in the legs of said U-tube; a different fluid in the bend of said U-tube; diaphragms on the legs of said U-tube; a movable member actuated by said diaphragms; and an indicator actuated by said member.

Signed at Toronto, this 6th day of September, 1922.

HERBERT E. T. HAULTAIN.