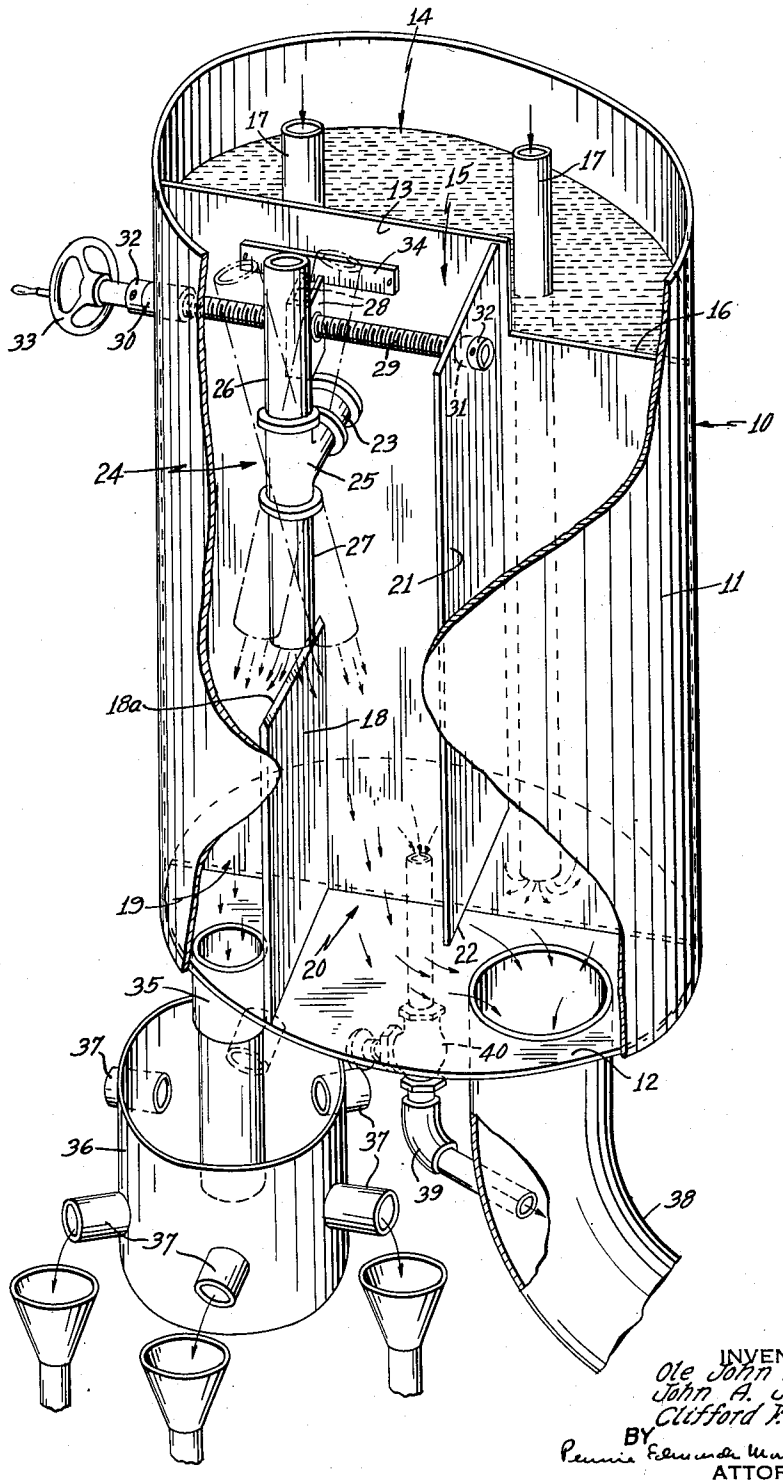
Jan. 20, 1953 O. J. EIDE ET AL 2,625,952

DISPENSING APPARATUS

Filed July 13, 1950



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Patented Jan. 20, 1953 2,625,952

UNITED STATES PATENT OFFICE

2,625,952

DISPENSING APPARATUS

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Application July 13, 1950, Serial No. 173,624

4 Claims. (Cl. 137—563)

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This invention is directed to the provision of improved apparatus for dispensing controlled quantities of liquids, especially viscous liquid suspensions containing a high proportion of solids which tend to clog conventional dispensing devices, and which require constant agitation to avoid settlement of the suspended solids.

The dispensing apparatus of the invention comprises a vessel divided interiorly by a vertical partition into a reservoir compartment and a discharge compartment. A divider plate extending from said partition to a wall of the vessel separates the lower portion of the discharge compartment into a dispensing chamber and an overflow chamber. An outlet pipe communicating through said partition with the interior of the reservoir compartment projects into the discharge compartment and therein carries a swing pipe which is movable through an arc of travel across the upper edge of the divider plate from the dispensing chamber to the overflow chamber. Means are provided for moving the swing pipe through its arc of travel, and for holding it in any chosen position in such arc of travel. A delivery conduit communicating with the interior of the dispensing chamber is provided for withdrawing liquid discharged from the reservoir compartment through the swing pipe and deflected by the divider plate into the dispensing chamber.

The upper edge, or a part of the upper edge, of the partition between the reservoir compartment and the discharge compartment forms an overflow weir; or the partition is apertured adjacent its upper edge to form such weir. Means are provided for introducing liquid to be dispensed into the reservoir compartment, and for maintaining such compartment full of liquid to the level of the weir, which is somewhat above the outlet pipe to which the swing pipe is secured. Excess liquid overflows the weir from the reservoir compartment into the overflow chamber of the discharge compartment, whence it may be withdrawn and recirculated again back to the reservoir compartment. A part of the continuous stream of liquid delivered through the swing pipe also normally is deflected by the divider plate into the overflow chamber, and recirculates with the overflow from the reservoir compartment. A baffle advantageously is arranged in the discharge

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compartment to prevent the overflow from the reservoir compartment from splashing into the dispensing chamber.

The new apparatus has a minimum of moving parts and includes no valves or metering orifices which might become plugged in handling viscous suspensions of finely divided solids. It is well adapted, for example, for dispensing accurately controlled quantities of such materials as milk of lime (a suspension of hydrated lime in water) which are very difficult to dispense in measured quantities with ordinary dispensing apparatus. The milk of lime commonly used as a reagent in various chemical and metallurgical processes is a liquid having a specific gravity of approximately 1.2 and a consistency approximating that of thick cream. When conventional dispensing apparatus is used to deliver it in controlled amounts, the apparatus soon becomes coated with a thick paste of lime which gradually stiffens and interferes with operation of the device. Metering orifices and valves commonly become clogged so as to be incapable of functioning properly. If the operation is intermittent, the dispensing apparatus must be thoroughly cleaned each time it is shut down, for otherwise the lime deposit adhering to it will dry and harden, making the dispenser inoperative.

These disadvantages are overcome by the dispensing apparatus of the invention. The milk of lime or other liquid being dispensed is handled only in pipes or compartments of large cross-sectional size which do not clog easily. In normal operation of the device, the liquid being dispensed is continuously in a state of motion so that it is maintained homogeneous throughout its mass. The swing pipe through which the liquid flows to the dispensing chamber and the divider plate which deflects a chosen fraction of the liquid into the dispensing chamber and the balance into the overflow chamber are both kept clean by the scouring effect of the continuously flowing liquid. The dispensing apparatus therefore requires a minimum of attention during operation, and its design is such that it can be drained readily, and sufficiently so as not to require cleaning, when not in use.

A preferred embodiment of the new dispensing apparatus is shown in the single figure of the accompanying drawing. The drawing shows the

dispensing apparatus in perspective, with a part of the wall of the dispensing vessel broken away so that the interior arrangement of the parts may be seen clearly.

Referring to the drawing, the dispensing apparatus comprises a vertical drum-shaped vessel 10 having a cylindrical wall 11 and a bottom 12. The vessel is divided interiorly by a vertical partition 13 into a reservoir compartment 14 and a discharge compartment 15. The partition 13 is advantageously welded to the cylindrical wall of the vessel, along substantially diametrically opposite lines, and to its bottom 12, in order to make a liquid-tight joint therewith. The partition is apertured by having one upper corner cut away, the bottom of such aperture forming an overflow weir 16 over which liquid from the reservoir compartment 14 can overflow into the discharge compartment 15. Inlet pipes 17 extending substantially to the bottom of the reservoir compartment provide for the delivery of liquid into such compartment and for maintaining it full of liquid to the level of the weir.

The lower portion of the discharge compartment is separated by a divider plate 18 into a dispensing chamber 19 and an overflow chamber 20. The divider plate is mounted substantially at a right angle to the partition 13, and is welded thereto and to the cylindrical wall 11 and bottom 12 of the dispensing vessel so as to form a liquid-tight partition between the dispensing chamber 19 and the overflow chamber 20. The upper edge 18*a* of the divider plate advantageously is beveled to a moderately sharp edge, as shown in the drawing.

A baffle 21 is mounted in the discharge compartment 15 and extends downwardly from the upper edge of the partition 13 to a point preferably below the horizontal level of the upper edge 18*a* of the divider plate. The baffle 21 is located to the side of the weir 16, and advantageously is secured in position by welding to the partition and to the cylindrical wall 11 of the vessel. The lower edge 22 of the baffle is located well above the bottom 12 of the vessel, so that it does not interfere with the flow of liquid through the overflow chamber 20; but it serves to prevent liquid overflowing the weir 16 from splashing across the divider plate 18 into the dispensing chamber 19.

An outlet pipe 23 fastened to the partition 13 projects into the discharge chamber 15 at a point vertically above the divider plate 18, and communicates through the partition with the interior of the reservoir chamber 14 at a level somewhat below the weir 16. A swing pipe 24 is pivotally secured to the outlet pipe 23 in the discharge chamber 15. The swing pipe most conveniently comprises a conventional pipe T 25 having its stem loosely threaded on the outlet pipe 23, with upper and lower pipe arms 26 and 27 threaded into the run of the T. The lower end of the lower arm 27 terminates just above the upper edge 18*a* of the divider plate, so that the swing pipe assembly, by turning on the threaded joint between the outlet pipe 23 and the T, can move through an arc of travel across the upper edge of the divider plate from a position where the lower end of its lower arm 27 opens into the dispensing chamber 19 to a position where its lower end opens into the overflow chamber 20. The upper arm 26 of the swing pipe extends far enough above the horizontal level of the weir 16 to insure that no liquid will escape from its upper end.

For moving the swing pipe through its arc of travel, a pair of retaining plates 28 are secured to its upper arm 26. A nut (not shown) which is held non-rotatably between the retaining plates 28 engages a lead screw 29 supported in bearings 30 and 31 mounted respectively in the cylindrical wall of the vesesl and in the baffle 21. Collars 32 prevent axial movement of the lead screw 29 in its supporting bearings without interfering with its rotational movement. A hand wheel 33 mounted on the end of the lead screw 29 where it projects outside the wall of the vessel is provided for convenience in manipulating it. By turning the hand wheel, the lead screw causes the nut held non-rotatably between the retaining plates 28 to advance or retreat along the screw, thereby moving the swing pipe through its arc of travel. The lead screw assembly also serves to hold the swing pipe at any selected position in such arc of travel.

The reference scale 34 mounted on the partition 13 may be provided to serve as a guide for setting the swing pipe in the proper position in its arc of travel. One edge of one of the retaining plates 28 may serve as a reference point for noting the location of the swing pipe 24 relative to the scale 34, or if desired a pointer (not shown) attached to the swing pipe may be provided as a convenience for this purpose.

A delivery pipe 35 communicates with the interior of the disepnsing chamber 19 through the bottom 12 of the vessel. The delivery pipe may lead to any desired point of use of the liquid entering the dispensing chamber 19, or, as shown in the drawing, it may empty into a distributing vessel 36 having a series of distributing outlets 37 all arranged in a horizontal plane for distributing substantially equal portions of the dispensed liquid to a plurality of points of use.

An overflow conduit 38 communicates with the interior of the overflow chamber 20 of the discharge compartment through the bottom 12 of the vessel. All liquid overflowing the weir 16, and such portion of the liquid delivered through the swing pipe 27 as is deflected by the divider plate 18 into the overflow chamber, flows into the overflow conduit 38, through which it may be pumped to a holding tank (not shown) and thence may be recirculated through the inlet pipes 17 to the reservoir compartment of the dispensing vessel.

A sump pipe line 39 including a control valve 40 connects the reservoir compartment at the bottom thereof with the overflow conduit 38. The sump pipe line permits emptying the reservoir compartment 14 whenever the apparatus is not in use.

Operation of the apparatus is very simple and easily controlled. Liquid to be dispensed (such, for example, as milk of lime) is delivered continuously into the reservoir compartment through the inlet pipes 17. Thereby the reservoir compartment is filled and kept filled to the level of the weir 16. Excess liquid delivered through the inlet pipes overflows the weir into the overflow chamber 20, whence it is withdrawn through the overflow conduit 38 and may be recirculated to the reservoir compartment. The continual flow of liquid through the dispensing apparatus keeps it well mixed.

The continual introduction of liquid into the reservoir compartment insures maintaining the liquid therein at a constant level determined by the weir, and so insures maintenance of a constant head of liquid above the outlet pipe 23. A

stream of liquid of constant volume per unit of time therefore flows through the outlet pipe 23 and discharges from the lower arm 27 of the swing pipe. In normal use of the apparatus, the swing pipe is positioned in its arc of travel so that this stream strikes the upper edge of the divider plate 18 and is deflected in part into the dispensing chamber 19 and in part into the overflow chamber 20. The beveled upper edge 18a of the divider plate facilitates splitting the stream with a minimum of splashing. The amount of liquid entering the dispensing chamber 19 may be accurately controlled by manipulation of the hand wheel 33 and of the lead screw 29 attached thereto. Once the swing pipe has been set in the proper position so that the correct quantity of liquid issuing from its lower arm 27 is being deflected by the divider plate into the dispensing chamber 19, it is held in such position by the lead screw 29. The scouring action of the constant flow of liquid through the swing pipe and over the divider pipe prevents any accumulation of solids from building up in or on these elements and so insures a constant rate of delivery of the liquid into the dispensing chamber over long periods of time.

If it is desired to discontinue delivery of liquid into the dispensing chamber 19 without shutting down the dispensing apparatus, the swing pipe may be turned through its arc of travel so that the entire stream of liquid issuing from its lower arm 27 enters the overflow compartment 20. When it is desired to shut down the apparatus, the introduction of liquid through the inlet pipes 17 is discontinued and the reservoir compartment 14 is drained by opening the valve 40. Drainage is sufficiently complete so that no special cleaning of the apparatus is normally required.

It is apparent from the foregoing that the new dispensing apparatus is simple in design and yet effective for dispensing, in accurately controlled quantities, milk of lime and other liquids containing large amounts of solids in suspension which are difficult to handle in conventional dispensing apparatus.

We claim:

1. Dispensing apparatus for liquids comprising a vessel, a vertical partition dividing the interior of said vessel into a reservoir compartment and a discharge compartment, a divider plate separating the lower portion of the discharge compartment into a dispensing chamber and an overflow chamber, an overflow weir formed adjacent the upper edge of said vertical partition providing for the overflow of excess liquid from said reservoir to said overflow chamber, an outlet pipe communicating through said partition with the interior of said reservoir compartment, a swing pipe connected to said outlet pipe in the discharge compartment and movable through an arc of travel across the upper edge of the divider plate from the dispensing chamber to the overflow chamber, means for holding the swing pipe in any chosen position in its arc of travel, and a delivery conduit communicating with the interior of the dispensing chamber for withdrawing liquid discharged from the reservoir compartment through the swing pipe into the dispensing chamber.

2. Dispensing apparatus for liquids comprising a vessel, a vertical partition dividing the interior of said vessel into a reservoir compartment and a discharge compartment, at least a part of the upper edge of said partition forming an overflow weir, means for maintaining said reservoir compartment full of liquid to the level of said weir, a divider plate separating the lower portion of the discharge compartment into a dispensing chamber and an overflow chamber, a baffle plate mounted in the overflow compartment in position to prevent liquid overflowing the weir from entering said dispensing chamber, an outlet pipe communicating through said partition with the interior of the reservoir compartment at a level below the weir, a swing pipe pivotally secured to said outlet pipe in the discharge compartment and movable through an arc of travel across the upper edge of the divider plate from the dispensing chamber to the overflow chamber, means for holding the swing pipe in any chosen position in its arc of travel, a delivery pipe communicating with the interior of the dispensing chamber at the bottom thereof for withdrawing such portion of liquid discharged from the reservoir compartment through the swing pipe as is deflected by the divider plate into the dispensing chamber, and an overflow conduit communicating with the interior of the overflow chamber at the bottom thereof for withdrawing liquid flowing into said chamber.

3. Dispensing apparatus for liquids comprising a vessel, a vertical partition dividing the interior of said vessel into a reservoir compartment and a discharge compartment, a divider plate separating the lower portion of the discharge compartment into a dispensing chamber and an overflow chamber, an overflow weir formed adjacent the upper edge of said vertical partition providing for the overflow of excess liquid from said reservoir to said overflow chamber, an outlet pipe communicating through said partition with the interior of said reservoir compartment, and extending into the discharge compartment at a point vertically above the upper edge of the divider plate, a swing pipe pivotally connected to said outlet pipe in the discharge compartment and movable back and forth through an arc of travel across the upper edge of the divider plate from the dispensing chamber to the overflow chamber, a nut secured to the swing pipe and an axially immovable rotatable screw engaging said nut for moving the swing pipe through its arc of travel and for holding it in any chosen position in said arc of travel, and a delivery pipe communicating with the interior of the dispensing chamber at the bottom thereof for withdrawing liquid discharged from the reservoir through the swing pipe and deflected by the divider plate into the dispensing chamber.

4. Dispensing apparatus for liquids comprising a vessel, a vertical partition dividing the interior of said vessel into a reservoir compartment and a discharge compartment, said partition being apertured adjacent its upper edge to form an overflow weir, an inlet conduit extending into the reservoir compartment adjacent the bottom thereof for introducing a continuous stream of liquid to be dispensed, thereby to maintain said reservoir compartment full of liquid to the level of said weir, a divider plate separating the lower portion of the discharge compartment into a dispensing chamber and an overflow chamber, a baffle plate mounted in the overflow compartment in position to prevent liquid overflowing the weir from entering said dispensing chamber, an outlet pipe communicating through said partition with the interior of the reservoir compratment at a level below the weir, a swing pipe pivotally secured to said outlet pipe in the discharge com-

partment and movable through an arc of travel across the upper edge of the divider plate from the dispensing chamber to the overflow chamber, means for holding the swing pipe in any chosen position in its arc of travel, a delivery pipe communicating with the interior of the dispensing chamber at the bottom thereof for withdrawing such portion of liquid discharged from the reservoir compartment through the swing pipe as is deflected by the divider plate into the dispensing chamber, and an overflow conduit communicating with the interior of the overflow chamber for withdrawal and recirculation of liquid deflected thereto by the divider plate and overflowing thereto from the reservoir compartment.

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