March 29, 1966 J. B. KEATON, JR 3,242,990

AUTOMATIC DISPENSING AND MIXING APPARATUS

Filed Jan. 6, 1964 3 Sheets-Sheet 1

FIG. 1

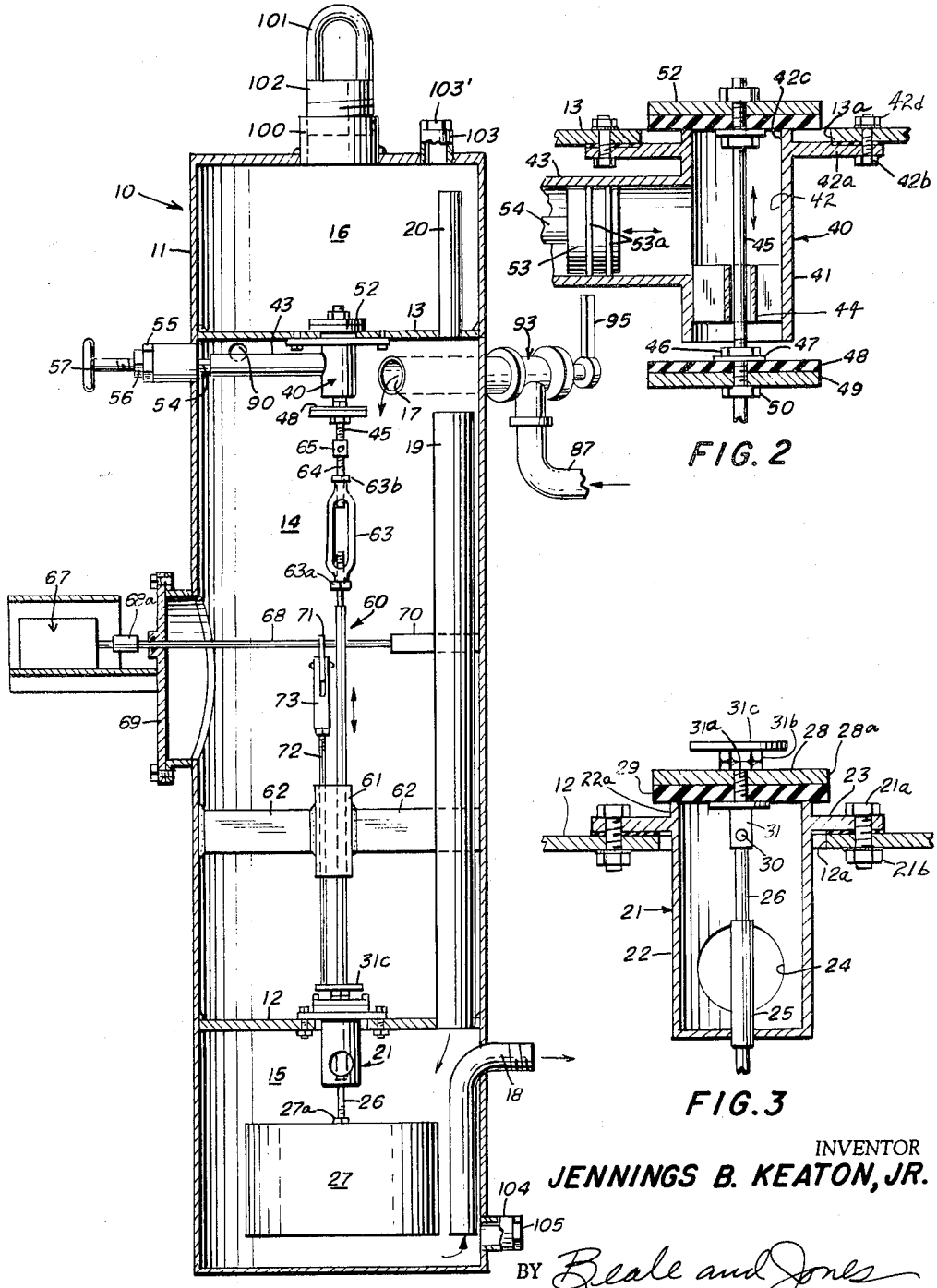


FIG. 2

FIG. 3

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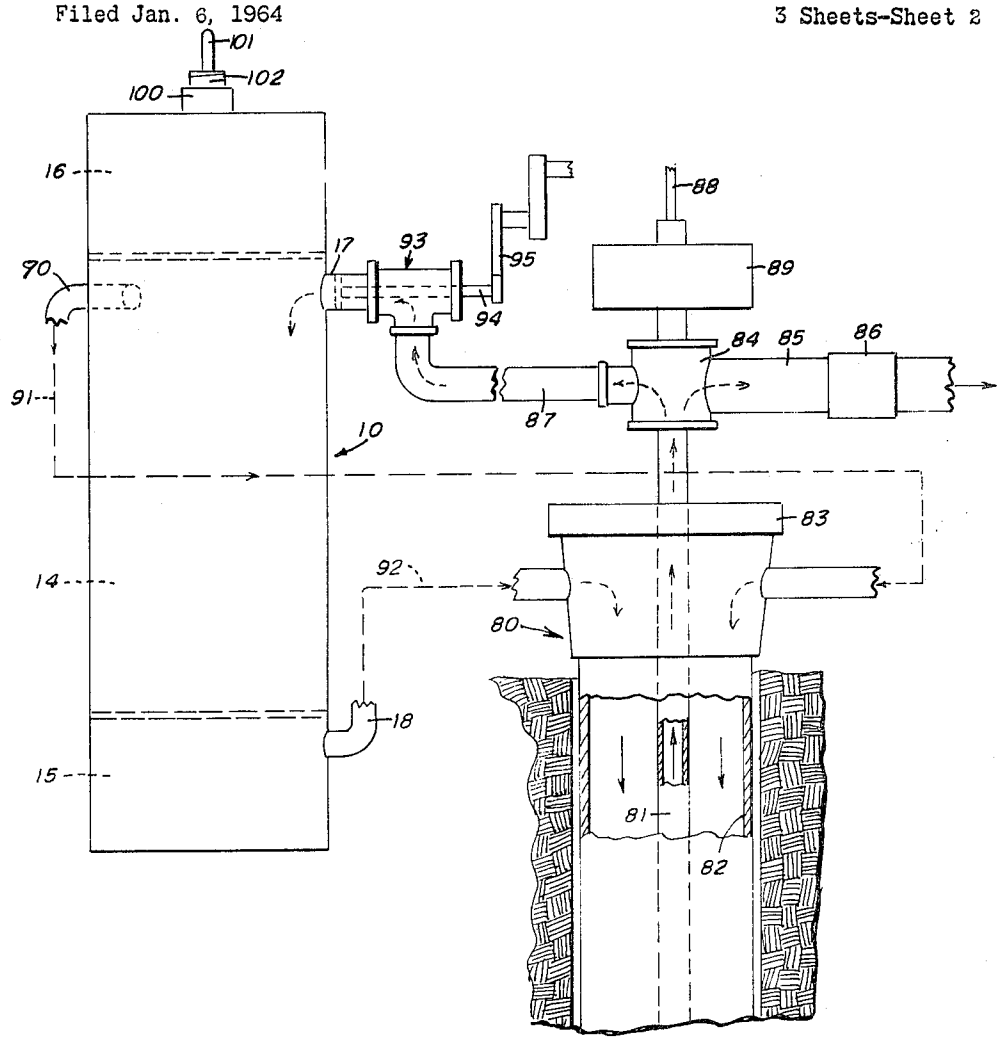


FIG. 4

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AUTOMATIC DISPENSING AND MIXING APPARATUS

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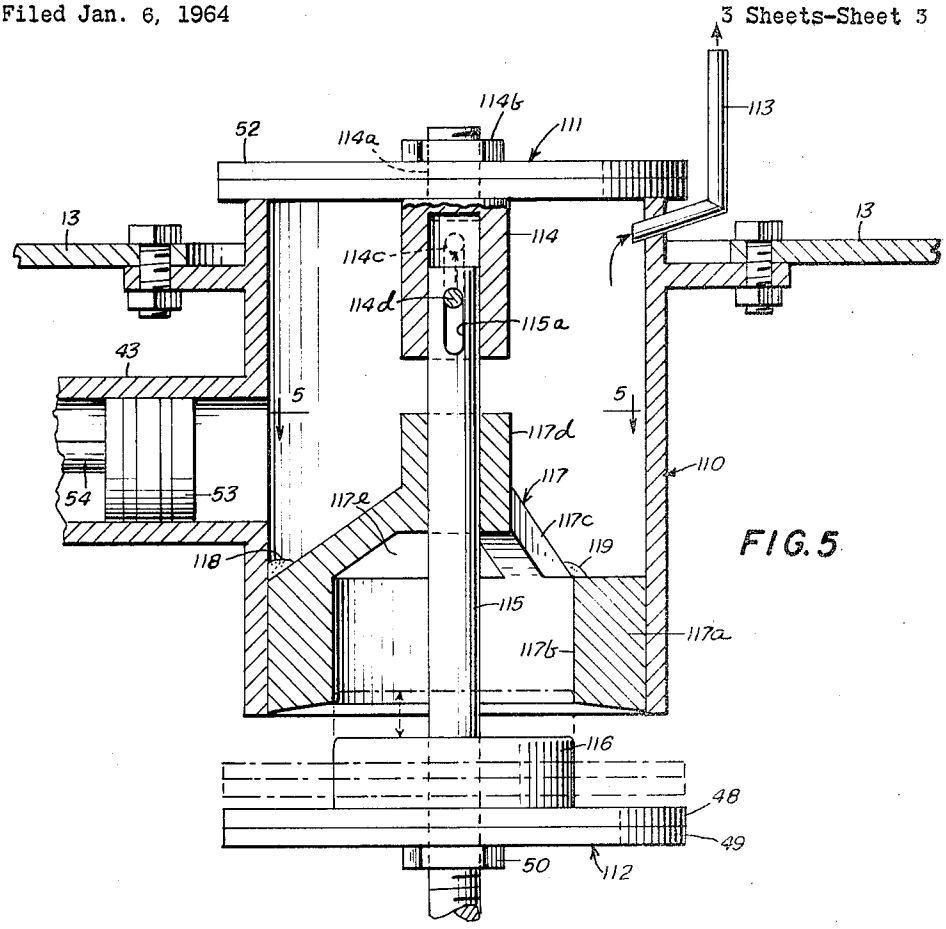


FIG. 5

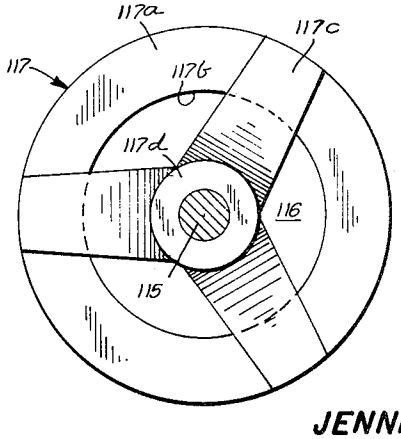


FIG. 6

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United States Patent Office 3,242,990 Patented Mar. 29, 1966

3,242,990
AUTOMATIC DISPENSING AND MIXING APPARATUS

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Filed Jan. 6, 1964, Ser. No. 335,795
14 Claims. (Cl. 166—54)

This application is a continuation-in-part application of my copending application Serial No. 283,417, filed May 27, 1963, now abandoned.

My invention is directed to improvements in automatic dispensing and mixing apparatus.

In a producing oil and gas well system where fluids are of a corrosive nature, or where produced fluids tend to leave deposits of scale, paraffin, or other undesirable products, it is necessary to introduce additive treating material in produced fluid and it is an object of this invention to provide automatic dispensing and mixing apparatus for this purpose.

It is also an object of this invention to provide this automatic dispensing and mixing apparatus for other uses such as in treating an entire pipe line system or even any system where undesirable fluid may be present that needs treatment as by exposure with additive treating material.

It is a further object of the invention to provide an automatic dispensing and mixing apparatus that has a minimum of parts, is efficient and may be used in hard and continuous service with little attention or maintenance.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter. It should be understood, however, that the detailed description and specific example is given by way of illustration only, and while indicating preferred embodiment of the invention, is not given by way of limitation, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from the detailed description.

In the drawings:

FIG. 1 is a partial vertical cross-sectional view of the apparatus;

FIG. 2 is a fragmentary enlarged vertical cross sectional view of the additive material measuring chamber and associated valves;

FIG. 3 is a fragmentary enlarged vertical cross-sectional view of the valve and its chamber between the mixing chamber and float chamber therebelow;

FIG. 4 is a diagrammatic showing of a producing well having attached the automatic dispensing and mixing apparatus for treating the well;

FIG. 5 is a cross-sectional view of an enlarged scale of a modified additive measuring chamber; and

FIG. 6 is a sectional view along line 5—5 of FIG. 5 showing the guide for the valve stem.

Throughout the description like reference numerals apply to similar parts.

The automatic dispensing and mixing apparatus is generally indicated at **10**, and in the form shown comprises a vertical cylindrical tank **11** of welded steel plate construction with suitable horizontal partitions **12** at the bottom and **13** at the top portion so as to provide three chambers. The middle chamber **14** is the mixing chamber; the bottom chamber **15** is the float chamber; and the top chamber **16** is the additive material chamber.

The object is to take fluid to be treated and introduce it into the mixing chamber **14** at the top entrance conduit as at **17** positioned at the top of chamber **14**. Additive material from chamber **16** is periodically inroduced into the mixing chamber **14** and at the proper time, as will be explained, mixing chamber **14** is emptied into the float

chamber **15** from which the material which has been mixed is siphoned off as by the siphon generally indicated at **18**.

An overflow stand pipe **19** is positioned in chamber **14** and terminates in spaced relation to the top of the chamber and communicates at its bottom with the float chamber **15**. So also a vent stand pipe **20** extends upward in the additive chamber **16** from the horizontal separating partition **13** and provides a vent between the chamber **14** and chamber **16**.

A first valve assembly is indicated at **21** and serves to connect the bottom of chamber **14** with the top of float chamber **15**. This valve **21** is mounted in a suitable centrally positioned aperture **12***a* in the bottom partition **12** as by cap screws **21***a* which screw into a nut **21***b* welded to the bottom of partition **12**. The valve **21** includes a cylindrical housing **22** extending down through aperture **12***a* in partition **12** and a horizontally extending flange **23** which rests on a gasket on top of partition **12**. A collar portion **22***a* extends at the top of cylinder **22** above the flange **23** and its top edge serves as a valve seat. Thus, the valve **21** is installed from above partition **12** and from within chamber **14**. The lower portion of the cylindrical body **22** has transverse apertures **24** adjacent the bottom thereof so as to provide for dispensing fluid from the mixing chamber and distributing it away from the top of the float as will be described. Mounted in the housing **22** is a fixed vertical sleeve **25** which receives a valve stem **26** that is attached to the top portion of a float **27** in the float chamber **15** where it is positioned and secured on the valve stem **26** by a threaded portion and a securing nut **27***a*. Attached to the upper portion of the valve stem **26** is the movable portion **28** of the valve which includes a top flange **28***a* having secured to the bottom thereof a gasket **29**. The upper end of valve stem **26** is attached by a transversely extending pin **30** to a wobble sleeve **31** whose upper end **31***a* is threaded and receives a pair of securing nuts **31***b* and has attached to its extreme upper end a platform **31***c* as by welding. The platform **31***c* serves to receive the bottom ends of reach rods as will be explained hereinafter. Thus, the float **27** through the rod **26** attached thereto will reciprocate the valve and alternately seat the gasket **29** on the valve seat at top edge of collar portion **22***a*. As the mixing chamber **14** fills and overflows through the stand pipe **19** fluid is received in the float chamber **15** and upon reaching a proper height moves the float **27** upward and opens the valve **21** whereupon the mixing chamber **14** dumps into chamber **15** from which it is siphoned out by the siphon **18**.

In this apparatus there is a feature of adding material for treating the production material which enters the conduit **17**. This material is added from the additive material chamber **16** at the top of the apparatus. It is essential that measured amounts of this material under control be added to batches in the mixing chamber. This is accomplished through use of an additive measuring chamber generally indicated at **40** which has valve means and provides for communication from chamber **16** to chamber **14**. This measuring chamber **40** will now be described.

It is comprised of a T-shaped housing **41** having a vertically extending cylindrical portion **42** and a transversely extending cylindrical portion **43** communicating therewith. Adjacent the upper portion of the housing **42** is an integral circular flange **42***a* that is attached to the bottom of the horizontal separating partition **13** by cap screws **42***b* which screw into nuts **42***d* welded to the top of partition **13**. The housing **42** extends up through a centrally positioned aperture **13***a* in separating partition **13** and has a top extension **42***c* that forms a valve seat. Within the housing **42** there is attached a vertically

extending guide sleeve having a vertical aperture therein to receive the valve stem 45 which is threaded at each end. The measuring chamber 40 is thus installed from below the horizontal portion 13 and from within chamber 14. Each end of the valve stem 45 is threaded and as at the bottom end receives a securing nut 46, a washer 47 and a gasket 48 of circular shape which is backed up by a circular plate 49 and secured by a nut 50 threadedly received on the bottom end of valve stem 45. The gasket 48 and plate 49 serve as a bottom valve for the lower end of the housing 42. A top valve 52 is of similar construction. Each of the gaskets in the respective valves are made of oil and water resistant material as "neoprene."

In order to provide for a measuring chamber in the additive material measuring chamber 40 the transversely extending cylindrical portion 43 receives therein a plunger 53 having thereon spaced apart O-rings 53*a*. This plunger 53 has a rod 54 attached thereto and extending out through the outer end of the cylindrical portion 43 and through a threaded fitting or housing 54 in the wall of the mixing chamber 14. A suitable nut 55 is screwed into the outer end of housing 54 and threadedly receives therethrough the rod 54 at which is adjusted by a hand wheel 57 on the outer end thereof and locked in position by setting up of the lock nut 56 against the stationary nut 55. Thus, when the top valve 52 is open the measuring chamber 42 is filled with additive material from chamber 16 and when the bottom valve 48 is open this measured material is permitted to flow out of the measuring chamber 40 while the top valve 52 closes off communication with the additive material chamber 16 thereabove.

In order to carry out the operation of the valves in the additive material chamber 40 a reach rod generally indicated at 60 extends through a guide sleeve 61 suitably supported in the center of the mixing chamber 14 by radially extending webs 62. This reach rod 60 has its lower portion resting on the platform 31*c* which is operated by the float 27 in conjunction with the valve 21 while its upper portion is attached through a suitable turn buckle 63 which provides for adjustment in the valve rod and securing in adjusted position by locking nuts 63*a* and 63*b*. Extending into the upper end of the turn buckle 63 is a short connecting rod 64 having a transversely extending apertured upper end received in a loose manner within a collar 65 so as to provide a wobble joint with the lower threaded end of the valve rod 45. It will be evident that the whole reach rod 60 is free to move up and down under the influence of the pusher plate 31*c* operated by the valve rod 26 attached to the float 27.

A recorder counting mechanism in the form of a counter generally indicated at 67 is operated by a rotary shaft 68 through a coupling 68*a* extending to the outside of the access manhole plate 69 atached to the chamber 14. This operating shaft 68 is supported at its opposite end from the counter in a suitable stub bearing 70 attached as by welding to the inner surface of mixing chamber 14. An arm 71 is made fast to the shaft 68 and a second reach rod generally indicated at 72 is attached to the arm 71 by a bifurcated fitting 73. The reach rod 72 is received through the guide collar 61 and rests on its lower end on the pusher plate 31*c* in turn operated by the valve rod 26 and the float 27. It will be seen that each time the mixing chamber 14 dumps a load of mixed material the counter 67 is tripped to indicate one dumping or one filling.

It will be observed that the siphon pipe 18 extends to the bottom of the float chamber in spaced relation thereto so that the float chamber may be automatically and periodically emptied and the float 27 will have moved down to close the valve 21 and permit a repeat of the filling and additive material measuring and dumping.

In FIG. 4 there is shown in diagrammatic form a production well generally indicated at 80 having the usual production tubing 81 therein and the annular space 82 therearound. A tubing head is indicated at 83 and a pumping T at 84 with a flow line 85 leading to a tank battery through a back pressure valve 86. A bleeder line 87 comes off of the pumping T and feeds a portion of the production fluid to the automatic dispensing and mixing apparatus 10. The usual sucker rod 88 and a stuffing box 89 are diagrammatically indicated.

The other connections of the automatic dispenser mixing apparatus 10 are a connection from a vent 90 in the upper part of the mixing chamber 14 through a suitable vent conduit line 91 to a portion of the annular opening 82 through the tubing head 83. The siphon pipe 18 is connected through a conduit at 92 to an opposite portion of the annular opening 82 in the well.

In order to prevent clogging a suitable orifice cleaner is indicated at 93 in the connecting line 87 feeding the entrance conduit connection 17 on the mixing chamber 14. The orifice cleaner 93 has an oscillating rod 94 operated by an arm 95 connected with the pumping equipment so that it is oscillated and the rod 94 carries a knife edge which cooperates with an orifice in the orifice cleaner 93. This orifice cleaner is covered by a separate application which is being filed by me.

This arrangement provides a rugged container 11 which may have a suitable top fitting 100 welded thereto with a lift eye 101 secured as by threads 102 thereon. A top outlet 103 may receive a pressure pop-off relief valve in place of the screw plug 103'. The outlet 103 serves as an access opening for filling the additive material chamber 16 on removal of the screw plug 103'. In the bottom of the float chamber 15 a suitable drain nipple 104 may be attached and provided with a removable screw plug 105 to permit draining and cleaning. This apparatus provides for an automatic treater for oil wells and the like and it may also be used for other purposes where automatic dispensing and mixing are desirable.

In FIGS. 5 and 6 there is shown a modified additive material chamber 110 with modified actuator for top valve 111, modified bottom valve 112 and a vent 113 for the chamber. The vent tube 113 leads to chamber 16, see FIG. 1, and extends above the stand pipe 20 therein.

Top valve 111 has a plate 52 and gasket therebelow as in FIG. 2. A tubular fitting 114 having a bolt portion 114*a* at its top extends through the top valve 111 and is secured by a nut 114*b*. The tubular body extends downwardly with its cylindrical cavity 114*c* receiving the upper end valve rod 115. The upper end of valve rod 115 is provided with a vertically extending slot 115*a* extending therethough to receive a transverse pin 114*d* secured in the tubular fitting 114. The arrangement of slot 115*a* and pin 114*d* is such that valve 111 is opened after valve 112 has closed so there may not be any through flow from additive material chamber 16 to mixing chamber 14. Thus the amount of additive material is maintained as desired regardless of the height of the material in chamber 16.

The bottom valve 112 is threaded at its lower end and threadedly receives a guide plunger 116. Next to this is slipped over the bottom valve gasket 48 and plate 49 as in FIG. 2 and a nut 50 as in FIG. 2 locks the assembly of lower valve 112 and plunger 116 in place on rod 115.

The rod 115 and the plunger 116 is guided accurately by a cage generally indicated at 117. The cage 117 has an annular portion 117*a* having a cavity 117*b* to adequately receive and guide plunger 116 therein. The cage 117 further has three illustrated upwardly inclined spaced fingers 117*c* which join with an annular boss or guide portion 117*d* for rod 115. The cage 117 is inserted into the lower end of tubular metering chamber 110 and secured by tack welding as at 118 and 119. Between the spaced fingers 117*c* are vertical spaces 117*e* providing free flow therethrough.

When chamber 14, see FIG. 1, is filled and spills over into chamber 15 by way of the standpipe 19, float 27

is actuated upward. Bottom valve **112** of the additive material metering chamber **110** is at the same time actuated upward with plunger **116** received in cavity **117***b* before the base of slot **115***a* can touch the pin **114***d* to open the top valve **111**. Thus, only one valve opens at any one time.

When chamber **15** begins to drain and let the float **27** lower then the reverse of the above occurs. The complete valve assembly from bottom valve **112** to and including the top valve **111** begins to drop down, however, with plunger **116** inside **117***a* no leak can occur and the measured amount of additive material is constant. Before plunger **116** comes out of cavity **117***b*, the top valve **111** has seated. After the top valve **111** is seated then plunger **116** comes out of **117***b* and it is stopped by the pin **114***d*, thus the bottom valve **112** is now open and the top valve **111** is closed and is kept closed by the weight of the entire valve assembly. By this means more accurate metering occurs of the additive material.

In the operation of this treater with an oil well, after several dumps of the treater, then the produced treated fluids will return again to the treater to become more concentrated which has an advantageous effect in that less corrosion inhibitor (additive material) can be used to keep the well system treated and thus provide for more economical operation. While the additive material chamber has been indicated as containing or adapted to contain liquid or fluid material it could equally as well be arranged to contain powdered material and feed a measured amount of that into the mixing chamber **14**. Thus, there is provided a batch type treating apparatus with suitable mixing chamber and pressure equilization conduit connections. The amount of additive material may be controlled in amount of each batch added and the device with its cooperating valves and operating float is so connected as to be reliable in operation without much attention.

I claim as my invention:

1. A device for mixing and dispensing liquids comprising, in combination, a mixing chamber having a filling inlet for admitting material to be treated, an additive material chamber adjacent said mixing chamber, a float controlled chamber below said mixing chamber, first valve means connecting the bottom of said mixing chamber with said float chamber, float means in said float chamber and connected with said first valve means for opening and closing the same, outlet means connected with said float chamber for removing liquids therefrom, an overflow stand pipe in said mixing chamber and connecting said float chamber with said mixing chamber for conveying the mixed and treated fluid from said mixing chamber to said float chamber, an additive material measuring chamber connecting said additive material chamber with said mixing chamber, said additive material measuring chamber having a top valve connecting it with said additive material chamber and a bottom valve connecting it with said mixing chamber, operating means connecting said top and bottom valves so one is open when the other is closed, said additive material chamber having a standpipe vent means extending upwardly therein and communicating at its bottom with said mixing chamber, float operating means connected with said float means and said first valve means and the operating means for said valves of the additive material measuring chamber whereby on said float closing said first valve means said top valve is closed and said bottom valve is opened of said additive material measuring chamber, said float chamber and said mixing chamber thereby having mixed fluid periodically removed therefrom and measured amounts of additive material are added to said mixing chamber for mixing with and treating the material added into the mixing chamber.

2. A device for mixing and dispensing fluids according to claim **1** wherein the bottom valve has a plunger on the top portion thereof cooperating with socket means in the lower portion of said measuring chamber to close off the bottom of the measuring chamber in advance of the bottom valve reaching closed position and wherein the operating means connecting said top and bottom comprises a valve rod connected to said bottom valve and extending upwardly in said additive material measuring chamber, the upper end portion of the valve rod having a vertically extending slot therein, said top valve having an elongated socket means depending therefrom and receiving the top portion of said valve rod with the top end of the valve rod in spaced relation to the top of the socket means when the top valve is closed and the plunger and bottom valve are open, said socket means having a transversely extending pin connected thereto and extending into said slot in the valve rod whereby the top end of said slot rides on said pin when plunger is out of its socket means and the bottom valve is open and wherein when the plunger moves up and closes its socket means the bottom of the slot in the valve rod rides against the pin to raise and open the top valve and wherein a vent means extends from the top of the measuring chamber into said additive material chamber to above the level of the top of the standpipe vent means therein.

3. A device for mixing and dispensing fluids according to claim **1** including counter recording means and means connected with said float means and said counter recorder means for actuation of the counter recorder means to record the number of fillings or emptyings of said mixing chamber.

4. A device for mixing and dispensing fluids according to claim **1** wherein said outlet means connected with said float chamber for removing liquids therefrom is a siphon tube extending to adjacent the bottom of the float chamber.

5. A device for mixing and dispensing fluids according to claim **1** wherein said operating means connected with the float means and the operating means connecting said top and bottom valves of the additive material chamber comprises a pusher means on the top of said first valve means and extending into said mixing chamber and a reach rod connecting at its upper end to said operating means between said bottom and top valves and having its bottom end resting against the top of said pusher means, said reach rod including length adjusting means.

6. A device for mixing and dispensing fluids according to claim **1** wherein said additive material measuring chamber comprises a vertical tubular portion having said top and bottom valves operatively closing and opening the respective ends thereof, a transversely extending chamber portion connected with said vertical tubular portion, a plunger adjustably positioned in said transversely extending portion for changing the size of said measuring chamber and operating means connected with said plunger and extending to exterior of said mixing chamber.

7. A device for mixing and dispensing fluids according to claim **6** including counter recording means and means connected with said float means and said counter recorder means for actuation of the counter recorder means to record the number of fillings or emptyings of said mixing chamber.

8. Oil well treating apparatus for an oil well having a production tubing and annular space therearound, a device for mixing and dispensing fluids connected with said oil well and comprising, a mixing chamber having a filling inlet and a first vent, a float controlled chamber therebelow, an additive material chamber above the mixing chamber, first valve means connecting the bottom of said mixing chamber with said float chamber, float means in said float chamber connected to and operating said first valve means, outlet means connected with said float chamber for removing liquids therefrom, means connecting said float chamber outlet means and said annular space of the oil well for dispensing thereto, an overflow standpipe in said mixing chamber connecting said float

chamber with said mixing chamber for conveying mixed and treated fluid from said mixing chamber to said float chamber, second valve means connecting the bottom of said additive material chamber with said mixing chamber, said second valve means having an additive material measuring chamber connected therewith, said second valve means having a top valve in the additive material chamber for opening and closing and allowing additive material to enter said measuring chamber and a bottom valve for emptying measured material from measuring chamber to mixing chamber, operating means connecting said first valve means and said top and bottom valves of the second valve means whereby when said float means opens said first valve means, said top valve opens and said bottom valve closes, second vent means connecting said mixing chamber and said additive material chamber, conduit means connecting said filling inlet on the mixing chamber with said production tubing for filling the mixing chamber and conduit means connecting said first vent means of said mixing chamber with said annular space of said well whereby said oil well may be automatically treated and measured amounts of additive material is added to said mixing chamber.

9. Oil well treating apparatus according to claim 8 including counter recording means and means connected with said float means and said counter recording means for actuation of the counter recorder means to record the number of fillings or emptyings of said mixing chamber.

10. Oil well treating apparatus according to claim 8 wherein said outlet means connected with said float chamber for removing liquids therefrom is a siphon tube extending to adjacent the bottom of the float chamber.

11. Oil well treating apparatus according to claim 8 wherein said operating means connecting said first valve means and said top and bottom valves of the second valve means comprises a pusher means on the top of said first valve means and extending into said mixing chamber and a reach rod connecting at its upper end to said operating means connecting said top and bottom valves and having the bottom end resting against the top of said pusher means, said reach rod including length adjusting means.

12. Oil well treating apparatus according to claim 8 wherein said additive material measuring chamber comprises a vertical tubular portion having said top and bottom valves operatively closing and opening the respective end thereof, a transversely extending chamber portion connected with said vertical tubular portion, a

plunger adjustably positioned in said transversely extending portion for changing the size of said measuring chamber and operating means connected with said plunger and extending to exterior of said mixing chamber.

13. Oil well treating apparatus according to claim 12 including counter recording means and means connected with said float means and said counter recorder means for actuation of the counter recorder means to record the number of fillings or emptyings of said mixing chamber.

14. A device for measuring and dispensing fluids according to claim 8 wherein the bottom valve has a plunger on the top portion thereof cooperating with socket means in the lower portion of said measuring chamber to close off the bottom of the measuring chamber in advance of the bottom valve reaching closed position and wherein the operating means connecting said top and bottom comprises a valve rod connected to said bottom valve and extending upwardly in said additive material measuring chamber, the upper end portion of the valve rod having a vertically extending slot therein, said top valve having an elongated socket means depending therefrom and receiving the top portion of said valve rod with the top end of the valve rod in spaced relation to the top of the socket means when the top valve is closed and the plunger and bottom valve are open, said socket means having a transversely extending pin connected thereto and extending into said slot in the valve rod whereby the top end of said slot rides on said pin when plunger is out of its socket means and the bottom valve is open and wherein when the plunger moves up and closes its socket means the bottom of the slot in the valve rod rides against the pin to raise and open the top valve and wherein a vent means extends from the top of the measuring chamber into said additive material chamber to above the level of the top of the standpipe vent means therein.

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