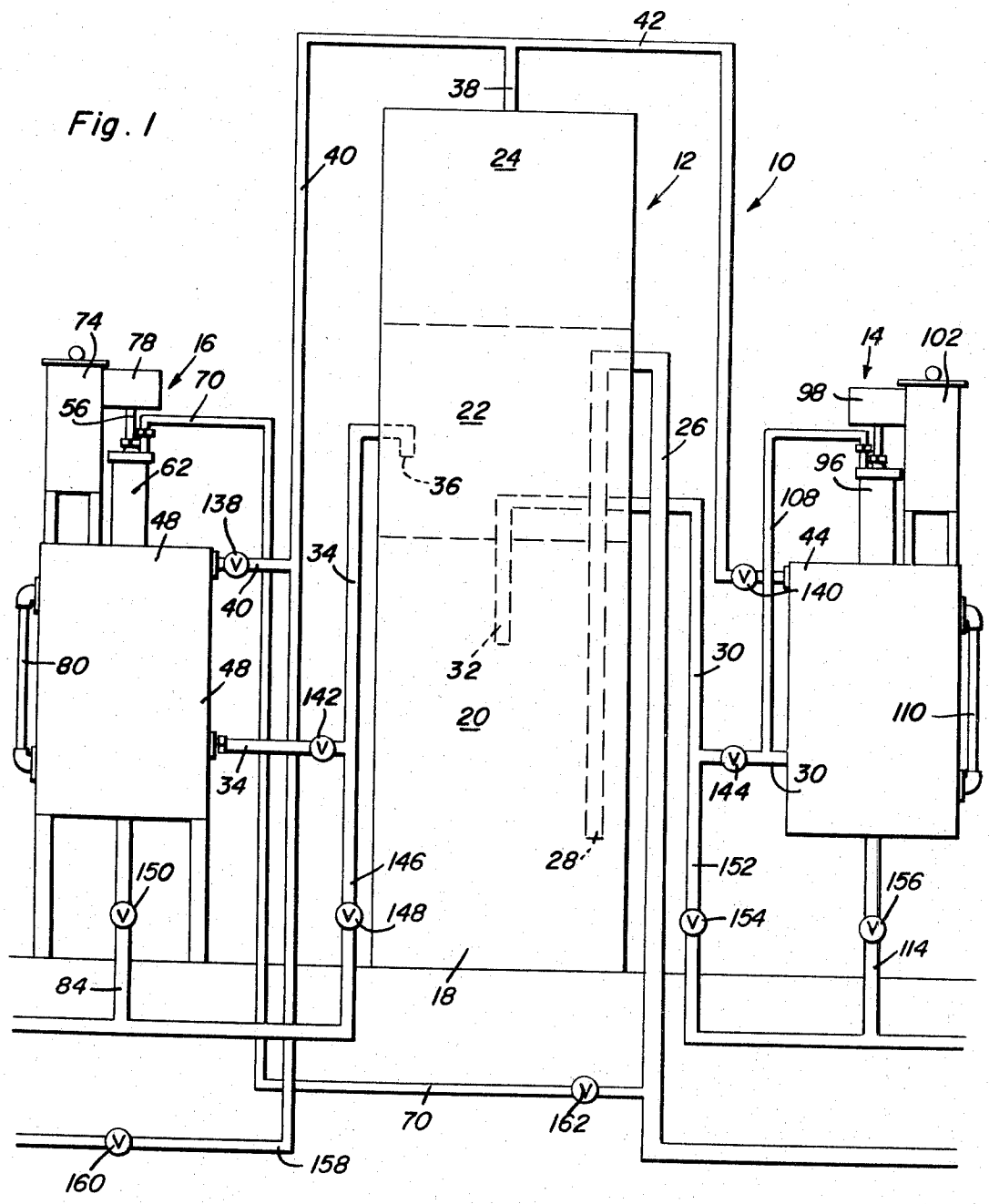
Nov. 7, 1967 D. R. CROOKS 3,350,851

DUMP POT SYSTEM WITH ADDITIVE PUMP

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Fig. 1



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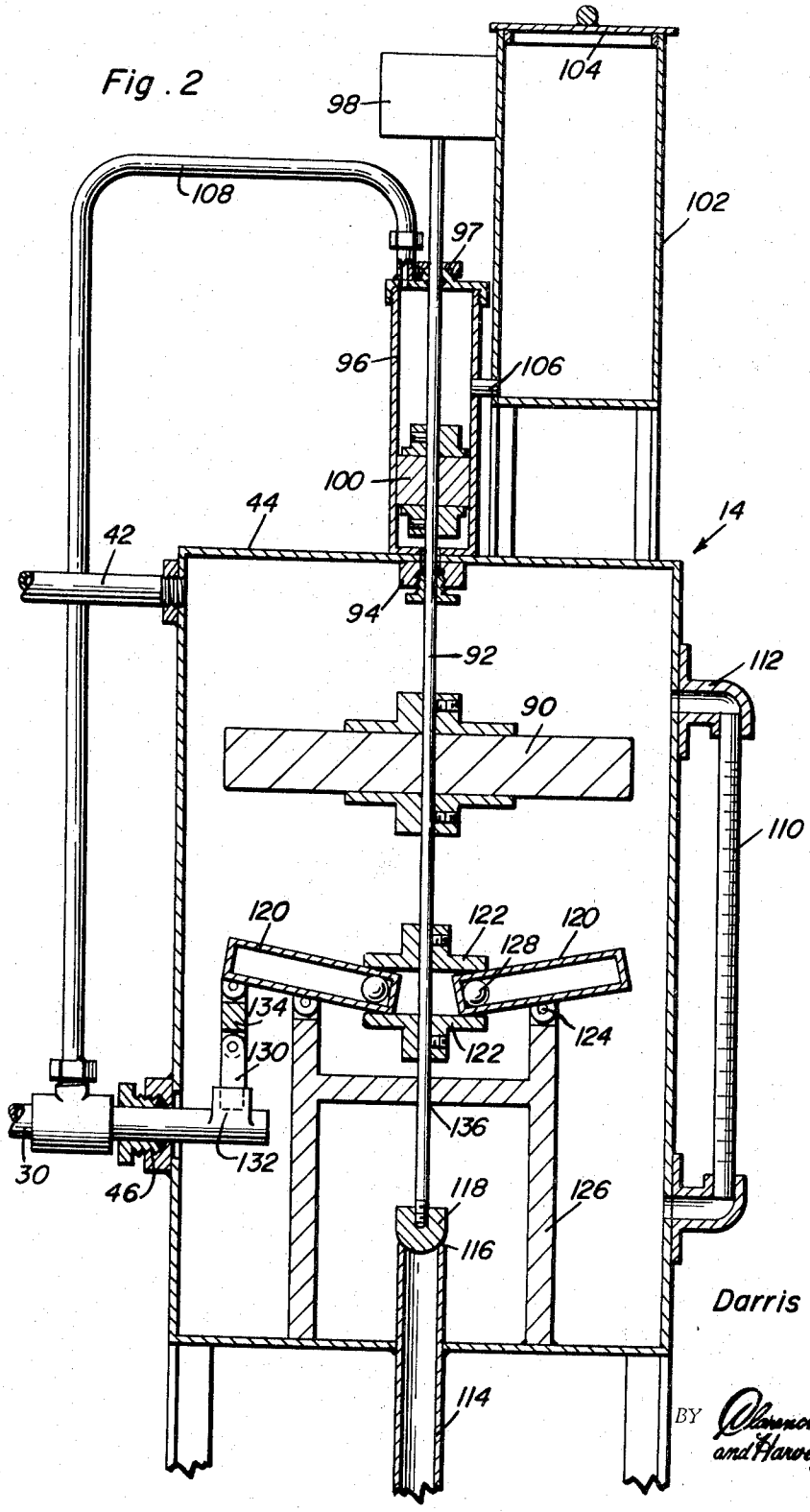
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Fig. 2



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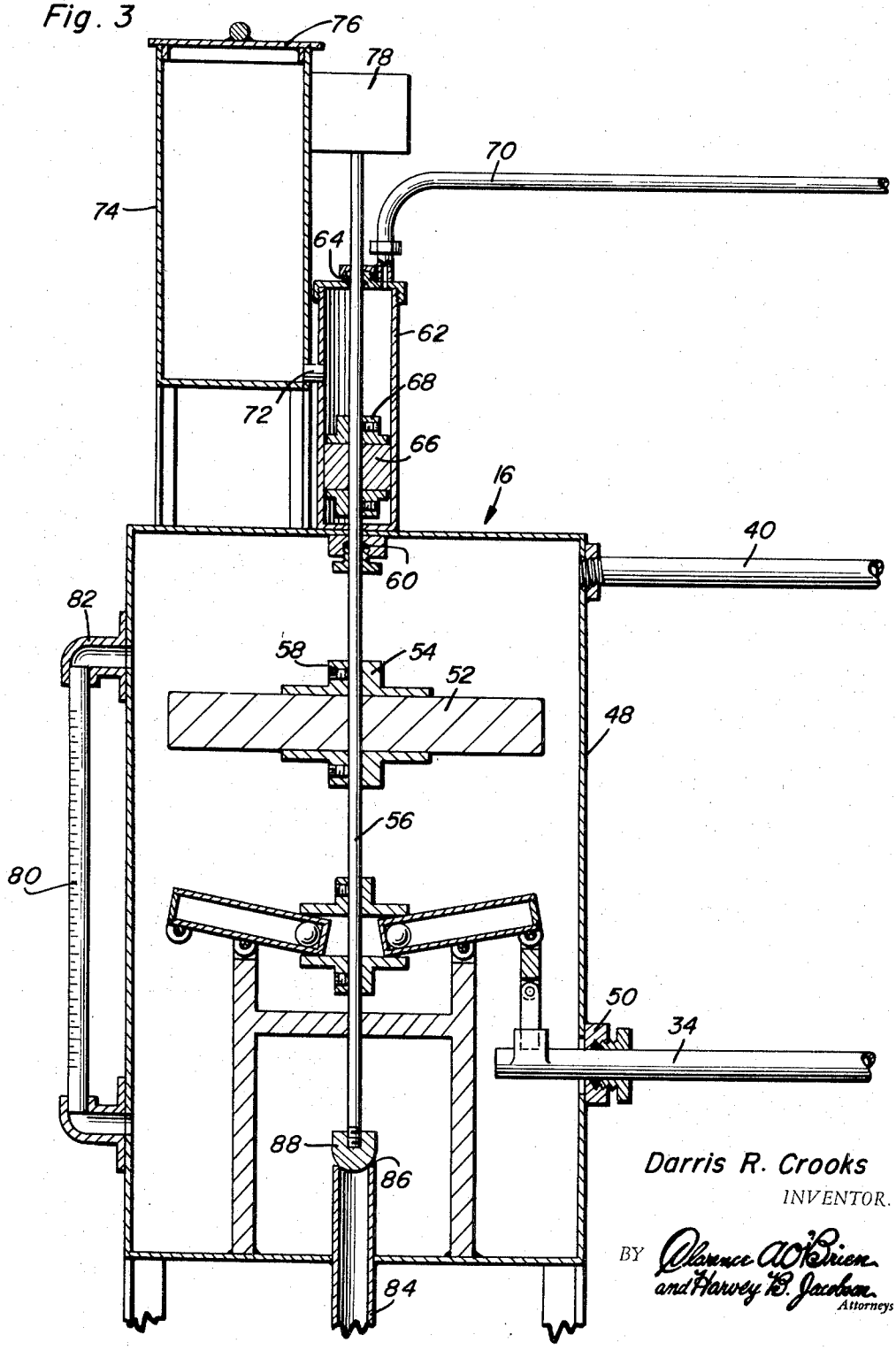
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DUMP POT SYSTEM WITH ADDITIVE PUMP

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Fig. 3



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DUMP POT SYSTEM WITH ADDITIVE PUMP

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10 Claims. (Cl. 55—166)

The present invention generally relates to a dumping system for use in maintaining a proper gas pressure on oil field heaters and separators and includes an additive pump and the dump pot arrangement.

An object of the present invention is to provide a dump pot method of maintaining gas pressure in an oil field separator or heater treater in which the dump pot system is controlled by a system of floats and weight exchanges in a manner to completely insure the proper dumping of the fluid each time it is necessary to do so and at the same time provides for the treating and measurement of both water and oil.

The present invention has for other of its objects the provision of a dump pot system which is relatively inexpensive to install and operate and is substantially trouble-free in operation.

A further object of the present invention is to provide a dump pot system for maintaining gas pressure which will provide a practical method of completely removing free gas from the oil by allowing it to rise from the oil while in the oil dump pot and enabling the gas to become part of the gas system thereby keeping the oil storage tank practically free of gas.

A further object of the present invention is to provide a dump pot system with additive pump to provide a satisfactory and efficient means of adding chemical to include oil in the form of a cylinder pump chemical applicator with the operation of the applicator being accomplished by using the discharged oil from the separator to operate the cylinder pump chemical applicator thereby causing chemicals to be added to the crude oil just prior to entry into the heater treater or separator.

Yet another important feature of the present invention is to provide a dump pot system in which exact measurement of all fluid being processed by the separator may be accurately measured.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a schematic illustration of the dump pot system of the present invention with the additive pump incorporated therein;

FIGURE 2 is a detailed sectional view of the water dump pot; and

FIGURE 3 is a detailed sectional view of the oil dump pot.

Referring now to FIGURE 1, the dump pot system of the present invention is generally designated by the numeral **10** which includes a separator generally designated by the numeral **12**, a water dump pot **14** and an oil dump pot **16**. The oil separator **12** includes an enlarged vertical tank **18** having generally three separate zones including a water zone **20**, an oil zone **22** and a gas zone **24**. Crude oil enters through a supply line **26** which extends upwardly alongside of the tank **18** and then extends inwardly and downwardly terminating in a discharge end **28** adjacent the bottom of the tank **18** thus discharging the crude oil into the water zone **20**. From a point adjacent the upper portion of the water zone **20**, a water outlet pipe **30** is provided with an inlet end **32** in the water zone **20** with the water pipe **30** extending to the water dump pot **14** in a manner described hereinafter. An oil outlet pipe **34** is communicated with the central portion of the oil zone **22** through the inlet **36** for discharge of oil to the oil dump pot **16** in a manner described hereinafter. Natural gas will nautrally rise through the gas zone **24** while oil naturally rises to the oil zone **22** and water will collect in the water zone **20** and the gas is separated and is discharged through gas discharge line **38** which branches into two separate lines **40** and **42** communicating with the oil dump pot **16** and the water dump pot **14** respectively as illustrated in FIGURE 1. The natural gas carried to the oil dump pot and water dump pot will maintain a pressure on the top of the oil to be dumped and also a pressure on top of the water to be dumped in a manner described hereinafter.

The crude oil as it enters the separator tank **18** may be heated and the oil starts separating from the water and rises with the gas toward the top of the tank with the oil being lighter than water and heavier than gas will be disposed in oil zone **22** while the gas is collected in the gas zone **24**. As the materials are discharged, they are replaced constantly by crude oil entering the separator.

The water dump pot **14** is illustrated in FIGURE 2 and includes a tank **44** having the gas line **42** communicated with the upper end thereof and the water discharge line **30** entering adjacent the bottom of the tank **44** by a sealed fitting **46**.

FIGURE 3 illustrates the oil dump pot **16** which includes a tank **48** having the natural gas line **40** communicated with the upper end thereof and the oil discharge line **34** communicated with the lower end thereof through an adapter or fitting **50**. Disposed in the tank **48** is a float **52** of any suitable construction impervious to oil and may include a buoyant member disposed between two fittings **54** secured to a central disposed rod **56** by the use of setscrews **58** or the like. Thus, as the oil level raises in the tank **48** due to oil entering the tank **48** through the oil inlet line **34**, the float **52** will raise thus elevating the rod **56**. The position of the float **52** on the rod **56** may be adjustable for varying the conditions of the oil level required in order to elevate the float **52** to move the rod **56**.

The upper end of the rod **56** extends up through the tank **48** through a packing gland or seal **60** and extends through a cylindrical pump chamber or barrel **62** and up through the top of the pump through a suitable packing gland or seal **64**. Mounted on the rod **56** interiorly of the cylindrical pump barrel **62** is a piston or plunger **66** secured adjustably in place by collars **68**. Upward movement of the pump plunger **66** by virtue of the upward movement of the float **52** will force a chemical additive disposed in the pump barrel **62** above the plunger **66** out through a chemical additive line **70**.

The chemical additive enters the pump barrel **62** through an inlet **72** at the bottom of a chemical additive tank **74** having a removable top **76** to enable replenishment of the supply of chemical. Since the quantity of chemical additive is determined by the point at which the plunger **66** passes the inlet **72** thus closing off the inlet, a positive volume of chemical additive may be discharged through the line **70** for each operation of the pump plunger **66**.

The upper end of the rod **56** which extends upwardly through the packing gland **64** is connected with a counter **78** which is of any conventional construction for counting the number of reciprocating cycles of the rod **56** thereby determining the quantity of chemical added and also the cycles of operation of the oil dump pot.

The contents of the oil dump pot or tank **48** is indicated by a transparent tubular manometer **80** connected to the tank and communicated with the interior thereof by fitting **82** at the top and bottom thereof. The struc-

ture of the manometer is conventional and is for the purpose of observing the contents of the interior of the tank 48. Also, the tank 48 may be provided with a removable inspection plate for the purpose of replacement, repair or adjustment of the components of the float mechanism and other structure within the interior of the tank.

The bottom of the tank 48 is provided with an oil dump line 84 with the upper end thereof defining a valve seat 86 for a valve member 88 attached to the lower end of the rod 56. Thus, as the float 52 is elevated by the elevating level of the oil in the tank 48, it will move the rod 56 upwardly thus actuating the chemical additive pump and at the same time opening the valve 88 to permit the oil to be dumped.

The structure of the water dump pot illustrated in FIGURE 2 is substantially the same as the oil dump pot in that it includes a float 90 secured onto a vertically reciprocating rod 92 which extends upwardly through a packing gland 94 into a pump barrel 96 and upwardly through a packing gland 97 in the upper end of the pump barrel 96 into a counter 98. The pump rod 92 is provided with a pump plunger 100 thereon reciprocating in the pump barrel 96 and the plunger 100 pumps an anti-corrosive chemical from the chemical additive tank 102 having a removable cover 104 thereon and an inlet 106 at the bottom for supplying the chemical additive into the pump barrel 96 so that as the plunger 100 is elevated by the pump rod 92, the chemical additive, that is, the anti-corrosive chemical will be discharged through the chemical discharge line 108 which discharges the anti-corrosive chemical into the water inlet line 30 thereby reducing water corrosion in the lines. This chemical line may lead to the crude oil inlet line 26 which leads to the separator or it may lead to the water zone 20 at the bottom of the separator and entry may be made into the separator at any point on the separator tank or at any point on the water line depending upon the desires of the user and the particular installation.

Also, the chemical additive line 70 is communicated with the crude oil inlet line 26 and is communicated therewith at any suitable point as illustrated in FIGURE 1.

Also, the water tank 44 is provided with a manometer 110 communicated with the top and bottom of the tank by fitting 112. Also, a water discharge line 114 communicates with the bottom of the tank and terminates in a valve seat 116 engaged and closed by a valve member 118 carried by the lower end of the float rod 92.

Both the water dump pot 14 and the oil pot 16 employ a novel mechanism for seating and unseating movement of the valve 118 and 88 respectively.

When the water dump pot 14 is empty and water is entering through the line 30, the valve 118 is engaged with the valve seat 116 thus holding the water in the pot. A plurality of tubular pivoted members or weight exchangers 120 are disposed with their inner ends between two vertically spaced collars 122 and have the central portion thereof pivoted by pivot pins 124 to a supporting framework 126 attached to the tank 44 in any suitable manner. The collars 122 are spaced apart sufficiently to enable rocking movement of the tubular members 120 and disposed interiorly of the tubular members 120 is a spherical ball which forms a weight 128 which may shift from one end to the other of the tubular member 120 thus moving past the pivot point 124 to move from a position on one side of the pivot point 124 to urge the float and rod downwardly to a position on the other side of the pivot point 124 to urge the float and rod upwardly. When the tank is empty and water is entering the tank, the weight of the rod, float and other components associated therewith orientates the tubular members 120 in such a position that the ends nearest the float rod 92 are disposed in a downwardly inclined position as illustrated in FIGURE 2. Gas pressure entering the line 42 would also serve to aid in moving the components downwardly since the gas pressure serves to aid in forcing water out

of the line 114 when the valve 118 is opened and the movement of such gas through the tank will tend to move the float and its components downwardly. The combined weight of the balls 128 resisting upward movement when fluid tries to raise the float 92, keeps the valve 118 seated until the upward pressure on the float 90 has reached a desired point at which time the bottom flange or trip 122 will move the weight exchangers or tubular members 120 toward the horizontal position and then slightly above a horizontal position with the inner end thereof inclined upwardly thus throwing the weights 128 to the outer end of the tubular members 120. Attached to one of the tubular members or weight exchanges 120 is a valve member 130 extending into a valve seat or fitting 132 formed on the end of the water inlet line 30. A multiple joint articulate connection 134 is provided between the valve member 130 and the tubular weight exchanger 120 to reciprocate the valve member 130 when the tubular weight exchangers 120 are pivoted. When the weight exchangers 120 are in the position illustrated in FIGURE 2 with the valve 118 closed, water will flow into the tank 44 since the valve 130 is open. However, when the float 90 moves the rod 92 upwardly as the water level elevates, the lower flange 122 will pivot the weight exchangers 120 upwardly about the pivot point 124 which will open the valve 118 and close the valve 130 and at the same time operate the pump plunger 100. This action forms a structure which provides an arrangement in which the weight of the balls 128 will form a restriction against upward movement of the rod 92 until such time as the float 90 begins to exert some pressure on the rod 92 due to the rise in the water level in the tank. As soon as the float 90 overcomes the initial resistance of movement of the rod 92, weights 128 and associated structure, the shifting of the weights 128 across the pivot point 124 will then exert a lifting force on the rod 92 which will assist the float 90 thereby serving to completely open the valve member 118 and completely close the valve 130 and operate the plunger 100 sufficient to discharge the chemical additive. Thus, while the water is actually being dumped from the tank 44, inlet water through the line 30 is stopped by the valve 130. Also, the frame structure 126 may have a guide 136 which not only guides the rod 92 but also limits the upward movement thereof if desired.

The operation of the weight exchangers 120 can be adjusted by inserting small plates or shims into this structure for limiting movement of the ball 128 or this may be accomplished by adjustable ends in the tubular weight exchangers. For example, if a float does not cause the weight exchanger to trip and allow the balls to roll, a plate can be inserted to keep the ball 128 nearer the fulcrum point when in the position illustrated in FIGURE 2 thus reducing the force necessary to be exerted thereon to cause the weight exchanger to pivot. Various adjustments can be made as to the orientation of the components on the rod 92 but once the mechanism has been adjusted for a particular operation, it should not be necessary to further adjust it unless the operating conditions are altered.

The structure of the oil dump pot insofar as the control for the valve 88 and the valve in the inlet line 34 operated by the weight exchangers is identical to that employed in the water dump pot and will not be described separately since the structure thereof operates in exactly the same manner as the water dump pot.

A by-pass procedure is incorporated into the present invention for use in the event that one of the dump pots needs to be repaired. Normally, gas enters the oil dump pot 16 through the line 40 but there is a control valve 138 incorporated therein and a similar valve 140 is incorporated into the gas line 42 extending into the water dump pot tank 44. Also, oil enters the dump pot tank 48 through the line 34 with a valve 142 being incorporated therein and a similar valve 144 is incorporated in the water line 30 which communicates the separator with the water dump pot tank 44. The oil line 34 has a by-pass line 146 com-

municated therewith having a valve **148** therein and the by-pass line **146** is connected with the discharge line **84** for the dump pot tank **48** which also has a valve **150** incorporated therein. The water line **30** has a water-by-pass line **152** communicated therewith having a valve **154** therein and the water discharge pipe **114** from the water dump pot tank **44** is communicated therewith and is provided with a valve **156**. Also, the gas line **40** which is communicated with the gas line **38** has a by-pass line **158** communicated therewith having a valve **160** incorporated therein. The oil by-pass line **146** communicates with the storage tank and of course the water discharge line may communicate with any suitable arrangement for discharge of the water and the gas by-pass line **158** may be communicated with a storage tank for natural gas.

If it is desired to repair the water dump pot, it is only necessary to close valves **140**, **144** and **156**. In order to repair the oil dump pot **16**, it is only necessary to close valves **138**, **142** and **150** and also if the pump **62** has to be repaired, a valve **162** in the chemical additive line **70** will be closed so that the crude oil may then pass directly into the storage tank. The valve **160** may be closed or may be left open when repair is being made to the oil dump pot. Thus, either of the dump pots may be isolated by selectively opening and closing the necessary valves and, if desired, both of the dump posts may be taken out of the system with only the separator operating.

In operation, crude oil enters the separator **12** through crude oil supply **26** and is separated into water zone **20**, oil zone **22** and gas zone **24**. The natural gas enters the oil dump pot through line **40** and the water dump pot through line **42**. Oil enters the oil dump pot through line **34** and water enters the water dump pot through line **30**. As the liquid level rises in the oil dump pot or in the water dump pot, the respective float and weight exchangers operate to open the dump valve, close the inlet in the outer end of the respective supply line and operate the pump plunger to discharge a given quantity of chemical additive and at the same time operate the respective counter thus enabling the counter to record an accurate count of oil processed which can be calculated by multiplying the number of cycles of operation shown on the counter by the volume dumped each time. Dumping is facilitated by the gas pressure which presses down upon the liquid in the dump pot tank thus providing a pressure discharge for the liquid in the tank. Various adjustments may be made on the float, the float control weight exchangers, the chemical additive pump plunger and other features to enable the structure to be varied for individual installations.

If desired, the tubular members **120** which are also considered weight exchangers may be mounted exteriorly of the pot and probably on top of the pot so that the necessary adjustments can be easily made.

Rather than have the chemical pump directly connected to the float rod **92**, the rod **92** may be connected to a fulcrumed connecting rod at one end thereof with the other end thereof being operatively connected to a remote chemical pump thereby enabling repair or replacement of the pump without closing down operation of the chemical pump. Another arrangement would involve the pump rod portion of the float rod being a separable section thereby enabling the section of the rod as well as the pump to be removed thus enabling continued operation of the dump pot when the pump is being repaired. A rod section could be added into the float rod to enable the counter to continue to operate even though the chemical pump portion of the float rod was removed for repair with chemical being added elsewhere by hand, or a spare pump could be easily inserted into the rod so operation could continue.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A crude oil separator and a dump pot system comprising a separating tank having a substantial vertical dimension, inlet means for crude oil communicated with said tank whereby the crude oil may be separated into a water zone, oil zone and gas zone from bottom to top of the separating tank, an oil dump pot, an oil line communicating the oil zone of the separating tank with the oil dump pot, a water dump pot, means communicating the water dump pot with the water zone of the separating tank, means communicating the oil dump pot with the gas zone of the separating tank, means communicating the water dump pot with the gas zone of the separating tank, said oil dump pot having a discharge line communicated with the bottom thereof, said water dump pot having a discharge line communicated with the bottom thereof, said oil dump pot including float operated valve means for retaining the discharge line closed until a predetermined quantity of oil is discharged into the oil dump pot, said water dump pot including float controlled valve means for discharging water from the water dump pot when a predetermined quantity of water is discharged into the water dump pot, said means communicating the gas zone with the oil dump pot and water dump pot discharging gas into the top of each dump pot for pressurizing liquid therein, each of said float operating means including an elongated rod extending upwardly through the top of the dump pot, a chemical additive pump assembly operatively connected to said rod exteriorly of the dump pot for pumping a predetermined quantity of additive each time the rod is operated.

2. The structure as defined in claim **1** wherein the lower end of each float operated rod includes a valve member thereon normally closing the discharge line.

3. The structure as defined in claim **2** wherein weight shifting means is associated with each float operated rod for retaining the rod in a lowermost position until the resistance of the weight shifting means has been overcome by buoyancy exerted on the rod by a float forming part of the float operated means with the weight shifting means then assisting in the opening movement of said rod.

4. A crude oil separator and a dump pot system comprising a separating tank having a substantial vertical dimension, inlet means for crude oil communicated with said tank whereby the crude oil may be separated into a water zone, oil zone and gas zone from bottom to top of the separating tank, an oil dump pot, an oil line communicating the oil zone of the separating tank with the oil dump pot, a water dump pot, means communicating the water dump pot with the water zone of the separating tank, means communicating the oil dump pot with the gas zone of the separating tank, means communicating the water dump pot with the gas zone of the separating tank, said oil dump pot having a discharge line communicated with the bottom thereof, said water dump pot having a discharge line communicated with the bottom thereof, said oil dump pot including float operated valve means for retaining the discharge line closed until a predetermined quantity of oil is discharged into the oil dump pot, said water dump pot including float controlled valve means for discharging water from the water dump pot when a predetermined quantity of water is discharged into the water dump pot, said means communicating the gas zone with the oil dump pot and water dump pot discharging gas into the top of each dump pot for pressurizing liquid therein, each of said float operating means including an elongated rod extending upwardly through the top of the dump pot, a chemical additive pump assembly operatively connected to said rod exteriorly of the dump pot for pumping a predetermined quantity of additive each time the rod is operated, the lower end of each float operated rod including a valve member thereon normally closing the discharge line, weight shifting means associated with each float operated rod for retaining the rod in a lower-

most position until the resistance of the weight shifting means has been overcome by buoyancy exerted on the rod by a float forming part of the float operated means with the weight shifting means then assisting in the opening movement of said rod, said weight shifting means including a valve in the inlet line for the dump pot thus closing off inflow while the discharge valve is open.

5. The structure as defined in claim **4** wherein said chemical additive pump associated with the oil dump pot has a discharge line communicated with the crude oil supply means for the separating tank.

6. The structure as defined in claim **5** wherein the additive pump associated with the water dump pot is communicated with a portion of the system receiving water for discharging an anti-corrosive chemical into the system.

7. The structure as defined in claim **4** wherein the chemical additive pump includes a cylindrical barrel, a plunger mounted on said float operated rod received in the barrel for reciprocation with said float operated rod, and an inlet for chemical additive communicated with said barrel.

8. The structure as defined in claim **7** wherein a chemical additive tank is communicated with the pump barrel, said plunger being longitudinally adjustable on

the rod for enabling limitation of movement of the float operated rod.

9. The structure as defined in claim **8** wherein the oil dump pot and the water dump pot each is provided with a by-pass line communicated with the respective oil and water inlet means for enabling the oil dump pot and water dump pot to be isolated for repair thereof.

10. The structure as defined in claim **4** together with a counting mechanism associated with each float operated rod for counting the number of cycles of operation thereof.

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