July 22, 1958 S. A. WILSON 2,844,213

WATER KNOCKOUT TANKS

Filed Jan. 27, 1955 2 Sheets-Sheet 1

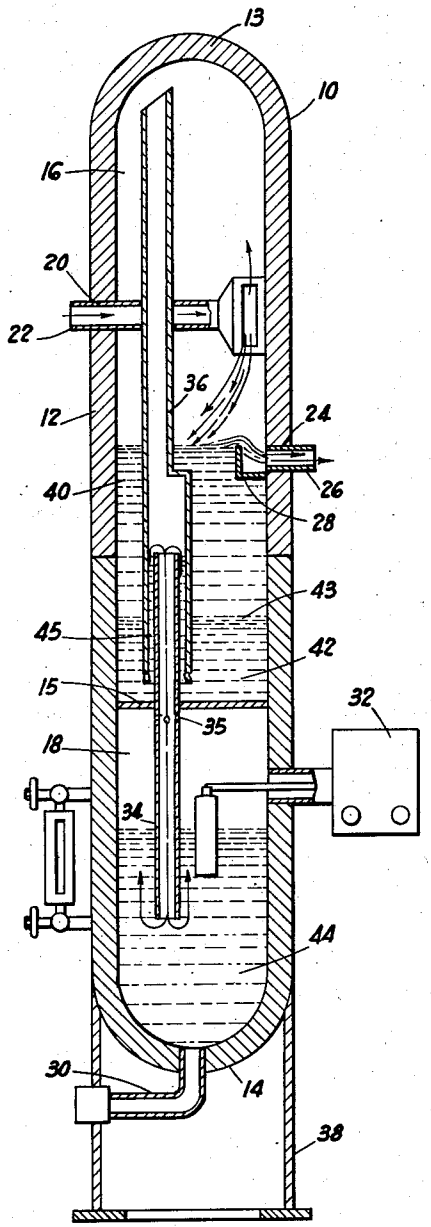


Fig. 1

INVENTOR.
S. A. Wilson
BY
ATTORNEY

July 22, 1958 S. A. WILSON 2,844,213

WATER KNOCKOUT TANKS

Filed Jan. 27, 1955 2 Sheets-Sheet 2

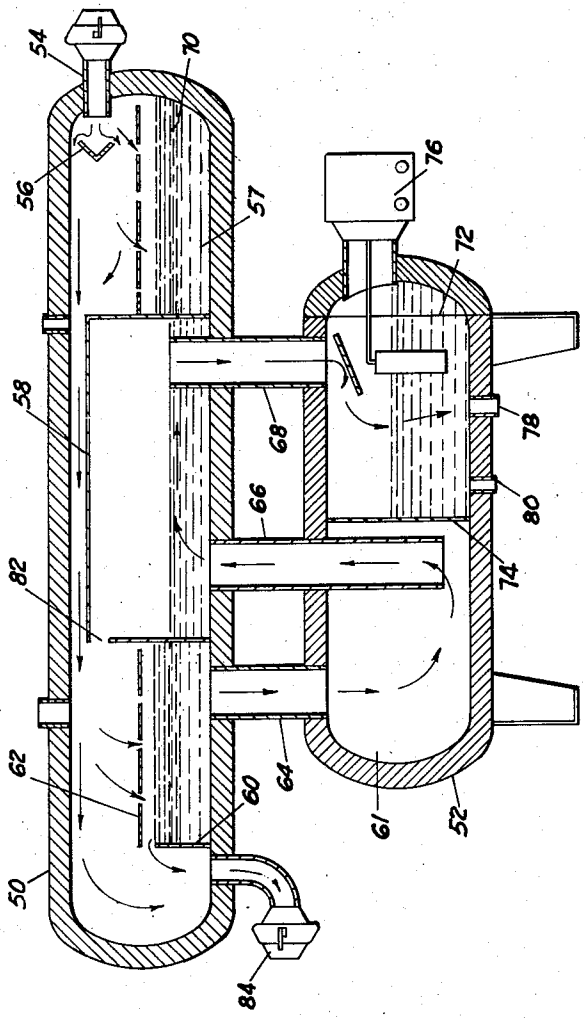


Fig. 2

INVENTOR.
S. A. Wilson
BY
ATTORNEY

United States Patent Office 2,844,213 Patented July 22, 1958

2,844,213

WATER KNOCKOUT TANKS

Samuel A. Wilson, Minden, La., assignor to National Tank Company, Tulsa, Okla., a corporation of Nevada

Application January 27, 1955, Serial No. 484,453

2 Claims. (Cl. 183—2.7)

This invention relates to improvements in water knockout vessels such as commonly used in the oil industry, and more particularly, but not by way of limitation, to a free water knockout tank designed to maintain a sensitive control of the water level within the vessel and to prevent loss of distillate through failure of proper control thereof.

It is well known in the oil industry that the fluid from producing oil wells often comprises a mixture of gas, oil and water. Sometimes the fluid is of an emulsion type which requires the use of heat, with or without chemicals in order to separate the water from the mixture. In many other instances, however, the water in the fluid is known as free water and may be easily separated from the gas-oil mixture by gravity. For example, fluids containing free water are transported from an oil well directly to a free water knockout tank wherein a column of the oil-gas-water mixture is collected. Oil and gas are of lighter weight than water and, therefore, will rise to the top of the fluid column in the vessel. This permits the oil and gas to be removed therefrom free of the bulk of the water so that the water will not have to be handled during the remaining processing or separation of the gas-oil mixture.

Free water removed in the above manner in existing knockout vessels is normally controlled by a liquid level controller which operates on the distillate-water interface. It will be apparent that the sensitivity of the distillate-water interface level control apparatus is greatly lessened with respect to a top level control operating between liquids and gases and usually will not adequately control the water level within the tank. If the water level is permitted to rise too high within the vessel it will usually flow therefrom with the distillate. Another disadvantage of present water knockout tanks is that in the event of liquid control failure, all the distillate may be lost. For instance, if the water valve should fail in an open position the distillate would be discharged from the tank with the water.

The present invention contemplates an improved free water knockout tank designed with upper and lower compartments to permit a positive sensitive water level control at the top level of the water as opposed to level control on the distillate-water interface. It will be apparent that this type of level control will provide a more efficient operation of the vessel by substantially reducing the possibility of the water level rising too high therein. Further, the two compartment design substantially precludes the possibility of loss of distillate with the discharged water due to failure of the level control device by providing a water seal in the upper chamber to prevent flow of the distallate into the lower chamber.

It is, therefore, an important object of this invention to provide a free water knockout vessel for use in a gas-oil separation apparatus which permits a positive sensitive water level control to preclude the possibility of water being discharged with the gas-oil distillate as the distillate leaves the vessel.

It is another object of this invention to provide an improved free water knockout vessel for use in the oil industry to separate water from a gas-oil-water mixture in such a manner as to prevent the gas-oil distillate from being lost due to the failure of the level control device.

It is a further object of this invention to provide an improved free water knockout vessel for use in the oil industry which is of a simple design for ease and economy of operation and construction.

Other objects and advantages of the invention will be evident from the following detailed description, read in conjunction with the accompanying drawings, which illustrate my invention.

In the drawings:

Figure 1 is a vertical sectional view of a free water knockout vessel embodying the invention.

Figure 2 is a vertical sectional view of a modified form of the invention.

Referring to the drawings in detail, reference character **10** refers in general to a free water knockout vessel of substantially an upright cylindrical configuration. The vessel **10** comprises a shell **12** with closed ends **13** and **14**, a substantially horizontal baffle **15** secured therein which separates the vessel **10** into an upper chamber **16** and a lower chamber **18**. An inlet port **20** is provided in the upper portion of the shell **12** for receiving any suitable inlet means **22** to permit access to the chamber **16** for a purpose as will hereinafter be set forth. An outlet port **24** is also provided in the shell **12** and is preferably disposed in the upper chamber **16** at a position below and diametrically opposite the inlet port **20**. Any suitable nipple **26** is secured within the outlet port **24** and cooperates with a weir box **28** in a well known manner to permit discharge of fluid from the chamber **16** as will hereinafter be set forth in detail. A suitable drain means **30** is provided at the bottom **14** of the shell **12** to permit discharge of liquid from the lower chamber **18** and complements a suitable liquid level control device **32** to control the liquid level within the chamber **18**. A pipe **34** extends upward from a point spaced above the bottom **14** of the shell **12**, through the baffle **15** and into the chamber **16** for communicating liquid from the chamber **16** to the chamber **18**. The pipe **34** is provided with a plurality of equalizer apertures **35** disposed below the baffle **15**. The pipe **34** terminates at its upper end within a riser **36** and at a point spaced below the weir box **28**. The riser **36** is vertically spaced within the chamber and may be supported therein by any suitable means, such as brackets (not shown). It will be apparent that any suitable base **38** may be provided to support the vessel **10** in a vertical position.

Operation

The fluid discharging from oil wells is usually a mixture of gas, oil and water, with the water in a free state, and is transferred from the well directly into a water knockout tank such as the vessel **10** described herein. The influent enters the vessel **10** through the inlet means **22** for disposition within the upper chamber **16**. The influent will fall by gravity to the bottom of the chamber **16** to form a fluid column. The oil and gas in the emulsion is of lesser specific gravity than the water, and will therefore rise to the top of the column to form a distillate **40** above the free water **42**. This separation process forms an interface **43** between the two liquids. As more fluid enters the chamber **16** the free water **42** will be forced upward in the annulus **45** between the pipe **34** and the riser pipe **36** and will fall through the pipe **34** into the lower chamber **18** providing a reservoir **44**. As the chamber **18** is filled with free water, the displaced air or gas within the chamber **18** will discharge through the equalizer ports **35** and flow upward through

the pipe **34** and riser **36**. The gas and distillate will be discharged from the chamber **16** through the outlet nipple **26** to storage or the like. The top of the pipe **34** in relation to the weir box **28** will control the respective heights of the distillate and water in much the same manner as is well known in a conventional treater or separator assembly. The level of the free water **44** in the chamber **18** will be controlled by the level control device **32** in the usual manner. It will be apparent that the liquid in the chamber **18** is substantially water; the control of the water level therein will provide a more sensitive action than would be possible if the level control apparatus were acting at the top level of the interface **43** between water and oil. The level control will not only be more sensitive, but will also be more reliable, thus providing a more efficient operation of the knockout vessel **10**. In the event of control failure, no distillate will be lost or discharged with the water through the drain **30** beacuse the water **42** in the upper chamber **16** will form a seal between the distillate **40** in chamber **16** and precludes discharge into the pipe **34**.

Figure 2 depicts a modified form of the present invention wherein a cylindrical tank **50** and a smaller tank **52** are horizontally disposed in a spaced relationship. The well stream enters the tank **50** through an inlet means **54** and impinges against an angled deflector plate **56** which may be secured within the tank **50** in any well known manner (not shown). Water, emulsion and distillate are separated in the tank **50** by gravity and fall to the bottom thereof to form a reservoir **57**. The liquids will flow around the water box **58**, and the liquid level is controlled by a weir plate **60** in a well known manner. The liquid surface is protected by a perforated plate **62**. The water, as hereinbefore stated, is the heaviest constituent in the emulsion and will settle by gravity to the bottom of the tank **50** and will flow downward into a chamber **61** in the tank **52** through a pipe **64** which connects the tanks **50** and **52**. The water will then flow upward through a second connecting pipe **66** which provides communication between the chamber **61** and the interior of the water box **58**. A pipe **68** extends upwardly in the water box **58** to a point below the top edge of the weir plate **60** for controlling the level of the oil-water interface **70** in a manner well known in the industry. Water will flow downward into a chamber **72** in the tank **52**. The chamber **72** is separated from the chamber **61** by a plate **74** which is secured to the inner periphery of the tank **52** in any well known manner (not shown). A suitable level control **76** cooperates with a suitable motor valve (not shown) to control the outgoing water through a water outlet **78**. An outlet means **80** communicates with a gage glass (not shown) to provide an exterior sight glass. If the motor valve fails open, the chamber **72** is drained of water and gas will blow through an opening **82** in the water box **58** to the motor valve. The water in the chamber **61** forms a seal to prevent loss of distillate through the drain **78**. The gas and oil remaining in the upper portion of the tank **50** is discharged through an outlet means **84** for transfer to storage, or the like.

From the foregoing, it will be apparent that the present invention provides a novel free water knockout vessel which maintains a sensitive and reliable water level control to substantially eliminate disadvantages inherent in such devices lacking such efficient controlling. The provision of a free water reservoir completely separate from the gas and distillate substantially precludes the loss of distillate if failure of the water control apparatus occurs. These features not only provide a more efficient water knockout tank, but reduce the expense of such operation by eliminating costly losses of distillate.

Changes may be made in the combination and arrangement of parts as heretofore set forth in the specification and shown in the drawings, it being understood that any modification in the precise embodiment of the invention may be made within the scope of the following claims without departing from the spirit of the invention.

I claim:

1. A free water knockout vessel comprising upper and lower horizontally disposed cylindrical tanks, means for admitting a gas-oil-water mixture to the upper tank wherein free water is separated by gravity from the oil and gas components, means for controlling the liquid level of the emulsion in the upper tank, a water box in the upper tank, a vertical baffle in the lower tank to provide a left hand and a right hand chamber therein, flow pipe means to communicate free water from the upper tank to the left hand chamber, flow pipe means to communicate water from the left hand chamber to the water box, flow pipe means to control the water level in the water box and to transport the water to the right hand chamber, means to control the water level in the right hand chamber, drain means in the right hand chamber to discharge water therefrom, means in the upper tank to discharge the gas-oil distillate therefrom, said water in the left hand chamber providing a seal to prevent loss of gas-oil distillate from the vessel.

2. A free water knockout vessel comprising upper and lower horizontally disposed cylindrical tanks, a water box in the upper tank, a vertical baffle secured within the lower tank to provide two chambers therein, means for admitting a gas-oil-water mixture to the upper tank wherein free water is separated by gravity from the oil and gas components, means for communicating the separated free water to the water box by passage through one chamber of the lower tank, means for communicating the water from the water box to the second chamber in the lower tank, drain means in the second chamber for discharging the water therefrom, said water in the first chamber providing a seal to preclude accidental loss of gas-oil distillate with the free water discharged from the vessel, and means in the upper tank to discharge the gas-oil distillate therefrom.

References Cited in the file of this patent

UNITED STATES PATENTS

2,457,959	Walker	Jan. 4, 1949
2,657,760	Glasgow	Nov. 3, 1953
2,681,150	Reid	June 15, 1954
2,710,071	Kinser et al.	June 7, 1955
2,738,026	Glasgow et al.	Mar. 13, 1956
2,786,543	Hayes et al.	Mar. 26, 1957