Aug. 20, 1957 A. H. PESNELL 2,803,259

MEANS FOR INJECTING TREATING CHEMICALS INTO AN OIL WELL FLOW LINE

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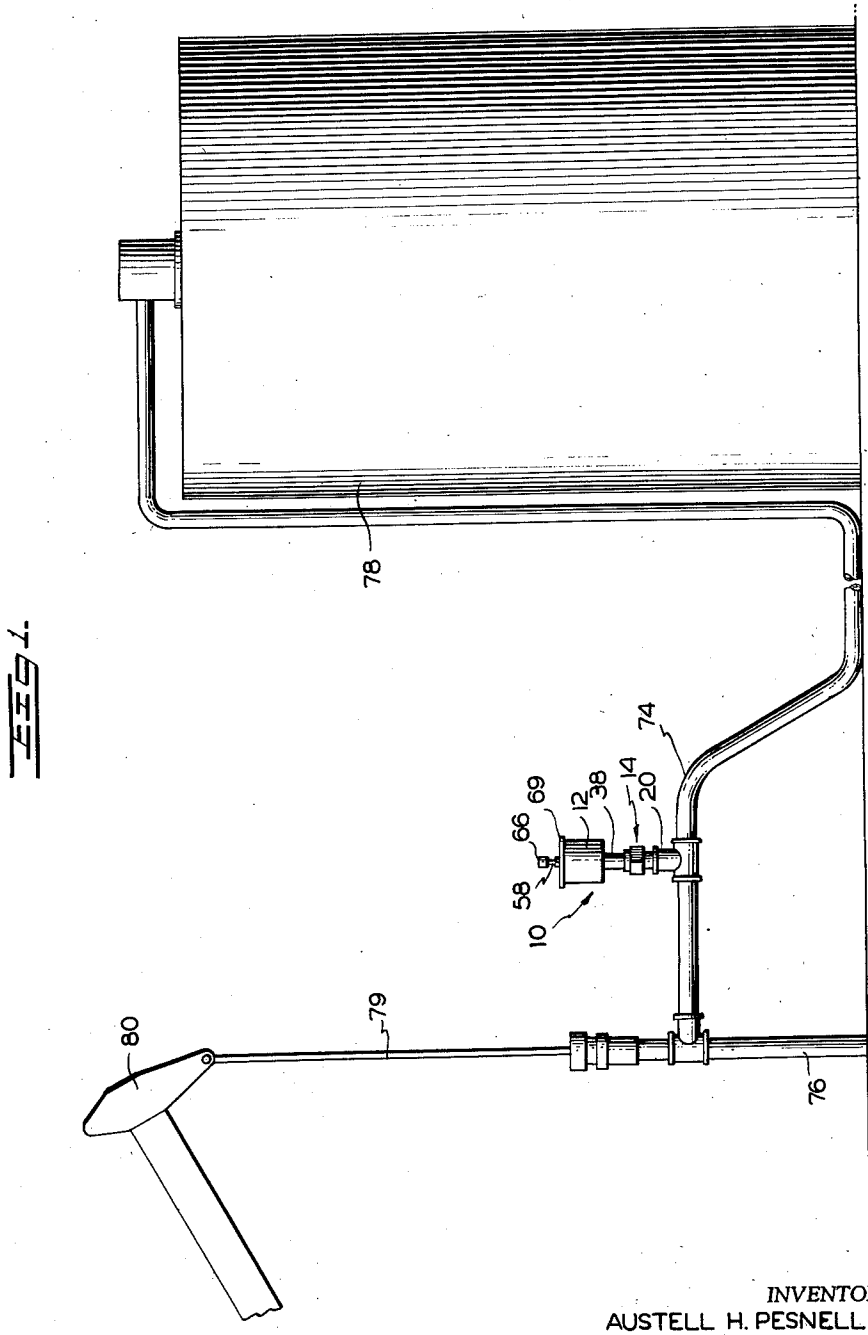


Fig. 1.

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Fig 2.

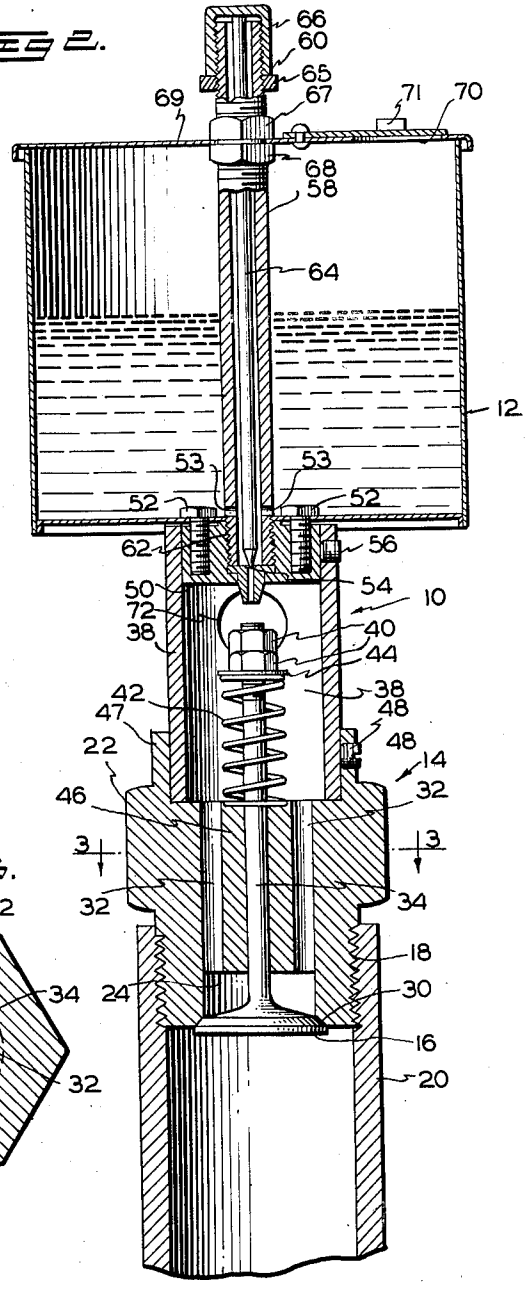
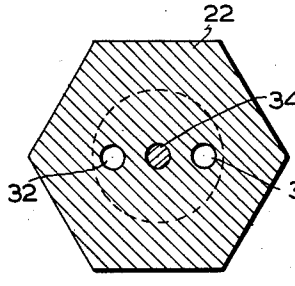


Fig 3.



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MEANS FOR INJECTING TREATING CHEMICALS INTO AN OIL WELL FLOW LINE

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4 Claims. (Cl. 137—87)

The present invention is concerned with apparatus for injecting predetermined quantities of chemically active liquids into the flow line of a pumping oil well.

More particularly, the invention is concerned with apparatus for use in delivering a chemical treating reagent to the flow line of an oil well pump to break an emulsion of the material being pumped.

A large majority of the producing oil wells in the United States today are pumping wells. Due to the loss of driving force in the producing formation, it becomes necessary to mechanically lift the oil to the surface. To accomplish this end, pumps are inserted into the well tubing in a manner well understood in the art. The pumps are usually actuated by means of walking beams which have their free ends secured to a sucker rod extending into the well to a point of attachment to the pump. The walking beam is pivoted medially and is conventionally operated by means of a pitman drive in a manner also well understood in the art.

A flow line is connected to the tubing to carry the oil which is continuously being raised by the pump disposed in the well. In the case of many oil wells, a large quantity of water, together with varying amounts of other foreign and mineral matter is brought up admixed with the oil. The water is usually very salty and the oil-water mixture must be separated before sending the oil to the refinery. Since oil and water are immiscible, the mixture is usually pumped to a separator tank where the oil and water layers which form may be easily separated. Unfortunately, however, recovering the oil from the mixture is quite often not so simple, as the mixture usually comes from the ground in the form of an emulsion which requires prolonged standing in storage for the two to separate, and in many instances even prolonged standing does not result in a complete separation. Obviously, considerable investment in separation tanks would be required if prolonged standing alone was depended upon for this purpose.

To overcome these difficulties, it is customary in the art to inject emulsion breaking chemicals into the flow lines leading from the wells to the separator tanks to effect separation more rapidly. The chemicals used for this purpose are ordinarily of a comparatively active nature, so that conventional pumps having packing glands etc. have a short life under operative conditions. This drawback has been substantially obviated in the art by employing specially constructed pumps for the purpose. In view of the fact that the treating chemicals employed are relatively expensive, it usually is desirable to employ metering pumps for the purpose, capable of delivering fluid in quantity, varying from a few drops for each barrel of oil emulsion being pumped to amounts substantially in excess thereof depending on the amount of oil being delivered from the well, the amount of entrained water and type emulsion.

While such prior art pumps satisfactorily perform their function, they are costly initially and in maintenance and usually depend upon electricity for power, or the motion

of the walking beam in actuating the oil well pump. In either instance, their purchase and operation adds to the cost of producing oil, which in the case of marginal wells may be well nigh prohibitive. Furthermore, being exposed to the elements renders a short life to such pumps and motors and in addition require constant surveillance by field personnel.

It is accordingly a principal object of the present invention to provide means for introducing treating chemicals into an oil well flow line which completely obviates the disadvantages associated with such prior art devices.

It is more specifically an important object to provide apparatus for the introduction of treating chemicals into a pumping oil well flow line which does not require a motor drive or power take-off from the walking beam of the well pump.

A further object is to provide apparatus for the intended purpose which is simple of construction and design and which possesses few working parts, but is durable and inexpensive in service.

Another important object is to provide apparatus of the type described having adjusting means whereby the quantity of treating fluid introduced to the flow line may be accurately controlled.

A still further object is to provide such apparatus in a manner so that the treating chemicals are introduced to the flow line only during the operation of the well pump.

A further object is to provide apparatus of the character described capable of carrying out its intended function with a minimum of contact of the working parts with the oil-water emulsion being carried by the flow line.

These and other objects and advantages of the invention will be apparent from the description which follows.

The accompanying drawings show the details of construction of a preferred form of my invention, wherein

Figure 1 is a fragmentary side elevation, showing the apparatus of the present invention in position on a pumping oil well flow line leading from the well to a separatory tank.

Figure 2 is a vertical section showing the apparatus of the present invention in its preferred embodiment.

Figure 3 is a sectional view taken along the line 3—3 of Figure 2.

Referring now in more detail to the drawings, reference character **10** generally indicates the injection means of the present invention which is comprised of a reservoir container **12**, a valve housing **14**, and a main valve **16** disposed in said housing.

The valve housing, indicated generally by the reference character **14**, is outwardly threaded on its lower free end as indicated at **18**, for easy attachment to an oil well flow line by means of the T **20** inserted therein. The housing **14** is provided with the hexagonal surface **22** to receive a pipe wrench in order to secure the housing in position on the neck of the T **20**. The housing **14** is provided with the fluid retaining or lower cylinder portion **24** in its lower inner free end, with the lower inner terminal edge of the cavity **24** being beveled as indicated at **30** to form a seat for the valve **16**. The bores or passageways **32**, which extend through the inner portion of housing **14**, communicate with the space **24**. Valve stem **34** also extends upwardly through the housing **14** into the upper detachable cylinder portion **38** forming space **36** disposed above the ports **32**.

Valve stem **34** is threaded on its upper free end to receive the nuts **40**. The compression spring **42** surrounds the portion of the stem **34** extending into the space **36**, and seats against the washer **44** held by the nuts **40**, and against the inner portion **46** of valve housing **14**. The cylinder portion **38** is secured to the main valve body by means of set screw **48**, mounted in the flanged portion **47** of the housing **14**. This arrangement

is provided so that the housing may be easily separated for cleaning, inspection and repair purposes as well as rendering the nuts **40** readily accessible for adjusting the compression of spring **42**, which holds valve **16** in its normally closed position.

The reservoir container **12** is provided with the fitting **50** on the bottom thereof for insertion into the cylinder portion **38** of the valve housing **14**. The fitting **50** is shown secured to container **12** by means of the bolts **52**, of which there are four in number, although the two can be made integral if desired. The arrangement shown, however, provides greater accessibility to the needle valve seat **54** for cleaning purposes. Fitting **50** is secured in position by means of set screw **56** in the cylinder portion **38** of valve housing **14**.

A pipe member **58** extends through the container **12**, and is threaded on its upper free end as shown at **60**, and on the lower free end as shown at **62**. Needle valve **64** extends through the pipe member **58** and is supported at its upper end by means of the threaded cap **66** which fits over the threads **60** of pipe member **58** whereby the needle valve **64** may be raised or lowered on its seat **54**. The pair of lock nuts **67** and **68** hold the pipe member **58** and contained needle valve **64** secured to the lid **69** of container **12**. Lock nut **65** is provided to secure the cap member **65** in position once needle valve **64** is properly adjusted. The lower end of pipe member **58** is threaded into a socket in the fitting **50** having communication with the needle valve seat **54**.

Lid **69** of container **12** is provided with a filling opening **70**, which is normally closed by the pivoted cap member **71**. The cap member **71**, when closed does not make an airtight seal since container **12** must have a slight vent to allow proper flow of treating fluid therefrom. A pair of sight ports **72** in the cylinder portion **38** of valve housing **14** provides a means whereby the discharge of treating fluid from container **12** may be readily observed.

Since the needle valve **64** provides a constant predetermined discharge of chemical from the container **12** whether the well pump actuating main valve **16** is in operation or not, I have shown the housing **14** as being machined or cast in a form to provide a fluid retaining space **24** in the lower portion thereof. The apparatus functions satisfactorily, however, wherein the recessed portion **24** is dimensioned to be no larger than required to receive the main valve **16** in its seated position. The space **36** and passageways **32** communicating with valve **16** will usually provide adequate fluid retaining space above the main valve.

In operation, the container **12** is filled through opening **70** with the desired treating chemical, such as "Tret-O-Lite" Solution #F–138 sold by the Tret-O-Lite Company of St. Louis, Missouri. The needle valve **64** is adjusted by means of the knurled cap **66** so that it clears the valve seat **54** to the proper degree to allow the required flow of liquid from container **12** through the discharge openings **53** in the lower end of pipe member **58**. This may vary from a drop-wise release to a small stream. The flow is observed through ports **72** and the required adjustments to needle valve **64** made accordingly.

The fluid flows through space **36** of cylinder portion **38**, and through the ports **32** to the retaining space **24** above the valve **16**, which is normally closed. The valve housing **14** is secured to the oil well flow line **74** in the manner previously described. Flow line **74** connects well tubing **76** with separator tank **78**. As the sucker rod **79** is moved up and down by the walking beam **80**, the pump disposed within the tubing **76** acts to lift the column of oil mixture accumulated in the tubing **76** and force a portion thereof out the flow line **74** in a manner well understood in the art. Each time the sucker rod **79** forces the pump down again, however, a backsurge is caused in the oil column in the tubing **76** and flow line **74**. This backsurge creates a slight temporary vacuum in the

flow line **74** which has been a source of troublesome annoyance to the art in connection with pumping wells of this type.

By using the apparatus of the present invention, I am able to utilize this intermittent vacuum to introduce the required treating chemicals to the flow line **74**, and thereby convert a source of annoyance into useful work. Each time the backsurge on the line **74** occurs to produce vacuum in the line, the main valve **16** is opened slightly to introduce the required amount of chemical to the line **74** from the retaining space **24** above valve **16**. Spring **42** acts to immediately close the valve **16** as the vacuum in the line is replaced by fluid under pressure. Since the amount of treating chemical required will vary with different wells, as will the amount of vacuum pulled by different pumps, each installation can be adjusted for the required opening by means of the nuts **40** on the valve stem **34**. In addition, the needle valve **64** can be adjusted to deliver the proper amount of chemicals to the retaining space **24** above valve **16**.

Since the oil-salt water mixture flowing in line **74** never contacts any part of my apparatus except the face of valve **16**, the only source of corrosion to the inner parts of the apparatus is the treating chemical being injected. In the case of most such chemicals presently being utilized in the art, this does not pose much of a problem where packing glands and the like are not involved as in the present invention.

Due to the fact that the pump in tubing **76** is usually disposed some several thousand feet in the area of the producing formation, the vacuum in the line **74** may actually occur during an up stroke of the pump, and therefore the condition existing in the flow line **74** at a given moment cannot be directly correlated with the motion of the pump. Also, as clearly pointed out, the injecting apparatus depends upon a vacuum being intermittently created in the flow line **74**. In the case of wells which produce large quantities of gases along with the oil-water mixture, the vacuum in the line may be considerably reduced, or entirely eliminated by the expansion of the absorbed gas in the mixture. Since only a slight vacuum is required to open the main valve **16** to the small degree required, most pumping well flow lines will be found to have the proper condition permitting the use of my apparatus.

It will be observed that my invention provides a simple means for accomplishing the intended purpose obviating expensive pumps and external sources of power.

While I have described the invention in connection with a specific embodiment, it will be understood that changes and modifications within the purview of those skilled in the art can be made without departing from the spirit and scope of the invention.

Having now described the invention, I claim:

1. In combination with an oil well and pump having a flow line discharging into a separator tank, improved means for automatically introducing treating chemicals into said flow line, said means comprising a valve housing mounted on said flow line, a normally closed valve mounted in said housing having a stem extending upwardly through said housing, a fluid retaining space disposed above said valve and surrounding a portion of said stem, a series of ports extending through said housing in communication with said fluid retaining space, spring means surrounding the upper free end of said valve stem to maintain said valve in a normally seated condition, a detachable reservoir container mounted on said valve housing communicating with said ports, means associated with said reservoir container for discharging controlled amounts of treating chemicals to said ports, said valve being periodically unseated to discharge said chemicals into said flow line in response to the periodic vacuum caused by the motion of said oil well pump, and means for varying the compression of said spring surrounding said valve

stem to control the amount of opening of said valve under different vacuum conditions.

2. Means for introducing small amounts of treating chemicals into the flow line of an oil well comprising, in combination with an oil well pump, flow line and separator tank, said pump being within the well and operating to move a column of fluid upwardly therein a valve housing mounted on said flow line, a valve mounted in said housing in communication with said flow line, said valve being supported and guidably mounted by a valve stem extending through a portion of said housing, delivery ports extending through said housing communicating with a fluid retaining space in said housing above the inner face of said valve, a reservoir container mounted on the upper free end of said housing, means for regulating the discharge of fluid from said container to said valve, said valve being intermittently opened to discharge treating fluid into said flow line by means of the intermittent vacuum created in said line by the motion of the column of fluid above said pump disposed in the well, means for returning said valve to its normally closed condition after each opening thereof.

3. Apparatus for introducing controlled quantities of treating chemicals into an oil well flow line discharging into an emulsion separator tank comprising a well pump, a valve housing mounted on said flow line, said housing being comprised of an upper detachable cylinder portion and a lower cylinder portion, a series of ports providing communication between said upper and lower cylinder portions of said housing, a main valve normally closing the open end of said lower cylinder portion, a partially threaded valve stem extending from said valve through said housing into said upper cylinder portion, a spring surrounding said stem in the upper cylinder portion of said housing, means on the threaded portion of said stem to vary the compression of said spring and control the force required to unseat said valve, a reservoir container detachably mounted on the free end of said upper cylinder portion by means of a fitting member corresponding to the inner diameter of said upper cylinder portion of said housing, said fitting being provided with a threaded socket having a needle valve seat communicating with said upper cylinder portion of said housing, an adjustable needle valve extending through said reservoir container and seated on said seat in said threaded socket when said reservoir container is mounted thereon, a series of sight ports in said upper cylinder portion whereby the discharge of treating chemicals from said container to said upper cylinder portion of the housing may be visually observed for adjustment of said needle valve having control thereof, said main valve being periodically opened to discharge treating chemicals into said flow line by the intermittent vacuum created in said flow line by the motion of said well pump.

4. Apparatus for automatically injecting emulsion-breaking chemicals into the flow line of a pumping oil well in response to the surge of liquid in said flow line comprising, in combination with an oil well pump, a flow line, a valve housing mounted on said flow line, a spring-biased normally closed valve mounted in said housing, said housing being divided into an upper fluid retaining space and a lower fluid retaining space, a series of ports connecting said upper and lower fluid retaining spaces, said normally closed valve acting as a bottom closure for said lower fluid retaining space, said valve having a stem portion extending into said upper fluid retaining space, the upper free end of said stem having means for adjusting the bias of said loading spring, said upper fluid retaining space being detachable from the remaining valve body to expose said biasing spring adjusting means, a reservoir container detachably mounted over said upper fluid retaining space, an adjustable needle valve extending through said reservoir container and communicating with the upper fluid retaining space of said valve housing, means for adjusting said needle valve so as to permit a continuous regulated discharge of chemical into said upper fluid retaining space, a series of sight ports in said upper fluid retaining space whereby the rate of chemical discharge into said space from said reservoir container may be observed, said first-named normally closed valve being periodically opened to discharge said chemicals into said flow line by the surge created vacuum in said line.

References Cited in the file of this patent

UNITED STATES PATENTS

2,047,414	Henry et al.	July 14, 1936
2,183,889	Magnuson	Dec. 19, 1939
2,225,087	Tade	Dec. 17, 1940
2,270,146	Steele	Jan. 13, 1942
2,607,441	Gillstrom	Aug. 19, 1952

FOREIGN PATENTS

10,185	Great Britain	July 15, 1884