Dec. 28, 1954 E. R. WILLIAMS 2,698,055

GAS GENERATOR FOR OIL WELL PUMP ENGINES

Filed Jan. 2, 1952 3 Sheets-Sheet 1

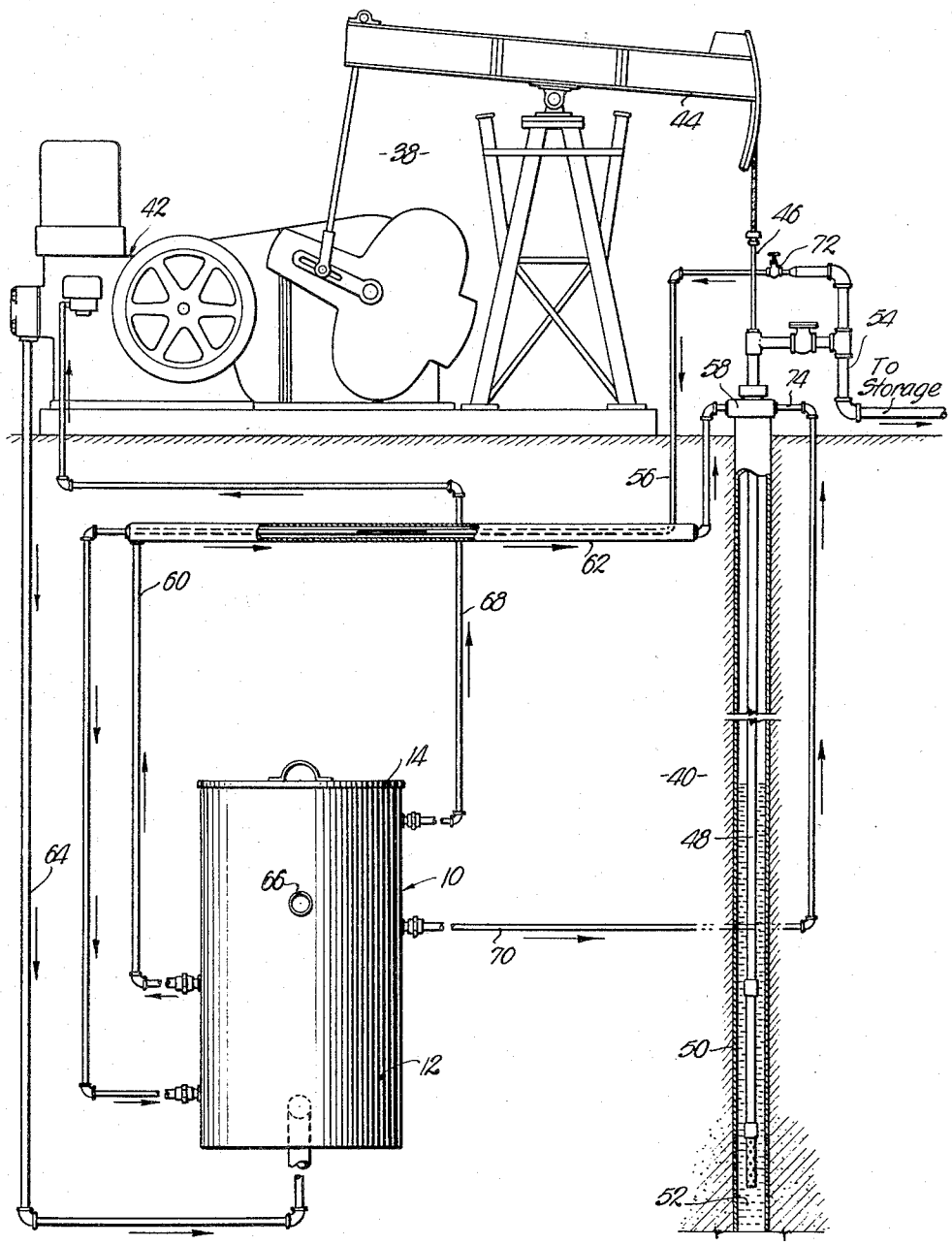


Fig. 1.

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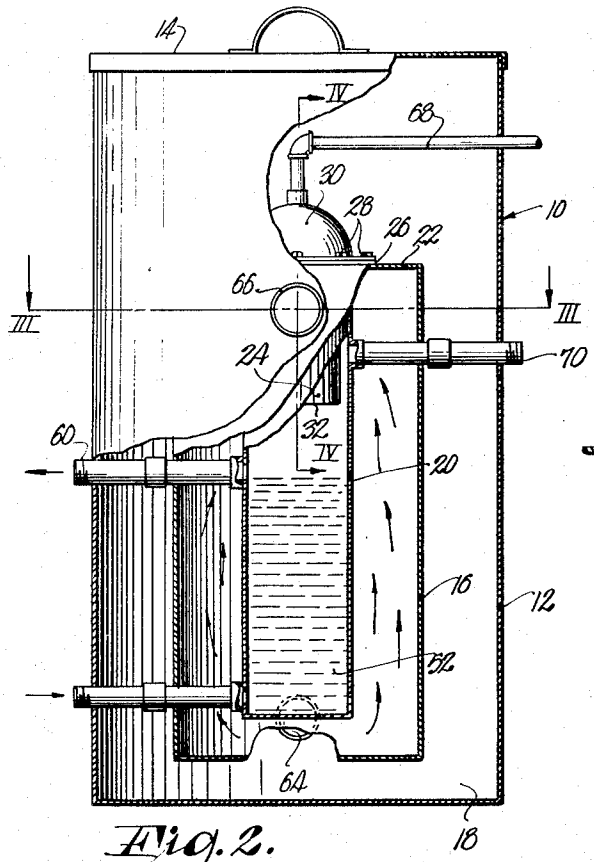


Fig. 2.

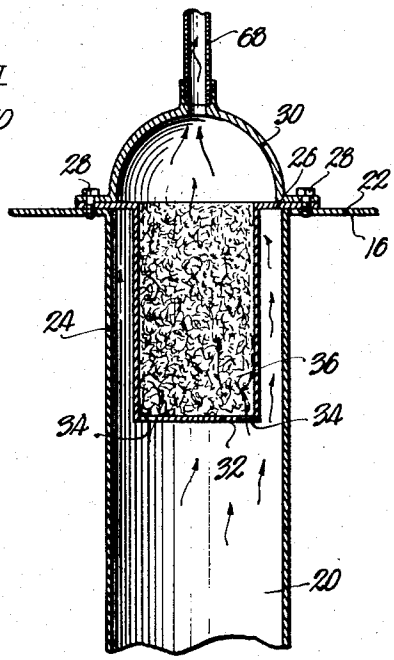


Fig. 4.

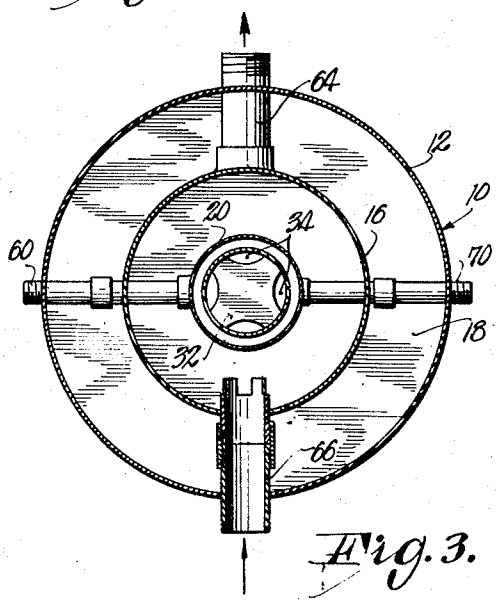


Fig. 3.

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GAS GENERATOR FOR OIL WELL PUMP ENGINES

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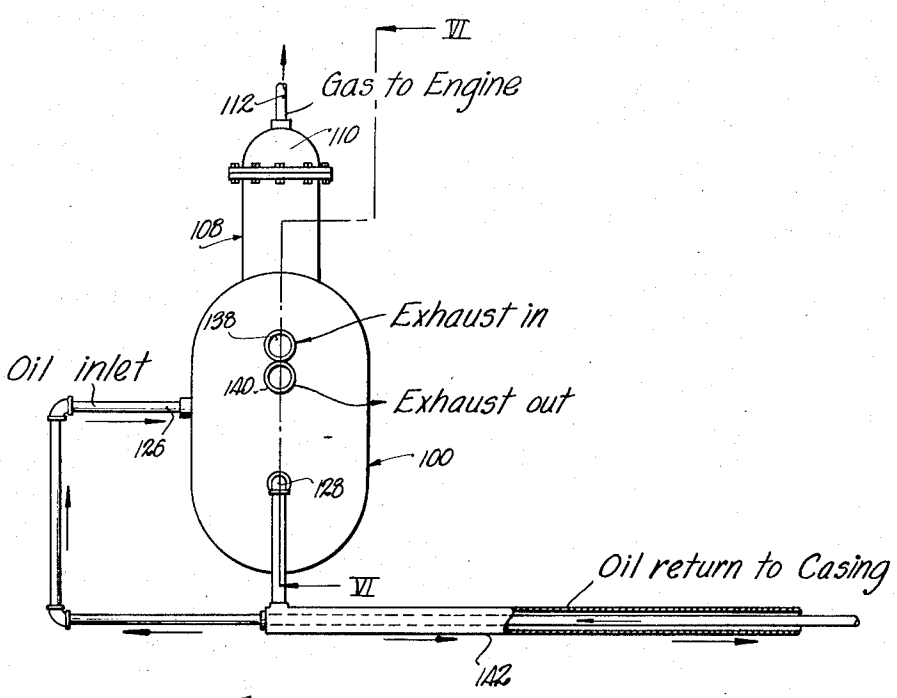


Fig. 5.

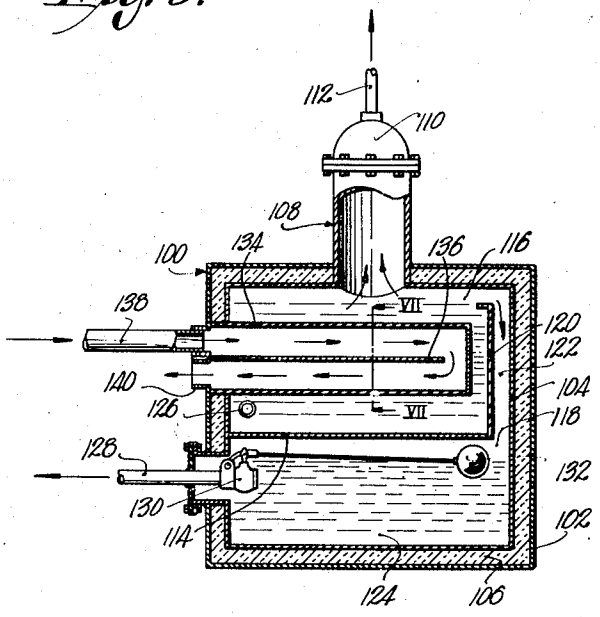


Fig. 6.

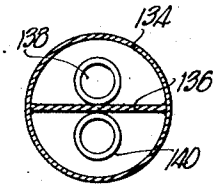


Fig. 7.

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2,698,055

GAS GENERATOR FOR OIL WELL PUMP ENGINES

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Application January 2, 1952, Serial No. 264,611

3 Claims. (Cl. 166—75)

This invention relates to equipment for use in connection with oil wells and particularly those utilizing an internal combustion engine for operating the oil well pump, the primary object being to provide structure for making it possible to utilize gas forming a part of the petroleum products being pumped as the fuel supply for such engine.

It is common practice to operate internal combustion engines serving as a prime mover for oil well pumps from free gas discharged from the pumped products, but many wells today do not have a sufficient supply of such free gas to continuously supply the engine with its fuel requirements.

It is the most important object of the present invention therefore, to provide a generator capable of automatically separating gas from the petroleum products as the latter is being pumped from the well and directing such generated fuel to the pump engine for use thereby during continual operation.

Another important object of the present invention is to provide a generator utilizing heat as the means for causing separation of the gas from the petroleum products, the heat being obtained from the exhaust fumes of the engine itself, thereby requiring no cost of operation whatsoever.

A further object of the present invention is to provide a gas generator having a container for receiving a portion of the oil being pumped and re-directing the same to the casing of the well, the exhaust fumes of the engine being brought into heat-exchange relationship with the oil in the container to cause automatic separation of the gas and thereby presenting a continuous and constant fuel supply for the engine.

A still further object of this invention is to provide a gas generator operable in conjunction with the well itself by utilizing the casing thereof as a storage means for the gas generated when such gas is not used by the engine as fast as the same is produced, there being a closed system interconnecting the well casing and the generator of the present invention.

A still further object of the present invention is to provide a generator for use in connection with wells wherein it is not possible to utilize the casing as a gas storage means, such generator still being capable however, of supplying a constant flow of gas to the pump engine.

Other objects include many important details of construction, all of which will be made clear as the following specification progresses.

In the drawings:

Figure 1 is a side elevational view of one form of gas generator for oil well pump engines and including a diagrammatic flow chart, together with a section through a well and an elevational view of the pumping assembly.

Fig. 2 is an enlarged, side elevational view of the generator similar to Fig. 1, parts being broken away and in section for clearness.

Fig. 3 is a transverse, cross-sectional view taken on line III—III of Fig. 2.

Fig. 4 is an enlarged, fragmentary, detailed cross-sectional view taken on line IV—IV of Fig. 2.

Fig. 5 is an end elevational view of a modified form of gas generator for oil well pump engines.

Fig. 6 is a cross-sectional view taken on line VI—VI of Fig. 5; and

Fig. 7 is an enlarged, fragmentary, detailed cross-sectional view taken on line VII—VII of Fig. 6.

Gas generator **10**, forming the subject matter of the embodiment illustrated in Figs. 1 to 4 inclusive, includes an outermost, preferably cylindrical drum **12**, having a removable lid **14** on its uppermost end. A hollow tank **16**, also preferably of cylindrical shape, is suitably mounted within the drum **12** in spaced relationship to the inner faces of the walls of drum **12**, and insulation (not shown) within space **18** of drum **12**, completely surrounds the tank **16**. The tank **16** in turn contains a cylindrical container **20** that is likewise spaced from the side and bottom walls of the tank **16**.

The container **20** depends from the uppermost wall **22** of the tank **16** and receives a smaller cylindrical receptacle **24**. The receptacle **24** is removable from within the container **20** through the medium of an out-turned, annular flange **26** on the receptacle **24** and resting upon the uppermost surface of wall **22**.

A series of bolts or other fastening elements **28**, releasably hold a hollow dome **30**, together with the flange **26**, attached to the wall **22**. Bottom wall **32** of the receptacle **24** is shaped as illustrated in Fig. 3 of the drawings, presenting a plurality of openings **34**. Filtering material **36** is packed within the receptacle **24** and comprises metal shavings or the like.

In Figure 1 of the drawings, there is illustrated a pumping assembly broadly designated by the numeral **38**, for oil wells **40**. Assembly **38** includes a prime mover in the nature of an internal combustion engine **42**, engine **42** operating a walking beam **44** that in turn reciprocates string **46** of a pump within tube **46** that is in turn disposed within a casing **50** mounted in the well **40**. The petroleum products **52** are pumped to suitable storage tanks not shown, by means of a line **54**. In accordance with the present invention, the line **54** is tapped with a conduit **56** that is in turn connected with the container **20** at the lowermost end thereof after passing through the drum **12** and the tank **16** in the manner illustrated by Fig. 2 of the drawings.

A cap **58** closes the uppermost end of the casing **50** and a second conduit **60** connecting with the cap **58** and, therefore, with the casing **50**, joins the container **20** below the receptacle **24** as shown in Fig. 2 of the drawings.

A heat exchanger **62** is provided by telescoping a portion of the conduit **56** within a portion of the conduit **60**. As shown in Fig. 1 of the drawings, exhaust fumes emanating from the engine **42** are directed into the tank **16** exteriorly of the container **20** by means of a tube **64** passing through the drum **12** and connecting with the tank **16** adjacent the lowermost end thereof as shown in Figs. 2 and 3 of the drawings. Such exhaust fumes pass from the tank **16** to the atmosphere by means of a short nipple **66** traversing the side walls of tank **16** and drum **12** adjacent the uppermost end of tank **16** as shown in Figs. 1, 2 and 3.

Gas emanating from the petroleum products **52** within the container **20**, is directed to the engine **42** by means of a second pipe **68** that passes through the drum **12**, and connects with the dome **30** as shown in Figs. 2 and 4. Excess gas over and above that required to operate the engine **42** is returned to the casing **50** by means of a third pipe **70** joining with the cap **58** and passing through the drum **12**, the tank **16**, and the container **20** adjacent the receptacle **24**.

A valve **72** in conduit **56** controls the flow of petroleum products **52** to the container **20** and a valve **74** within the pipe **70** controls the flow of gas from the container **20** to the casing **50**.

In operation, the initial starting of engine **42** may be accomplished by priming in the usual manner. As soon as assembly **38** commences pumping products **52** to the storage tanks by way of line **54**, valve **72** may be opened to cause a portion of such products **52** to be pumped into the container **20** by way of conduit **56**. These products are initially heated within the heat exchanger **62** and are redirected from the container **20** to the casing **50** by way of conduit **60**. Hot exhaust fumes emanating from the engine **42** and passing through the tank **16** by way of tube **64** and nipple **66**, operate to heat the products **52** within container **20**, causing the loose gas ends to rise therefrom within container **20** and pass into the receptacle **24** by way of openings **34**. Filtering of the

rising gases by the shavings **36**, removes such liquid as may be carried with the gas, the liquid draining back through the openings **34** into the container **20**.

By means of a suitable control forming a part of the engine **42**, the fuel requirements of the engine **42** are fed thereto constantly and at a predetermined rate. Normally, more gas will be generated within the container **20** than is required to operate the engine **42** and such excess gas is re-directed to the casing **50** from the container **20** by way of the pipe **70**. In many wells, the gas pressure that is built up within the casing **50**, will not adversely effect the free flow of products **52** to the pump and therefore, a ready supply of gas fuel is made available for use by the engine **42** at all times. Thus, in the event that the generator **10** fails to produce sufficient gas to supply the engine **42** for a short period of time, the supply of gas within the casing **50** above the products **52**, will pass to the engine **42**, from casing **50** by way of pipe **70**, container **20**, receptacle **24**, dome **30** and pipe **68**.

In many wells however, it is not possible to store the excess gas within the casing **50** for the reason that such pressure acting upon the level of products **52** within the well **40**, adversely effects the free flow of the products **52** into the tube **48** containing the pump. In such cases, it is preferable to make use of a generator **100** forming the subject matter of the form of the present invention illustrated in Figs. 5 to 7 inclusive.

Generator **100** includes an outermost, elongated drum **102** within which is mounted a suitable container **104** surrounded by insulation **106**. An upstanding receptacle **108** communicating with the container **104** and passing through the drum **102**, may also be provided with a bottom wall such as at **32** in Figs. 3 and 4, for receiving filtering means **36** if desired. A dome **110** on the receptacle **108** has an outlet pipe **112** comparable to pipe **68** for directing the gas to an internal combustion engine. The container **104** is provided with a horizontal partition **114** that spans the distance between the side walls of the container **104** and sets out an upper compartment **116** and a lower compartment **118**. An upstanding baffle **120** at one end of the partition **114** spans the distance between the side walls of the container **104** and presents a space **122** for overflow of petroleum products **124** from compartment **116** to compartment **118**. Petroleum products **124** are directed from the well to the container **104** and particularly to the compartment **116** of the latter by means of a conduit **126** comparable to conduit **56** in Fig. 1. A second conduit **128** connecting with the casing of the well and with the compartment **118** of container **104**, returns the products **124** to the well. A valve **130** within the conduit **128** is controlled by a float **132** in the compartment **118**, valve **130** opening as float **132** rises and closing as the float **132** moves toward the lowermost end of its path of travel.

The compartment **116** of container **104**, houses an elongated, cylindrical tank **134** having a longitudinally extending, horizontal baffle **136**. A tube **138** for receiving exhaust fumes from an internal combustion engine communicates with the tank **134** above baffle **136** and a short nipple **140** communicating with the tank **134** below the plate **136**, directs the exhaust fumes to the atmosphere.

A heat exchanger **142** is provided by telescoping the conduit **126** within the conduit **128**. The operation of the generator **100** is in part similar to the operation of generator **10**. Petroleum products **124** are directed to the container **104** from the well by means of conduit **126** and are returned to the casing of the well by conduit **128**. Exhaust fumes emanating from the engine, pass into the tank **134** by tube **138**, such fumes serving to heat the products **124** within the compartment **116** of container **104**. The loose gas ends are separated and rise within the receptacle **108** and thence pass to the engine from dome **110** by way of pipe **112**. The products **124** pass from the compartment **116**, over the uppermost end of the baffle **120** and thence into the compartment **118** by way of space **122**. The products **124** return to the casing of the well by way of conduit **128** when the valve **130** is open.

Such operation continues as long as the engine consumes substantially all of the generated gas, but, if more gas is produced than is required by the engine, the increased pressure within the receptacle **108** and therefore, within the container **104**, operates to retard and/or stop the flow of products **124** into the container **104** by way of conduit **126**. When the pressure is relieved, the flow of products **124**, through the container **104**, will continue. When the flow of products **124** into the compartment **116** is reduced or stopped, the float **132** gradually closes, thereby maintaining a predetermined level of liquid within the compartment **118** whenever the supply of gas in the container **104** is above that required by the engine.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. For use with a well having a casing closed at its uppermost end, a pump in the casing provided with a line for passage of gas-bearing, liquid petroleum products from the pump to a point of storage, and an internal combustion engine for operating said pump, structure for generating gas from said products to fuel the engine comprising a container; a pair of conduits for conveying a portion of said products from the line into said container and from the container into the casing respectively; a tank having an outlet and disposed in heat exchange relationship to the container; a tube for directing hot exhaust fumes from the engine into the tank; and a pair of pipes for feeding gas rising from said products in the container from the latter to the engine and to the casing respectively.

2. For use with a well having a casing closed at its uppermost end, a pump in the casing provided with a line for passage of gas-bearing, liquid, petroleum products from the pump to a point of storage, and an internal combustion engine for operating said pump, structure for generating gas from said products to fuel the engine comprising a container having a products inlet port, a gas discharge port and a products discharge port; a pair of conduits for conveying a portion of said products from the line into said container through said products inlet port and from the container through said products discharge port into the casing respectively; a tank having an outlet and disposed in heat exchange relationship to the container; a tube for directing hot exhaust fumes from the engine into the tank; and means responsive to the pressure of gas within the container and including a float-valve in said products discharge port for maintaining a predetermined level of said products in the container.

3. Structure for generating gas as set forth in claim 2 wherein is provided a pair of pipes for feeding gas rising from said products in the container from the latter to the engine and to the casing respectively.

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