May 3, 1927. 1,626,940

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BURNER FOR OIL WELL CLEANERS

Filed Dec. 19, 1925 3 Sheets-Sheet 1

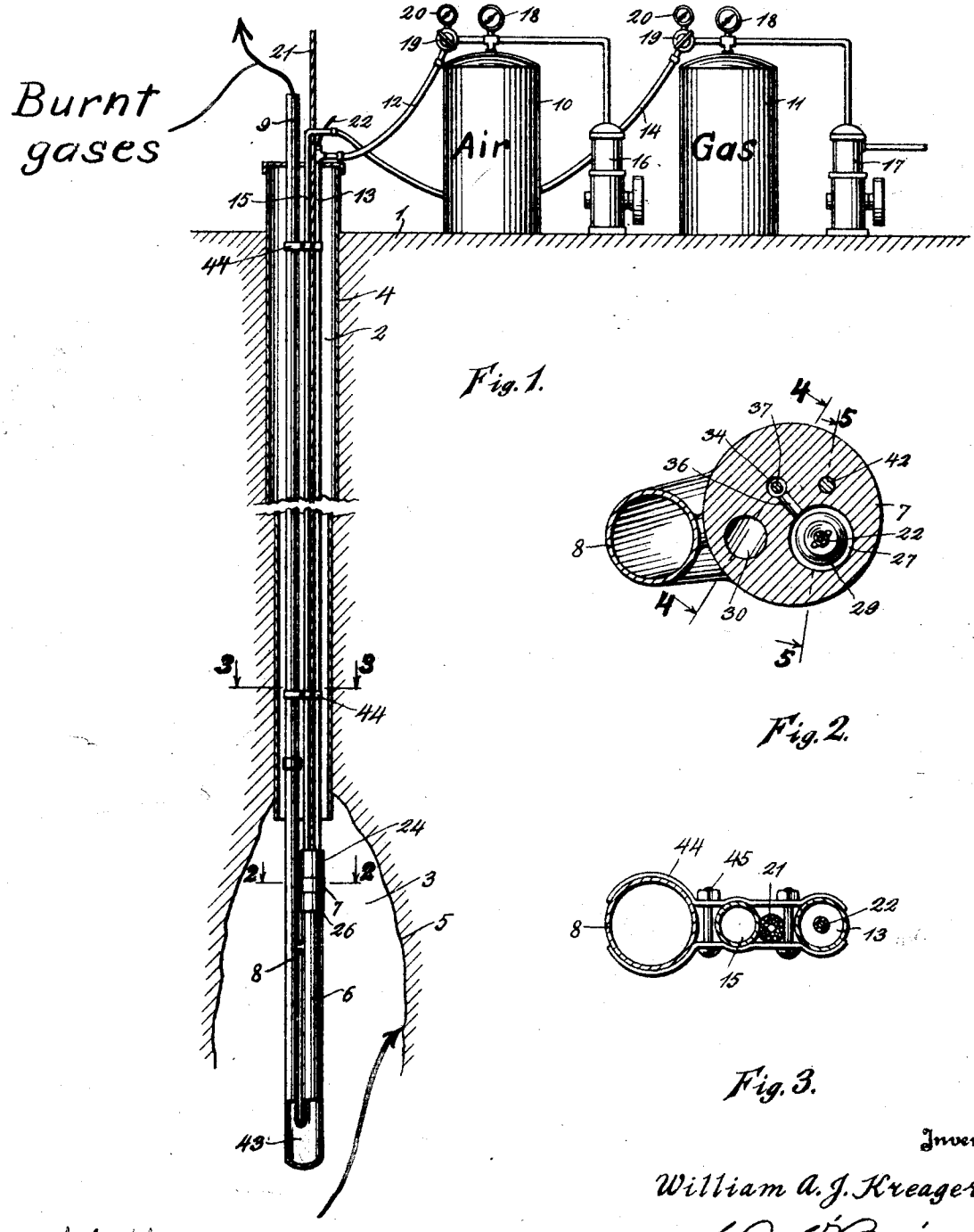


Fig. 1.

Fig. 2.

Fig. 3.

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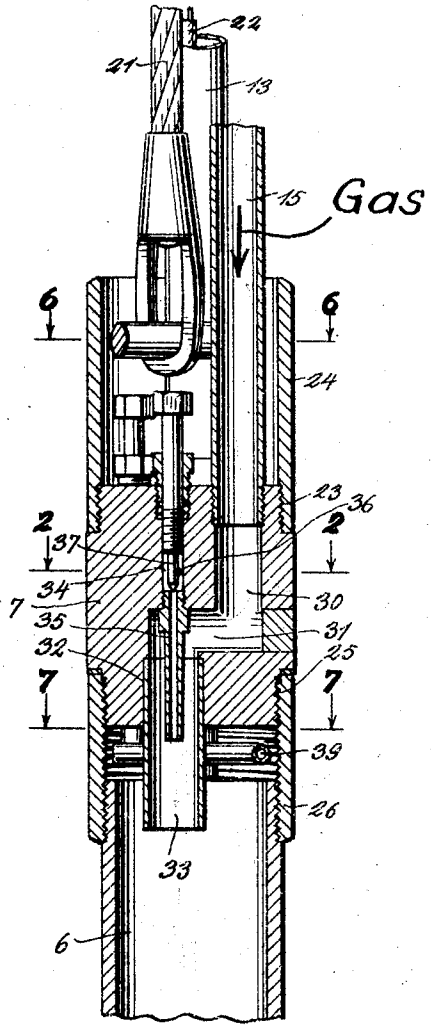


Fig.4.

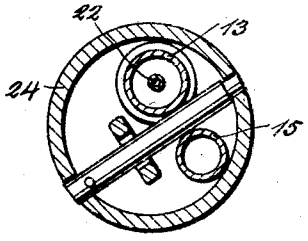


Fig.6.

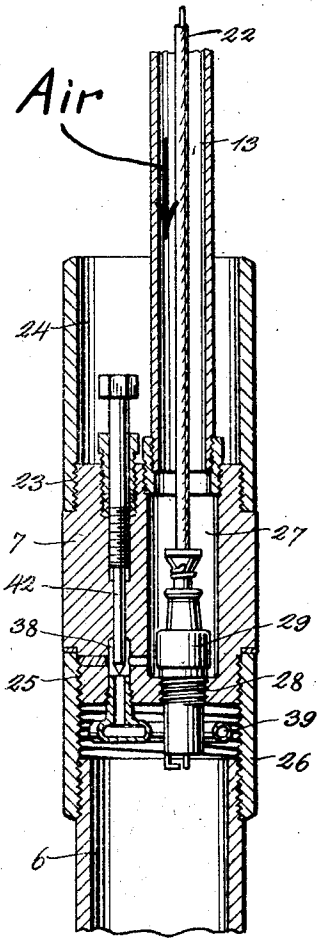


Fig.5.

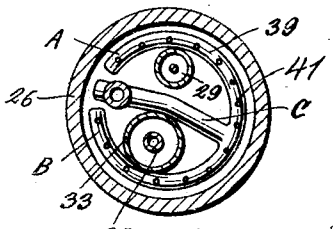


Fig.7.

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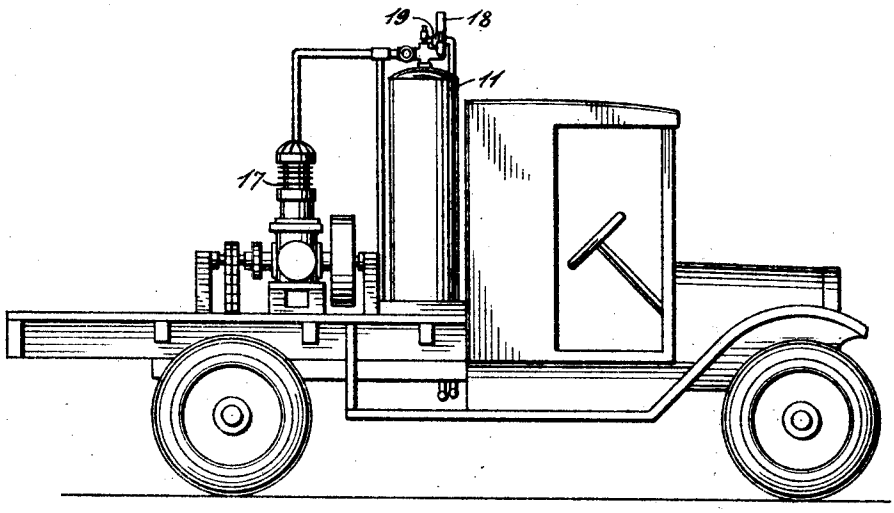


Fig. 8.

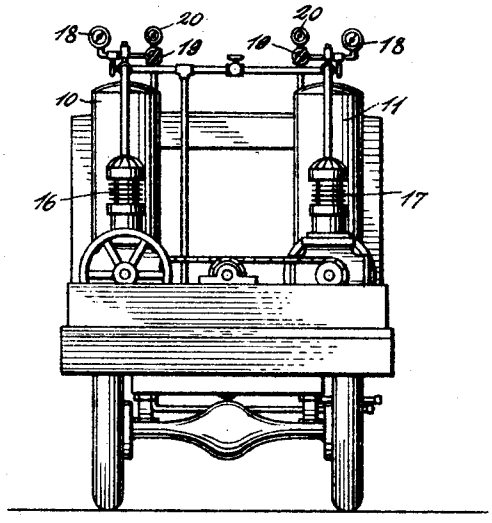


Fig. 9.

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Patented May 3, 1927. 1,626,940

UNITED STATES PATENT OFFICE.

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BURNER FOR OIL-WELL CLEANERS.

Application filed December 19, 1925. Serial No. 76,460.

This invention relates to improvements in apparatus for clearing oil wells of clogging material and has reference more particularly to improvements in the construction of the burner and associated parts.

In United States Letters Patent 1,449,420, granted March 27, 1923, a device of the general type to which this invention relates is disclosed and the present invention is in the nature of an improvement on said patent.

It is well known that oil wells have a tendency to clog and become unproductive. This clogging is due almost entirely to the presence of paraffine which forms a coating on the inner surface of the sump or chamber at the bottom of the well. This coating may extend for several inches into the materials forming the walls and form a very effective seal that prevents the oil from entering the well.

Many different methods have been proposed for removing this paraffine coating or seal and among these the most successful depend on the use of heat for melting the paraffine. The problem of transferring heat from the surface of the well to the bottom where it is to be applied is a difficult one as the wells are often several thousand feet deep. If, steam, hot gases, heated oil or water, are employed, the greater amount of the heat will be lost by the time that the heat carrying medium reaches the bottom. It is evident that the most efficient way of heating the interior and surrounding walls at the bottom of the well is to generate the heat where it is wanted by some means such as the burning of a combustible gas. The problem of burning gas a mile or so under the surface of the ground presents many practical difficulties. In the first place the gas must be conducted to the bottom where the combustion is to take place, it must then be mixed with the proper proportion of air and ignited and in the second place it is evident that the combustion must take place inside of a closed chamber as the sump at the bottom of the well may be filled with oil or water.

In the United States patent above identified a device is described and claimed which makes it possible to maintain combustion at any desired point beneath the earth's surface and which can be used for producing heat for the purpose of clearing oil wells. Experience has shown, however, that the apparatus shown and described in the said patent can be made more serviceable and will operate in a more satisfactory way if certain changes are made in the construction and it is to these improvements that the present application is directed.

The improved construction has been illustrated in the accompanying drawings and will now be described in detail, reference for this purpose being had to the said drawings in which the preferred embodiment has been shown and in which:

Fig. 1 designates a vertical section through the ground and shows diagrammatically the apparatus employed in generating heat for the purpose of cleaning the well;

Fig. 2 is a transverse section taken on line 2—2, Fig. 1 and Fig. 4;

Fig. 3 is a section taken on line 3—3, Fig. 1 and shows the manner of clamping the pipes together;

Fig. 4 is a section through the burner, taken on line 4—4, Fig. 2;

Fig. 5 is a section taken on line 5—5, Fig. 2;

Fig. 6 is a section taken on line 6—6, Fig. 4;

Fig. 7 is a section taken on line 7—7, Fig. 4;

Fig. 8 is a side elevation of the compressor plant, and,

Fig. 9 is an end view thereof.

Numeral 1 indicates the surface of the ground and 2 the vertical shaft of the oil well that is to be cleaned while numeral 3 designates the sump or the enlarged cavity at the lower end of the well. Wells of this kind are usually cased at least for a part of their depth and this casing has been designated by numeral 4.

Let us now assume that the walls 5 of the sump have become sealed through the action of the paraffine and that the interior of the sump must be raised to the temperature necessary for melting the paraffine so that it will flow and restore the porosity of the walls. The apparatus employed for this purpose has been shown more or less diagrammatically in Fig. 1 and consists of a combustion chamber to the upper end of which a burner 7 has been attached. A vent pipe 8 has its lower end in communication with the lower end of the combustion chamber 6 and extends the entire depth of the well terminating at 9. Above the ground are two tanks 10 and 11, one of which is intended as a storage reservoir for air and

the other as a storage reservoir for gas. The former is connected by means of a tube 13 with the pipe 14 that extends downwardly to the burner 7, while tank 11 is connected by means of a tube 14 with the gas pipe 15 that also extends down to the burner 7. Compressors 16 and 17 each operated by some suitable power means such as a motor or an internal combustion engine serve to compress the air and gas into the tanks. Each tank is provided with a pressure gauge 18 and has a reducing valve 19 between it and the tube 12 or 14 as the case may be. The pressure gauges 20 are located on the delivery side of the valves 19 so that they will indicate the reduced pressure. A steel cable 21 is attached to the burner and to a suitable hoisting apparatus (not shown) for the purpose of raising and lowering the parts. A well insulated electric cable 22 extends through the air supply pipe 13 and connects with one electrode of a spark plug in the manner and for the purpose to be hereinafter described.

The burner 7 is formed from a suitable cylindrical member of brass or other suitable material whose upper end is provided with a threaded part 23 to which the cylindrical extension 24 is secured. The lower end of the burner is likewise threaded in the manner indicated by numeral 25 and to this threaded part the coupling 26 is secured. A hole 27 extends into the body member 7 and terminates in a threaded opening 28 of somewhat smaller diameter and in which the spark plug 29 is secured. The pipe 13 is threadedly connected to the upper end of opening 27 in the manner shown in Fig. 5. Another opening, designated by the number 30, extends downwardly into the block 7 in the manner shown in Fig. 4 and has its lower end connected by means of a transverse opening 31 with the vertical opening 22 from which extends the short tubular member 33. An opening 34 of smaller diameter than the opening 32, but concentric therewith, extends from the upper end of the burner 7 to the transverse opening 31 and carries a downwardly projecting nozzle 35. A transverse opening 36 connects the interior of opening 27 with the interior of the opening 34 at a point directly above the nozzle 35, so that the amount of air that can enter the nozzle will be controlled by the needle valve 37. Another opening 38 extends from one end of member 7 to the other and has a tubular distributer 39 secured to its lower end. A transverse opening 40 connects the opening 38 with the vertical opening 27 so that air may pass from the interior of the opening 27 to the distributer 39 and leave the latter through the series of small holes 41 which are on the upper side of the distributer and direct the air upwardly against the under surface of the burner 7. A needle valve 42 controls the entrance of air into the distributer 39.

It is now evident that when the gas pipe 15 is connected with the compressed air supply in tank 11, gas will flow through the openings 30, 31 and 32 and emerge through the short tubular member 33. The rate of flow of the gas can be controlled by means of the reducing valve 19. Since the air pipe 15 is connected with the compressed air tank 10, air may be caused to flow downwardly and into the opening 27 where it will divide into two streams, a portion flowing through the hole 36 and thence through the nozzle 35 and mixing with the gas that is flowing through the tubular member 33. When the amount of air leaving the nozzle 35 is properly proportioned to the amount of gas, a Bunsen burner effect is produced and a blue flame of intense heat is the result. If the burner were to be used in the open air, the proper mixing of the air and gas in the tube 33 would be satisfactory. Experiments have demonstrated, however, that when the combustion is to take place in a closed combustion chamber, such as that provided by the tube 6, the flame will not be as steady and intense as it should be and as it is when burning in the open air. It has, therefore, been found necessary to create within the combustion chamber a condition that resembles that of the open air and this has been attained by means of the distributer 39 which has two semi-circular branches A and B to which air is supplied through the central pipe C. The air from the distributer is directed upwardly against the bottom of the burner block 7 and moves from above downwardly and envelopes the flame as it emerges from the tube 33. This produces a condition resembling that which prevails when the flame is burning in the open air with the result that the flame is steady and can be easily regulated. When the distributer is absent, the flame will pulsate more or less disagreeably and has a tendency to extinguish itself, but when air in quantities is introduced through the distributer, the flame becomes quiet and steady in the manner explained.

The gaseous products of combustion will be forced downwardly to the lower end of the chamber 6 and will enter the vent pipe or flue 8 through the opening 43 (Fig. 1) and will pass upwardly through the flue which may extend the entire distance to the surface, as shown, or may terminate any place within the well, but must extend up above the level of the liquid if there is any liquid in the well.

The ignition is effected by means of the spark plug 28 which operates in the same manner as in an automobile. High tension current is conducted to the spark plug through the insulated conductor 22.

When the parts have been assembled as described and put into place in the well in the manner shown in Fig. 1, the valve controlling the gas is opened and sufficient gas is admitted to fill the combustion chamber. The spark plug is now connected to the high tension circuit after which the air valve is opened allowing air to enter. As soon as air in sufficient quantities has entered the mixture will ignite after which the spark plug may be disconnected. The volume and intensity of the flame can be controlled from the surface of the ground by means of the valve 19 and may be so regulated as to completely fill the combustion chamber in tube 6 or reduced to a very small flame. By this means an enormous amount of heat can be generated at the precise spot where it is to be used with the result that there is little or no loss of heat but all of the heat is made available for the purpose for which it is intended.

The pipes may be clamped together by means of clamps 44 and bolts 45 in the manner shown in Fig. 3.

In order that the apparatus may be conveniently transported, it is mounted on a truck in the manner shown in Figs. 8 and 9 where the several parts have been indicated by the proper reference numerals.

Having now described my invention, what I claim as new is:

1. An apparatus for burning gas, comprising in combination, a burner head having an opening for the passage of air and another opening for the passage of gas, a cylindrical member attached to the burner head at one end and having the other end closed, a flue for the escape of products of combustion attached to said cylindrical member near the closed end, means for introducing air and gas in proper proportions to produce a combustible mixture, means for intimately mixing the air and gas at the point of entrance and means for introducing any additional air for the purpose of enveloping the flame.

2. An apparatus for burning gas, comprising in combination, a burner head having an opening for the passage of air and another opening for the passage of gas, a cylindrical member attached to the burner head at one end and having the other end closed, a flue for the escape of products of combustion attached to said cylindrical member near the closed end, means for introducing air and gas in proper proportions to produce a combustible mixture, means for intimately mixing the air and gas at the point of entrance and means for introducing additional air for the purpose of enveloping the flame, said last named means comprising an air nozzle secured to the burner head and provided with air outlet openings between the end of the burner head and the base of the flame.

3. An apparatus for cleaning oil wells, comprising in combination a burner head, a cylindrical combustion chamber having one end closed and the other open, said open end being connected to one end of the burner head, a flue for the escape of the gaseous products of combustion communicating with the combustion chamber near the closed end thereof, means for introducing air and gas into the combustion chamber in proper proportions for producing combustion, means for mixing said gas and air just before they enter the chamber, means for igniting the mixture so as to produce a flame and means for enveloping said flame in an oxygen containing atmosphere.

4. An apparatus for cleaning oil wells, comprising in combination a burner head, a cylindrical combustion chamber having one end closed and the other open, said open end being connected to one end of the burner head, a flue for the escape of the gaseous products of combustion communicating with the combustion chamber near the closed end thereof, means for introducing air and gas into the combustion chamber in proper proportions for producing combustion, means for mixing said gas and air just before they enter the chamber, means for igniting the mixture so as to produce a flame, means for enveloping said flame in an oxygen containing atmosphere, and means for independently controlling the quantity of air and gas admitted to the combustion chamber.

5. An apparatus for cleaning oil wells, comprising in combination, a burner head, a cylindrical combustion chamber having one end closed and the other open, said open end being connected to one end of the burner head, a flue for the escape of the gaseous products of combustion communicating with the combustion chamber near the closed end thereof, means for introducing air and gas into the combustion chamber in proper proportions for producing combustion, means for mixing said gas and air just before they enter the chamber, means for igniting the mixture so as to produce a flame, means for enveloping said flame in an oxygen containing atmosphere, and means for independently controlling the quantity of air and gas admitted to the combustion chamber, said last named means comprising pressure reducing valves.

In testimony whereof I affix my signature.

WILLIAM A. J. KREAGER.