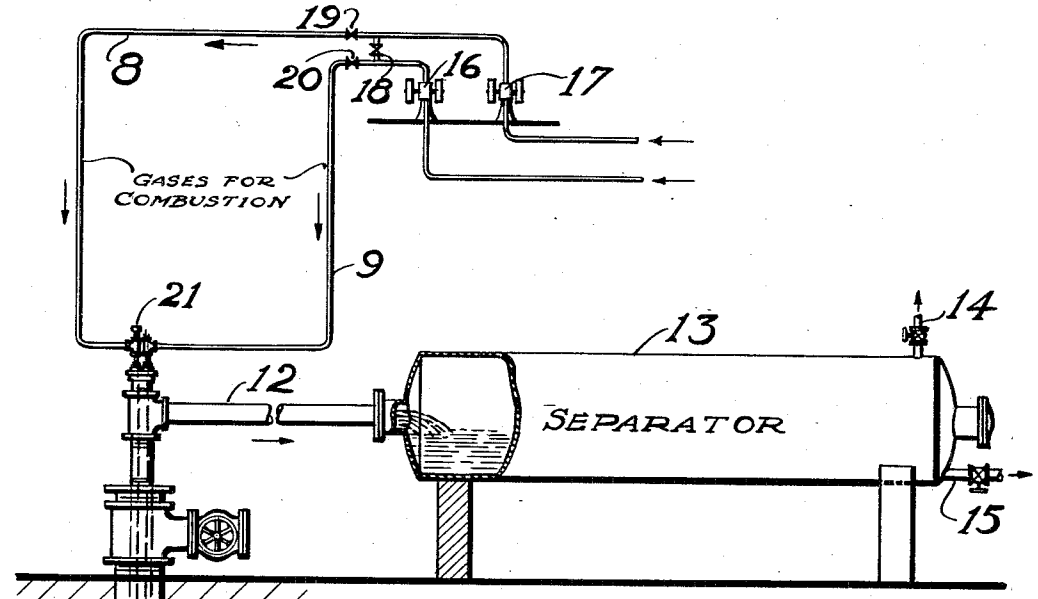
May 31, 1932. F. A. HOWARD 1,861,013

PROCESS FOR RECOVERING PETROLEUM AND APPARATUS THEREFOR

Filed June 24, 1927



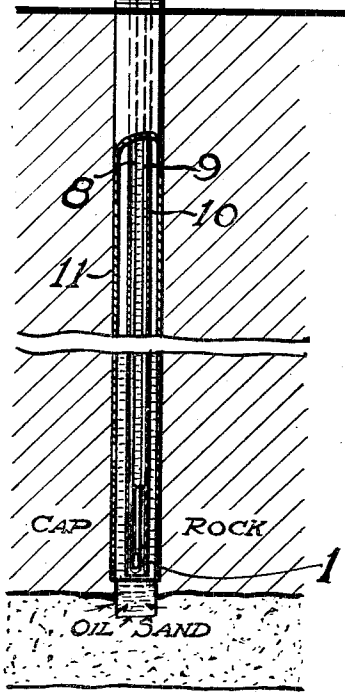


FIG.-2

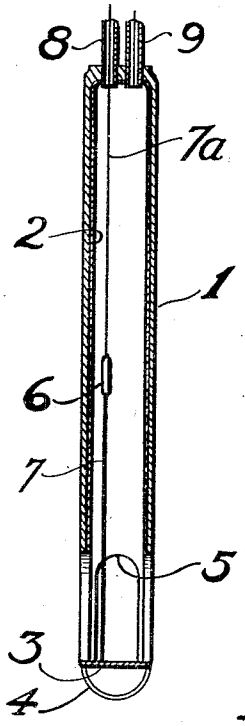


FIG.-1

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Patented May 31, 1932 1,861,013

UNITED STATES PATENT OFFICE

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PROCESS FOR RECOVERING PETROLEUM AND APPARATUS THEREFOR

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This invention relates to a method and apparatus for obtaining petroleum from oil wells. More particularly the invention relates to an improved method and apparatus for the revival or acceleration of flow in wells which flow sluggishly or have ceased to flow.

In accordance with my method, gases are generated by combustion below the level of the oil in the well. The gases commingle with the oil to form a column of mixed oil and gas.

Fig. 1 of the annexed drawings is a vertical section of apparatus adapted for maintaining combustion at a point in the oil to be lifted and

Fig. 2 is a vertical plan, partly in section, of apparatus suitable for carrying out my invention.

Fig. 1 illustrates an elongated cylindrical chamber 1, having a refractory lining 2 and a steel floor 3. The guide 4 is provided on the lower end of the chamber for facilitating descent in the tube. Combustion gases may escape through openings 5. Rod 7 holds the means for initiating combustion 6 at the proper point in the chamber. The wire 7*a* is a means for lowering the igniter 6 and rod 7 into the chamber. Gases to support combustion may be introduced through inlet pipes 8 and 9.

Fig. 2 illustrates the combustion chamber, previously described, in tube 10 which in turn is concentrically located in casing 11. Compressors 16 and 17 supply air and natural gas respectively, or mixtures of the two, through pipes 8 and 9 to the chamber. Valves 18, 19 and 20 control flow lines 8 and 9. 21 is a stuffing box through which the ignition element may be introduced in the combustion chamber. The oil lifted passes through pipe 12 into separator 13 from which combustion gases and oil may be withdrawn through valved pipes 14 and 15 respectively.

The apparatus shown is in illustration merely and not in any sense in limitation of that which may be used without departing from my invention. Among other things, the apparatus may be so operated that only one of the lead in pipes 8 or 9 is required. The inner tube 10 may, under certain conditions, be dispensed with and the products of combustion liberated in casing 11. Equalization chambers may be provided in pipes 8 and 9 to assist in maintaining a uniform rate of flow.

When operating the apparatus shown, with the burner in position, compressors 16 and 17 are started up. Their running rate is adjusted so that a combustible mixture of air and gas will result in the chamber 1 and the oil will be displaced therefrom. Combustion is initiated by means of element 6. Element 6 may be of various forms; it may consist of a cage containing spongy platinum, in which event it is only necessary to lower the element into the chamber and combustion is thereby initiated. It may consist of a resistance element or spark gap in which case it is necessary to lower it into the chamber so that rod 7 makes contact with steel floor 3 and thereupon to apply current, high tension for spark gap or low tension for resistance element. The lowering of the ignition element is accomplished by a wire passing through stuffing box 21 and pipe 8. If electrical ignition means is employed, this wire should be suitably insulated. The lead in pipes may be utilized as return for the electric current.

Subsequent to ignition, the operation of the compressors is continued and combustion is thereby maintained in chamber 1. This chamber permits of the maintenance of combustion therein although entirely surrounded by liquid and the hot gaseous products of combustion escape thorugh the openings 5 into the column of petroleum. This results in a resumption or acceleration of flow and the ascending column of petroleum and gas is diverted through pipe 12 to separator 13. The gas passes off through valved pipe 14 while petroleum is withdrawn through valved pipe 15. The gas from 14 is preferably diverted to a gasoline recovery plant for treatment. Instead of pumping air and gas separately, I may pump a mixture of air and gas by means of one compressor and either air or gas or a mixture of the two by means of the other compressor provided the mixtures pumped are separately non-combus-

tible and on uniting in the chamber, form a combustible mixture.

The heat of combustion operates to prevent the formation of paraffinic or other organic deposits in the casing and to remove previously formed obstructions of this character. In an alternative method of operating this apparatus, I may dispense with one lead-in line and discharge both compressors into a common line, for example 8, by appropriate manipulation of valves 18, 19 and 20. In this case, the compressors are operated to deliver a mixture of air and gas in combustible proportions by means of one lead-in pipe. The rate of flow of this mixture through the lead in pipe may be greater than the rate of flame propagation. The method of ignition and the subsequent operation of the apparatus are substantially identical with that previously described.

While I have described a form of apparatus and methods of operation, it will be understood that my invention is not limited thereto but comprises broadly a method and apparatus for lifting petroleum oils from natural reservoirs by the generation and liberation of products of combustion at a point in the oil to be lifted.

What I claim is:

1. The method of lifting oil from oil wells, which comprises bringing together non-combustible mixtures of air and gas in separate non-combustible streams below the surface of the oil to be lifted and in such proportions as to form a combustible mixture, igniting said combustible mixture, continuously maintaining the resulting flame without explosion and commingling the products of combustion with the oil to be lifted to form an ascending column of mixed oil and gas.

2. The method of lifting oil from an oil well, which comprises passing fuel and air in a confined stream to a combustion chamber within the body of oil in the well and opening into the body of oil, igniting the fuel in the combustion chamber only when the fuel reaches a position beneath the level of the body of oil, and commingling the products of combustion with the oil to form an ascending column of mixed oil and gas.

3. A gas lift elevator for a well casing containing liquid, comprising a combustion chamber having an outlet submerged beneath the normal level of liquid within the casing, means for supplying fuel and air to the chamber, an ignition element, and means for suspending the ignition element within the chamber for initiating combustion of the fuel.

FRANK A. HOWARD.