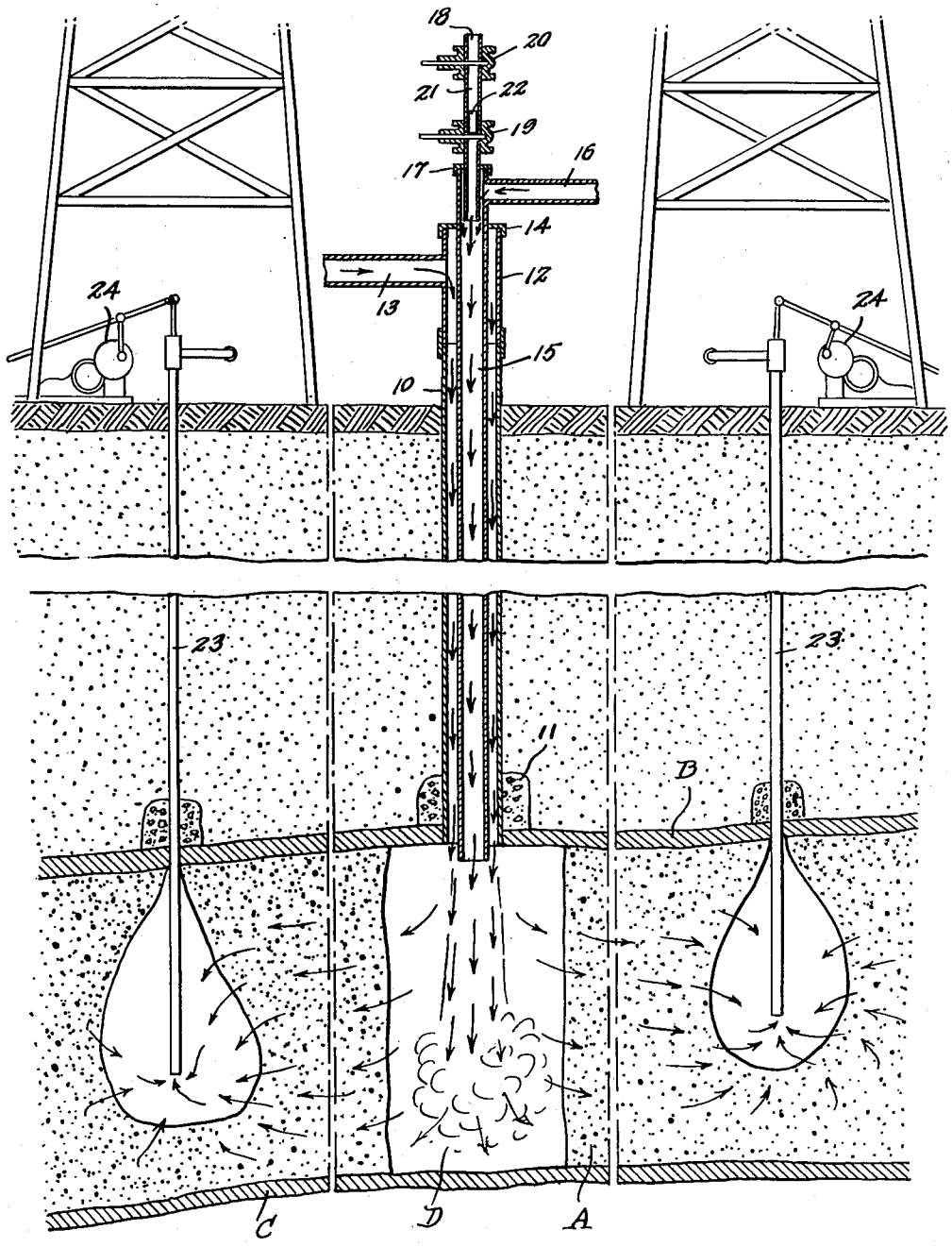
Jan. 30, 1940. H. W. HIXON 2,188,737

APPARATUS FOR RECOVERING OIL FROM SUBTERRANEAN OIL POCKETS

Filed April 26, 1939



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Patented Jan. 30, 1940

2,188,737

UNITED STATES PATENT OFFICE

2,188,737

APPARATUS FOR RECOVERING OIL FROM SUBTERRANEAN OIL POCKETS

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Application April 26, 1939, Serial No. 270,084

2 Claims. (Cl. 166—1)

This invention is concerned with the recovery of oil from wells from which the yield has been exhausted by the employment of the usual pumping methods.

It is generally recognized that approximately two-thirds of the oil in the average oil pocket remains after the yield is exhausted under the ordinary methods which is attributed to the fact that this percentage adheres to the oil bearing sands and is imprisoned thereby after the natural gas pressure has driven off the more loosely held oil to the well where it is forced out in the gusher stage and is later pumped out when the gas pressure has been depleted.

The present invention is directed to an improved method of and apparatus for recovering practically all of the remaining oil imprisoned in the oil sands of a pocket after the yield from the usual methods has ceased to prove profitable.

More particularly the invention comprehends an improved method of stripping the oil from the oil sands of a pocket which essentially consists in forming a combustion chamber in the pocket extending throughout the height thereof and communicating with the well casing, then introducing air under pressure so as to force back into the oil sands the water which is usually present after which gas under pressure is directed into the combustion chamber and mixed with the air to provide a combustible mixture which is then ignited by means of an igniter dropped through the air line to effect ignition of the combustible mixture and burning of the same in a jet form in the combustion chamber as it issues therinto from the casing so as to continuously produce heated products of combustion which permeate from the combustion chamber through the oil sands to heat and lower the viscosity of the oil adhering to the sands and thereby build up an accumulated pressure which drives the oil thus freed to one or more wells tapped into the pocket through which its removal is effected.

The invention is further directed to an improved combustion apparatus for carrying out the method which preferably consists of an outer tubular casing leading from above the surface downwardly to an opening into the combustion chamber with an air pipe extending from above the surface downwardly through the outer casing and having at its upper end an air lock to permit of the introduction of an igniter after the initial scavenging of the combustion chamber of water and subsequent to the introduction of the proper proportion of air and gaseous fuel.

With these and other objects in view, the invention is set forth in greater detail in the following specification, pointed out in the appended claims and illustrated in the accompanying drawing wherein the figure is a diagrammatic vertical sectional view illustrating the apparatus employed and the manner in which the method is carried out.

Referring to the drawing by characters of reference A designates an oil pocket, B the usual cap or covering stratum, C the bottom stratum, it being understood that the oil pocket is filled with oil bearing sand.

In carrying out the invention, the apparatus may include as a part thereof an abandoned or previously used outer tubular casing 10 which extends downwardly from above the surface to and through the upper stratum B and opens into the oil pocket A. The lower portion of the casing will be thoroughly sealed by cementing as at 11 at the point where it extends through the cap or stratum B.

A combustion chamber D is then formed in the oil sand extending throughout the height of the pocket by the use of a number of shots of nitroglycerin and bailing out.

The apparatus includes an upper outer casing section 12 which is attached to and extends upwardly from the upper end of the outer casing section 10 and is provided with a lateral intake pipe 13 and a cap 14. An air pipe 15 extends downwardly through the cap 14, the upper casing section 12 and the casing section 10, the lower end thereof terminating a proper distance below the lower end of the outer casing 10. Adjacent the upper end, the air pipe is provided with a lateral intake pipe 16 and above the intake pipe the air pipe 15 is provided with a cap 17 through which extends a reduced pipe 18 provided with a vertically spaced pair of gate valves 19 and 20 defining therebetween an air lock chamber 21.

In carrying out the method, air under pressure is supplied through the intake pipe 16 to the air pipe 15 and the air pressure is thereby introduced to the combustion chamber D for initial scavenging the chamber of water which is driven by the air pressure into the oil sands in the pocket A. The upper gate valve 20 is opened and an igniter 22 which may be of any suitable type such as a dynamite cap or a percussion cap is placed in the air lock chambers 21 after which the upper gate valve 20 is closed. The gas is then slowly admitted to the outer casing through the intake pipe 13 and the gas and air are permitted to commingle as they are continuously fed under pressure through the casing 10 and air

pipe 16 so as to form a continuous jet of a combustible mixture. The lower gate valve 19 is then opened to permit the igniter 22 to drop through the pipe 18 and air line 15 for exploding in the combustion chamber D to ignite the jet of air and gas emerging from the lower ends of the casing 10 and air line 15. After ignition the jet will continue to burn so long as the air and gas are fed thereby continuously producing heated fluid products of combustion which, due to the accumulated pressure, will permeate throughout the oil sands of the pocket A to lower the viscosity of the oil adhering thereto and by means of the pressure thus developed, drive the freed oil towards and into one or more vent well casings 23 tapped into the pocket A, the removal of the oil being accomplished by the usual pumps 24.

What is claimed is:

1. An apparatus for recovering oil adhering to and imprisoned in the oil sands of a subterranean pocket, having a chamber formed therein including an outer conduit communicating with and extending upwardly from the pocket, an inner conduit extending through the outer conduit, a closure cap at the upper end of the outer conduit through which the inner conduit extends, a pipe extending downwardly through the upper end of the inner conduit, a pair of vertically spaced valves in the exposed portion of said pipe, air and gas conduits communicating respectively with the inner and outer conduits and a percussion igniter adapted to be positioned within the pipe between said valves for release, descent through the air pipe and explosion thereof to ignite the combustible mixture produced by the gas and air jets issuing from the conduits into the pocket.

2. An apparatus for recovering oil adhering to and imprisoned in the sands of a subterranean oil pocket, having a chamber formed therein, which apparatus includes an outer conduit having sealed communication with and extending upwardly from the pocket, an inner conduit extending through the outer conduit with the upper end thereof extending above the outer conduit and with the upper end of the outer conduit having sealed relation with the inner conduit, a pipe extending downwardly through the upper end of the inner conduit with the inner conduit sealed thereabout, a pair of vertically spaced valves in the exposed portion of said pipe, air and gas conduits communicating respectively with said conduits, and a percussion igniter adapted to be positioned within the pipe between said valves for release, descent through the inner conduit and explosion thereof so as to ignite the combustible mixture produced by the gas and air jets issuing from the conduits into the pocket.

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