July 28, 1925. 1,547,197

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METHOD AND APPARATUS FOR PRODUCING CRUDE OIL

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Fig. 1.

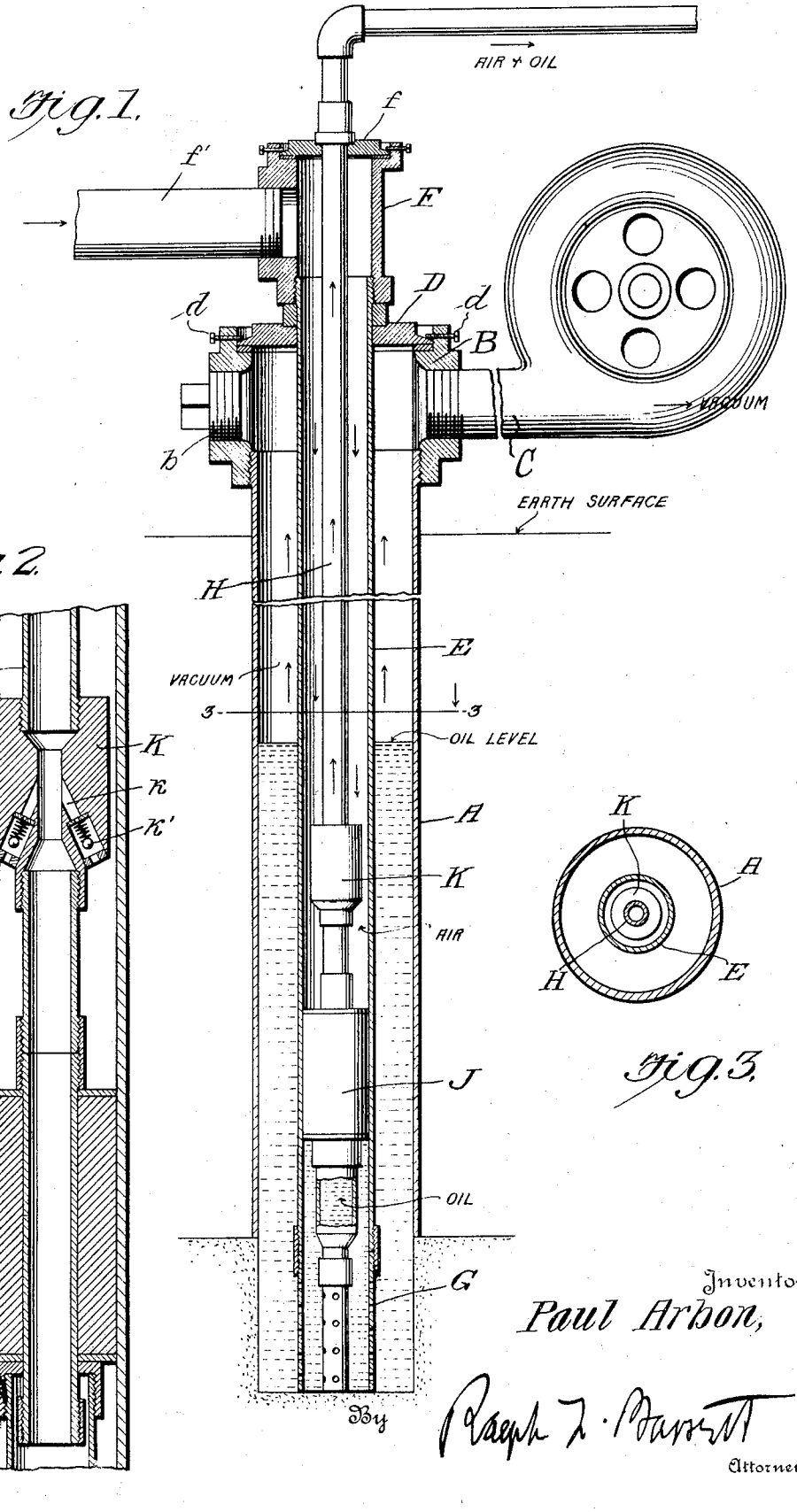


Fig. 2.

Fig. 3.

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METHOD AND APPARATUS FOR PRODUCING CRUDE OIL.

Application filed September 25, 1923. Serial No. 664,690.

To all whom it may concern:

Be it known that I, PAUL ARBON, a subject of the King of Great Britain, residing at Tulsa, in the county of Tulsa and State of Oklahoma, have invented certain new and useful Improvements in Methods and Apparatus for Producing Crude Oil, of which the following is a specification.

This invention relates to the production of crude oil by means of the jet system in the presence of a vacuum and forms an advanced step over that system disclosed and claimed in my prior application, Serial No. 610,265, filed January 2, 1923. The present invention also utilizes the combined jet and packer set forth in my application, Serial No. 610,264, filed January 2, 1923.

Heretofore, experiments utilizing jets or ejectors in the production of crude oil from wells where a vacuum is placed upon the sand, have been failures. By the present arrangement, it has been found possible to place the sand under vacuum without interfering with the operation of the jet system. The present apparatus includes three strings of pipe, viz: the casing, the outer tubing, and the inner tubing. The strings of tubing are provided with perforations at the same level which are immersed in the fluid. The inner tubing is packed above the perforated portion from the outer tubing, and carries such jets as may be necessary in the operation of the well. The pressure for the operation of the jets is fed from a suitable source between the inner and outer tubing and enters the jet to elevate the oil.

The outer casing is provided with a conventional head which communicates, by means of suitable piping, with a vacuum tank or other vacuum producing means. By this arrangement, the vacuum is placed upon the sand through the casing, or rather between the walls of the casing, and the outside wall of the outer tubing without interfering with the operation of the pressure necessary for the successful operation of the jet.

Reference will be had to the accompanying drawing forming a part of this specification and wherein like numerals of reference designate corresponding parts throughout the several views, in which

Fig. 1 is a vertical sectional view through an operating well;

Fig. 2 is an enlarged vertical section through a fragment of the apparatus and showing the construction and arrangement of the packer and jet; and

Fig. 3 is a transverse section on line 3—3 of Fig. 1.

Referring now to the construction and arrangement of the various parts comprising the present invention, reference character A will be seen to indicate the outer casing provided with a conventional head B formed with suitable outlets *b* for communication with the vacuum producing means hereinafter referred to, by means of pipes C. The casing head closure D is held in position against the usual packer and inwardly projecting flange by means of the screws *d* and is provided with a central opening through which the outer tubing E passes for connection with the head F. The outer tubing E is provided with one or two joints of perforated piping G which is arranged at the same level as the corresponding perforated pipe section carried by the inner tubing H.

This inner tubing H is packed at a point above the perforated pipe section by means of the "pony" packer J. This packer J, as shown in Fig. 2, prevents the upward movement of the fluid between the inner and outer tubings. The jet K is located directly above the "pony" packer J. This packer is described and claimed in a co-pending application heretofore mentioned and is shown in enlarged section in Fig. 2. In this figure, the jets *k* are shown provided with the spring pressed valve balls *k'* (in open position). The inner tubing H projects upwardly through the head cap *f* to a suitable separator casing head plant or the like, as my be necessary according to the nature of the well. The pipe *f'* which is tapped into the head F communicates with an air compressor or natural gas pressure as circumstances may warrant, and this pressure, as is obvious, flows downwardly between the inner and outer tubings to the jets for the elevation of the oil.

It is of considerable importance that the various parts be located in substance as indicated in the drawing, and in this connection, particular attention is called to the location of the packer with relation to the fluid.

The method of operation consists in placing a vacuum upon the sand through the pipes C and at the same time injecting the air or gas pressure through pipe *f'* for the operation of the jet and the elevation

of the oil. Obviously, all of the benefits of the vacuum system of producing oil are present and, at the same time, the unusual results of the jet system are obtained.

What I claim as new and useful and desire to secure by Letters Patent is:—

1. A method of producing oil consisting in submitting to vacuum portions of oil producing sand within a casing to cause a seepage of the oil, permitting the elevation of the oil within an outer tubing within said casing, and elevating the oil within said tubing through an inner tubing by means of pressure.

2. A method of producing oil consisting in submitting to vacuum portions of oil producing sand within a casing to cause a seepage of the oil, permitting the elevation of the oil within an outer tubing within said casing, and elevating the oil within said tubing through an inner tubing by means of controlled pressure.

3. A method of producing oil consisting in submitting to vacuum portions of oil producing sand within a casing to cause a seepage of the oil, permitting the elevation of the oil within an outer tubing within said casing, and elevating the oil within said tubing through an inner tubing by means of controlled pressure through a series of jets.

4. A method of producing oil consisting in subjecting oil sands to a vacuum within a casing to cause the seepage of the oil and in elevating said oil through a tubing within said casing by means of pressure free from the influence of the vacuum.

5. An apparatus for producing oil consisting of an outer casing provided with a head, a plate for said head formed with a central opening, an outer tubing projecting through the opening in said plate, spaced from the casing and extending below the casing, the lower portion of said outer tubing being formed of a series of perforations and the upper portion of said tubing being connected to a T head, an inner tubing within said outer tubing, a packer between the inner and outer tubing, a jet arranged above the packer, a discharge pipe for the inner tubing, and means for creating a vacuum in the upper portion of the casing.

6. A casing formed with a casing head, a discharge pipe for said casing head, a closure for said casing head formed with a central opening, an outer tubing extending through the central opening and being provided with a casing head, a connection for said casing head, an inner tubing, a packer between the inner tubing and outer tubing, a series of jets communicating between the inner and outer tubings, and the perforated pipe section at the lower extremities of the inner and outer tubings, and means for creating a vacuum in the upper portion of said casing.

7. An apparatus for producing oil consisting of an outer casing provided with a head having a central opening, an outer tubing projecting through the opening in said head, spaced from the casing and extending below the casing, the lower portion of said outer tubing being open to permit oil to enter the outer tubing, an inner tubing within said outer tubing and having a discharge pipe at its upper end, a packer between the inner and outer tubings, a jet arranged above the packer, means for introducing a compression fluid into the upper portion of the outer tubing, and means for creating a vacuum in the upper portion of the casing to cause oil to rise in the space between the casing and outer tubing.

In testimony whereof I affix my signature.

PAUL ARBON.