May 6, 1958 A. E. HANSEN 2,833,222

WATER AND OIL DEGASIFYING WELL

Filed June 11, 1954 2 Sheets-Sheet 1

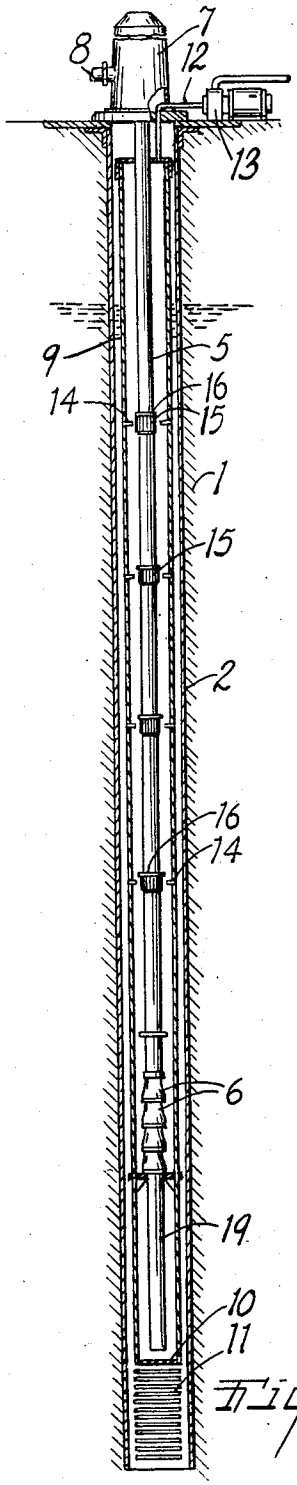


Fig. 1

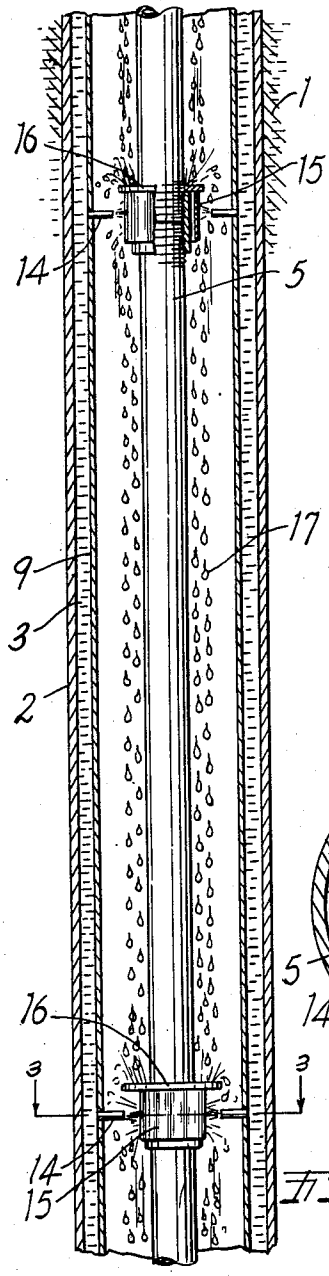


Fig. 2

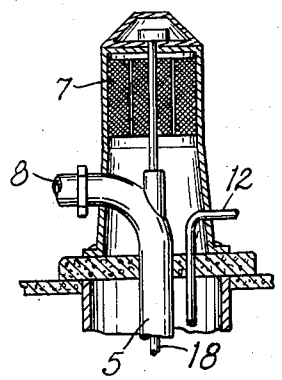


Fig. 4

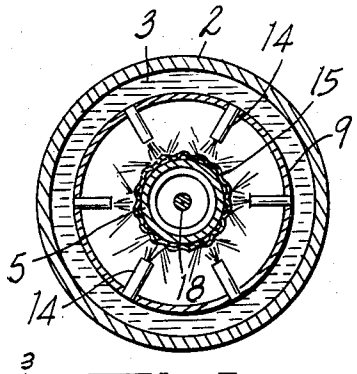


Fig. 3

INVENTOR.
Alfred E. Hansen
BY Otis A. Earl
ATTORNEY.

May 6, 1958 A. E. HANSEN 2,833,222

WATER AND OIL DEGASIFYING WELL

Filed June 11, 1954 2 Sheets-Sheet 2

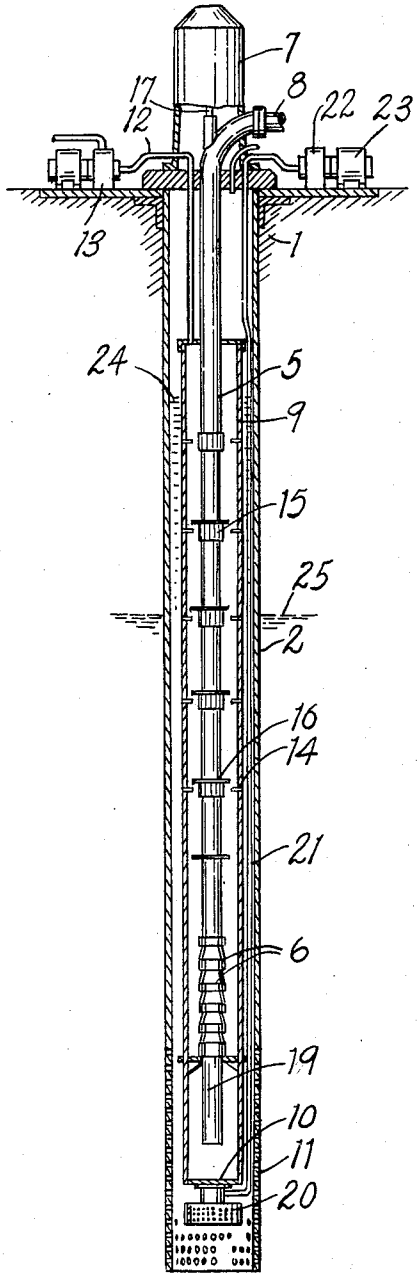


Fig. 5.

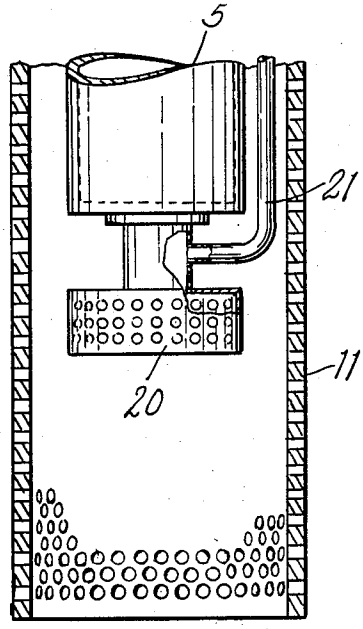


Fig. 6.

INVENTOR.
Alfred E. Hansen
BY Otto A. Earl
ATTORNEY.

United States Patent Office 2,833,222 Patented May 6, 1958

2,833,222

WATER AND OIL DEGASIFYING WELL

Alfred E. Hansen, Muskegon, Mich.

Application June 11, 1954, Serial No. 436,050

4 Claims. (Cl. 103—113)

This invention relates to a water and oil degasifying well.

The main objects of the invention are:

First, to provide a well structure which while simple is very efficient in removing gas from ground liquid, commonly water or oil, as it is pumped from the well.

Second, to provide a well structure having this advantage which is not likely to become inoperative from use over a long period of time or require replacement of parts.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined and pointed out in the claims.

Preferred embodiments of the invention are illustrated in the accompanying drawing, in which:

Fig. 1 is a view in vertical section of a well embodying my invention, certain parts being shown in full lines and mainly conventionally.

Fig. 2 is an enlarged fragmentary view in vertical section on a line corresponding to the section of Fig. 1, falling water being conventionally illustrated as drops.

Fig. 3 is an enlarged fragmentary view partially in section on a line corresponding to line 3—3 of Fig. 2.

Fig. 4 is an enlarged fragmentary view partially in vertical section illustrating the relation of the motor to other parts.

Fig. 5 is an enlarged fragmentary view mainly in vertical section of a second form of my invention in which an air lift is used to increase the liquid level in the casing above that of the normal ground level.

Fig. 6 is an enlarged fragmentary view partially in vertical section of the lower end of the embodiment shown in Fig. 5.

It will be understood that no attempt has been made to show the parts in their relative proportions and that these are or may be considerable varied in practice. Various parts are shown conventionally as the structure thereof will be readily understood.

In the accompanying drawing, 1 represents the ground and 2 a tubular well casing sunk therein. This well casing is sunk below water level so that a substantial depth of ground water stands within the casing as is indicated at 3, in Figs. 2 and 3. It will be understood that that water level illustrated relative to the surface of the ground is merely for the purpose of illustration.

In this embodiment the pump discharge column or water delivery pipe 5 is provided with a series of impeller housings 6. The motor is conventionally shown at 7. The water discharge is indicated at 8. The impeller shaft is shown at 18 but the impellers are not illustrated.

In spaced concentric relation within the casing I mount a gas separator tube or sleeve 9. A substantial length of this sleeve should be surrounded by the ground water or oil as is indicated in Fig. 2. The sleeve 9 is closed at its lower end 10 and the discharge column or water discharge pipe 5 is concentrically located with the extension 19 opening to the lower end of the sleeve.

The casing 2 is provided with a screen conventionally indicated at 11. The sleeve has a gas exhaust or outlet 12 provided with a suction pump 13 which produces a partial vacuum within the sleeve and exhausts or draws the gas therefrom. To facilitate the separation of the gas from the water or oil the sleeve is provided with vertically spaced annular groups of nozzles 14, the nozzles opening to the casing and discharging radially inward. The nozzles of the groups are angularly spaced, as is best shown in Fig. 3, and are directed to impinge on the vertically corrugated splash or impingement members 15. The members 15 serve to break up the water that the jets discharge from the nozzles in quite small particles thereby releasing the gas therefrom.

Impact plates 16 are arranged above the members 15, the members 15 being preferably annular and disposed with their peripheries in spaced relation to said sleeve. The liquid discharged from the upper nozzles and upper plates 16 falls upon the adjacent lower plates and is sprayed and broken up, as indicated by the drops 17, conventionally shown in Fig. 2, so that any remaining gas escapes therefrom. The gas is drawn off or escapes from the top of the degasifying sleeve. The partial vacuum resulting from the gas suction pump 13 renders the well somewhat more efficient than when gas is allowed to escape through a vent opening. The partial vacuum in the casing increases the flow of liquid through the nozzles and the force with which it impinges the impingement member 15.

The embodiment of my invention shown in Figs. 5 and 6 is well adapted for use in conditions where the ground level depth of water or oil is not sufficient to fill the casing to the desired or efficient working level. In most soil conditions if the level of the liquid to be pumped falls the well can be sunk to the desired depth; however, certain conditions render that impractical and in such conditions I provide a so-called air lift 20 which is disposed at the lower end of the sleeve 9 and is in the form of a perforated cylinder or head connected by the conduit 21 to an air pump 22. The air pump 22 is driven by a motor 23. The air is forced into the head 20 through the conduit 21 in sufficient volume and at sufficient pressure to raise the level of the liquid as is indicated at 24, Fig. 5, above the ground liquid level indicated at 25.

The liquid, oil or water as the case may be, is discharged through the nozzles 14 as the result of gravity and also as the result of the partial vacuum in the sleeve 9, forceably against the impingement or splash members 15 which breaks the liquid up into a spray. The liquid falls in the form of drops indicated at 17 upon the impact plate below, the liquid from the upper impact plates successively falling upon the lower which keeps the liquid in broken up or drop condition and greatly facilitates the escape of gas therefrom which is drawn off by the suction pump 13.

I have illustrated and described my invention in a commercial embodiment, the parts, however, being shown without regard to exact proportions in view of the fact that a portion may be varied and the parts are shown in susbtantially reduced size. However, it is believed that the disclosure made will enable those skilled in the art to embody or adapt my invention as may be desired.

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

1. In a well, the combination with a casing extending below the ground level of the liquid to be pumped so that a substantial length of the casing is filled with the liquid, a gas separator sleeve disposed in spaced concentric relation within said casing to be surrounded by ground liquid therein, said sleeve being closed at its

lower end and having a gas exhaust at its upper end, a pump discharge column pipe disposed in spaced concentric relation within said sleeve and opening at its lower end thereto, a plurality of annular impact plates mounted on said pump discharge column and in vertically spaced relation, with their peripheries in spaced relation to said sleeve, annular vertically corrugated impingement members mounted on said pipe below and closely adjacent to said impact plates, radially directed angularly spaced nozzles mounted on said sleeve to discharge against said impingement members and opening to said well casing, said plates, members and nozzles coacting to break up the water facilitating the escape of gas therefrom through said sleeve.

2. In a well, the combination with a casing extending below the ground level of the liquid to be pumped so that a substantial length of the casing is filled with the liquid, a gas separator sleeve disposed in spaced relation within said casing to be surrounded by ground liquid therein, said sleeve being closed at its lower end and having a gas exhaust at its upper end, a pump discharge column disposed in spaced relation within said sleeve and opening at its lower end thereto, a plurality of annular impact plates mounted on said pump discharge column in vertically spaced relation with their peripheries in spaced relation to said sleeve, plural groups of horizontally and radially directed angularly spaced nozzles mounted on said sleeve and projecting thereinto to discharge radially against said column within said sleeve and opening to said well casing, each group of said nozzles being directed against said pump column underneath a different one of said impact plates, said plates and nozzles coacting to break up the liquid facilitating the escape of gas therefrom through said sleeve.

3. In a well, the combination with a casing extending below the ground liquid level so that a substantial length of the casing is filled with ground liquid, a gas separating sleeve disposed within said casing to be surrounded by ground liquid therein, said sleeve being closed at its lower end and having a gas exhaust above the ground liquid level, a pump discharge column disposed within said sleeve and open at its lower end thereto, a plurality

of impact plates spaced vertically within said sleeve and disposed transversely thereof in partial blocking relation to the sleeve above the opening of said discharge column, a plurality of groups of angularly spaced nozzles projecting inwardly from said sleeve and opening to said well casing to discharge radially within said sleeve, and vertically extending impingement members disposed within said sleeve to be impinged by the jets discharged from said nozzles, said impingement members being located below said impact plates to be guarded thereby from falling liquid.

4. In a well, the combination with a casing having a portion thereof extending below the ground level of the liquid to be pumped, a gas separating sleeve disposed concentrically within the casing to extend below the liquid level therein, said sleeve being closed at its lower end, a vacuum pump connected to said sleeve, a pump discharge column disposed within said sleeve and opening thereto, a plurality of impact plates mounted on said column in vertically spaced relation and disposed transversely thereof in partial blocking relation to the sleeve above the opening of said discharge column, vertically spaced impingement members mounted on said column below and closely adjacent to said impact plates, radially directed angularly spaced nozzles mounted on said sleeve and opening to said casing to discharge against said impingement members, an air lift discharge head disposed within said casing at the lower end of said sleeve, and means for supplying air under pressure to said head.

References Cited in the file of this patent

UNITED STATES PATENTS

344,137	Royce	June 22, 1886
1,253,115	Whitney	Jan. 8, 1918
1,472,560	Griffiths et al.	Oct. 30, 1923
1,499,710	Weisgerber	July 1, 1924
1,554,471	Trumble	Sept. 22, 1925
1,639,734	Jones	Aug. 23, 1927
2,071,393	Doherty	Feb. 23, 1937
2,618,339	Glover	Nov. 18, 1952
2,652,130	Ferguson	Sept. 15, 1953