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MEANS FOR WELL CLEANING

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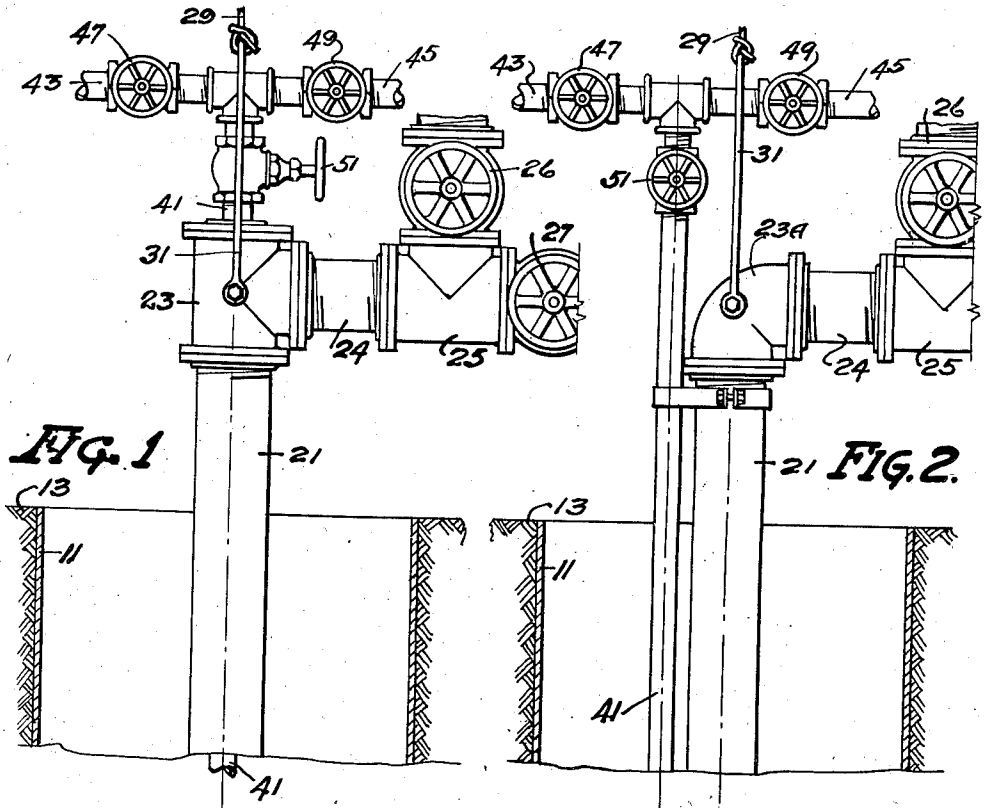
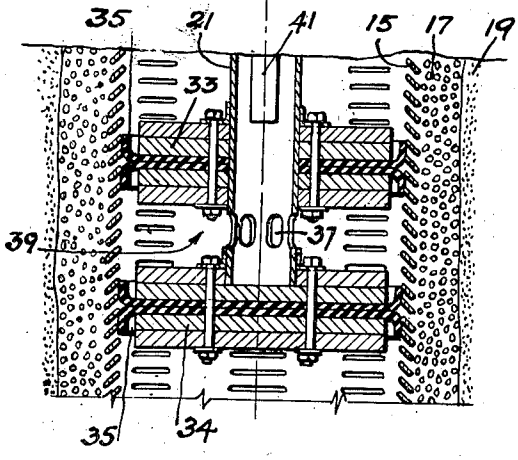
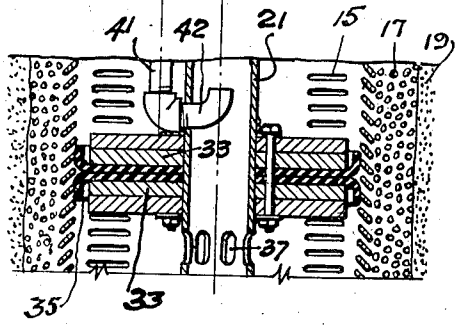


FIG. 1

FIG. 2





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MEANS FOR WELL CLEANING

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1 Claim. (Cl. 166—20)

This invention relates to improvements in means for well cleaning, and has particular reference to apparatus for separating off a restricted length of well screen or strainer to localize a correspondingly restricted screen area for treatment, and subjecting such area to repeated surge impulses alternately drawing liquid in and forcing it out through said screen area, and particularly for supplementing and accelerating the cleaning action by chemical and heat treatment.

The instant invention is related to the invention disclosed in the application of Norris E. Gunderson for Means and methods for well cleaning, Serial No. 371,659, filed December 26, 1940, to which application reference is here made.

In certain types of well a bore is dug from the surface of the ground into the water or oil bearing sands and a strainer installed in the sand, this strainer in some cases being a metal strainer of extremely fine mesh and in other cases a screen of coarse mesh surrounded by aggregate, the two in the latter case forming the strainer, this latter type only being in the present instance illustrated. After the well is built it is usually developed by pumping, such development being continued until clear water flows.

Also after wells have been in use for some time there is a tendency in some cases for the strainer structure to silt up and seriously impair flow, and in other situations a deposit of chemical, electrolytic, or other nature forms on the screen and/or the surrounding aggregate, it having been found in some instances that this deposit has substantially solidly filled a major part of the screen interstices and the well capacity has been reduced so much that the well is worthless.

In developing the wells, or in cleaning the wells after they have silted up, a temporary pumping outfit should be used, but there is great reluctance to incur the expense of a temporary pumping outfit, particularly since such outfit depreciates with great rapidity due to the wear and tear of sand and silt bearing water, or such water mixed with chemicals which attack the pump structure. Often, therefore, the original or service pumps are used for the purpose, and the silt and sand or these materials mixed with acids damaging to the pump parts seriously impair the subsequent usefulness of the outfit.

The present invention contemplates means for remedying such situations, improving well flow, and restoring wells to usefulness; and particularly to means for such purpose which substantially eliminates moving parts subjected to the action of such deleterious materials or actions.

The objects of the present invention are:

To provide means;

For segregating a screen area to localize treatment;

For establishing alternate suction and surge action on said segregated screen area;

For treating the segregated screen area with acid or other suitable chemical to effect loosening or disintegration of adhering substances, and if desired, continuing such treatment into the surrounding aggregate or structure; and

For heating the treating chemical to accelerate the action, or heating alone should chemical treatment not appear indicated; and for combining the actions of heat, chemicals, suction, and surge.

A further object is to improve the detail of the device employed.

The means by which the foregoing and other objects are accomplished and the method of their accomplishment will readily be understood from the following specification upon reference to the accompanying drawing, in which:

Fig. 1 is a sectional elevation showing the upper or ground surface end of the device, and the lower or chamber end thereof, as installed for use, and a fragmentary portion of a well screen and surrounding aggregate and structure.

Fig. 2 is a substantially similar view showing a slightly modified form of the device.

Referring now to the drawing in which the various parts are indicated by numerals:

11 is the casing of a well bore extending downward from the ground surface 13. 15 is a fragmentary portion of a screen, 17 aggregate surrounding said screen, and 19 the liquid bearing sand which surrounds the aggregate. 21 is a string of pipe forming a column of sufficient length to extend from somewhat above the ground surface downward into the screen, the upper end structure of this string preferably, as shown in Fig. 1, including a T 23, or as shown in Fig. 2, an elbow 23—A, from either of which a lateral pipe 24 extends. Preferably also, this structure includes a T 25 and branches controlled by valves 26 and 27, leading therefrom, one branch, as the branch controlled by valve 26, leading to a source of chemicals, not shown, and the other serving as an overflow.

The column 21 and head structure may be supported as by a cable 29 and suitable connecting means 31, the cable 29 being raised and lowered by suitable hoisting means, not here shown, to correspondingly raise and lower the column 21

and other structure associated therewith, as to shift the lower end toward area of action.

At its lower end the column 21 carries two heads 33, 34, (the head 33 only being shown, in Fig. 2), which heads are of slightly less diameter than the interior bore of the screen 15 and have projecting resilient sealing members 35, here shown as oppositely faced cup leathers, which are adapted to form sealing means substantially preventing flow of liquid longitudinally along the screen. The lower end of the column 21 is closed, as by abutment against or embedment in the lower head 34.

37 are openings establishing communication between the column 21 and the chamber 39 formed between the screens. 41 is a pipe through which air or steam is delivered to the head end of the structure, this pipe, in Fig. 1, extending downward within the column 21 substantially to the head level, and in Fig. 2, as extending downward along the outside of the pipe and carrying a nozzle structure extending into the pipe and upwardly turned, the column and pipe, in either case, being constructed and adapted to function as the well known air lift type of pump when air is forced in through the pipe 41.

In either form the pipe 41 at its upper end, preferably has branches 43, 45, as for connection to sources not shown, of compressed air and steam respectively. 47, 49 and 51 are cut-off valves.

The pipe 41 may be slidably disposed through the T 23 to adjust the level of the lower end of the pipe 41 relatively to the column 21 if desired.

In making use of the device the assembly is lowered into the well until the heads 33 and 34 are within the strainer section. Ordinarily they are lowered until they just enter the strainer section and work is subsequently done from the top down, or they are lowered to the bottom of the strainer section and work done from the bottom up.

After the device has been thus lowered into the well and the spaced heads 33, 34 positioned to separate off an area of the strainer for treatment, a suitable acid or other chemical is introduced through the valve 26 of the lateral pipe 24, the valve 27 being closed. This chemical passes downward through the column 21 and into the chamber 39 between the heads, and acts on the area of screen or strainer surrounding the chamber. If desired, steam is introduced, as through the pipes 45 and 41, the air control valve 47 and chemical and overflow control valves 26 and 27 being closed, heating the chemical. After the chemical has been allowed to act for a desired period of time compressed air is turned in through the pipes 43 and 41 and bubbles up within the column 21 acting in the usual manner of the air lift to raise the liquid in the column 21, and at option discharge it through the overflow valve 27, or back through the chemical valve 26 toward the source of chemical supply. This action may be continued, in which case the chemical valve is closed and the overflow valve opened, drawing in liquid through the strainer from the surrounding strata 19 and discharging it through the overflow valve; or the air may be cut off and on repeatedly and the liquid in the column 21 be allowed to surge downward and be drawn upward, exerting outward and inward pulsations through the strainer. In such case ordinarily the overflow valve 27 is closed to conserve chemical, and the action is ordinarily repeated until the deposits on the area of screen under treatment are loosened and dislodged, after which the heads 33, 34, are lowered or raised, as the case may be, to outline a new area of treatment and the foregoing operations repeated.

It will be understood that the successive introduction and cut-off of air to produce alternate inward and outward surges of pressure through the screen may be used alone, or in connection with the acid treatment, or with treatment and heating, and, particularly in oil wells where choking up of the screen is often caused by paraffin or other substances responsive to heat, that the chemical treatment may be dispensed with and heating alone resorted to. Obviously during the introduction of steam the air control valve 47 is cut off and ordinarily also both the valves 26 and 27 are closed, and after such heat treatment the steam valve is closed, the overflow valve 27 opened and use of the air lift begun.

It will be understood that after the head structure of the device has been lowered substantially to ground level both the column 21 and the pipe 41 must be supported and additional sections of pipe added in order that further lowering may be accomplished; and that raising is accomplished in reverse manner by removing sections of the pipes from time to time as occasion may require.

I claim:

Means for cleaning an annular well screen and surrounding strata, including means longitudinally spaced apart in and cooperating with said screen for establishing a chamber having a surrounding screen wall, a vertically disposed pipe column secured to said chamber-establishing means and extending upward therefrom above the earth surface, means for supporting and raising and lowering said column, a head structure on said column adapted for connection to a source of chemical supply and for independent discharge from said column, means respectively for controlling discharge flow and flow to or from said chemical supply source, an auxiliary air pipe positioned to discharge within and adjacent the lower end of said column, said pipe leading upward above the surface of the earth, means adapted to establish connection to a source of air supply, means adapted to establish connection to a source of steam supply, and means for controlling flow of air and steam through said air pipe.

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