May 26, 1936. E. C. HYDE, JR., ET AL 2,042,103

APPARATUS FOR HEATING AND AGITATING WELLS

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Fig. 1.

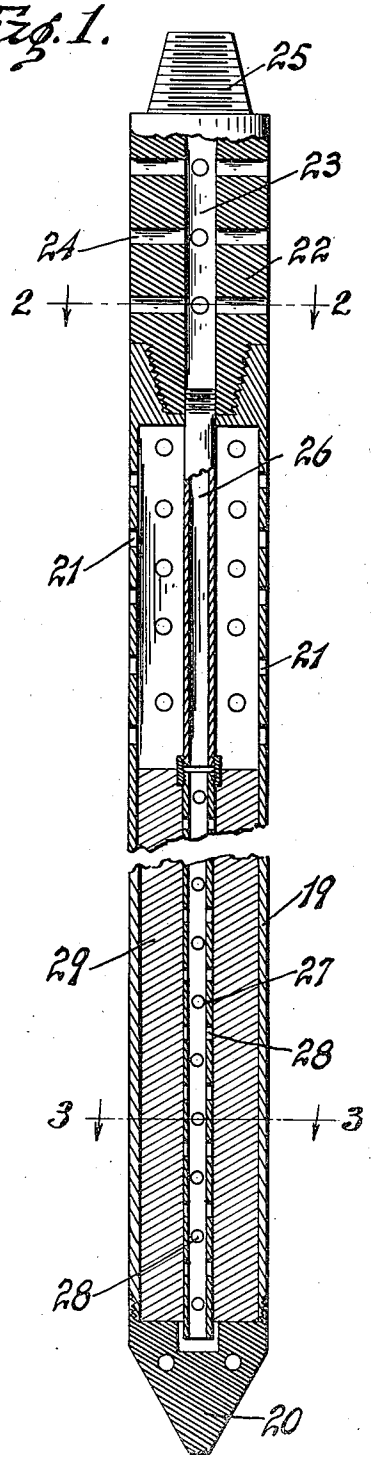


Fig. 2.

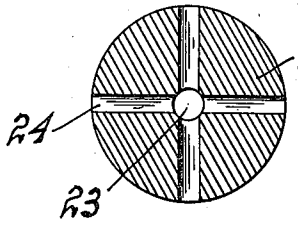
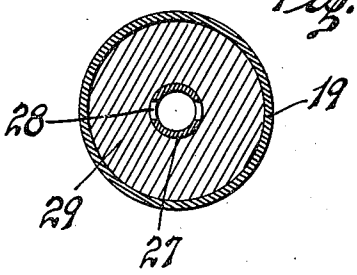


Fig. 3.



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APPARATUS FOR HEATING AND AGITATING WELLS

Edward C. Hyde, Jr., Kansas City, Mo., and Jack C. Renfro, Huntington Beach, Calif., assignors, by direct and mesne assignments, of forty-nine per cent to Joy J. Richart, Whittier, Calif., two per cent to Frank Harder, Huntington Beach, Calif., and forty-nine per cent to said Renfro

Application May 1, 1934, Serial No. 723,346

6 Claims. (Cl. 166—17)

Our invention relates to a method and apparatus for heating and agitating wells, particularly, oil wells, whereby the production thereof is materially increased.

The apparatus of the present invention is designed for lowering into an oil well a suitable container or shell holding chemicals, which are adapted to react when brought into contact with the water of the well. The container or shell in which the chemicals are lowered into the well is constructed of a material which is inert or unaffected by the chemicals and chemical reactions which take place therein, and is provided with means for circulating the water of the well into the lower end of the apparatus and discharging the products of the reaction from the upper portion of the apparatus, preferably in the form of jets directed radially outward from the apparatus. By constructing the container of the apparatus of a material which is inert to the reaction, the container may be used for moving the reacting mixture up or down the well so as to locate the center of the reaction at any desired point in the well. Prior efforts to clean wells by the use of exothermic reacting chemicals have employed containers which entered into the reaction and so could not be employed for holding the reacting mixture in a predetermined position, except for a short period of time.

Within the container or shell which is inert to the contained reacting materials, there are provided chemicals which are capable of reaction together upon contact with the water in the well, which chemicals are intended to clean or loosen the formations of the well or casing by utilization of one or a combination of the following effects thereof. The reaction being exothermic, it liberates heat which raises the temperature of the surrounding portions of the well, and the liberation of this heat acts to break down and melt different materials, such as wax or gum, which may be clogging perforations of the casing of the well or cavities of crevices in the earth formation. It is estimated that a temperature rise of as high as 200° F. may be secured, if desired. A further effect from the reacting chemicals is the liberation of a gas jetted against perforations in the casing or crevices of the earth formation with sufficient violence to have some effect in breaking up the obstructing materials and for creating a mechanical agitation effect adapted to bring such materials into a solution or into an emulsion with the materials of the well. An additional effect of the gas supplied by the reaction is that to some extent it is dissolved into some of the ingredients of the well hole, such as the gums or waxes, and thus decreases the viscosity or hardness of such gums or waxes, so that upon again cooling the gum or waxes it will not solidify to plug or block either the perforations of the casing or different crevices of the ether formation back of the casing.

A further effect from the chemical reaction is the solvent effect of the chemicals used on the different materials which are plugging or blocking or obstructing the flow of oil into the well hole or casing.

The chemicals employed within the apparatus consist of a metal, such as aluminum, which provides an exothermic reaction with an alkali, such as sodium or potassium hydroxide. The alkali metal is preferably employed in the solid form, whereas the metal which is to react therewith is preferably employed in the container in the form of a cylinder or tube.

The present invention, together with various additional objects and advantages thereof, will best be understood from a description of the preferred form or example of an apparatus embodying the invention. For this purpose, I have hereinafter described a preferred form or example of such apparatus, in which

Figure 1 is a longitudinal sectional view of an apparatus containing a hydrate of an alkali metal, and a metal pipe.

Figure 2 is a sectional view taken on line 2—2, of Figure 1.

Figure 3 is a sectional view taken on line 3—3, of Figure 1.

Referring more particularly to the drawing, our invention contemplates an apparatus to introduce a hydrate of an alkali metal and a metal into a well. The alkali and the metal react chemically in the presence of water, and large quantities of hydrogen gas are liberated. Chemical reaction is exothermic, and the heat of the reaction will melt the waxy or asphalt-like solids in the casing perforations. The liberated hydrogen gas will agitate the fluids in the well, and the apparatus itself is moved up and down in the well to further agitate the well fluids. The heating and agitation will effectively open the perforations in the casing so that the production of the well will be materially increased.

In the apparatus, as shown in the drawing, there is included a pipe 19 formed of a metal, such as steel or iron, which will not react rapidly with the alkali metal. A tapered block 20 screws onto the bottom of the pipe 19. A plurality of holes 21 are provided adjacent the upper end of

the pipe 19. A sub 22 screws into the top of the pipe 19. This sub is provided with a central bore 23, and a plurality of ports 24 extend outwardly from the central bore. A pin 25 on top of the sub permits the apparatus to be coupled to a wire line, socket or drill pipe.

A pipe 26 screws into the lower end of the bore 23, and this pipe may be of iron or of aluminum, if desired. If the pipe 26 is iron, an aluminum pipe 27 is attached to the bottom thereof. The aluminum pipe has a large number of ports 28 in the side thereof. An alkali, such as sodium or potassium hydroxide, partially fills the pipe 19. The alkali is indicated at 29. The alkali preferably does not extend above the holes 21.

In running the apparatus into the well, the holes 21 are plugged with grease or the like so that the tool can be dropped substantially to the bottom of the well before the chemical reaction starts. When the bottom of the hole is reached, or a point at which it is desired to wash, the apparatus is rapidly moved up and down, and the grease is thus washed out of the holes 21. Water then enters thru the holes 21, and the exothermic reaction occurs between the alkali metal and the aluminum pipe 27. The liberated hydrogen gas passes upwardly thru the ports 28, then thru the pipe 26 into the bore 23, and out of the ports 24. The heat generated by the chemical reaction radiates outwardly from the apparatus, and the wax or asphalt in the casing perforations is melted. The liberated hydrogen causes an agitation in the well, and the apparatus itself is constantly moved up and down to further increase the agitation in the well fluids.

The apparatus thus described further provides a means by which the exothermic reaction can be made to take place opposite any desired portion of the oil well. This follows because of the fact that the shell of the apparatus is composed of a material which is inert to the reaction and thus will remain undecomposed during the violent reaction taking place, which may last in cases a number of hours. By positioning the apparatus opposite the particular portion of the well to be treated or by slowly moving the apparatus throughout a portion of the well where treatment is desired, such portion of the well may be thoroughly treated. At the conclusion of the reaction, the apparatus may be withdrawn from the well and re-built with materials for further use.

While the particular apparatus for treating wells herein described is well adapted to accomplish the purposes and objects of the present invention, it is to be understood that the invention is not limited to the specific form shown, but includes all such modifications and changes as come within the scope of the appended claims.

Having described our invention, we claim:

1. An apparatus for heating and agitating wells, comprising a shell formed of a metal substantially inert to the action of a hydrate of an alkali metal, said shell having a plurality of openings adjacent the upper end thereof, the lower end of said shell being filled with a hydrate of an alkali metal, a metallic pipe of a metal which reacts exothermically with said hydrate of an alkali metal extending into the alkali metal, and gas outlet means at the upper end of said pipe.

2. An apparatus for heating and agitating wells, comprising a shell formed of a metal substantially inert to the action of a hydrate of an alkali metal, said shell being closed at the lower end thereof, said shell having a plurality of holes adjacent the upper end thereof, a hydrate of an alkali metal in the lower end of such shell, a metallic pipe of a metal which reacts exothermically with said hydrate of an alkali metal suspended in the shell and extending into the alkali metal, and gas outlet means at the upper end of said pipe.

3. An apparatus for heating and agitating wells, comprising a shell, said shell being closed at the lower end thereof, said shell having a plurality of holes adjacent the upper end thereof, a metallic pipe suspended in the shell and extending into the alkali metal, a sub mounted on the upper end of the shell, said sub having a central bore and a plurality of ports extending outwardly from the bore, said pipe extending into the bore whereby a gas outlet is provided.

4. An apparatus for heating and treating oil wells, comprising a shell, said shell containing substances which react exothermically upon the addition of water, said shell being substantially inert to the action of said substances, said shell having openings at its lower portion to permit entry of water to the interior thereof, said shell having apertures in the upper portion to permit the release of gases and products generated from the reaction within the interior of said shell.

5. An apparatus for heating and treating oil wells, comprising a shell, said shell containing an alkali and a metal which reacts exothermically with the alkali, said shell being substantially inert to the action of said substances, said shell having openings at its lower portion to permit entry of the water in the interior thereof, said shell having apertures in the upper portion to permit release of the gases and products generated from the reaction.

6. An apparatus for heating and treating oil wells, comprising a shell, said shell containing aluminum and solid sodium hydroxide, said shell being substantially inert to the contained substances and their products of reaction, said shell having means for admitting water from the well into its lower portion, and means for discharging water and the products of reaction from the upper portion of said shell.

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