

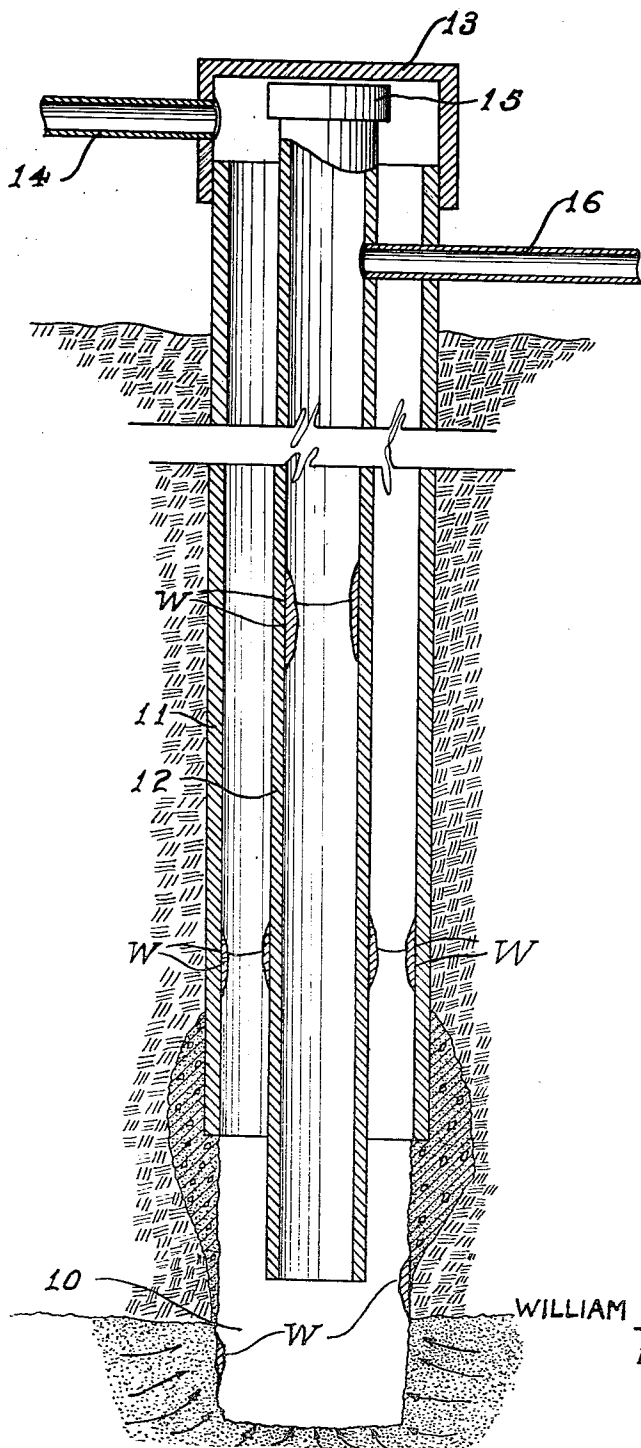
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METHOD FOR DISSOLVING PARAFFIN AND WAX

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METHOD FOR DISSOLVING PARAFFIN AND WAX

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1 Claim. (Cl. 166—21)

This invention relates to the removal of paraffin and wax from oil wells, pipe lines, and the like, and in particular it relates to and has for its objects the dissolving, cutting and removing of wax or paraffin from the casing and tubing pipes of oil wells and other portions thereof, and from pipe lines and other places where it may occur.

Further objects of this invention are to provide a paraffin and wax solvent and a method of applying the same for removing paraffin and wax deposits from wells and the pipes therein which is readily soluble in and miscible with the oil and/or water occurring in the well.

In the production of crude oil by various methods such as from naturally flowing wells, wells artificially flowed, and wells equipped with various pumping devices there is formed in the reservoir area at the bottom of the well hole where the oil accumulates, in the tubing and in the annular space between the tubing and the casing pipe, material deposits of paraffin and/or amorphous wax. The accumulation of this paraffin or wax in the wells occurs to such an extent that it completely clogs the interstices of the producing strata, and otherwise attaches itself to the tubing and casing pipe so that in extreme cases it is impossible to produce oil from the well.

The drawing diagrammatically illustrates in cross-section an oil well showing at the bottom thereof the reservoir 10, and the casing pipe 11, and a string of tubing 12. For the purpose of describing the present invention it will be noted that the casing pipe 11 is provided with a cap 13 at the top portion thereof into which there is inserted a pipe 14, while the string of tubing 12 is also provided with a cap 15 at the top thereof and connected thereto is a pipe 16.

This invention relates both to the product for dissolving and cutting the paraffin and wax from the well hole and to a method of applying and utilizing the solvent in so removing the paraffin and wax.

We propose to inject into the well hole, either through the tubing or the casing pipe, sufficient amounts of paraffin and wax solvents in the form of liquid hydrocarbons of the paraffin or methane series. These hydrocarbons will be saturated or unsaturated and preferably distillates of that series, and as such will preferably consist of such hydrocarbon liquids as kerosene, naphtha, casinghead or natural gasoline, gasoline of motor fuel specifications, and kettlebottoms, which may be described as a residue distillate obtained in the manufacture of natural

gasoline or any suitable unsaturated petroleum hydrocarbon distillate.

When the above described solvents are used in wells of relatively shallow depth, for instance up to 3,000 feet, it has been found that from ten (10) to one hundred (100) gallons of any of the above mentioned solvents will be sufficient to dissolve and cut the wax and paraffin in the well. However, if the wells to be treated are of considerable depth, for instance over 3,000 feet, it is best to use larger amounts ranging from one thousand (1,000) to three thousand (3,000) gallons of solvent. These figures relative to the quantity of solvent to be used are based upon the average wells classified as deep and shallow and are not intended to be the exact amounts for any one well.

With further consideration of the drawing, assume that the wax and paraffin have materially clogged the casing, or tubing pipes, and the reservoir area, and are clinging to the surface thereof in large quantities at the points designated by the reference letter W. In such a case any of the paraffin or wax solvents as above described, for instance, kerosene or gasoline could be injected through the pipe 14 into the annular space between the casing pipe 11 and the tubing 12, and by applying pressure thereto, and/or by the utilization of a pump, the solvent could be pumped or forced to the bottom of the well 10 and up into the tubing 12 and back to the surface by way of pipe 16. If a pump is used to circulate the solvent in the manner described, it would be continuously returning to pipe 14 as it issues from pipe 16, and causing the solvent to recirculate in the manner described. Although it should be understood that in lieu of introducing the solvent at 14 and allowing it to escape from the well at 16, it could just as well be introduced into the pipe 16 connected with the tubing 12 and allowed to issue from the well by way of pipe 14 connected to the casing pipe 11. In either event, after several cycles of the circulation as above described, the pump, or any other motive force used, would be discontinued for an appreciable period of time, allowing the solvent to remain stationary in the well hole and in the casing and tubing pipe, allowing it to have a soaking action to cut and dissolve the wax and paraffin formed on the surfaces thereof. After such soaking or standing period, the pump or other motive force would again put the admixture of solvent and oil of the well into motion and circulate it as previously described. The method above described of circulating the solvent in the well can also be conducted with-

out the intermittent soaking or standing phase. It should therefore be appreciated that it may not be necessary in all cases to allow the solvent to stand stationary as described, but in wells which are clogged to only a minor degree with the wax and paraffin, it may only be necessary to circulate the solvent therein for a short period of time to sufficiently dissolve and cut the same. It is therefore proposed to allow the solvent to remain stationary in the well between cycles of circulating the same only when the well is clogged with paraffin and wax to a major degree in order that the solvent may have a longer period of time to dissolve the wax and so more effectively remove the same.

In lieu of causing the solvent to circulate in and out of the well as above described, it has been found that if the wax is present on the interior walls of the casing pipe and on the exterior walls of the tubing pipe, then the solvent may be introduced into the space between the casing and tubing pipes by way of pipe 14 and thereafter gas under pressure may be introduced to the interior of the tubing pipe by way of pipe 16, and by alternately applying high and low pressure to the gas so introduced, the admixture of oil and solvent present in the well in the form of a liquid column between the casing and tubing pipes will be caused to reciprocate up and down, and such a rocking motion will serve to wash the walls of these pipes and cut therefrom the wax and paraffin. Here again it has been found advantageous to discontinue this reciprocating or rocking motion of the solvent at various intervals and to allow it to remain stationary so that the solvent may have the opportunity of soaking into and cutting the wax, after which the reciprocating movement of the column of solvent is again resorted to in order that the paraffin and wax may be removed. After treating the walls of the pipes in this manner the solvent is then removed by applying continuous pressure to the tubing, which will thereby force the solvent up into the top portion of the annular space formed by the pipes 12 and 11 and cause it to ultimately flow through pipe 14, by which it is removed.

Here again it is to be understood that in lieu of introducing the solvent by way of pipe 14 into the annular space between the casing pipe and the tubing, the solvent may be introduced into pipe 16 and thence into the tubing 12. This latter mode of application is resorted to particularly when it is the interior walls of the tubing that contain the accumulation of wax or paraffin. In this last mode of application the gas under pressure would then be introduced into the pipe 14 and thence into the annular space between the tubing and casing, and by the alternate application of high and low pressures as above described, the liquid column of solvent and oil in the tubing pipe 12 will be caused to reciprocate up and down, and so in addition to acting as a solvent for cutting paraffin and wax from the interior of tubing, it will also wash the tubing walls and thereby assist in cleansing them of deposits. As previously mentioned in connection with the introduction of the gas through pipe 16 and into the tubing 12, and the introduction of the liquid column of solvent through pipe 14 and into pipe 11, the gas being introduced into pipe 14 in this present case, may also be so controlled as to allow the column of solvent in the tubing pipe 12 to remain at a standstill in order that it may soak the paraffin and wax adhering thereto in order to cut the same from the walls, and after such

soaking action the pressure may again be applied through pipe 14 in alternate high and low amounts to cause the column of solvent in the tubing pipe to reciprocate up and down and so wash the walls clean. The solvent in the tubing pipe 12 will, of course, be removed by applying sufficient pressure through pipe 14 so as to force the solvent up through the tubing pipe and out through pipe 16. By utilizing the solvents above referred to, and the method of applying them as just described, it has been found that a well which is but moderately clogged with paraffin or wax may be treated in the above manner for a period of from two to three hours, and it will thereafter be found that the solvent has removed substantially all paraffin and wax formerly adhered to the walls of the pipes and the well hole wall surfaces, leaving the same free and clean for production. However, when the well contains material amounts of paraffin and wax, it has been found necessary in such cases to treat the well for a greater period of time, usually in the neighborhood of from five to ten hours.

In some wells the wax and paraffin deposits are present in such large amounts that the solvents previously described will remove them only after a prolonged application, and when such wells are being treated as previously described, it has been found necessary to incorporate in such solvents some substance which is a particularly active wax or paraffin solvent and which will materially aid in the cutting and dissolving of paraffin. A predominant amount of kettlbottoms and/or naphtha when used with a relatively small proportion of naphthalene flakes or carbon tetrachloride, will produce a highly satisfactory solvent for cutting paraffin and wax from wells. In the above solvent, the flaked naphthalene or carbon tetrachloride, whichever is used, will form the minor portion of the solvent and should not be over substantially ten percent (10%) by weight, nor materially less than three percent (3%) by weight, the remaining portion of the solvent being composed of such substances as kettlbottoms or naphtha. This solvent will, of course, be used in the exact manner as previously described.

When the wax or paraffin occurs in wells which are producing a material amount of water, which may be brine, it has been found convenient and more efficient to add to the solvent some material which will render the same water soluble in order that it will be miscible with the water, and in particular with that occurring in the bottom portion of the well hole adjacent the reservoir area, which is shown in the drawing at 10, to render the solvent miscible therewith. Any suitable water soluble agent may be added, such as any of the modified fatty acids, particular reference being had to soaps or any other type of saponifying agent. In this latter type of solvent, it is to be understood that any of the solvents heretofore described could be used, and that the same may readily be rendered water soluble. However, for a particular example of a wax solvent for use in wells which are producing material amounts of water, it is proposed to use such a substance as kettlbottoms or naphtha, and to constitute approximately 97% by weight of the solvent, and naphthalene flakes or carbon tetrachloride and the like to be present and constitute approximately 3% of the wax solvent. To such a solvent mixture there would then be added sufficient quantities of a saponifying agent such as soap to render the solvent miscible with water. It is to

be further understood that this last described water soluble solvent would be used in substantially the same manner as the solvents heretofore described.

5 After the well has been treated in any of the above described manners, the well may then be put on production and the oil produced will contain the solvent admixed therewith which during the course of refining the oil will result in the recovery of the solvent as one of the products. 0 Therefore it can readily be appreciated that the improved method and product for cutting and dissolving paraffin and wax deposits in wells and removing them is extremely economical.

5 While we have described and explained our invention with particular reference to oil wells, it is to be understood that we do not limit our invention to such a specific use, as the same can be

used with equal efficiency in wells of any type, and also in the cleansing and removing of paraffin and wax from pipe lines and similar conduits by merely applying the principle taught in our specification.

5 What we claim and desire to secure by Letters Patent is:

The method of cleaning wells and well pipes of deposits of paraffin and wax which consists in introducing into a well hole a water miscible 10 liquid wax solvent in the form of a column of liquid hydrocarbons containing a minor portion of modified fatty acid saponifying agent and flake naphthalene and causing said column of solvent to be reciprocated up and down in the well 15 to dissolve the paraffin therein.

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