

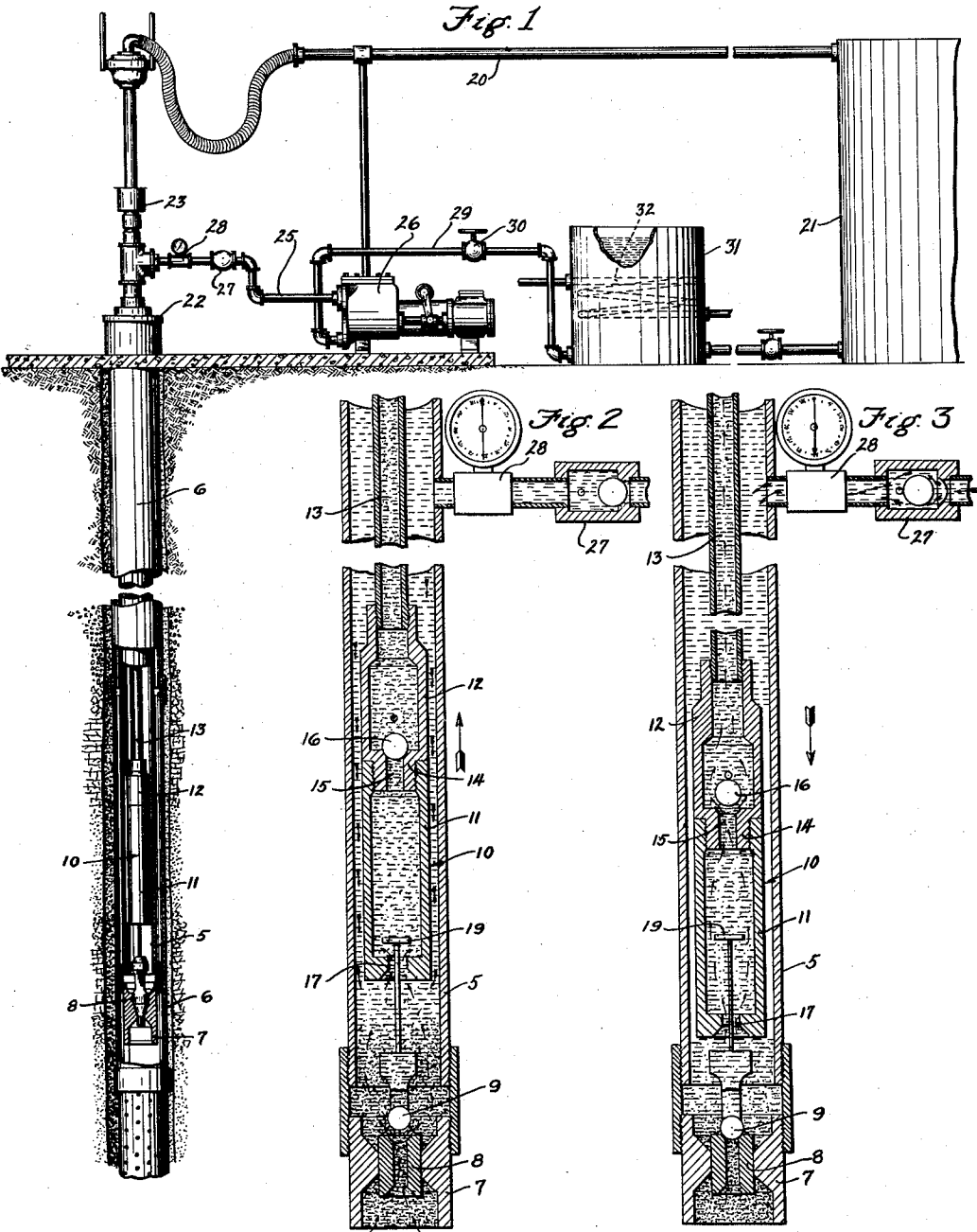
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W. T. SMITH

METHOD OF AND APPARATUS FOR PUMPING SAND LADEN OIL WELLS

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METHOD OF AND APPARATUS FOR PUMPING SAND-LADEN OIL WELLS.

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To all whom it may concern:

Be it known that I, WILSON T. SMITH, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Method of and Apparatus for Pumping Sand-Laden Oil Wells.

This invention relates more specifically to a method of pumping "sanded" oil wells, or wells in which the oils are of such character as to preclude efficient pumping operations without entailing injury to the pumping mechanisms, and a form of apparatus that may be conveniently employed in connection therewith.

The primary object of the invention is to provide a method of introducing under pressure during the operation of the pumping mechanism, a solvent or liquefying agent to the pump chamber beyond the piston to liquefy the heavy hydro-carbons or oil sands to insure a successful and efficient pumping operation without undue wear on the pump parts.

It frequently occurs in the pumping of oil wells that the oils being pumped are of such a heavy sand laden character that it is practically impossible to pump the same, further, even if the oils flowing into a well possess sufficient fluidity to permit of a partially successful pumping operation, the pump packings, and other parts of the mechanism are so quickly cut and worn that operations have to be frequently discontinued in order to renew and restore the worn pump parts.

By the employment of the herein described method and pumping apparatus, oils that are heavily impregnated with sand or other foreign substances are quickly and efficiently liquefied to such an extent that they may be successfully pumped without the usual attendant disadvantages.

In the accompanying drawings I have illustrated a preferred embodiment of my invention, it being understood however, that no limitation is necessarily made to the precise structural details therein exhibited, but various changes, alterations, and modifications may be resorted to within the scope of my invention when desired.

Fig. 1 is a longitudinal sectional view of a form of apparatus employed in connection with the pumping method, the pumping mechanism being shown in a well casing.

Fig. 2 is a partial longitudinal section of

a pump mechanism illustrating diagrammatically the method of introducing the liquefying agent to the pump chambers.

Fig. 3 is a similar view illustrating the position of the pump parts on the pumping stroke.

As shown in the various figures of the drawing the working barrel of the pump is made up of a plurality of pipe sections coupled together and suspended within the well casing 6 in the usual manner. The lower end of the working barrel is provided with the usual shoe 7 in which is mounted a valve cage 8 having a standing valve 9, all of said valve parts may be of the ordinary or any preferred construction.

The pump plunger 10 is preferably made up of hollow sections 11, 12, the upper section 12 having a reduced end is secured in screw threaded engagement with the lower end of the well tube 13. The lower end of this section also is provided with a reduced portion 14 exteriorly threaded for engaging the upper end of the lower section 11, and it has a central duct 15, the annular upper edge of the duct forming a seat for a ball valve 16.

The lower section 11 of the pump plunger 10 is provided with a central opening or duct 17 for the passage of oil therethrough on a pumping operation. Secured to the upper end of the standing valve case is a rod 18 that extends upwardly through the duct 17 into the interior of section 11 of the pump barrel, the end of the rod having a cross bar 19 whose length is greater than the diameter of the duct 17. By means of this rod the standing valve can be readily removed on a withdrawal of the pump plunger when it is desired to renew or repair some of the pump parts.

Well tube 13 is connected at the upper end thereof by a pipe line 20 to an oil storage tank 21 located a distance from the well. The upper end of the pump barrel is sealed by a screw plate 22, and the well tube reciprocates vertically through the usual stuffing box 23 at the upper end of the pump barrel.

In order to intermittently introduce a solvent or liquefying agent to the interior of the pump barrel in advance of the plunger, a pipe line 25 leads from the upper end thereof and is connected to a feed pump 26, preferably of the boiler feed type. Interposed in pipe line 25 is a ball check valve 27,

and a pressure gauge 28 designed to indicate the pressure of the oil within the pump barrel during the operation of the pump. Feed pump 26 is supplied with a liquefying agent, preferably crude petroleum, through pipe line 29, controlled by a valve 30, connected to a pump feed tank 31, that is in turn connected by a valve controlled pipe line to the storage tank 21. In order to increase the fluidity of the oil in the tank 31 should the same be of excessive sand laden character, a steam coil 32 suitably connected to a steam line is mounted therein.

It will be understood that the above described apparatus represents a preferred form, although other forms may be conveniently employed in the accomplishment of the main object of my invention, i. e., to sufficiently liquefy the sand laden oil so that the same may be pumped without injury to the mechanism.

When a pumping operation is started and the plunger is in its lowermost position, (see Fig. 3) the feed pump is set in operation to deliver a volume of heated oil under pressure to the pump barrel at the upper end thereof, the oil completely filling the chamber of the pump barrel above the standing valve, and the chamber of the lower section of the pump plunger.

On an upward movement of the pump plunger, as shown in Fig. 2, the oil in the pump barrel above the plunger will exceed the pressure of the oil beyond the check valve 27 to close the same and force the oil downwardly through the space between the plunger and pump barrel into the sand laden oil issuing from the well, the flowing streams of oil co-mingling around the standing valve and completely liquefying the sand laden oil.

When the plunger has reached the limit of its upward movement and the downward or pumping movement is begun, the check valve 27 will be opened as the pressure on the oil in the upper portion of the pump barrel is relieved to permit of a fresh supply of liquefying oil to the chamber of the pump barrel. As the plunger continues to descend the standing valve will automatically close, and the oil thereabove will be forced upwardly through the hollow plunger and well tube 13 to the storage tank. It will be understood that the pump plunger 10 is of less diameter than the interior diameter of the pump barrel, thus leaving a space therebetween through which the oil supplied by the pump 26 may be forced downwardly to the

lower portion of the pump barrel adjacent the standing valve.

By placing a check valve in pipe line 25 all back pressure on the feed pump is relieved, thereby eliminating any danger of destroying the pump packings or valve seats of the pump.

By intermittently introducing on the non-pumping stroke of the pump plunger a fluid oil for admixing or liquefying the sand laden oil issuing through the standing valve into the pump barrel, I am enabled to efficiently pump heavily sand laden oil from a well which would otherwise clog the pump and prevent an operation of the same.

What I claim is:

1. An apparatus of the class described, comprising a pump barrel sealed at the upper end thereof and a valved closure at the lower end, a hollow pump plunger loosely mounted therein, a fluid inlet pipe line leading to said pump barrel at the upper end thereof, said line leading to a source of fluid supply, a feed pressure pump connected to said pipe line, and a check valve interposed in said line between said feed pump and pump barrel, said valve adapted to shut off the fluid supply to said pump barrel on a reciprocation of the pump plunger in one direction.

2. An apparatus of the class described, comprising a pump barrel closed at the top and provided with a standing valve at the bottom, a hollow plunger mounted therein for vertical reciprocation, the diameter of said plunger being such as to leave an annular space between the barrel and plunger, a fluid supply pipe line connected to the pump barrel above the plunger, a feed pressure pump connected to said pipe line for forcing fluid to said barrel intermittently, and a check valve mounted in said pipe line adapted to be operated on a non-pumping stroke of said plunger, whereby the fluid in the barrel above the plunger will be forced downwardly around the pump barrel to the space adjacent the standing valve.

3. The herein described method of pumping oil wells in which the oil to be pumped is of semi-fluid form, consisting of intermittently introducing an oil into the well during the non-pumping operation of the pump mechanism.

In witness that I claim the foregoing I have hereunto subscribed my name this 15th day of April, 1924.

WILSON T. SMITH.