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M. T. McKEE

METHOD OF CEMENTING OIL WELLS

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Fig. 1

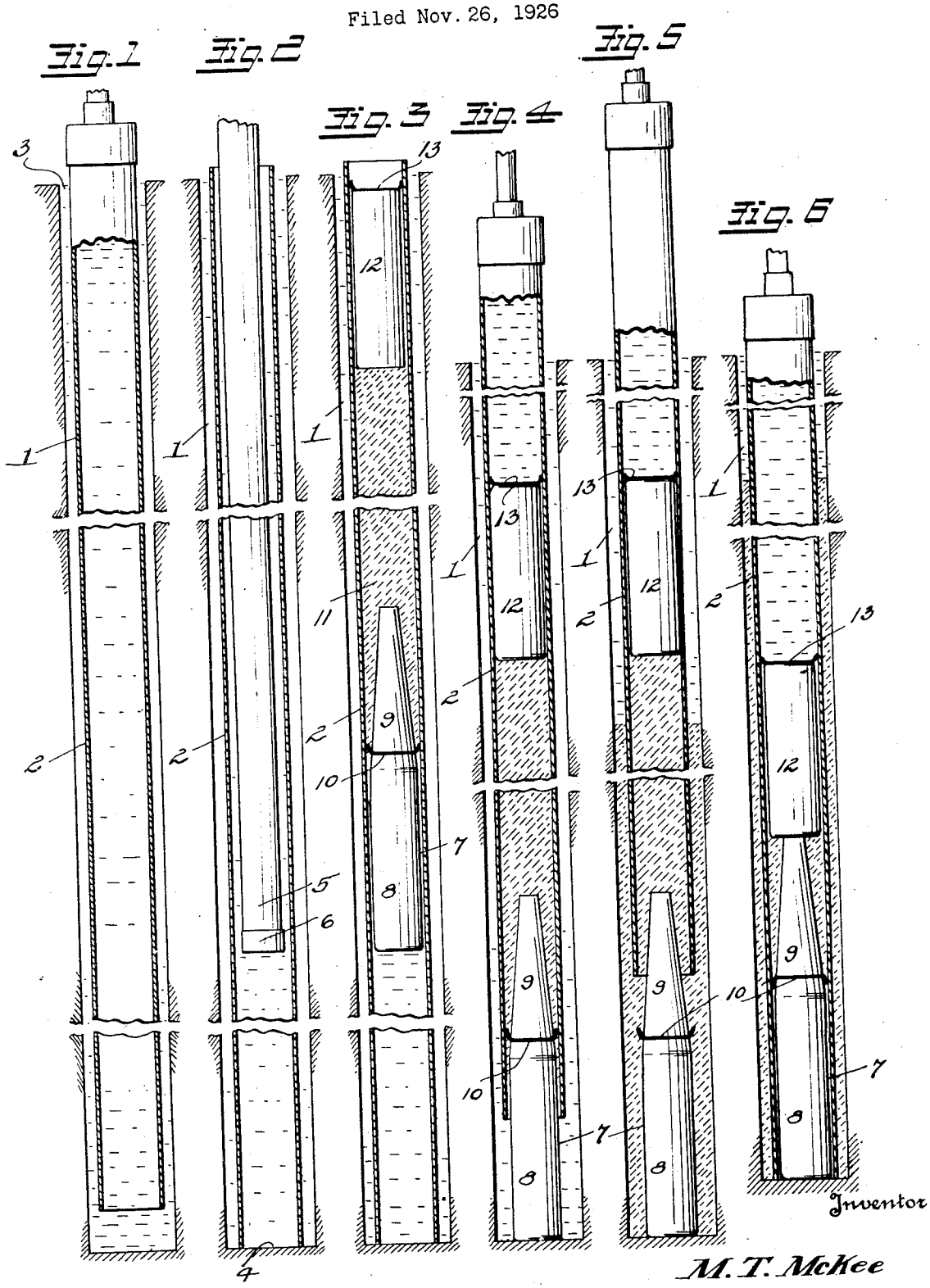
Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6



Inventor

M. T. McKee

By W. S. McDowell.

Attorney

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MIERLEY T. McKEE, OF ZANESVILLE, OHIO.

METHOD OF CEMENTING OIL WELLS.

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This invention relates to an improved method of cementing in an operating position the casing of an oil or gas producing well, and has for its object the provision of a novel method whereby this operation can be performed in a more facile, expeditious and economical manner, from a standpoint of time and materials used, than the commonly employed method now in general use for this purpose.

For a further understanding of the invention reference is to be had to the following description and the accompanying drawing; wherein:

Figures 1 to 6 inclusive disclose vertical sectional views setting forth the consecutive steps employed in carrying out the present invention.

In carrying out the invention it will be understood that the usual hole 1 is drilled in the ground by any approved method of drilling, such, for example, as by the employment of rotary drills. When the hole or well has been drilled to the proper place or depth where it is decided to set the casing 2 and cement it in place, which may be accomplished by dropping a weighted measuring line to the bottom of the well to determine its depth, the casing 2 is inserted in the well and maintained slightly spaced, as shown in Figure 1, from the bottom thereof. Ordinarily, the bottom of the well contains a certain quantity of thick heavy mud and it is preferable to remove this by pumping water downwardly through the casing 2 so as to thin the mud and force the same upwardly and out of the well between the walls of the casing and the well, as indicated at 3 in Figure 1. By this step the mud in the lower part of the well is removed so that when the measuring line is lowered the same will engage firm material at the bottom of the well and the exact depth of the latter may then be determined with accuracy. It will be understood that the measuring line may be dropped to the bottom of the well through the piping of the rotary drill, if desired.

After the depth of the well has been determined and the excess mud removed therefrom through the above described pumping operation, the casing 2 is inserted in the well as shown in Figure 2, with the lower end of the casing resting upon the bottom 4 of the well. After the mud laden water has been thoroughly flushed out of the well and casing by the process of pumping in clear water, the drill pipe or tubing 5 with its lower end closed as at 6 is forced into the casing so as to displace and force out of the top of the casing a large proportion of the water contained therein, and to make room for the reception in said casing of the plugs and cementitious material used in securing the casing in place. Following the displacement of the water from the casing, the tubing 5 is removed and there is inserted in the top or upper portion of the casing a lower plug member 7. This plug member consists of two sections, a lower section 8 of cylindrical form having uniform diameter throughout the length thereof, and an upper section 9, which is of substantially conoidal or tapered form, the smaller portion of the section 9 being located at the upper end thereof. Between the sections 8 and 9 there is provided a fabric gasket 10, which is adapted to engage with the inner wall of the casing so as to secure a seal between the plug member and the casing.

On this plug member there is poured into the casing a suitable quantity of cement, as shown more particularly in Figure 3 and designated by the numeral 11, which body of cement rests upon the lower plug member and is supported thereby. Resting on the top of the body of cement is an upper plug member 12 of cylindrical form and of substantially uniform diameter throughout the length thereof, the top of this plug member being provided with a gasket 13 which engages the inner wall of the casing and provides a seal between said upper plug member and said casing.

Following the operation of inserting the cement and the plug members in the manner and order described the casing is elevated slightly from the bottom of the well and the pumps are started so as to force the plug members and the cement downwardly, permitting of the displacement of the water below the lower plug member until the latter engages with the bottom of the well, as shown in Figure 4. The casing is then elevated slightly, as indicated in Figure 5 to permit of the flow of the thoroughly wet cement from the lower end of the casing into the bottom of the well and upwardly between the casing and the walls of the well, allowing the cement to arise to the desired height in the space 3. The casing is then lowered, as shown in Figure 6, until the

same again rests on the bottom of the well and wherein the cementing operation has been completed. The plug members may then be removed from the casing in any suitable manner such as by means of fishing tools or by drilling the plugs out with drilling tools, and the concrete is permitted to set and harden so as to retain the casing in its operating position and to greatly reinforce and strengthen the same.

In view of the foregoing it will be seen that the present invention provides a positive, simple yet effective method for cementing an oil or gas well casing in its applied and operative position in the bottom of the well, and a method by means of which the work may be carried on accurately and economically avoiding both waste of materials and time in completing the several steps of the operation. The method may be carried out by the employment merely of standard drillers' tools and does not involve special apparatus or additional investment cost of any kind.

It will be observed that the operation of the apparatus is particularly positive. Thus when the lower plug member reaches the bottom of the well the pumps forcing the same downwardly are automatically stopped by the back pressures thereby set up, so that the operator will be informed when to elevate the casing to release the concrete into the desired sealing spaces. Then, after the casing has been raised and the operation of the pumps again commenced, the operator will be notified when the cement has been fully forced out of the casing by the contacting of the upper plug member with the lower plug member, which again causes the pumps to automatically cease operation. In this manner the operator can maintain strict supervision over the apparatus and the control thereof rendered sufficiently positive to insure effective results.

What is claimed is:

1. The method of cementing wells, which consists in pumping a drilled well to remove heavy mud laden water from the well casing and the space outside thereof, in lowering the casing so that the same will rest on the bottom of the well, displacing a portion of the water from said casing, placing a body of cementitious material in said casing between a pair of upper and lower plug members raising the casing slightly from the bottom of the well, forcing these materials downwardly in said casing to the bottom of the well with the lower plug member in contact with said bottom, elevating the casing to allow continued pressure applied to the upper plug member to force the cementitious material out of the bottom of the casing and into the lower part of the well and upwardly between the walls of the well and the casing, and in again lowering the casing so that the same rests upon the bottom of the well.

2. In apparatus for cementing oil wells, a casing, a pair of plug members slidably mounted within said casing and adapted to receive between them and within said casing a body of cementitious material, and a substantially conoidal tip section provided upon the upper end of said lower plug member.

3. In apparatus for cementing wells, a casing, a plug member receivable within said casing and formed to include a cylindrical body of substantially uniform diameter having the upper end thereof terminated in a tapering parted construction of materially less diameter than said casing, and an upper plug member slidably received within said casing and possessing a body of substantially uniform diameter throughout the length thereof.

4. In apparatus for cementing oil wells, a casing, a plug member slidably received within said casing and including a body portion of slightly less diameter than the internal diameter of said casing, a flexible gasket carried by the body portion of said plug member and arranged to engage with the walls of said casing, and a tip section of conodial form carried in connection with the upper end of said plug member and possessing a diameter of materially less than that of said casing.

5. In apparatus for cementing wells, a casing, a plug member slidably received within said casing and formed to include a body portion of a diameter substantially with that of said casing and having the upper end thereof provided with a portion forming a guide for the lower end of said casing, said guide portion being of less diameter than the lower end of said casing, and an upper plug member slidably received within said casing and having a diameter substantially with that of the interior of said casing.

6. In apparatus for cementing oil wells, a casing spaced from the bottom of the well, a plug having a tapered upper end portion slidably received within said casing, means for forcing a body of cement above said plug down the casing until the said plug rests on the bottom of the well, the tapered portion of the plug remains at all times within the casing and serves to permit the cement to be forced downwardly around said tapered portion and out around the outside of said casing, said tapered portion also serves to guide the casing in positioning the same on the bottom of the well after the cementing operation.

In testimony whereof I affix my signature.

MIERLEY T. McKEE.