

Sept. 6, 1955

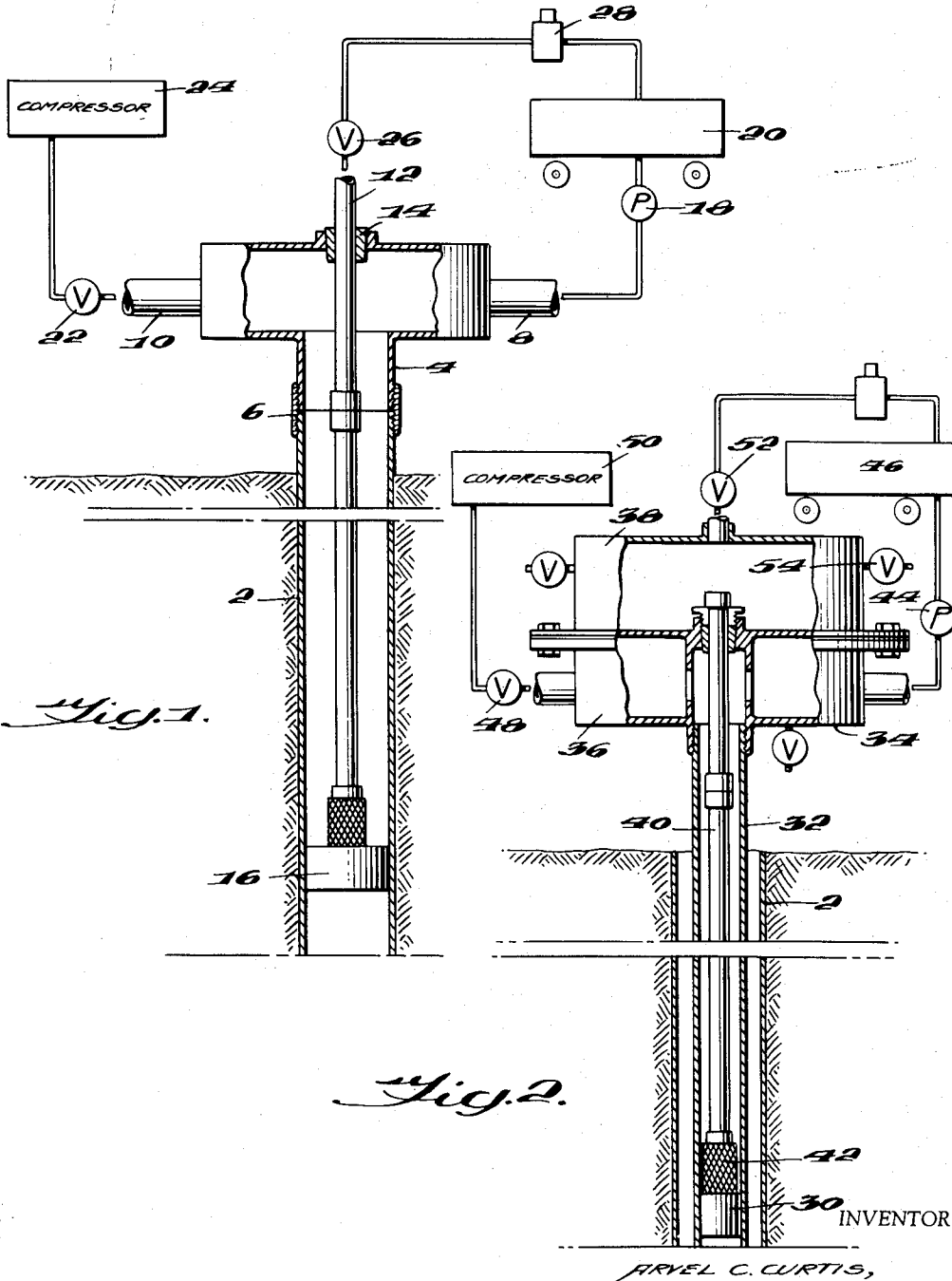
A. C. CURTIS

2,717,038

METHOD FOR CLEANING AND COATING THE INTERIOR OF WELLS

Filed Feb. 9, 1953

2 Sheets-Sheet 1



BY *Barley, Stephens & Hunting*

ATTORNEY



1

2,717,038

## METHOD FOR CLEANING AND COATING THE INTERIOR OF WELLS

Arvel C. Curtis, Odessa, Tex., assignor to Pipelife, Inc., a corporation of Texas

Application February 9, 1953, Serial No. 335,857

8 Claims. (Cl. 166—1)

The invention relates to the cleaning and coating of the interior of pipes arranged in substantially vertical position, and more particularly to the cleaning and coating of the inside of wells, such as oil wells.

The primary object of the invention is to provide a method for painting the inside of the pipes of wells and the like which is an improvement over any heretofore available.

Another object of the invention is to provide such a method which is economical and which does not require that the well be kept out of operation or production for long periods of time.

Still another object of the invention is to provide a method by which, in wells having a tubing inside a casing, both the inside and outside of the tubing and the inside of the casing can be painted or coated in a single procedure.

A further object of the invention is to provide such a process which is relatively easy to use even in remote areas such as many oil fields.

It is well known that most liquids brought out of the earth through wells of various sorts have a tendency to corrode the metal pipes, both casing and tubing, which are used in the wells. The use of coated sections of pipe in the drilling or completion of the well does not avoid this trouble, since the joints are exposed to corrosion.

The present invention provides an arrangement by which the pipes in a well can be cleaned and thereafter coated while installed in the well, so that the joints are covered and are not exposed to the corrosive influence of the liquids in the well.

The invention has the further advantage that it can be operated with a relatively low pressure considering the depth of the well, this pressure being considerably lower than that of the head of liquid in the well.

Further objects and advantages of the invention will appear more fully from the following description, particularly when taken in conjunction with the accompanying drawings which form a part thereof.

In the drawings:

Fig. 1 is a diagram showing one arrangement for painting the inside of a well casing;

Fig. 2 shows a system utilized in painting the inside of the tubing of a well; and

Fig. 3 shows a similar arrangement utilized in painting both the interior of the casing and the exterior and interior of the tubing.

It has been found that a satisfactory and uniform coating can be produced on the inside of a vertically arranged tube, such as a well tubing or casing, by filling the tube with a coating material, introducing a smaller pipe into the tube at a point near the bottom of the section to be coated, and displacing downwardly by gas pressure, such as air pressure, the coating material in the tube, pushing it up through the smaller tube and removing it therefrom. Also, because of the much smaller cross-section of the

2

inner tube, a comparatively low pressure is required for carrying out this operation.

It has also been found that a well tube can be adequately cleaned before it is coated by a similar treatment with a suitable liquid cleaning material.

In the system shown in Fig. 1, for coating the interior of a well casing 2, a member 4 is secured at the top end of the casing by a suitable collar 6. The part 4 has lateral pipes or connections 8 and 10, and an opening in the top in which a pipe 12 of considerably smaller cross-section than the interior of the casing 2 can be secured by a wedge block 14 or in any other suitable fashion.

In operation, a plug 16 is first set in known fashion near the bottom of the casing 2. Pipe 8 is connected through pump 18 to a container 20, which may contain a cleaning solution, while pipe 10 is connected through a valve 22 to an air compressor 24 or other suitable source of compressed gas.

In using this arrangement, the pump 18 first pumps cleaning solution from the tank 20 into the well until it is substantially full. This solution will fill both the inside of the pipe 12 and the space around it within the casing 2 above the plug 16. When the cleaning material has been allowed to stand in the well for a sufficient time to ensure proper removal of deposits, valve 26 is opened and pump 18 is shut off; and compressor 24 is started and valve 22 opened. The air pressure in the top of the casing 2 will then push the liquid cleaning material within the casing down and up through pipe 12 back to container 20.

When the material is all displaced downwardly in the well, the pipe 12 will still be full of cleaning material. However, the gas entering the bottom of pipe 12, while bubbling up through the liquid in it to some extent, will in part raise this liquid and in part entrain it so as to carry it over into the container 20. Of course a separator such as 28 may be provided in the line to the container 20 so as to allow the escape of the air and separation thereof.

This procedure will leave the interior of the casing in a clean condition.

Another container holding coating material is now substituted for container 20. Valve 22 is closed, and pump 18 will pump the coating material into the well until it fills the casing above the plug.

Pump 18 is now shut off, valves 22 and 26 are opened and compressor 24 is started. The pressure on top of the coating material will again force it down within the casing, and will leave a smooth substantially uniform film of coating material on the inside of the casing. When the coating material reaches the bottom, it is entrained or otherwise driven up through the pipe 12 in the same manner as the cleaning material.

When all the coating material has been removed from the casing and the pipe 12, a substance may be added to the air which will coat with the coating material to cause it to set up quickly. The use of such a substance in coating the interior of pipe lines has been described in my application for Method of Coating the Interior of Pipe Lines Serial No. 332,739, filed January 22, 1953.

The pipe 12 and the member 4 are now removed, and the plug 16 taken out of the well, leaving a coating on the interior of the casing 2 which will resist corrosion and reduce the friction of the fluids.

Figs. 2 and 3 show the coating of a well by the use of an apparatus of the type shown in my application for Apparatus for Cleaning and Coating the Interior of Wells and the Like, Serial No. 335,858, filed February 9, 1953.

In the arrangement shown in Fig. 2, only the interior of the well tubing is coated, the casing 2 being unaffected. A plug 30 is set at the bottom of the tubing 32, and the

3

apparatus referred to above, indicated at 34, is secured on the top end of the tubing. This arrangement is a casing which forms expansion chambers 36 and 38. The tubing 32 opens into the expansion chamber 36, while a pipe 40 of substantially smaller cross-section than the tubing 32 is inserted into the well to a point near the plug, and opens at its upper end into the chamber 38. A screen 42 is arranged on the bottom end of the pipe 40.

Chamber 36 is connected through pump 44 to a suitable container 46 and through a valve 48 to an air compressor or other source of compressed gas 50. An opening in the top of chamber 38 is also connected through valve 52 to container 46.

This arrangement operates in general in the same manner as that of Fig. 1. A container 46 holding cleaning material is used first, this material being pumped by pump 44 into chamber 36 from which it flows to the interior of tubing 32 and fills that tubing as well as the pipe 40. Pump 44 is then stopped, valves 48 and 52 are opened and compressor 50 started to displace the cleaning material through the tubing 32 up through pipe 40 into chamber 38. Some of this material will be driven on through valve 52 to chamber 36 and any which remains in chamber 38 can be removed through valved outlet 54.

When the interior of the tubing is clean, and the cleaning material removed, a container 46 of coating material is connected to valve 52 and pump 44 and the same procedure repeated.

Fig. 3 shows a system in which both the inside of the casing 2 and the outside and inside of the tubing 32 are coated simultaneously. In this case, member 34' contains a lower expansion chamber 36' which is connected through valve 48 to compressor 50 and through pump 44 to container 46. The upper chamber 38' opens into the top of the tubing 32, which is secured therein by a suitable holding member 56. Directly above this opening is a valved pipe 50 leading to container 46.

A screen 42' is arranged at the bottom of the pipe 32, while a plug 16 is provided in the casing 2.

In this arrangement, it is necessary to remove the tubing 32 from the casing, insert the plug 16 and then restore the tubing 32. The part 34' is then secured on top of the casing 2, and the arrangement operates in the same manner as that shown in Fig. 2.

When the coating is completed, the tubing 32 must again be removed, plug 16 taken out and the tubing 32 reinserted in the well.

While I have described herein some embodiments of my invention, I wish it to be understood that I do not intend to limit myself thereby except within the scope of the claims hereto or hereinafter appended.

I claim:

1. Method of coating the inside of a substantially vertical pipe containing another pipe of smaller cross-section therein which comprises blocking off the larger pipe shortly below the lower end of the smaller pipe, filling the interior of both pipes with liquid coating material, and introducing gas into the upper end of the larger pipe under sufficient pressure to force the coating material upward through the smaller pipe until substantially all the coating material is removed from the larger pipe.

2. A method as claimed in claim 1 in which said gas is air.

3. Method of coating the inside of a substantially vertical pipe containing another pipe of smaller cross-section therein which comprises blocking off the larger pipe shortly below the lower end of the smaller pipe, filling the interior of both pipes with liquid coating material, introducing gas into the upper end of the larger pipe under sufficient pressure to force the coating material upward

4

through the smaller pipe until substantially all the coating material is removed from the larger pipe, and thereafter removing the coating material from the smaller pipe.

4. Method of coating the inside of a substantially vertical pipe containing another pipe of smaller cross-section therein which comprises blocking off the larger pipe shortly below the lower end of the smaller pipe, filling the interior of both pipes with liquid coating material, introducing gas into the upper end of the larger pipe under sufficient pressure to force the coating material upward through the smaller pipe until substantially all the coating material is removed from the larger pipe, and continuing so to introduce gas under sufficient pressure to pass up through and at least partially to entrain the coating material in the smaller pipe until the material is substantially entirely removed therefrom.

5. Method of coating the inside of a well tubing which comprises inserting a plug in the tubing remote from the top thereof, introducing into the tubing a pipe of substantially smaller cross-section to a point adjacent such plug, filling the tubing and pipe with liquid coating material, introducing gas into the upper end of the tubing under sufficient pressure to force the coating material upward through the smaller pipe until substantially all the coating material is removed from the tubing, and thereafter removing the coating material from the smaller pipe.

6. Method of coating the inside of a well tubing which comprises inserting a plug in the tubing remote from the top thereof, introducing into the tubing a pipe of substantially smaller cross-section to a point adjacent such plug, introducing cleaning material into the top of the tubing until the tubing and pipe are substantially full, introducing air into the top of the tubing under sufficient pressure to force the cleaning material upwardly through the smaller pipe, thereafter removing the cleaning material from the smaller pipe, then introducing a liquid coating material into the top of the tubing until the tubing and pipe are substantially full, and then introducing gas into the upper end of the tubing under sufficient pressure to force the coating material upward through the smaller pipe until substantially all the coating material is removed from the tubing, and thereafter removing the coating material from the smaller pipe.

7. A method of coating simultaneously the inside and outside of a tubing and the inside of a casing of a well which comprises inserting a plug in the casing a short distance below the lower end of the tubing, filling the interior of the tubing and casing with liquid coating material, introducing gas into the upper end of the casing under sufficient pressure to force the coating material upward through the tubing until substantially all the coating material is removed from the casing, and continuing so to introduce gas under sufficient pressure to pass up through and at least partially to entrain the coating material in the tubing until the material is substantially entirely removed therefrom.

8. A method as claimed in claim 7 in which said gas is air.

#### References Cited in the file of this patent

#### UNITED STATES PATENTS

|           |                       |               |
|-----------|-----------------------|---------------|
| 1,700,995 | Burns et al. _____    | Feb. 5, 1929  |
| 2,133,015 | Boylan et al. _____   | Oct. 11, 1938 |
| 2,260,282 | Grint _____           | Oct. 28, 1941 |
| 2,510,771 | Bond et al. _____     | June 6, 1950  |
| 2,654,436 | Carlisle et al. _____ | Oct. 6, 1953  |