

1,342,927..

2 SHEETS—SHEET 1.



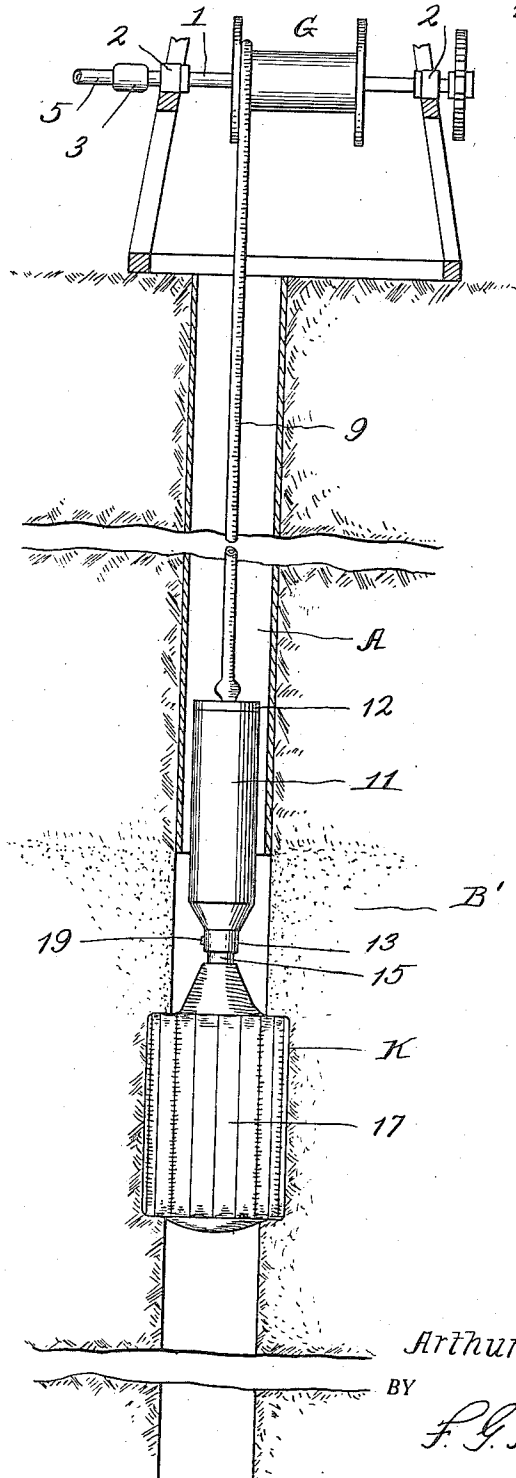
A. T. RUTHVEN.
WELL PLUGGING APPARATUS.
APPLICATION FILED DEC. 7, 1918.

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Patented June 8, 1920.

2 SHEETS—SHEET 2.

FIG. 4.



WITNESS:

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WELL-PLUGGING APPARATUS.

1,342,927.

Specification of Letters Patent.

Patented June 8, 1920.

Application filed December 7, 1918. Serial No. 265,766.

To all whom it may concern:

Be it known that I, ARTHUR T. RUTHVEN, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Well-Plugging Apparatus, of which the following is a specification.

In drilling oil wells it sometimes happens that the drill is run through a stratum of rock separating the oil sand from an underlying sheet of water which latter then floods the former and renders the well useless unless the aperture through the rock can be sealed. On other occasions the drill is run below a paying oil sand in the hope that a better producing sand will be found at a lower level, but when expectations are not realized it is desirable to plug the well at the bottom of the layer of paying sand to prevent the oil running down to the bottom of the well.

By the use of my apparatus the aperture in the rock can be quickly and effectually plugged, or a false bottom may be formed in the well at the bottom of the paying sand and thus prevent wastage of oil and oftentimes total abandonment of a well.

In order that the invention may be fully understood, reference will now be made to the accompanying drawings, in which:

Figure 1 is a broken, vertical, sectional view of a well with my apparatus in operative relation thereto, and in position to plug an orifice in a layer of rock in the well.

Fig. 2 is a vertical sectional view of the apparatus.

Fig. 3 is a cross sectional view of a sack or flexible container, on line III—III of Fig. 2.

Fig. 4 is a vertical sectional view of a well with the apparatus in position to form a false bottom in said well.

Referring now in detail to the various parts, A designates an oil well extending through a stratum of oil sand B and communicating with a sheet of water C through an orifice D in a layer of rock E, which was pierced during the drilling operation.

F, designates a derrick of ordinary or preferred form mounting a windlass G embodying a shaft 1 journaled in bearings 2 and united by a swivel or other coupling 3 to a pipe 5, which leads to a pump or a tank (not shown) containing compressed air or other fluid under pressure.

The shaft 1 is hollow from the coupling 3 to a short section of pipe 7 extending radially through the drum of the windlass and curved at its outer end in order that it may be readily connected to the upper end of a tubular cable 9, which is of such construction that it will not collapse or flatten out and cut off the flow of fluid there-through when wound upon the windlass G.

The lower end of the cable 9 is connected to the upper end of a container 11, consisting, preferably, of sheet metal and provided at its reduced lower end with a coupling member 13, for engagement with a coupling member 15 at the upper end of a flexible container or sack 17.

The coupling member 13 fits loosely over the coupling member 15, which has a laterally projecting pin 19 for entrance into a bayonet slot 20, in said coupling member 13. The foregoing connection reliably secures the flexible container 17 to the container 11, and permits the latter to be uncoupled from the former while in position in a well, as will hereinafter appear.

The flexible container 17 may be of suitable material such as rubber, canvas, leather, etc., and has longitudinal folds 22, so that it may expand radially for the purpose of plugging the well. The flexible container 17 is prevented from expanding or stretching longitudinally, by one or more cables 24 secured at their lower ends to the lower end of the flexible container 17 and secured at their upper ends to the coupling member 15.

26 designates a valve which is normally held to its seat in the coupling member 15 by a coil spring 28, to retain the fluid under pressure in the flexible container 17.

In practice, should the drill pierce the layer of rock E, as disclosed on Fig. 1, and thus permit the underlying water to flow upwardly through the orifice D and flood the oil sand B, said orifice D is plugged as follows: A small amount of cementitious or other sealing material H is placed in the flexible container 17 to weight down its lower end, so that it may readily pass down into the well. The container 11 is then supplied with cementitious material I in sufficient amount to nearly fill the flexible container 17. The two containers are then coupled together and let down into the well through the intermediacy of the tubular cable 9, until the flexible container 17, is ap-

proximately, half way through the orifice D, which may be readily determined by the log of the driller. Fluid under pressure is then admitted through the cable 9 to the container 11 to blow the cementitious material from the latter through the coupling members 13 and 15, past the valve 26 and into the flexible container 17, which is expanded to the dotted line position, by the cementitious material and the pressure exerted thereon. The fluid through the cable 9 is then shut off, whereupon the valve 26 immediately closes and retains the pressure within the flexible container 17. The cable 9 is then grasped at the top of the well and rotated until the container 11 is turned sufficiently to disengage its slotted portion 20 from the pin 19, whereupon said container 11 is hoisted from the well. As the flexible container 17 is left in the orifice D the latter is permanently sealed by said container 11 and the cement therein, which sets and becomes hard. Thus the flow of water into the oil bearing sand B through the orifice D is effectually cut off.

In case the drill is run below a stratum of oil producing sand, such as B', Fig. 4, with the expectation of locating a better paying stratum at a lower level and such expectation is not realized, it becomes desirable to form a false bottom in the well at the bottom of the oil bearing sand B' in order that the oil may be economically recovered. This is accomplished by enlarging the diameter of the well as at K, with an underreamer or other suitable tool. The two containers with the sealing material are then lowered into the well as before-described until the flexible container 17 is at the enlarged portion K of the well. The flexible container 17 is then expanded by the material from the container 11 and the fluid introduced through the cable 9, until said container 17 fits tightly within the enlarged portion K of the well. The container 11 is then uncoupled from the flexible container 17 which is permitted to remain in the well and on becoming hard forms a substantial false bottom which prevents the oil from flowing to the lower end of the well.

The cement or other material put in the container 11 may be previously mixed with water or it may be placed in said container in a dry state, in which event water instead of air is introduced through the cable 9 to mix with the cement and force it from the container 11 into the flexible container 17.

In some instances it may be desirable to dispense with the container 11 and connect the cable 9 directly to the flexible container 17, in which case cement may be introduced in a dry state into said container 17 through the cable 9 followed by water to be mixed with the cement, or mortar in a semiliquid state may be used but care must then be

exercised to clean out the cable 9 before such mortar hardens therein.

From the foregoing description, it is apparent that I have produced simple and efficient means whereby a well may be effectually plugged at any desired point, and while I have shown and described the preferred form of apparatus for accomplishing results above described, I retain the right to make such changes in the construction, combination and arrangement of parts as properly fall within the spirit and scope of the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

1. In an apparatus of the character described, a flexible container adapted to hold a sealing material for plugging a well, and means for introducing a fluid into said flexible container to force the same firmly into engagement with the wall of the well.

2. In an apparatus of the character described, a flexible container adapted to hold a cementitious material for plugging a well, and means for lowering said flexible container and introducing fluid therein to force the same firmly against the wall of the well.

3. In an apparatus of the character described, a sack adapted to hold a cementitious material for plugging a well, and a tubular cable for lowering said flexible container and introducing fluid therein to force the same firmly against the wall of the well.

4. In an apparatus of the character described, a flexible container adapted to hold a sealing material for plugging a well, means for introducing a fluid under pressure into said flexible container to force the same firmly into engagement with the wall of the well, and means to prevent the fluid escaping from the flexible container.

5. In an apparatus of the character described, a flexible container adapted to hold a cementitious material for plugging a well, a tubular cable for introducing a fluid under pressure into said flexible container to force the same firmly into engagement with the wall of the well, and means to prevent the fluid escaping from the flexible container.

6. In an apparatus of the character described, a flexible container adapted to hold a cementitious material for plugging a well, a tubular cable for introducing a fluid under pressure into said flexible container to force the same firmly into engagement with the wall of the well, and a valve to prevent the fluid escaping from the flexible container.

7. In an apparatus of the character described, a flexible container adapted to hold a sealing material for plugging a well, means for introducing a fluid into said flexible container to force the same firmly into engagement with the wall of the well, and means within the flexible container to pre-

vent the same from stretching vertically when the fluid is introduced therein.

8. In an apparatus of the character described, a flexible container adapted to hold
5 a sealing material for plugging a well, means for introducing a fluid under pressure into said flexible container to force the same firmly into engagement with the wall of the well, means to prevent the fluid escap-
10 ing from the flexible container, and a cable to reinforce the flexible container and prevent the same from expanding longitudinally.

9. In an apparatus of the character described, a flexible container adapted to hold
15 a sealing material for plugging a well, and a second container secured to the first container to supply the same with sealing material.

10. In an apparatus of the character described, a flexible container adapted to hold
20 a cementitious material for sealing a well, a second container secured to the first container to supply the same with sealing material, and means for introducing fluid under
25 pressure into said second container to force the material therein into the flexible container for the purpose described.

11. In an apparatus of the character described, a sack adapted to hold a cementitious material for sealing a well, a container
30 secured to said sack to supply the same with cementitious material, and a self closing valve to admit the material from said container into the sack.
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12. In an apparatus of the character described, a flexible container adapted to hold a sealing material for plugging a well, a metal container for holding a supply of
40 sealing material for said flexible container, coupling members for detachably connecting the two containers, and means for lowering the containers and introducing fluid under pressure into the metal container, substantially as described.
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13. In an apparatus of the character described, a flexible container adapted to hold material for sealing a well, and means for
50 lowering said container into the well and supplying it with sealing material.

14. In an apparatus of the character described, a flexible container adapted to hold material for sealing a well, means for lowering
55 said container into the well and supplying it with sealing material, and means to prevent the material escaping from the container.

15. In an apparatus of the character described, a flexible container adapted to hold material for sealing a well, means for lower-
60 ing said container into the well and supplying it with sealing material, and means to prevent the container from stretching longitudinally.

In testimony whereof I affix my signature
65 in the presence of two witnesses.

ARTHUR T. RUTHVEN.

Witnesses:

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L. J. FISCHER.