April 18, 1950 T. SPRAGUE ET AL 2,504,462

APPARATUS FOR SEALING OIL WELLS

Filed March 24, 1948 3 Sheets-Sheet 1

Fig. 1

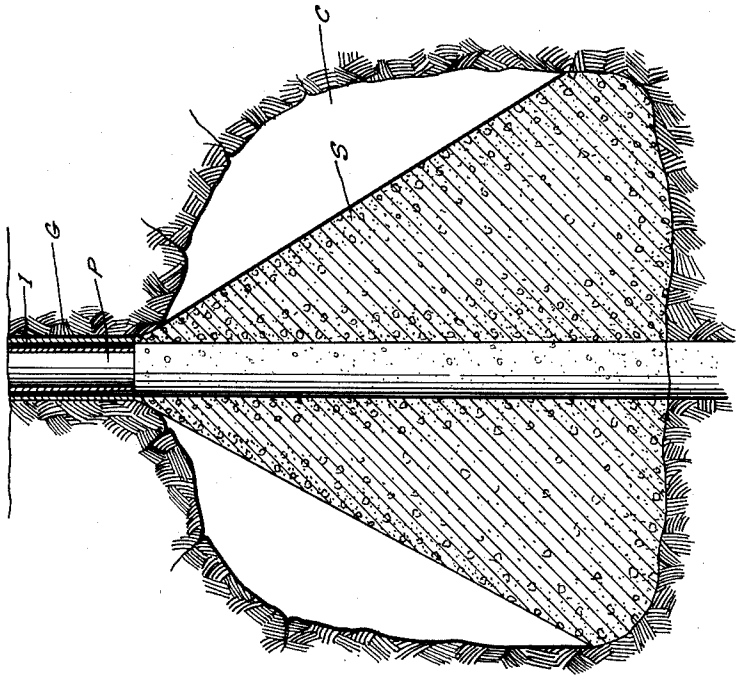
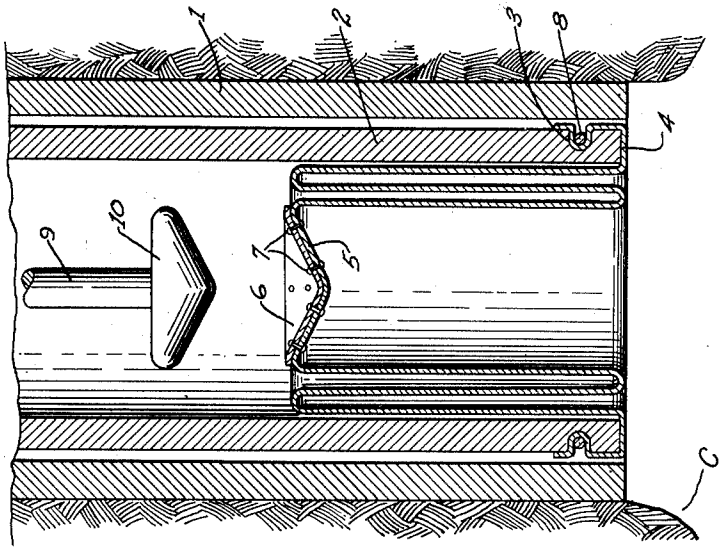


Fig. 2



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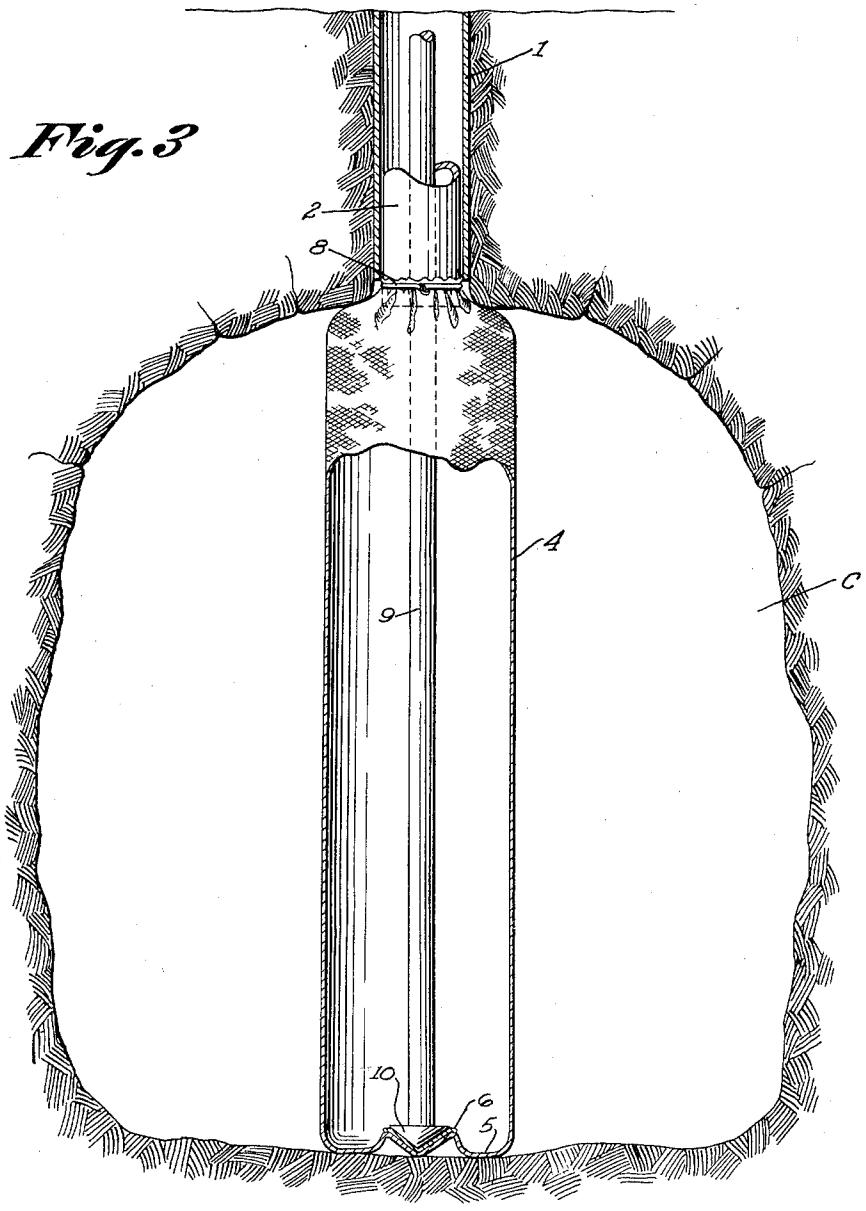
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April 18, 1950 T. SPRAGUE ET AL 2,504,462

APPARATUS FOR SEALING OIL WELLS

Filed March 24, 1948 3 Sheets-Sheet 2

Fig. 3



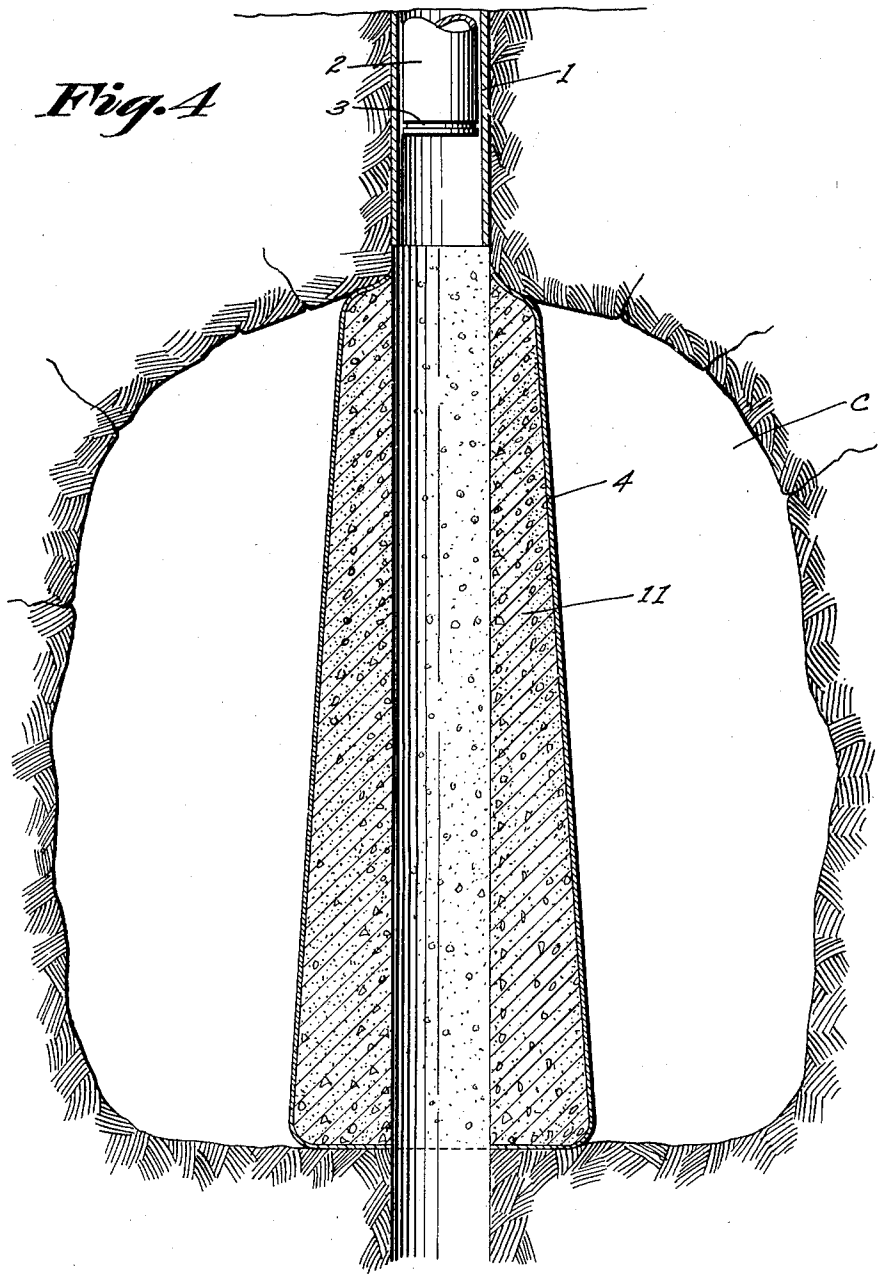
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APPARATUS FOR SEALING OIL WELLS

Filed March 24, 1948 3 Sheets-Sheet 3

Fig. 4



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APPARATUS FOR SEALING OIL WELLS

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3 Claims. (Cl. 166—13)

1

Sometimes in drilling a well the bit suddenly falls freely for a certain distance, which may be a few or a great many feet. This indicates that the drill has penetrated a subterranean cavern. It is desired to continue the well beyond the bottom of the cavern and as water streams are generally flowing in such caverns it becomes essential to seal off the cavern.

Heretofore, the seal has been made by pouring concrete through the well hole into the cavern. The concrete eventually forms a cone extending from the top to the bottom of the cavern. The well is then drilled through the concrete after it has set.

In the case of a tall cavern, a prodigious amount of concrete is required in order to effect the sealing, involving considerable expense.

An object of the present invention is to provide an improved and simplified method for sealing such subterranean caverns, greatly reducing the amount of concrete required, shortening the period required for the work, and providing an entirely adequate seal.

A further object of the invention is to provide simple apparatus, effective for carrying into operation the improved method.

The invention consists in the novel construction, arrangement, combinations of parts and method as hereinafter more fully described and claimed.

Three sheets of drawings, largely diagrammatic, accompany this application as part thereof, in which like reference characters indicate like parts throughout.

Referring to the drawings:

Figure 1 is a vertical cross section through a subterranean cavern illustrating the conventional method heretofore employed for sealing a subterranean cavern;

Figure 2 is a vertical cross section through the bottom portion of a well casing adjacent the top of a subterranean cavern, and showing the apparatus of the present invention in position for the sealing operation;

Figure 3 is a vertical cross section through a subterranean cavern showing the flexible sack as used in the present invention extending from floor to ceiling of the cavern with the extending tool in position; and

Figure 4 is a vertical cross section through a subterranean cavern showing the flexible sack filled with cement and the well drilled therethrough and beyond the floor thereof.

The method of the present invention comprises sending down into the casing after a cavern has

2

been encountered, a pipe through which concrete will eventually be poured, the lower part of the pipe having attached thereto and enclosed therein a heavy bag or sack of canvas or other flexible and expansible material of generally cylindrical or frustro-conical form, and preferably having a flat bottom. When the pipe has been lowered to the level of the top of the cavern a string of rod is thrust down having a plunger on the lower end thereof to engage the bottom of the bag and push it out of the lower pipe, the top of the bag remaining attached to the lower end of the pipe. The length of the bag is predetermined according to the height of the cavern and which can be ascertained in the usual manner. When the bag has been extended by the plunger rod until its bottom is seated on the floor of the cavern, concrete is poured through the pipe filling the bag, distending it and causing it to rest firmly on the floor of the cavern surrounding the spot where the subsequent drilling will take place. Sometimes the weight of the concrete itself is relied upon to push the bag out of the pipe and the weight of the concrete is sufficient in all cases to fully distend the bag or sack to a diameter substantially larger than the well hole proper, so that the sack and its included concrete constitutes a vertical pillar extending from the floor to the ceiling of the cavern in alignment with the long axis of the well. After the concrete has set the drilling is resumed and the well extended through the center of the concrete column and continued below the cavern as far as desired. As is customary, the casing progressively follows the drill tool down through the cavern and through the lower portion of the well hole to the desired depth.

Since the concrete does not have to stand any outwardly directed pressure on account of the presence of the casing, it need not be a conventional concrete mixture, but can be a lightened or softer concrete or a poor mixture of ordinary concrete.

Referring to the drawing the conventional mode of sealing a well heretofore employed is illustrated in Figure 1, wherein the well casing 1 is extended to the ceiling of the cavern and thereafter a smaller pipe P is inserted, through which the concrete is poured to constitute a seal S which depends on its size and shape either on the interior dimensions of the cavern, or in the case of large caverns, upon the angle of repose of the concrete.

In Figure 2 is illustrated the lower end of the concrete inserting pipe 2 which has been lowered

through the casing 1 to the upper end of the cavern C.

In the embodiment of the invention illustrated herein, the pipe 2 is formed with an annular groove 3 adjacent its lower end and into this annular groove the mouth portion of the sack or bag 5 is contracted and secured by a cord or wire 8.

Preferably, a reinforcement cap 6 is secured to the inner surface of the bottom of the sack as by means of rivets 7 to receive the thrust of a plunger 10 secured on the end of a string of rods 9.

Preliminary to lowering the pipe 2 into the well casing, the sack 4 is folded back in upon itself within the lower end of the pipe 2, as is well illustrated in Figure 2, although no particular arrangement of the sack is required, and it can be tucked back into the bore of the pipe 2 in any manner desired, but preferably with the bottom of the sack inwardly disposed, as illustrated.

When the lower end of the pipe 2 with its enclosed sack reaches the point adjacent the ceiling of the cavern C, the plunger rod is forced down, thereby expelling the sack from the tube and extending the same downwardly, as illustrated in Figure 3, until the bottom 5 thereof is in contact with the floor of the cavern, whereupon the plunger and pusher rod are withdrawn and concrete is poured through the pipe 2, thereby fully extending the flexible and expansible sack 4 into a column of substantially greater diameter than the bore of the well and extending from floor to ceiling of the cavern.

Thereafter the concrete 11 within the sack is permitted to set and the drilling of the well is continued, extending through the column and below the floor of the cavern to the desired depth.

The tube 2 is withdrawn prior to the resumption of the drilling operation of course, and in so doing ruptures the top of the sack or breaks the tie cord 8 and the sack remains in position on the column.

Having thus fully described the invention, we claim:

1. Apparatus for placing a concrete pillar in a subterranean cavern in connection with well digging comprising, a pipe of a diameter slightly smaller than the bore of the well casing extending to the top of the cavern, a sack having an extended diameter greater than the outer diameter of the well casing and a length slightly greater than the height of the cavern, said sack secured by its mouth portion to the lower end of the pipe and folded back upon itself within the lower portion of the bore of the pipe.

2. Device of claim 1 in which the sack is formed of expansible fabric material and has a reinforced bottom to resist the thrust of an expelling tube.

3. Device of claim 1 in which the pipe is formed at its lower end with an annular groove in its outer face and the mouth portion of the sack is contracted and secured in said groove by a flexible tie member.

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