

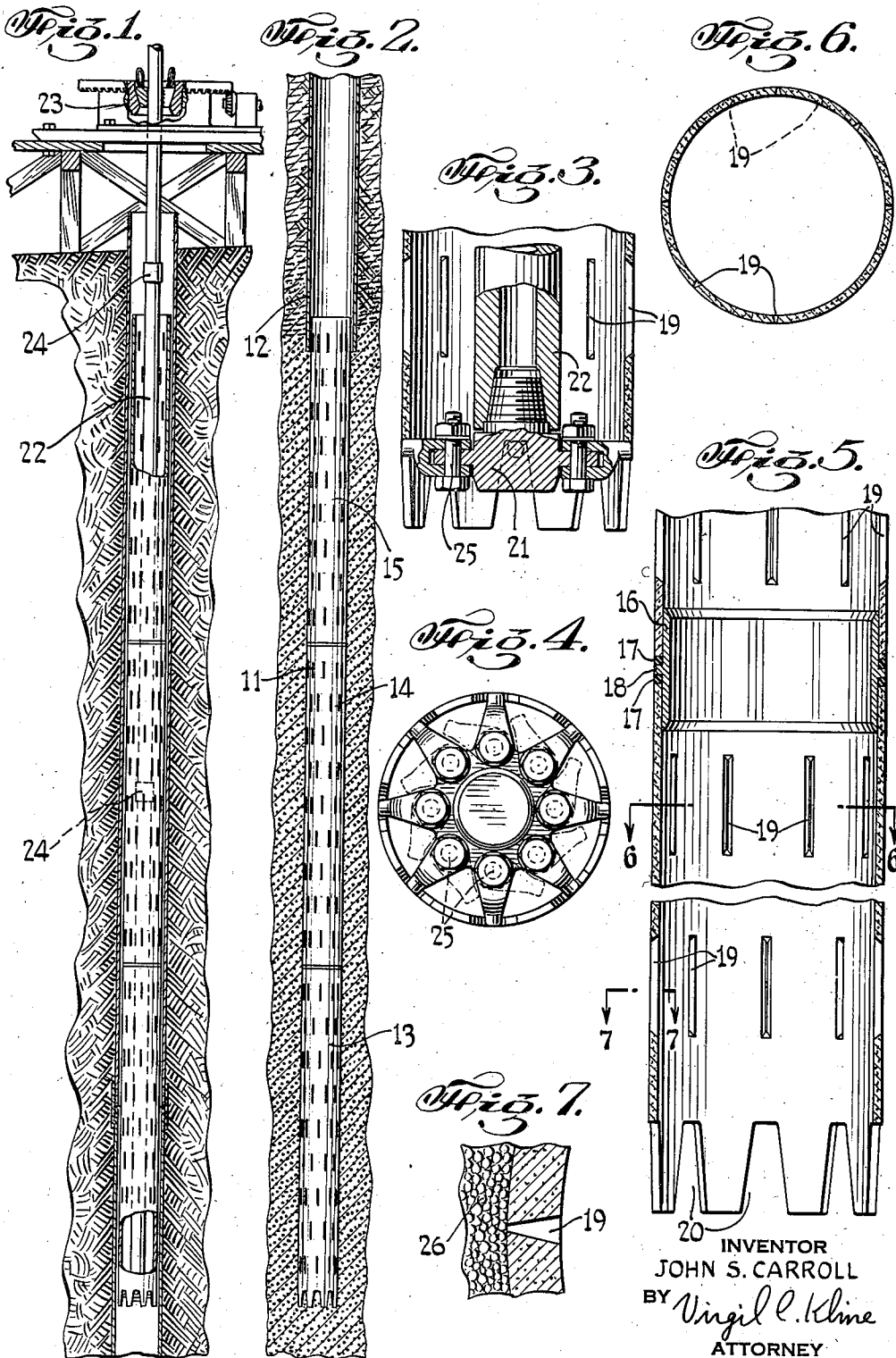
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LINER FOR WELLS

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LINER FOR WELLS

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This invention relates to a liner for a portion of a drilled deep hole, such as an oil well, gas well, or the like.

The invention is particularly useful in connection with oil well drilling operations and will be illustrated by description with reference thereto. It is to be understood, however, that the invention may be used in connection with the temporary lining of other deep and narrow drilled holes that may require subsequent deepening.

In drilling for oil, it is frequently desirable to test a given stratum or level for rate of flow of oil therefrom. In such a case, there is lowered into the well an assembly of metal casings of usual type but perforated at close intervals and of outside diameter just slightly less than the inside diameter of the hole. With this assembly constituting a temporary liner in position at the bottom of the well, the flow of oil is gauged, the liner meanwhile holding back the material of the wall of the hole.

When the test of flow is completed, the liner is withdrawn, so that drilling operations may be resumed, if it is desired to extend the hole to a lower level. However, there is sometimes much difficulty in withdrawing the liner.

The present invention comprises a liner and liner assembly that are crushable, so that, when the test at a given level is completed, the drilling may be resumed without attempting to remove the liner.

A preferred embodiment of the invention is illustrated in the attached drawing and the invention will be described for the purpose of exemplification, in connection therewith.

Fig. 1 shows an elevational view, partly in section and partly diagrammatic, of the upper part of a shaft or hole through which the liner assembly is being lowered.

Fig. 2 shows a sectional view of the lower part of the hole with the temporary liner in place, after removal of the means used in lowering the liner.

Fig. 3 shows a more detailed view, in section, of the means for holding the liner assembly at the lower end thereof, during the lowering operation.

Fig. 4 shows a bottom plan view of the said means.

Fig. 5 shows a sectional view of the meeting portions of two adjacent sections of pipe and the connecting means and gasket therebetween.

Fig. 6 shows a cross sectional view on line 6—6 of Fig. 5.

Fig. 7 shows a sectional view, on a larger scale, of a slot in the wall of the crushable pipe and

material of the wall of the well restrained thereby.

The oil well liner 11, in place (see Fig. 2), rests at its lower end on the bottom of the well and extends upwardly therefrom to a position above that of the strata or level to be tested and, preferably, overlaps the conventional metal casing 12. In this manner, caving in of the well during testing is prevented.

The liner is advantageously constructed of a plurality of sections 13, 14, and 15, numbering sometimes a dozen or more, which are arranged endwise, one above the other, the joints therebetween being closed by the connectors 16 and gaskets 17.

The connectors and the gaskets, like the sections of pipe themselves, are crushable and adapted to be broken into bits by an oil well drill or the like.

Thus, the sections of pipe are preferably constituted of a shaped, highly compressed and densified, and then hardened fibre-reinforced cementitious composition. Thus, there may be used pipes constructed of asbestos and Portland cement and of the type now much used in water lines. Where the high strength of such asbestos pipes is not necessary, there may be used pipes of asbestos-reinforced gypsum, again in highly compressed, densified, and hardened condition. For some purposes, also, there may be used carbon pipes.

The connectors are suitably constructed of a brittle weak cast iron, a brittle and weak brass, or other alloy of the general properties stated. These connectors include suitably a ring element extending inside and above and below the joint between two sections of pipe and a web element 18 extending outwardly from the said ring element and between the ends of the said sections.

The gaskets may be constituted of a cheesy but at least moderately resiliently compressible rubber composition or the like. Thus, there may be used a rubber and/or "neoprene" composition including a very large proportion of solid fillers to impart cheesiness.

The connectors 16 serve to keep the adjacent sections of pipe in alignment and, with the gaskets, to minimize chipping of ends of adjacent sections of pipe.

The sections of pipe in the liner are provided with openings 19 permitting the passage of fluid therethrough. Preferably, these openings are narrow slots which are staggered with respect to each other, as illustrated.

The width of these narrow apertures is suffi-

ciently large, on the one hand, to permit the flow of the oil therethrough and, on the other hand, sufficiently small to restrain passage therethrough of sand 26 or other solids from the wall of the hole.

These openings are suitably tapered in cross section, the narrow portion being exposed on the outer surface of the liner and the openings becoming wider towards the inside of the liner.

The width of the openings at the narrowest portion thereof should be selected in accordance with the size of the grains of sand or fineness of other material of the wall of the hole, this relation being about as illustrated in Fig. 7, so that the sand or the like cannot pass through the openings. Typical openings may be about 4 inches long, about one-sixteenth inch wide at the narrowest portion, and about three times as wide at the inside wall of the liner.

The lowest section of the pipe is suitably provided with cut-outs 20, so that the pipe seats itself in non-rotatable manner on the bottom of the hole.

In lowering the crushable pipe into the hole, there is employed to advantage the means illustrated in part in Figs. 1, 3, and 4.

These means include the element 21 which engages the lower end of the pipe that is to constitute the liner and from which there extends the elongated member, as, for instance, the drill pipe 22, which extends, at all times, to the top of the hole at least and suitably to a cable elevator such as used for raising articles from an oil well. This elevator is conventional and, therefore, not illustrated.

By means of the gripping means 23 and the said elevator, which are alternately engaged and disengaged from the drill pipe, sections of the asbestos-cement pipe may be individually placed around the drill pipe and lowered thereon until they contact with either the bottom support element 21 or the top of a section of the pipe previously placed around the drill pipe. Additional sections of the drill pipe also are supplied as needed, the union between adjacent sections of the drill pipe being illustrated at 24.

As the sections of the liner pipe are introduced one by one, the drill pipe is fed into the hole, meanwhile being supported, at all times, either by the said elevator or means 23 adjacent to the entrance to the hole.

Finally, when all sections of the pipe desired have been placed around the drill pipe, with the connectors and gaskets such as shown in Fig. 5 between adjacent sections, the whole assembly is lowered completely into the well, a sufficient number of sections of drill pipe being added, one by one, to extend from the support means above the well to the bottom of the hole.

When the liner assembly comes to rest on the bottom of the hole, the means 21 are disengaged from the bottom of the liner assembly, as, for instance, by rotation of the drill pipe so as to cause pivoting of the outer parts of the said element upon the bolts 25. The said element and elongated member or drill pipe 24 are then removed from the well, the drill pipe being taken apart in sections as it emerges above the top of the hole. The elongated member may consist in part of an element such as a cable attached to the top of the drill pipe.

The liner introduced into the hole is allowed to remain there during the period in which the flow of fluid (oil or gas, for instance) is being tested.

If, as a result of the test, it is decided to drill to a lower depth, it is not necessary to remove the liner before the drilling is resumed.

When the drilling is resumed, the drill, such as one commonly used in a rotary drilling operation, breaks up the crushable pipe, connections, and gaskets into small pieces. The drill may pass through these broken up parts, although they are preferably removed, as the drilling progresses, in the same manner that is used in removing drillings from the well.

It will be understood that the details given are for the purpose of illustration, not restriction, and that variations within the spirit of the invention are intended to be included in the scope of the appended claims.

What I claim is:

1. A well liner comprising sections of crushable perforated pipe, crushable connectors between the joints of adjacent sections, an end of said liner having projections for engagement with the bottom of a well to hold the liner stationary.

2. A well liner comprising crushable perforated pipe, a lowering means rotatably releasable from said liner, and means on the lower end of said liner constructed to engage said first-mentioned means when lowering said liner into the well and to penetrate the adjacent soil to prevent rotation of said liner during disengagement of said first-mentioned means from said liner.

3. A well liner comprising a plurality of sections of crushable perforated pipe, crushable connectors joining adjacent sections of said pipe, a rotatably releasable connective device, and means on the lower end of the liner constructed to be engaged by said connective device and to penetrate the adjacent soil of said well to prevent rotation of the liner during disengagement of said connective device from said liner.

4. In combination with a well liner lowering mechanism having rotatably releasable liner connecting elements, a well liner comprising a plurality of sections of crushable perforated pipe joined by crushable connectors, and means on the lower end of said liner constructed to be engaged by said elements to facilitate lowering said liner into a well and to penetrate the bottom of said well to prevent rotation of the liner during disengagement of said rotatable releasing element from the liner.

5. A well liner comprising sections of crushable perforated pipe, crushable connectors between the joints of adjacent sections, an end of said liner having a plurality of blunt projections for engagement with the bottom of a well to hold the liner stationary, said projections being formed of frangible material.

6. A device to be used as a temporary testing liner in a previously drilled well, comprising a body portion consisting of a plurality of sections of crushable pipe, said device comprising a portion at one end thereof consisting of a plurality of blunt projections for engagement with the bottom of a well to hold the liner stationary, said projections being formed of frangible material.

7. In a temporary liner for testing a drilled well, a body portion consisting of crushable pipe, said body portion being provided with a plurality of openings, and a portion at one end of said liner provided with a plurality of keys formed so as to engage the bottom of a well to hold the liner stationary, said keys being formed of frangible material.