July 13, 1943. L. L. HARDEMAN 2,323,992

WELL SHAFT

Filed May 7, 1941

Fig. 1.

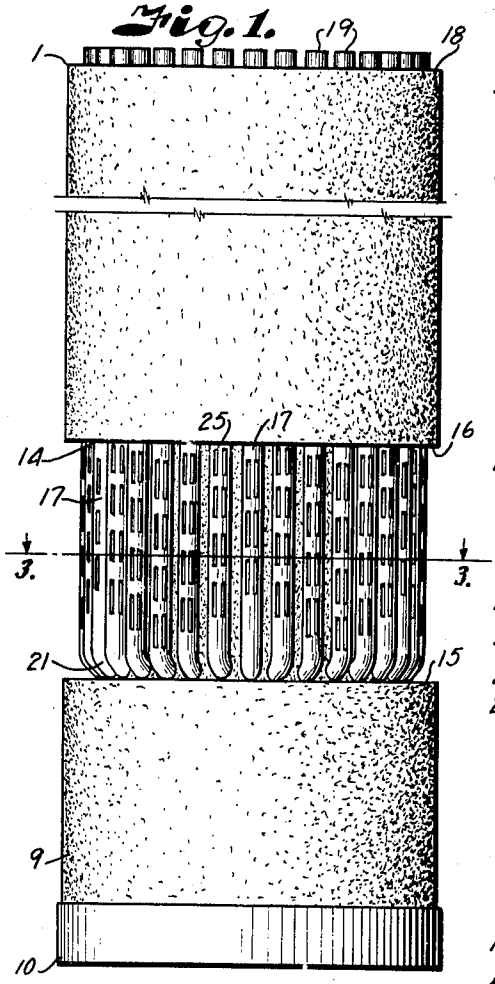


Fig. 2.

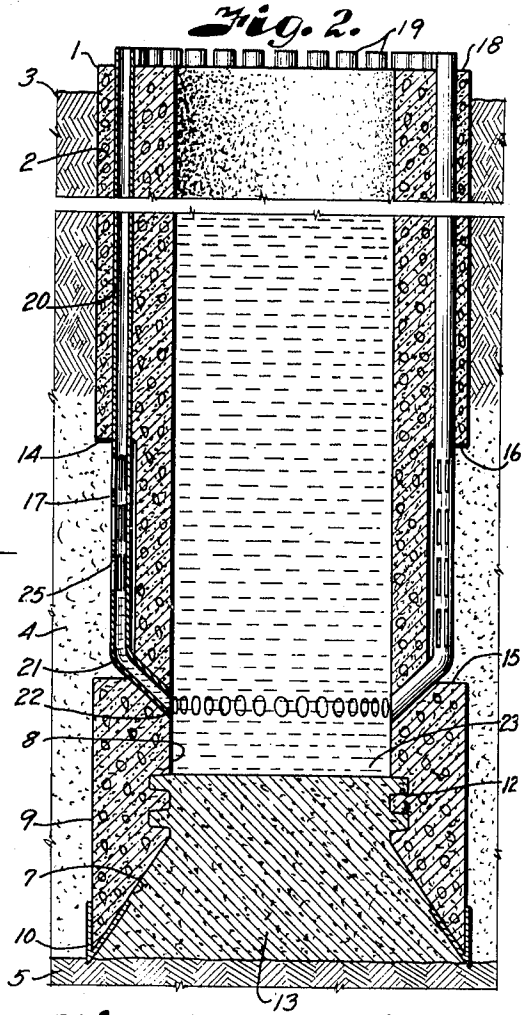


Fig. 3.

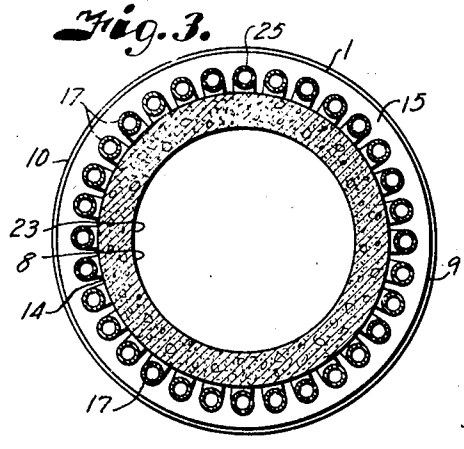


Fig. 4.

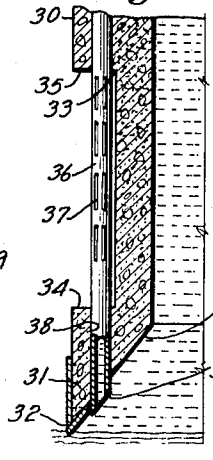
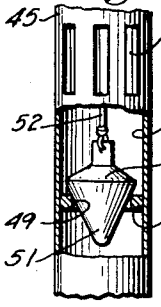


Fig. 5.



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WELL SHAFT

Lyman Lynch Hardeman, Leavenworth, Kans.

Application May 7, 1941, Serial No. 392,220

4 Claims. (Cl. 166—5)

This invention relates to well shafts and more particularly to a well shaft embodying a strainer and/or a screen for passing fluid in subterranean fluid bearing formations, into which the shaft has been sunk, to the interior of the shaft; the principal object of the present invention being to provide a convenient, relatively economical and highly efficient well shaft.

Other objects of the invention are to provide for facilitating cleaning the well shaft, screen or strainer; to protect the well screen or strainer; to so arrange the shaft as to facilitate sinking thereof into a fluid bearing formation; to increase the effective fluid draining area of the shaft; to facilitate anchoring the shaft in the fluid bearing formation; to minimize sanding up or other fouling of the fluid drainage portions of the shaft; and to provide improved elements and arrangements thereof in a well shaft of the character and for the purposes noted.

In accomplishing these and other objects of the present invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawing wherein:

Fig. 1 is a longitudinal elevational view of a well shaft embodying the features of the present invention.

Fig. 2 is a longitudinal vertical sectional view through the well shaft illustrated in Fig. 1.

Fig. 3 is a horizontal transverse sectional view through my improved well shaft substantially on the line 3—3, Fig. 1.

Fig. 4 is a detail longitudinal vertical cross-sectional view through a portion of the lower end of a well shaft embodying my invention, a modified form of strainer pipe being illustrated.

Fig. 5 is a detail fragmentary elevational view of a modified form of strainer pipe illustrating a valve for controlling entrance of fluid into the interior of a well shaft.

Referring more in detail to the drawing:

1 generally designates a well shaft embodying the features of the present invention, which is sunk in a hole 2 in the earth 3 and extended downwardly through a fluid bearing formation 4, the well shaft ultimately being sunk to a suitable supporting structure 5 below the fluid bearing formation 4.

The well shaft is preferably of substantially cylindrical conformation and preferably consists of concrete or a like aggregate. The lower end of the shaft is preferably provided with an outwardly tapering base 7 from the inner surface 8 thereof to the outer surface 9, the lower end of the tapered base and the outer surface of the shaft being provided with a preferably metallic cap 10 to form a cutting edge for the shaft and thus facilitate its being lowered through the earth and fluid bearing formation.

Spaced annular key-ways 12 are also preferably provided for the well shaft on the inner face and adjacent the lower end thereof for receiving and holding an anchor 13 of suitable material that is preferably capable of being poured and adapted for subsequent setting to not only anchor the well shaft but close the lower end thereof and thus prevent sanding or fouling of the interior of the well shaft from materials tending to enter the lower end thereof.

The periphery of the well shaft is preferably set back in spaced relation to the lower end of the shaft, as indicated at 14, to provide spaced annular shoulders 15 and 16, the shoulder 16 being provided at the upper end of said set-back portion 14. The shoulder 16 is preferably of less width than the shoulder 15, the arrangement being such as to reduce skin friction of the shaft above the shoulder 15.

17 designates a series of annularly arranged well screening and/or straining pipes, the upper ends of which preferably extend upwardly above the upper end 18 of the well shaft as indicated at 19 in such a manner as to make them freely accessible. The body portions of such pipes 17 extend through apertures or passages 20 arranged within the body of the shaft and extending downwardly from the shaft below the shoulder 16 and in exterior relation to the shaft at the set-back portion 14 thereof. The lower ends of the shaft screen or strainer pipes 17 are bent inwardly, as at 21, and directed preferably angularly downwardly for termination at their lower open ends 22 adjacent the lower end 23 of the interior of the well shaft.

With the arrangement illustrated, it is apparent that the lower upwardly directed annular shoulder 15 protects the pipes 17 and prevents their being sheared off or otherwise multilated while the well shaft is being sunk through the earth for ultimate placement on the supporting structure 5 on the earth.

In order to pass fluid, such as water, from the fluid bearing stratum 4 into the interior 23 of the well shaft, the pipes 17 are preferably slit in the portions of the several pipes between the shoulders 15 and 16 of the shaft. The slits of the pipes are generally indicated at 25 and each pipe is provided with series of the slits arranged in spaced relation peripherally about the pipes

respectively and preferably staggered vertically. The series of slits 25 are so spaced and arranged that they provide considerable area of drainage of the fluid bearing stratum or formation and thus maintain an effective drainage condition even though some of the slits might become stopped up by sand, gravel or other debris.

Due to the vertical arrangement of pipes above the shoulder 15, and due to the slits or perforations being longitudinal relative to the pipe, it is apparent that suitable tools, brushes or the like may be lowered into the pipes for cleaning out the slits. Further cleaning may be accomplished by the action of a jet of water passed downwardly through the entire length of the pipes to wash the slits free of silt, sand, etc. and to thoroughly clean the same and recondition them for drainage purposes.

In using a well shaft constructed as described, a hole is sunk in the earth in a suitable manner. Forms are then placed in the well hole, and the shaft is built up in the forms. The hole is then deepened; the shaft sunk further and additional material added to the shaft as it is built up in accordance with the depth of the well hole. The pipes are arranged in the well shaft in suitably coupled sections with the slit portions of the pipes arranged between the shoulders at the ends of the off-set portion of the well shaft. After the well shaft has been sunk a sufficient distance into and through a fluid bearing formation, it is anchored by applying the anchor to the interior lower end of the well shaft, the anchor being locked in place by the key-ways illustrated. Water or other fluid in the formation 4 then seeps into the interior of the well through the pipes by way of the slits thereof and a suitable pump is applied to the interior of the shaft for withdrawing the fluid from the shaft for suitable purposes and for transfer to suitable points of use of the fluid.

In some instances it may be desired to extend the drainage pipes directly through the well shaft and the base thereof, without bending the pipes. Such an arrangement is illustrated in the modified form of invention illustrated in Fig. 4 wherein 30 designates a concrete or other suitable well shaft having a tapered base end 31 provided with a cutting edge cap 32 at its lower tapered end. The shaft is provided with a setback 33 defined by a lower annular shoulder 34 and an upper annular shoulder 35, the shoulder 34 preferably being wider than the shoulder 35 to reduce skin friction of the shaft above the shoulder 34 as it is being sunk into the earth. Vertical pipes 36 are provided which have vertically spaced series of slits 37 substantially similar to the slits in the pipes of the preferred form of invention. In this instance the pipes extend directly downwardly, as indicated at 38, and terminate at their lower ends 39 in the interior 40 of the well shaft.

The use and operation of a well shaft constructed in accordance with this modified form of invention is substantially similar to that described in connection with the preferred form of invention, with the exception that the pipes are easier to clean by suitable tools applied from the upper end of the well shaft due to the fact that such tools do not have to make the turn or bend in the pipes as in the preferred form of invention.

In Fig. 5 a modified form of pipe 45 is illustrated which may, if desired, be substituted for either of the pipes of the forms of invention illustrated in Figures 1 to 3 and/or 4. In this instance similar series of slits 46 are provided to drain fluid from a fluid bearing formation into the interior 47 of the pipes and subsequently pass such fluid to the interior of the well shaft. The interior of the pipes 45 are preferably provided with a ring 48 that may be welded or otherwise secured in position below the slits 46, the ring 48 preferably having a central aperture 49 that forms a valve opening controlled by plug valve 50 of tapered self-centering character, as indicated at 51. The plug valve 50 is provided with a controlling element 52, such as a suitable line or cable, that extends upwardly through the pipes 45 to the surface of the well or earth and may be manipulated to open the pipes for passage of fluid therethrough or to close the pipes to passage of fluid when, for example, the flow is faster than the capacity of the pump normally removing the same or, for example, when it is desired to empty the interior of the shaft and thus clean the well shaft.

It is apparent therefore that I have provided a convenient, relatively economical and highly efficient well shaft embodying a fluid strainer or cleaner admirably suited for the purposes for which designed.

What I claim and desire to secure by Letters Patent is:

1. In a well shaft of the character described, a tubular body member having an exterior annular recessed portion in spaced relation to the lower end of the shaft defined by shoulders, the lower shoulder being wider than the upper shoulder to reduced skin friction of the shaft above said lower shoulder during sinking thereof, and pipes in the shaft opening into the interior of the shaft adjacent the lower ends thereof and having intermediate portions extending across the recessed portion, said intermediate portions of the pipes being provided with openings at the recessed portion of the shaft for providing communication through the pipes from the interior of the shaft to the exterior thereof.

2. In a well shaft of the character described, a tubular body member having an exterior annular recessed portion in spaced relation to the lower end of the shaft defined by shoulders, the lower shoulder being wider than the upper shoulder to reduce skin friction of the shaft above said lower shoulder during sinking thereof, and pipes in the shaft opening into the interior of the shaft adjacent the lower ends thereof and having upper ends opening out of the shaft at the upper end thereof and having intermediate portions extending across the recessed portion and exteriorly of the shaft, said intermediate portions being provided with slots opening to the exterior of the shaft at the recessed portion of the shaft for providing communication through the pipes to the interior of the shaft from the exterior thereof.

3. In a well shaft of the character described, a hollow body member having an annular set-back portion in spaced relation to the lower end of the shaft, and series of spaced pipes mounted in the body member having portions extending through said set-back portion and having openings at the set-back portion for communication from the interior through the pipes to the exterior of the well shaft respectively, said pipes extending directly from the top of said well shaft to the bottom of the set-back portion approximately in the same vertical plane throughout the length thereof.

4. In a well shaft of the character described, a tubular body member having an exterior annular recessed portion in spaced relation to the low-

er end of the shaft, the portion of the body member above the recessed portion being smaller than the portion below to reduce skin friction of the shaft during sinking thereof, passages in the walls of the shaft extending from the upper end thereof to the recessed portion, other passages in the walls of the shaft extending from the lower end of the recessed portion to the interior of said shaft, and pipes extending across the recessed portion for connecting the respective passages, said pipes having longitudinally and vertically spaced slots therein opening into the recessed portion to provide communication from the exterior of the shaft adjacent the recessed portion through the respective pipes and passages with the top of said shaft and with the interior thereof.

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