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WELL CONSTRUCTION AND METHOD OF MAKING THE SAME

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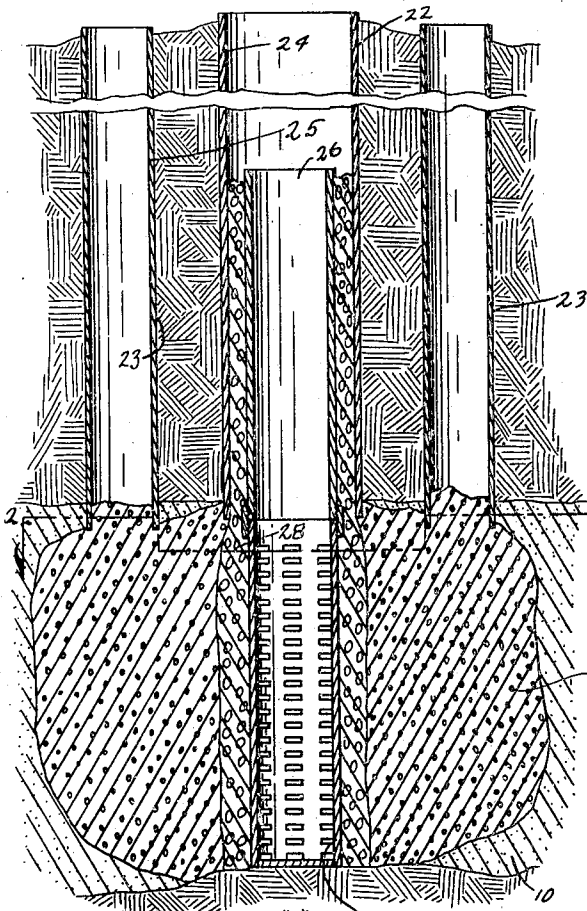


Fig. 1.

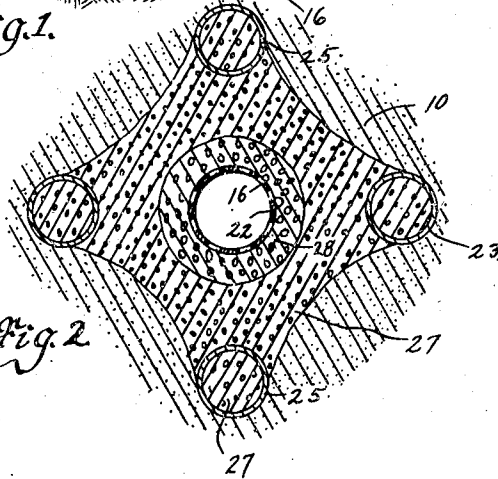


Fig. 2

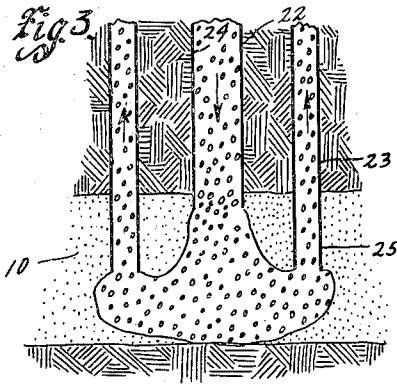


Fig. 3.

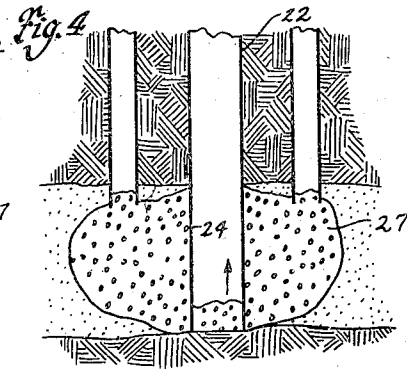


Fig. 4

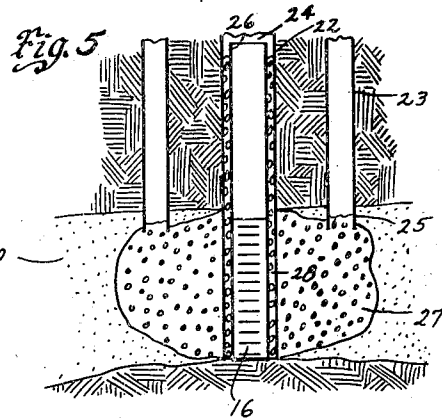


Fig. 5

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UNITED STATES PATENT OFFICE

2,025,317

WELL CONSTRUCTION AND METHOD OF
MAKING THE SAME

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2 Claims. (Cl. 166—21)

My invention relates to wells constructed with gravel and sand pack and a method for making them.

It is the object of my invention to provide a well construction and a method for making the well, which well embodies a gravel pack arranged with relatively large gravel adjacent the screen or strainer at the bottom of the well with finer gravel or sand arranged outwardly from the larger gravel, whereby the flow of water through the screen is facilitated nearest the center of the circle of inflow and whereby the formation of algae and the like to the extent which might clog the screen is prevented.

With this and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my well, and in the practice of my method, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which:

Figure 1 shows a vertical sectional view of a finished well made by my method.

Figure 2 shows a horizontal, sectional view taken on the line 2—2 of Figure 1; and

Figures 3, 4 and 5 show diagrammatic, vertical, sectional views illustrating steps in the method of making the well.

In the construction of wells, considerable difficulty is encountered at times due to the growth of algae around the screen in the sand at the bottom of the well. This algae will sometimes grow and clog the screen.

I have provided a well and method for making it by which the disadvantage of this growth of algae and the consequent clogging of the screen may be eliminated.

I shall describe my method and the well made thereby and then explain some of the advantages thereof.

In constructing a well according to my method, a central hole 22 is drilled, and one or more outwardly spaced holes 23 are drilled. The hole 22 is cleaned out for instance by pulling the fine water bearing sands out through the outer holes 23. It will, of course, be understood that casings 24 and 25 are placed in these holes 22 and 23.

The casing 24 is shown let down to the top of the water bearing sands in Figures 1 and 2. The casings 25 are let down farther than the casing 24, the fine sands are pulled out through the casings 25 and gravel 27, that is fine gravel, is let down through the casing 24 until it begins to be pulled out of the casings 25, which indicates that the hole is filled with gravel.

After the fine sand is replaced by the gravel 27 at the bottom of the hole, the casings 25 are pulled upwardly, for instance to the position shown in Figure 4, for enlarging the hole by re-

moving more of the fine water bearing sands from the hole through the casings 25 and replacing it with more gravel supplied through the casing 24.

The casing 24 is then let down through the lower end of the water bearing sands and the gravel in the lower end of it is pulled out, which leaves the casing 26 empty of but surrounded by the gravel 27.

An inner casing 26 with a strainer 16 on its lower end is then lowered as in Figure 13. Coarse gravel 28 is then let down between the casings 24 and 26.

Thereafter either the casing 24 or the casing 26 may be removed as is desirable.

As shown in Figures 1 and 5, I have shown the casing 26 cut off and its upper part removed, and the casing 24 left in place around the remaining short section of the casing 26 above the strainer 16, it being necessary to withdraw it from the position of Figure 5 to the position of Figure 1 to permit the flow of water to the screen 16.

It may be mentioned in passing that sometimes water bearing sands are found at different levels, and there may be strainers for each of these sands, packed in the manner herein described.

I have described my well and the method of making it, however, as though there were only the lower water bearing sand.

I shall now explain some of the advantages of this type of well.

Referring now particularly to Figures 1 and 2, it will be observed that the strainer 16 is in the water bearing sands. These sands are usually relatively fine, sometimes so fine that some of the fine sand is consequently drawn through the strainer and pulled up through the well. Sometimes also silt is drawn through the strainer. It is therefore desirable to pack the hole around the strainer with gravel coarser than the water bearing sands for reasons set forth for instance in my Patent, No. 1,748,589.

I have found also that quite frequently there grows in the sand around the strainer, where air sometimes gets to the bottom of the well, algae. This growth may continue to the point where the algae clogs the strainer. Sometimes silt mixes with this algae growth and sometimes the algae decomposes and becomes a plastic mass, somewhat similar to a clay, which then sticks to the outside of the strainer and collects in increased mass until the strainer clogs.

I have found that by packing coarse gravel around the strainer, the accumulation of the algae growth can be prevented. I believe this is due to the fact that the water can flow fast enough through the larger voids of the coarse

gravel, so that the algae is simply washed through.

The use of the coarse gravel also serves another function. It is desirable that the fine sand should be kept away from this screen or strainer, so that it can not be brought up with the water. It is also desirable to use a coarse gravel next to the strainer or screen in order that there may be an increased flow of water next to the screen.

I find, however, that where one grade of coarse gravel is used next to the screen, there are frequently cases where that gravel, when large enough to prevent the formation and massing of algae will not be fine enough to prevent the fine water bearing sands passing through, and being drawn out with the water. This is especially true if the grains of the water bearing sands are rounded.

I have therefore found it highly desirable for getting the most efficient practical results to use one or more intermediate grades or sizes of gravel outside the coarse gravel pack next to the screen.

So in the form of the well shown in Figure 1, I have shown for instance outside the screen 16 the coarse gravel 28 and the finer gravel 27, the latter, however, being coarser than the water bearing sands. The gravel 27 is selected for size, depending upon the condition of the water bearing sands. Thus by using the intermediate gravel 27, I provide a gravel with voids, which will permit proper flow of water from the water bearing sands, but will prevent the flow through the gravel of silt and the fine water bearing sand. Then when the water reaches the larger voids of the coarse gravel next to the screen or strainer, its flow is so unrestricted as to afford a maximum water flow to the strainer. This has not only the advantage of affording a maximum flow of water to the strainer, but it also enables the water to carry the algae or such small amount of silt as may have passed the outer intermediate gravel into the strainer, and prevents both sand clogging and algae clogging of the strainer.

I have also found from long experience that this type of well has great advantages where the water is mineralized or contains encrusting solids. In such cases, the sand or gravel next to the strainer may become coated, and this, of course, restricts the flow of water to the strainer. In such case, an agitator may be employed. This is some device in the form of a plunger or the like, by which the water can be forced back and forth through the material immediately outside the strainer.

I find in a well of the kind described here, the use of this agitator and the forcing of the water back and forth through the coarse gravel, and the intermediate gravel, clears the gravel of the encrustations, so that after the use of the agitator, the well will be in its original condition.

A double or plural pack of this kind permits the use of a screen with larger openings than would otherwise be practicable or possible.

When the coarser screen is used, the water flow is facilitated to that extent and the capacity of the well is increased.

For purposes of illustrating a typical case, the gravel 28 in the well as shown in Figures 1 and 2 may be of a size, which would pass a $\frac{3}{4}$ th inch mesh screen and which would not pass a $\frac{5}{8}$ th inch mesh.

Then in the illustrative case, the intermediate gravel 27 may for example be such as will pass a $\frac{3}{8}$ th inch mesh screen and will not pass a $\frac{1}{4}$ th inch mesh screen.

These sizes are illustrative, and it will be understood from what has been said above that the sizes of these gravels may vary depending upon the conditions found in a particular well.

Sometimes it is desirable in order to get the best result to use a third gravel finer than the gravel 15. This might be for instance such as would pass a $\frac{1}{2}$ inch mesh and would not pass a $\frac{1}{8}$ th inch mesh. This use of an additional finer gravel is particularly desirable where the water bearing sand formation is sand such as is known as quick sand and provides a gravel pack arranged in graded zones from the coarsest gravel next to the strainer to the finest gravel next to the water bearing sands.

It will thus be seen that I have provided a well and a method for making it, whereby the clogging of the strainer by algae or mud or fine water bearing sands is eliminated.

It will be seen from the foregoing that some variations may be made in the construction of the well and the steps used in building it.

The disclosure of the practical method having been made, it is practical to produce the well with the graded gravels between the water bearing sands and the strainer.

I claim as my invention:

1. A method of well construction, comprising drilling a hole to the water bearing sands, sinking a casing in the hole to such sands, drilling a spaced hole, withdrawing material through the second hole and letting down gravel through the first hole for thus forming a gravel pack around the lower end of the first hole, letting said casing down, drawing out the gravel and material from within it, and then letting down a second casing with a strainer spaced within the first casing and lowering coarser gravel to fill the space between the two casings, the inner and outer casings and between the strainer and the outer casing to a point substantially above the level of the water bearing sands, and pulling the outer casing to approximately the upper level of the water bearing sands.

2. A method of well construction, comprising drilling a hole to the water bearing sands, sinking a casing in the hole to such sands, drilling a spaced hole, withdrawing material through the second hole and letting down gravel through the first hole for thus forming a gravel pack around the lower end of the first hole, letting said casing down through said gravel pack to substantially the lower surface of the water bearing sands, drawing out the gravel and material from within it, and then letting down a second casing with a strainer spaced within the first casing, and lowering coarser gravel between the two casings, the inner and outer casings and between the strainer and the outer casing to a point substantially above the level of the water bearing sands, pulling the outer casing to approximately the upper level of the water bearing sands and cutting said inner casing off above the level of said coarser gravel.

THOMAS W. THORPE.