

UNITED STATES PATENT OFFICE.

JOHN C. SWAN, OF MARIETTA, OHIO.

METHOD OF EXCLUDING EXTRANEOUS FLUIDS FROM WELLS.

1,379,657.

Specification of Letters Patent.

Patented May 31, 1921.

No Drawing.

Application filed October 29, 1919. Serial No. 334,250.

To all whom it may concern:

Be it known that I, JOHN C. SWAN, a citizen of the United States, residing at Marietta, in the county of Washington and State of Ohio, have invented certain new and useful Improvements in Methods of Excluding Extraneous Fluids from Wells, of which the following is a specification.

In the usual methods of drilling wells for oil, it is the custom when a water-bearing stratum is encountered and drilled through to insert into the bore, a casing consisting of a series of lengths of connected steel or iron pipes of suitable diameter, this casing extending beneath the water-bearing stratum and thereby shutting off the water from the bore. As successive water bearing strata are encountered, additional strings of casing are inserted. These successive strings extend one inside the other from the surface to a location below the water and the need of them necessitates the starting of the bore with a sufficient diameter to permit the insertion of as many strings of casing as may be necessary.

Obviously, large quantities of steel and iron in the form of pipes, are used, and the cost of transportation to the location where the hole is being bored and the cost of labor for their installation is very large in addition to the purchase cost.

Further the drilling of an initially large hole is necessitated, which adds to the cost of the well.

It is the object of my invention to obviate the necessity for using successive strings of casing and the necessity and expense of large hole drilling and these objects I attain by sealing up the successive water bearing strata in the bore by the method which will now be described.

My method consists in first heating the porous, seamed, or stratified rock through which the water enters the bore, to such a degree that a fluid sealing compound forced into the bore, will freely enter the pores or interstices of the water-containing stratum and will thereafter solidify into a mass sufficiently solid to prevent the further ingress of water into the bore. As such sealing compound I prefer to use the vapor of naphthalene either by itself or mixed with a carrier gas, such as natural gas and with or without steam.

Naphthalene solidifies at 79° C., and while

it boils at about 217° C., volatilizes at temperatures considerably below its boiling point and is readily volatile with steam or other liquids of low boiling points. Naphthalene is very sparingly soluble in petroleum but not soluble in cold water. These characteristics make it particularly available for my purpose.

In carrying out my method, I force into the well a suitable heating medium such as hot water which may be heated under sufficient pressure to raise its temperature to a suitable degree above its boiling point at atmospheric pressure. The hot water is forced into the well under sufficient pressure to overcome the hydrostatic head of the water in the porous stratum and forces its way into the porous mass thereby heating the same to such a degree that when the naphthalene vapor is introduced it will be able to permeate the water bearing strata to the desired extent without solidification.

After the rock has been heated to the necessary degree, the water in the tubing is displaced by pressure of a gas, such as natural gas, the water being forced back into the porous formation. With this pressure-gas is mixed naphthalene vapor, the gas being heated to a sufficient temperature to maintain the naphthalene in vapor condition. As an additional heating and carrying gas, I may add superheated steam.

The hot naphthalene laden gas will penetrate the cracks and crevices of the rock formation and will solidify therein when it reaches those regions which are cool enough to cause solidification, and gradual solidification will continue until the cracks and crevices are completely sealed.

The heating of the rock and introduction of the sealing vapor may be effected by any suitable apparatus, such as that described in my Patent No. 1,307,207, patented June 17, 1919.

While I have specified naphthalene on account of its availability in large quantities and its low cost, any other solidifying body of suitable physical properties may be used for this purpose.

I claim:—

1. The method of preventing the flow of water from a water-bearing stratum, which consists in filling the interstices and crevices of such stratum by forcing therein the vapor of a substance which will solidify

upon cooling to form a seal against the further entrance of water.

2. The method as claimed in claim 1 in which the substance used is naphthalene.

5 3. The process as claimed in claim 1 in which there is associated with the vapor a heated carrier gas.

4. The process as claimed in claim 3 in which the carrier gas is mixed with steam.

5. The process as claimed in claim 3 in 10 which the carrier gas comprises natural gas and steam.

In testimony whereof I affix my signature.

JOHN C. SWAN.