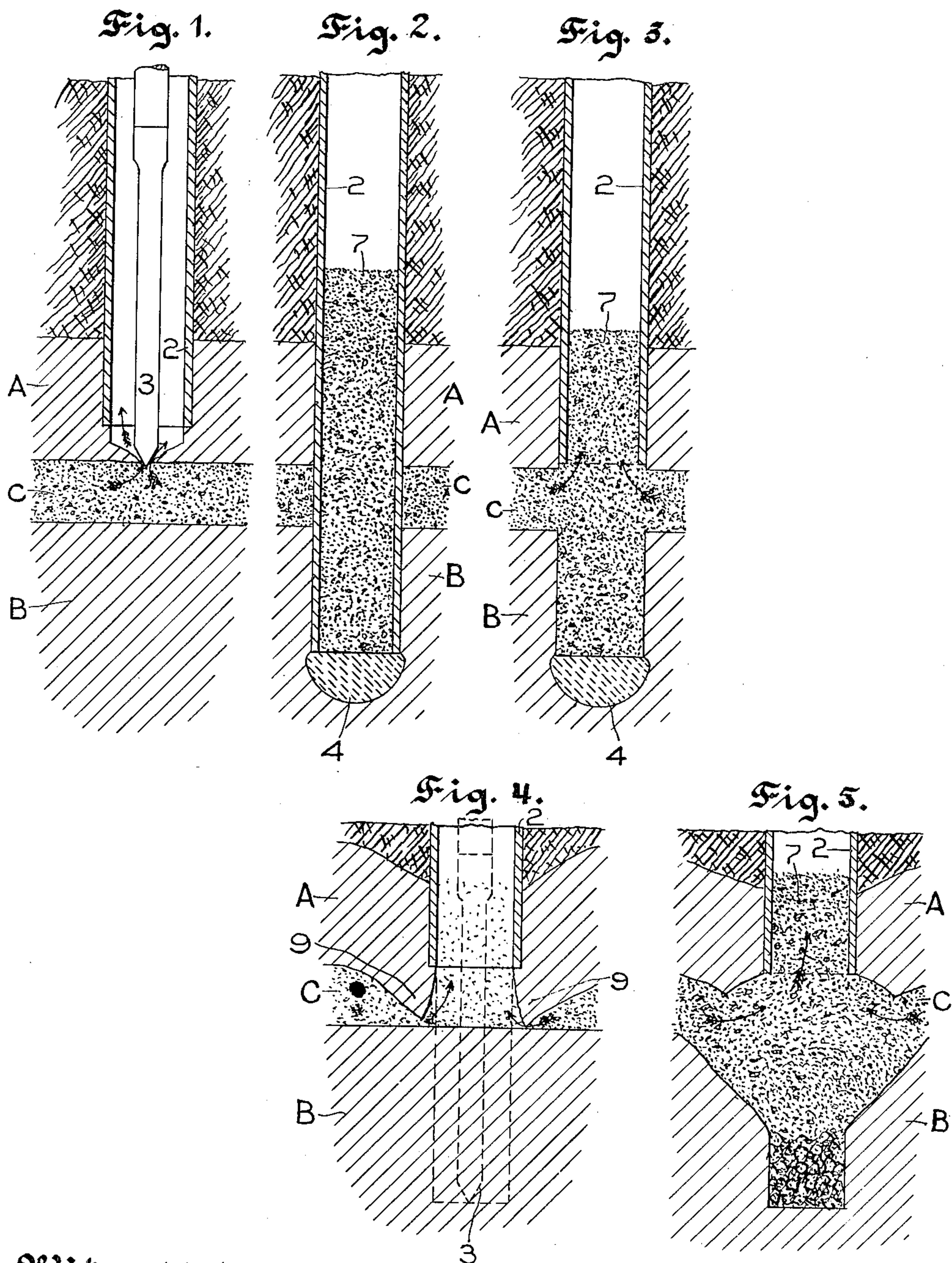


No. 837,433.

PATENTED DEC. 4, 1906.

D. M. SWAIN.  
METHOD OF WELL CONSTRUCTION.

APPLICATION FILED OCT. 23, 1905.



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# UNITED STATES PATENT OFFICE.

DAVID M. SWAIN, OF STILLWATER, MINNESOTA.

## METHOD OF WELL CONSTRUCTION.

No. 837,433.

Specification of Letters Patent.

Patented Dec. 4, 1906.

Application filed October 23, 1905. Serial No. 284,008.

*To all whom it may concern:*

Be it known that I, DAVID M. SWAIN, a citizen of the United States, residing at Stillwater, in the county of Washington and State of Minnesota, have invented certain new and useful Improvements in Methods of Well Construction, of which the following is a specification.

My invention relates to improvements in method of well construction designed particularly for natural-gas wells where the gas occurs in a stratum of sand or gravel between an overlying and an underlying stratum of clay.

Difficulty has been experienced in sinking or constructing gas-wells in such formations, owing to the fact that as soon as the drill reaches the gas-bearing stratum the pressure of the gas will drive the sand and gravel out through the well-casing and remove the support for the superincumbent clay. The overlying clay being thus deprived of its support will sag or drop down until it meets or nearly meets the underlying impervious stratum, and thus block the passage of the gas into the well-casing. It is particularly the purpose of my method of construction to prevent the passage for the gas from being thus blocked.

To this end my invention consists in the method hereinafter particularly described and claimed.

In the accompanying drawings, forming part of this specification, Figure 1 is a sectional view of a well-casing in use in an earth formation of the kind described, showing the drill just entering the gas-bearing stratum of sand or gravel. Fig. 2 is a similar view of the casing driven entirely through the stratum of sand with the drill removed. Fig. 3 is a similar view with the casing withdrawn above the stratum of gas-bearing sand. Fig. 4 is a sectional view of a well-casing where the drill has penetrated the stratum of sand or gravel and the overlying stratum of clay has been deprived of its support; and Fig. 5 is a sectional view of the same after the drill has been withdrawn, the obstructing portion of the overlying clay removed, and the passage for the gas filled with sand or gravel.

In the drawings, A and B represent, respectively, an overlying and an underlying stratum of clay or other impervious material, and C represents an intermediate stratum of gas-bearing sand or gravel.

In the practice of my method I employ an ordinary tubular casing 2 and appropriate

drill 3, which works within the casing. In Fig. 1 I have shown the drill driven down so as just to reach the gas-bearing stratum, the drill of course being slightly in advance of the lower end of the casing. As soon as the drill reaches the gas-bearing stratum the gas will rise in the casing, and if the apparatus were permitted to remain in that position the gas would blow out the gas-bearing sand and gravel and permit the overlying clay to fall, as illustrated in Fig. 4. Therefore as soon as the rising gas is detected the drill is withdrawn and casing is driven down entirely through the stratum of gas-bearing sand or gravel into the position shown in Fig. 2. The material in the casing is then drilled out, and sufficient cement is dropped to the bottom of the well to form a seal 4 to prevent the possibility of water working up into the casing and obstructing the flow of gas.

The next step in my improved method is to fill the lower part of the bore with means pervious to the flow of gas which will prevent the blowing out of the gas-bearing stratum. I prefer to accomplish this by first filling the entire casing with sand or gravel to a height sufficiently above the gas-bearing stratum to make it impossible for the gas to blow it out, as illustrated in Fig. 2. The casing is then drawn up sufficiently to bring its lower end above the bottom and preferably above the top of the gas-bearing stratum, as shown in Fig. 3, thus permitting the gas to pass directly into the lower end of the pipe. The gas-permeable instrumentality which has been inserted into the casing completely fills the bore of the well after the withdrawal of the casing and prevents the sand and gravel in the gas-bearing stratum from being blown out. If the sand and gravel should perchance have been blown out or partially blown out, so as to remove the support for the overlying clay and permit it to fall, as shown in Fig. 4, the drill is driven down through the gas-bearing stratum and into the underlying clay, as illustrated in dotted lines in Fig. 4, the casing being permitted to remain above the gas-bearing stratum. The drill is then removed and water is poured down the casing in sufficient quantity to wash away the lower end of the fallen clay and to wash out a considerable cavity in the underlying clay, as seen in Fig. 5, the action of the water being assisted by the pressure and passage of the gas through it. The water is then bailed out and suffi-



cient sand or gravel 7 put down the casing to fill the bore of the well to a point above the gas-bearing stratum and the bottom of the casing. The sand or gravel will fill up the passage between the overlying and underlying clay with a gas-permeable filling, so that the overlying clay will not fall and the gas will pass freely through the filling into the casing.

10 Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

15 1. The method of well construction for natural-gas wells which consists in sinking a casing to the gas-bearing stratum, then boring a communicating bore or hole through the gas-bearing stratum and into the stratum underlying it, and then filling the hole with gas-permeable material.

20 2. The method of well construction for natural-gas wells which consists in sinking a casing through the gas-bearing stratum and removing the material within the casing, then filling the casing to a point above the 25 bottom of the gas-bearing stratum with gas-permeable material, and then withdrawing

the casing above the bottom of the gas-bearing stratum.

3. The method of well construction for natural-gas wells which consists in sinking a casing through the gas-bearing stratum and removing the material within the casing, then inserting in the casing a gas-permeable filling, and withdrawing the casing above the bottom of the gas-bearing stratum. 35

4. The method of well construction for natural-gas wells which consists in sinking a casing to the gas-bearing stratum, then drilling a communicating bore or hole through said stratum, then removing the drill, then 40 washing out said bore or hole and the walls of the adjacent strata, then removing the water, and then filling said hole and the washed-away portions of the adjacent strata with gas-permeable material. 45

In testimony whereof I affix my signature in presence of two witnesses.

DAVID M. SWAIN.

Witnesses:

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EMILY F. OTIS.