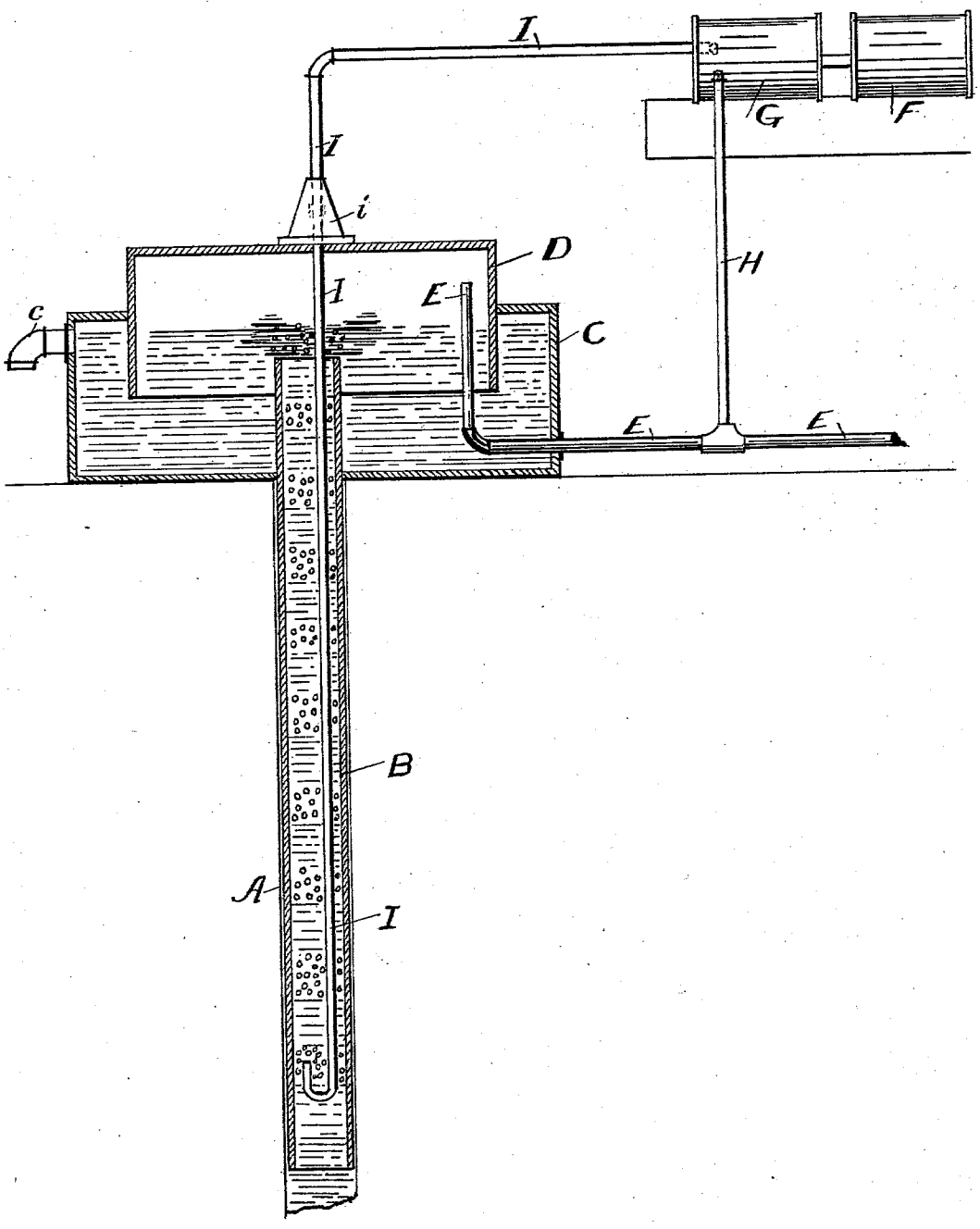
No. 753,045. PATENTED FEB. 23, 1904.

A. S. COOPER.

METHOD OF OBTAINING GAS FROM WELLS.

APPLICATION FILED DEC. 12, 1902.

NO MODEL.



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No. 753,045. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

AUGUSTUS STEIGER COOPER, OF OAKLAND, CALIFORNIA.

METHOD OF OBTAINING GAS FROM WELLS.

SPECIFICATION forming part of Letters Patent No. 753,045, dated February 23, 1904.

Application filed December 12, 1902. Serial No. 134,933. (No specimens.)

To all whom it may concern:

Be it known that I, AUGUSTUS STEIGER COOPER, a citizen of the United States, residing at Oakland, county of Alameda, State of California, have invented a certain new and useful Method of Obtaining Gas from Wells; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates in general to the art or method of obtaining natural gas.

It relates particularly to a method of obtaining such gas from wells in which the gas is in solution with the water which enters the well.

This method, briefly stated, consists in lifting such water from the well by means of a hydrocarbon gas introduced under pressure into the water column below and in collecting the gas liberated from the water so lifted.

In California there are many wells which yield natural gas; but in most of these there is no free gas. It is present in solution in the water which enters the well. The absorbing power of water for such gas is facilitated by low temperature and high pressure and is counteracted by high temperature and removal of pressure. The presence of gas in solution in water and the liberation of the gas by the removal of pressure are clearly shown by the fact that in the wells referred to when they cease to flow water the flow of gas ceases. It follows that if the flow be resumed the gas will again be liberated, the explanation being that when the water enters the bottom of the well the gas is in solution under a pressure which prevents its liberation, but as the water ascends in the well the pressure is decreased and the gas is liberated. Some wells of this general character—that is, wells in which there is no free gas (the gas being present only in solution in water)—are flowing wells; but most of them are not. When in the former wells the flow ceases or diminishes materially, the well is abandoned, and in the case of the originally non-flowing wells they are never exploited, as the gas cannot be obtained.

The object of my invention therefore is to obtain the gas from these wells, whether they are non-flowing originally or have ceased to flow, or the flow therefrom is not sufficient to be profitable, or it is desired to increase the yield of gas from those which do flow. My method for effecting this is to lift the water which contains the gas in solution, so that the pressure being reduced the gas will be liberated and may be collected. This lifting applies not only to the non-flowing wells, but also to the flowing wells, in which latter case the flow is increased, and consequently more gas is obtained. My invention contemplates the lifting of this water by means of compressed hydrocarbon gas introduced below into the water column. This is the most complete and practical form of my method and is the form which I have illustrated in the accompanying drawing, the figure in which represents an apparatus in which my method may be carried out.

In the drawing, A is the well. B is the tubing therein. C is the outer vessel of the holder at the mouth of the well, and D is the inverted inner vessel. From the inner vessel issues the pipe E to the main, and from the outer vessel leads the water-spout *c*.

F is an engine, and G is a compressor operated by the engine. A pipe H leads from the main E to the compressor, and a pipe I leads from the compressor to a suitable connection (indicated by *i*) to and through the inner vessel D and down in the tubing B to near the bottom of the well. The gas and water in the bottom of the well are under atmospheric pressure, according to the depth of the well, and the gas is, as I have stated, in solution in the water; but when the water is raised, the pressure being relieved, the gas will separate from the water and be collected in the holder. Part of this gas is taken by the pipe H and passing through the compressor is forced down through pipe I into the well below and there, being discharged under the water column, will lift said column in a series of layers and intervening bubbles, as I have indicated, and by being thus lifted the atmospheric pressure is reduced, and the gas will be liberated and may be collected.

I am aware of the practice of pumping water by compressed air, the so-called "air-lift" pumps in mine-drainage, &c. This practice is, however, wholly inapplicable to the purpose I have in view for two reasons—namely,

that the addition of air to the water containing gas in solution in wells of the character I have mentioned will make an explosive mixture or compound or it will under any circumstances deteriorate or impoverish the gas and in both instances will render it unsuitable for illuminating and other purposes to which natural gas is put. Air cannot, therefore, be used in lifting such water in these wells; but by employing a hydrocarbon gas either made for the purpose or, as it will be in practice, taken from the natural gas of the well itself, as I have shown in the drawing, the result of lifting the water to liberate its gas will be accomplished, and at the same time the gas so obtained will not be explosive or impoverished or deteriorated in any manner, and it will be suitable for any purpose to which it is usual to put it. Thus such wells will be made productive, whereas they have heretofore been useless or not sufficiently profitable or abandoned.

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

The method of obtaining gas from wells containing water with gas held in solution, which consists in lifting said water in the well by means of a hydrocarbon gas introduced under pressure into the water column below, and collecting the gas liberated from said lifted water.

In witness whereof I have hereunto set my hand.

AUGUSTUS STEIGER COOPER.

Witnesses:

WALTER F. VANE,

D. B. RICHARDS.