(No Model.)

P. M. HITCHCOCK.

PROCESS OR METHOD OF OPERATING GAS WELLS.

No. 336,317. Patented Feb. 16, 1886.

Fig. 2.

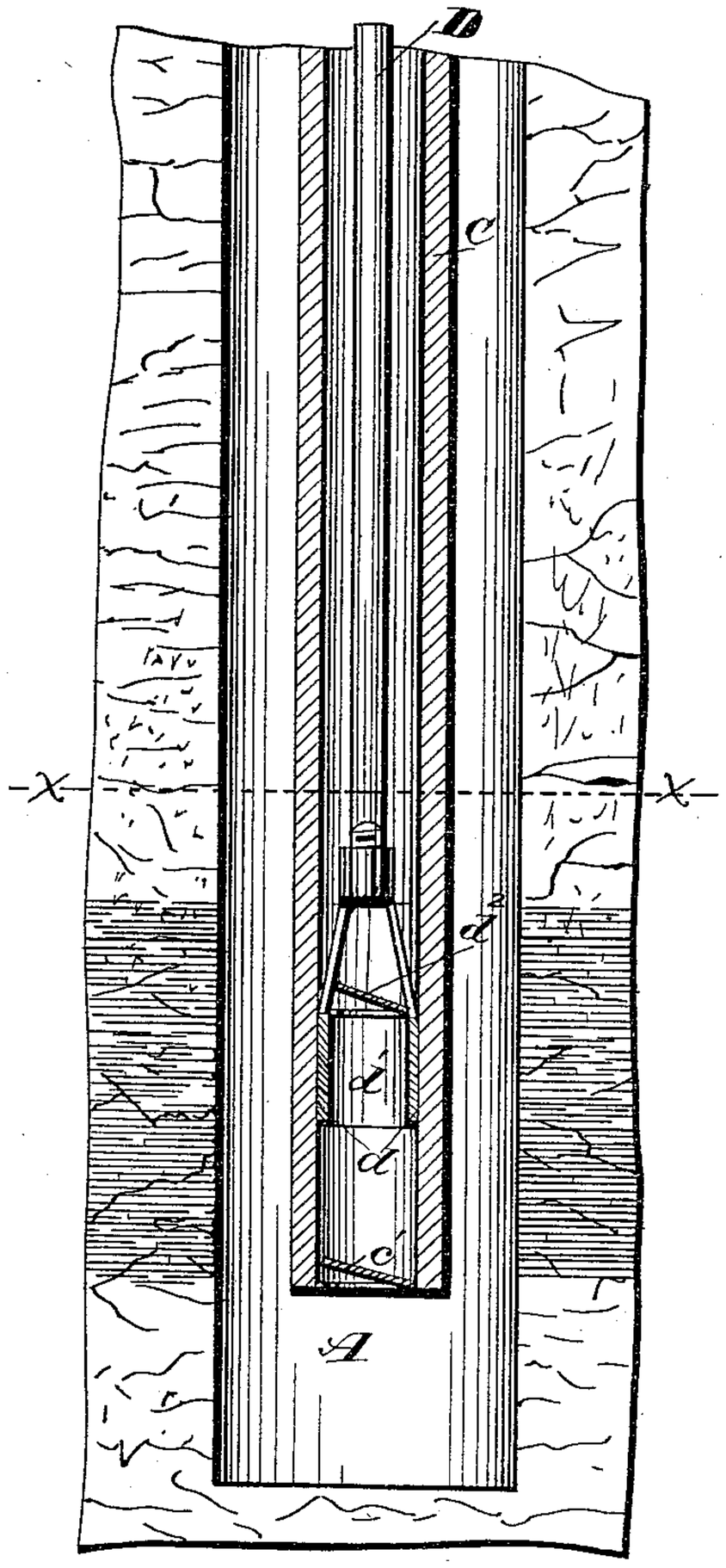
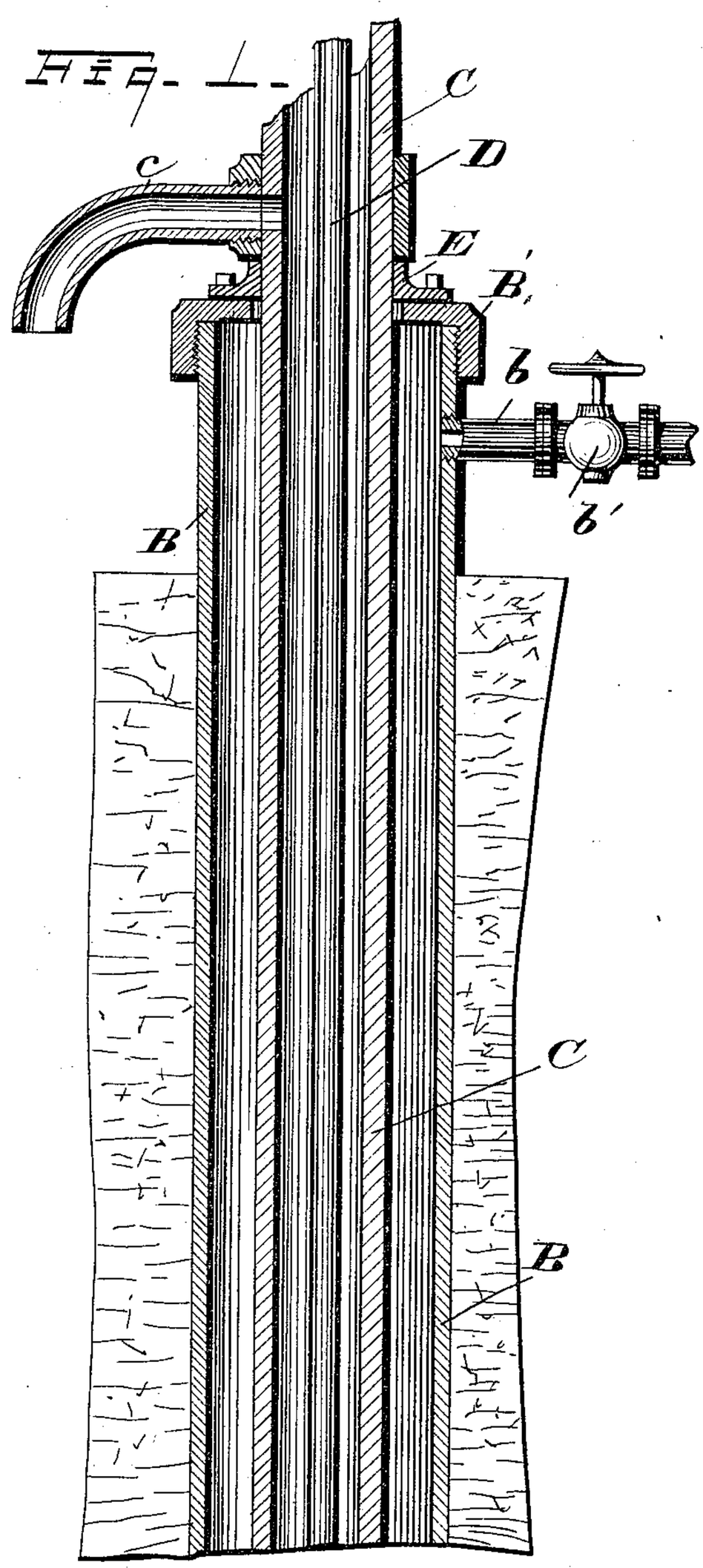


Fig. 1.



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UNITED STATES PATENT OFFICE.

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PROCESS OR METHOD OF OPERATING GAS-WELLS.

SPECIFICATION forming part of Letters Patent No. 336,317, dated February 16, 1886.

Application filed October 18, 1884. Serial No. 145,858. (No model.)

To all whom it may concern:

Be it known that I, PETER M. HITCHCOCK, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in a Process or Method of Operating Gas-Wells, and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to an improved process or method of operating gas-wells, the object being to separate the water from the gas preferably at or near the bottom of the well, and by means of suitable pumping apparatus to keep the well so exhausted of water that a free flow of gas will not be prevented or hindered by an accumulation of water in the well.

A further object is to provide two passage-ways from the well, the one for the passage of gas and the other for the passage of water that is pumped from the well, (the one of which is usually inclosed in the other,) to the end that by closing the passage-way for the gas and controlling its escape a pressure of gas is had to aid in elevating the water in the process of pumping.

With these objects in view my invention consists in a process or method hereinafter described and claimed.

Gas-wells are usually of great depth, perhaps eight or ten hundred feet would be no more than the average, while in some cases wells have respectively been sunk several thousand feet. Such of these wells as yield a considerable supply of gas are of great commercial value.

The accumulation of water in gas-wells in such quantities as to obstruct the flow of gas frequently causes much damage, and sometimes entirely destroys the commercial value of the well. It is customary to insert tubing in the well from the surface of the ground some distance downward, to cut off the surface-water; but this is not always entirely effective, and more or less of the surface-water will sometimes seep in; also, deep veins of water, such as supply Artesian-wells, are sometimes crossed in sinking gas-wells, and by reason of their great depth, or by reason of their proximity to or of their issuing from the shale or other stratum of rock in which the gas is found, these veins sometimes cannot well be shut off from the well. Of a large class of wells from which the water cannot practically be entirely excluded, it must be removed, or sooner or later the supply of gas will be shut off by the accumulation of water, and the well thereby rendered worthless. The depth of water that will thus shut off the gas will depend on the pressure of gas encountered, and this will vary greatly in different localities. The gas in the stratum where it is found is always under pressure, and in some instances this pressure is so great that probably if the well were filled with water the gas would force its way out, although perhaps not with such a uniform flow as would render the gas very valuable. Usually, however, the pressure is not so great but that long before the well is filled with water the gas will cease to flow, and in such wells the surplus water must be removed to render the wells of any permanent value, and the maximum commercial value is only reached when the surplus-water is so constantly removed that flow or supply of gas will be uniform. Heretofore it has been a problem in many cases how to remove the water, as required, without incurring an expense greater than the value of the gas thus obtained. It is well known that pumping on a small scale, especially when the water is raised to a great distance, is much more expensive, according to the amount of work performed, than when done on a large scale.

In view of the foregoing premises I have devised a process and apparatus for removing the water from gas-wells, in which the pressure of the gas may be utilized and made to aid in lifting the water.

In my method I employ two passage-ways—the one for the gas and the other for the water. The former is closed at the top, and by means of suitable valve mechanism the escape of gas is controlled, so that approximately the normal pressure of gas in its stratum is had in the gas passage-way. The two passage-ways are in open relation with each other at the bottom, and the inner or water-tube should extend some distance below the line where the gas enters the well. The water of course descends by its gravity to the bottom, and as it accumulates covers the lower end of the water-

tube, and the pressure of gas above on the water forces the latter into the water-tube or passage-way until the column of water balances the pressure of gas. Above this equilibrium-point the water must be elevated by other means—that is, pumped out. In some cases the pressure of gas may be sufficient to discharge the water through the water-pipe, and in such cases of course no pumping mechanism will be required. The most convenient arrangement of parts, usually, is to use the well, properly secured at the top by tubing, for the gas passage-way, and to insert a water-tube in the well, and extending it to near the bottom thereof. This water-tube also incloses the pumping mechanism. A preferable arrangement is shown in the accompanying drawings.

Figure 1 is an elevation in section of the upper part of a gas-well with suitable tubing, piping, and attachments embodying my invention. Fig. 2 is an elevation in section of the lower part of the gas-well, showing the lower end of the water-pipe and pumping mechanism.

A represents the gas-well, into the upper end of which is driven the tubing B. This tube fits tight into the bore of the well and extends down some distance, to cut off the surface-water, and also prevents the escape of gas from the well, except through one or more outlet-pipes, *b*, that are arranged for this purpose. The tube B extends some distance above the ground, as shown in Fig. 1, and is provided with a cap, B′, that screws onto the end of the tube. Through this cap is inserted the water-pipe C, that extends preferably near the bottom of the well, and below where the gas enters, that we will suppose is on the line *x x*, Fig. 2. The tube C has a waste-pipe, *c*, and has attached a collar or flange, E, that is bolted to the cap B′, forming a tight joint. By loosening the bolts the tube C may be raised up out of the well. The tube C has inclosed the pump-rod D, that may connect above with any suitable mechanism for operating it, and has attached below the plunger or bucket *d*, provided with a central orifice, *d′*, and valve d^2, opening upward. The lower end of the tube C has attached the inside valve, *c′*, opening upward. The outlet-pipe *b* has a valve, *b′*, and may have in addition a safety-valve, when required; also, a pressure-gage, to indicate the pressure of gas in the well, will be found convenient.

In operating the well the water of course descends by its gravity to the bottom, and when a sufficient amount has accumulated to cover the end of the tube C, the pressure of gas will force the water up more or less in the tube, according to the amount of pressure. If, as is sometimes the case in wells that are not very deep, the pressure of gas is sufficient to discharge the water from the well, no pumping apparatus will be required, and in such a case the tube C should be provided with a valve, to prevent the escape of gas through this tube when the water is all exhausted. Usually the pressure of gas will only force the water part way up the said passage-way or tube, and the pump performs the balance of the labor; but every foot that the water is raised by the force of the gas reduces the cost of pumping. It is not essential that the bucket or plunger *d* should operate near the end of the water-tube, as shown, but only so far down the tube that it will be sure to meet the water; also, if the bucket *d* descends some distance below the water, the valve *c′* is not essential to the working of the pump, but may be useful as a check-valve.

I have shown a preferable arrangement of pipes to form the passage-ways for gas and water in carrying out my improved process; but I do not wish to confine myself to this construction and arrangement, as the passage-ways may be formed otherwise than with tubes, and various changes might be made without departing from the scope and spirit of my invention.

I hereby reserve the right to embody in a subsequent application for Letters Patent any novel features in the mechanism shown or described in this application.

What I claim is—

1. The process or method herein described of operating gas-wells, and consisting, essentially, first, in providing different passage-ways or tubes from the well for the discharge, respectively, of gas and water, the passage for the water terminating a distance below the gas-passage; second, in regulating the discharge of gas from the well to retain as far as possible the initial pressure of the gas, so that when the water within the well covers the lower end of the water-passage the pressure of gas within the well above the water aids in forcing the water up in the water passage-way, substantially as set forth.

2. The process or method herein described of operating gas-wells, and consisting, essentially, in providing separate passage-ways, respectively, for gas and water, and providing the gas passage-way with suitable valve mechanism for controlling the escape of gas, and providing the water passage-way, which terminates below the gas passage-way, with suitable pumping mechanism, and connecting the passage-ways for gas and water in such a manner that the gas and water are separated in and preferably near the bottom of the well, and that any pressure of gas had in the well is utilized to aid in discharging water from the well, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 9th day of October, 1884.

PETER M. HITCHCOCK.

Witnesses:
JNO. CROWELL,
CHAS. H. DORER.