(No Model.) 2 Sheets—Sheet 1.

N. C. DYE.

APPARATUS FOR WASHING GAS.

No. 420,378. Patented Jan. 28, 1890.

Fig 1.

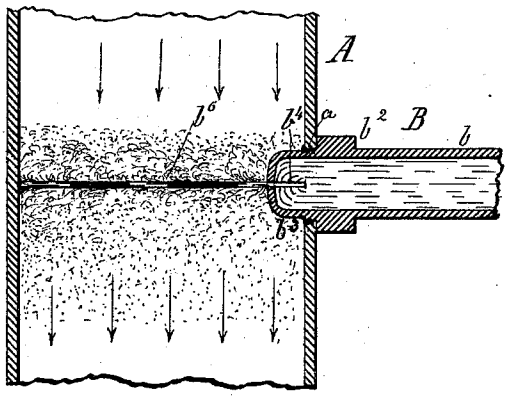


Fig 2.

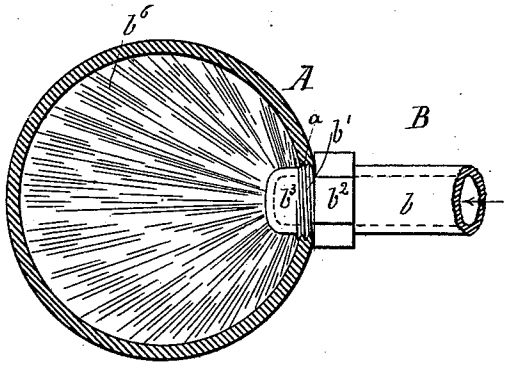
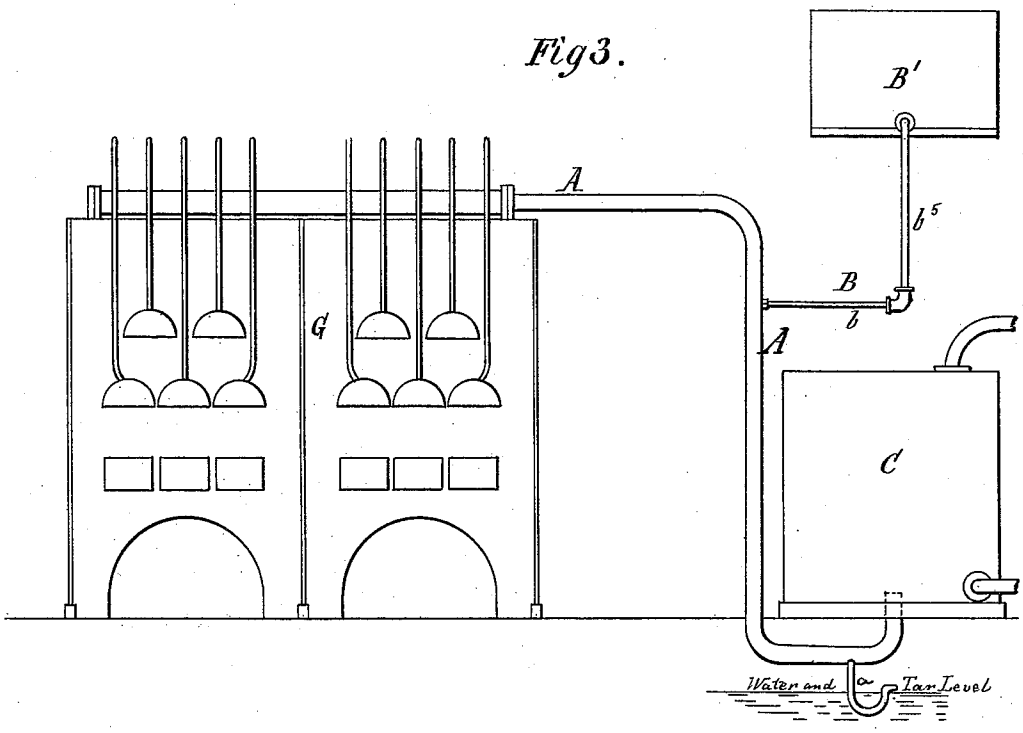


Fig 3.



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E. T. Fenwicke

Inventor:

Nath.l C. Dye

by his attys

Mason, Fenwick & Lawrence

N. PETERS, Photo-Lithographer, Washington, D. C.

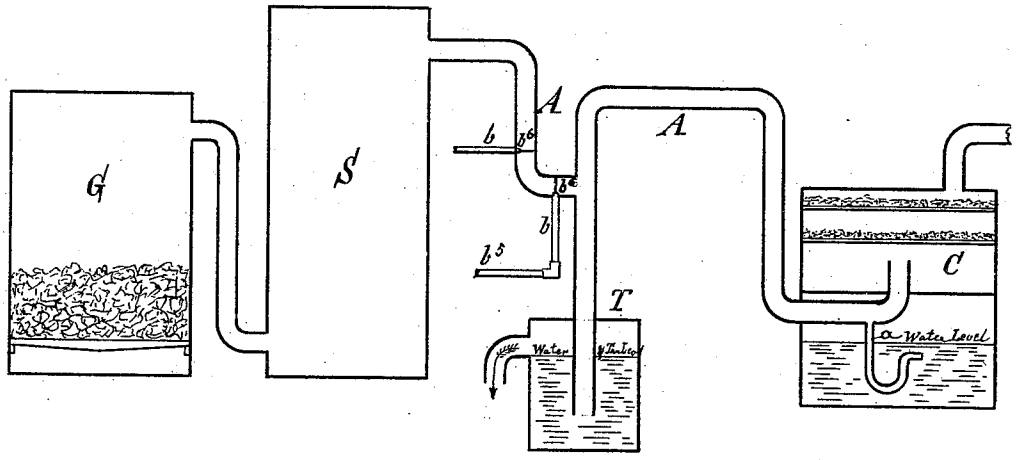
(No Model.) 2 Sheets—Sheet 2.

N. C. DYE.

APPARATUS FOR WASHING GAS.

No. 420,378. Patented Jan. 28, 1890.

Fig 4.



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UNITED STATES PATENT OFFICE.

NATHANIEL C. DYE, OF RUTLAND, VERMONT.

APPARATUS FOR WASHING GAS.

SPECIFICATION forming part of Letters Patent No. 420,378, dated January 28, 1890.

Application filed August 9, 1889. Serial No. 320,230. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL C. DYE, a citizen of the United States, residing at Rutland, in the county of Rutland and State of Vermont, have invented certain new and useful Improvements in Apparatus for Washing Gas; 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 appertains to make and use the same.

My invention consists in an improved method of and a novel apparatus for washing, scrubbing, and cooling gas, as will be hereinafter described and specifically claimed.

In the accompanying drawings, Figure 1 is a vertical central section of a main gas-pipe provided with the improved gas washer, scrubber, and cooler. Fig. 2 is a horizontal section of the same. Figs. 3 and 4 are diagrams of two types of gas generators and purifiers having a main pipe provided with the improved gas washing, scrubbing, and cooling apparatus.

The letter A in the drawings represents a main pipe of a gas-generator; B, a gas washer and cooler; G, a gas-generator, and C a gas-purifier.

Between the gas-generator G and purifier C of a gas-works the main pipe A is placed, and it conducts the gas from the former to the latter. Into this pipe A the nozzle portion b of the gas washer and cooler B is secured by means of a screw-thread b' on the said nozzle portion and a corresponding screw-thread a in the pipe A. A prismatic formation b^2 on said nozzle portion serves to facilitate the use of a wrench for fastening or unfastening the nozzle portion. The nozzle b^3 extends into and slightly beyond the inner surface of the pipe A, and is there provided with a longitudinal slot b^4, forming a narrow flat orifice, which terminates at the inner surface of the pipe A. This nozzle portion b is connected by means of pipe or conduit b^5 with an elevated reservoir B', from which the water is conducted under pressure through said pipe or conduit b^5 into the nozzle portion b and through the slot b^4 into the pipe A, and thus a transverse diaphragm or unbroken sheet b^6 of water is produced, which strikes the whole inner surface of pipe A, and, rebounding, is dashed into spray in the manner described. Through this diaphragm or water-sheet b^6 and the spray thereof the gas from the generator is forced, and being thus thoroughly mixed with the same is freed by the current and the spray of such impurities as readily unite with water, and it is at the same time cooled down to such a degree that the remaining tar and nearly all the other impurities are precipitated or concentrated, and thereby separated from the gas.

In connection with my invention I still propose to use lime as a purifier, the slaked lime being placed in trays or sieves within purifier-boxes, and the gas, after having been washed, scrubbed, and cooled, as herein described, is passed through the lime on its way from the generator to the gasometer.

The pressure necessary for producing a powerful current of water may be secured from a highly-elevated reservoir, a force-pump, or other suitable means, and this pressure may be varied to suit circumstances. A pressure of about sixty-five pounds to the square inch has been found to work very satisfactorily. While the pressure at the head or source of the water is sixty-five pounds to the square inch, there is very little pressure comparatively in the thin sheet of water which stands across the main gas-pipe, and through which the gas passes from the generator to the purifier, for when the water leaves the end of the nozzle it is in a body of only about one-eighth of an inch thick, as seen in the drawings, and runs off as rapidly as the pressure in the nozzle will cause it to flow, and it is immediately carried away with the condensation of the gas-vapor through the siphon at the bottom of the pipe, and thus the gas-pipe is always free from water—accumulated water, which would be liable to retard the flow of gas and cause a back-pressure. The resistance of the thin sheet of water is not more than sufficient to keep the sheet in a diaphragm form and in slight contact with the inner surface of the pipe, and thus insure the subjection of the

entire volume of gas to the washing, scrubbing, and cooling action of the cool water.

If desirable, several nozzles *b* may be employed at suitable distances apart, so that the water will flow through several transverse water-sheets b^6 in succession, and thus be subjected to a more effective treatment of cleansing and cooling.

In practice it is often found necessary to run in water-gas works about six thousand feet of gas in twenty to twenty-five minutes through an eight-inch pipe, and the gas leaves the superheater while it is red-hot or ofttimes at a white heat. The gas in this condition strikes the diaphragm of water about five feet from the superheater, and hence I generally employ two or more, but sometimes only one, diaphragm of water. This depends upon how fast gas is generated in a given-sized generator and under a given amount of heat. When the gas strikes the first diaphragm of water, the water strikes every particle of gas-vapor, or nearly every particle. Should there be any vapor that has not come in contact with the first diaphragm and spray from it, the second one would take up what escaped from the first, and so on, according to the number of spaced water-diaphragms within and along the pipe between the generator and purifier. The solid sheet or sheets of water completely fill the circular space across the pipe to the extent of the thickness of the sheet or sheets, leaving no space for the gas to pass except it passes through the diaphragm or diaphragms of solid water. This operation is different from that of spraying or jetting water upon gas in the pipe, because the gas in the sprinkling method has freedom, in part, to pass between the jets of water, and thus it is not all subjected to the action of the water in its passage to the purifier.

In the water-mains of Rutland, where I have introduced my invention, sixty-five pounds pressure to the square inch being used, I have found one nozzle sufficient; but where the pressure of the water in the water-mains is but twenty-five pounds to the square inch two or more nozzles might be necessary. All depends, as above stated, upon the amount of gas generated. It is a very convenient arrangement to apply, as I have shown, one or two nozzles immediately between the gas generator and purifier, as the gas can be washed, scrubbed, and cooled and then at once passed directly into the purifier.

It is obvious that if the gas-mains be made of squared or any other appropriate form than cylindrical, the same result of forming a complete diaphragm of water across the pipe would be produced if the slit in the end of the nozzle is extended entirely across the nozzle from the inner surface of the pipe on both sides of the nozzle.

Before entering the purifier the gas is relieved of water and tar by means of an escape or drip pipe *a*, provided in the pipe A, which for that purpose enters the purifier from below. This drip-cup may be in the form of an inverted siphon, forming a gas-trap, which allows only tar and water to escape in the manner illustrated. In Fig. 4 I have shown a construction which I have successfully employed. It consists of a generator G, superheater S, sealing-tank T, and lime-purifier C, supplied with water-nozzles *b*, between the superheater and sealing-tank. It will be readily seen that the sealing-tank serves the same purpose as the above-described inverted-siphon drip-pipe *a*. Before entering the purifier the gas is again relieved of any water and tar precipitated during its passage beyond the bottom of the purifier by means of an inverted-siphon drip-pipe *a*, as above described. In this apparatus I may also employ one or more nozzles *b* in the pipe A between the generator and superheater, and provide in the lowest portion of the pipe a drip-pipe *a*, as described.

It will be seen from the aforegoing specification that a great benefit is derived from my invention, as the gas in all of its particles is acted upon by the forcibly flowing unbroken diaphragm or sheet of water, as well as by the diffused spray of water in the pipe produced by the forcible contact of the periphery of the circular diaphragm or sheet of water with the inner surface of the pipe, the gas thus acted upon being stripped of all its impurities for which water has an affinity, while the tar and nearly all of the other impurities not taken up by the water are condensed or caused to be precipitated upon the bottom of the pipe, from whence they discharge into gas-traps, as shown.

My simple apparatus renders unnecessary the costly and inconvenient treatment of the gas in a separate washer, scrubber, and cooler, and while the employment of lime as a purifier is not dispensed with much less expense for apparatus for washing, scrubbing, and cooling the gas is incurred than with ordinary methods and apparatuses.

What I claim is—

1. The combination, with a gas-pipe A, of a water-conduit *b*, provided with a nozzle b^3, having a narrow oblong discharging-orifice b^4 and standing transversely to said gas-pipe, said orifice being so formed that the water is caused to spread into a thin circular diaphragm or sheet which impinges upon the inner surface of the gas-pipe all around, substantially as described.

2. The combination, with the inner surface of the gas-pipe A, of a water-conduit b^5, provided with a nozzle b^3, extended beyond the inner surface of the pipe and formed with a narrow oblong discharging-orifice b^4, which begins on both sides thereof at the curved inner surface of the pipe and extends entirely across the nozzle, substantially as described.

3. The combination, with a gas generator

and purifier, of the nozzle or nozzles b^6, said nozzle or nozzles being applied to a gas-pipe connecting said generator and purifier, and the oblong orifice or orifices of the nozzles beginning on the inner surface of the gas-pipe and extending entirely across the nozzle, substantially as described.

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

NATHANIEL C. DYE.

Witnesses:
JOEL C. BAKER,
ELLA M. BALLOU.