2 Sheets--Sheet 1.

I. N. STANLEY.

Process and Apparatus for the Manufacture of Gas.

No. 161,836. Patented April 6, 1875.

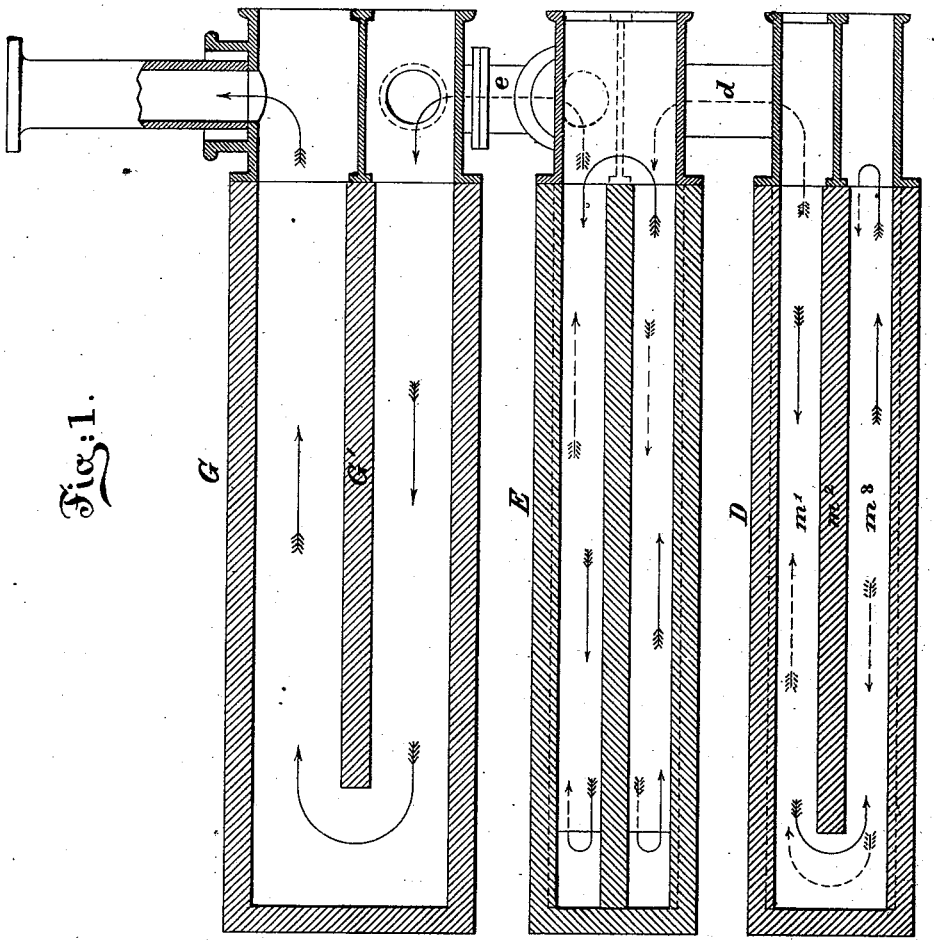

Fig: 1.

Witnesses:

E. Volkmann

W. C. Dey

Inventor

Ira N. Stanley

by his attorney F. A. Nelson

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2 Sheets--Sheet 2.

I. N. STANLEY.

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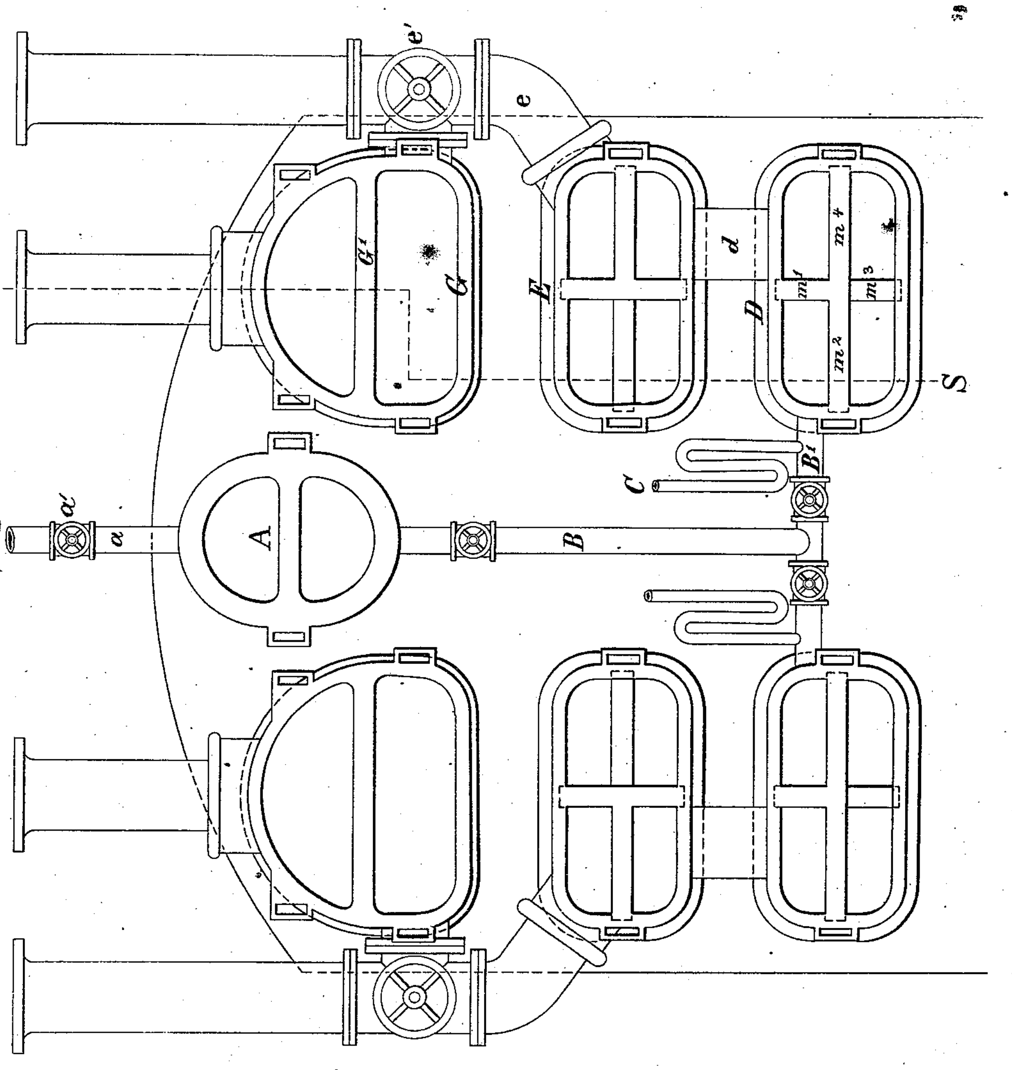
Fig: 2.



Witnesses:

E. Volkmann.

Inventor:

Ira N. Stanley,
by his attorney

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

IRA N. STANLEY, OF BROOKLYN, NEW YORK, ASSIGNOR TO HIMSELF AND EDWARD D. WHITE, OF SAME PLACE.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR THE MANUFACTURE OF GAS.

Specification forming part of Letters Patent No. **161,836**, dated April 6, 1875; application filed September 19, 1874.

To all whom it may concern:

Be it known that I, IRA N. STANLEY, of Brooklyn, Kings county, New York, have invented certain Improvements relating to Gas-Manufacture, of which the following is a specification:

My invention overcomes some of the serious difficulties heretofore encountered in the manufacture of a permanent and just sufficiently rich gas by the use of naphtha or analogous volatile hydrocarbon. I employ steam, naphtha, and bituminous coal with apparatus for presenting them to each other under favorable conditions.

The following is a description of what I consider the best means of carrying out the invention.

The hydrogen and carbonic oxide resulting from the passage of the steam through incandescent charcoal or anthracite is made to take up the naphtha or mingle with it, so that the vapor of naphtha is intimately combined with the gases resulting from the decomposition of the coal. Vaporization of the petroleum liquid or naphtha induces a lowering of temperature which is not always uniform. I insure the attainment of a thorough mixture and of a just sufficiently high temperature by afterward carrying it through one or more peculiarly-divided retorts, so as to expose it for a long time to surfaces maintained at a dull red heat. Next, this mixture of permanent gases and superheated naphtha vapor is introduced into a coal-distilling retort and caused to circulate in contact with the solid materials therein. This raises the temperature higher. There is reason to believe that the mixture undergoes a permanent chemical change on raising its temperature to or above a cherry-red heat. The result of my process is a permanent gas of a good illuminating-power, and of about the proper specific gravity. By presenting the mixture to gas-producing coal simultaneously with the heating thereof, I induce conditions under which my experiments indicate that all the carbon is utilized in the gas, and none is deposited as lamp-black or otherwise.

I propose to ascertain by further experiment what proportion the mixture of gases and vapor should bear to the bituminous coal distilled. I can carry the gaseous matter through two or any other number of coal-retorts, so as to attain the desired proportion.

The accompanying drawings form a part of this specification.

Figure 1 is a longitudinal vertical section on the line S S in Fig. 2. Fig. 2 is a front view, with the covers of the retorts removed.

Similar letters of reference indicate corresponding parts.

The brick arch over the bench, and all parts not represented, may be of the ordinary construction.

A is a long vessel exposed to a high temperature, and divided horizontally into two chambers. Steam is introduced through a pipe, *a*, from a boiler, (not represented,) and is compelled to travel the whole length of the vessel A, and then descend at the back through an opening in the horizontal partition, and then travel forward through the lower chamber. Both the chambers in this retort or decomposing-vessel should be kept filled with coarse coke, charcoal, anthracite coal, or other tolerably pure carbon in an incandescent condition. The steam, in passing through the interstices in this heated mass, sets free its hydrogen by parting with its oxygen, which latter forms, with the carbon, carbonic oxide. These gases descend through the pipe B, which may be inclosed in ashes or the like, to better maintain the high temperature of the gases. It branches at the bottom. I will describe the right-hand branch and its connections, it being understood that the left-hand side of the bench is the same. C is a pipe, bringing a constant moderate supply of petroleum, naphtha, gasoline, or other volatile hydrocarbon, from a source not represented. It may arrive at its junction with the branch pipe B′ either in the condition of vapor or of fluid, or partly of each. Entering the pipe B′, and mingling with the hot gases therein, it becomes not only volatilized, but assumes the form of more or less superheated vapor. In this condition the mixture of gaseous matter enters the lowermost retort D, and is compelled to travel backward and forward therein.

This retort D, as also the next above it, is

maintained at a temperature about as high as is found, in practice, may be reached without danger of depositing the carbon. I esteem a dull red, or one which is only moderately luminous in the dark, to be about the best temperature.

Each of the retorts D and E is divided by peculiarly-formed removable partitions, which cross each other and extend nearly the whole length of the retort. The upper vertical partition m^1 extends the whole length of the retort. The left-hand horizontal partition m^2 extends nearly to the back end.

The mixture of gases received from the pipe B′ moves backward in the left upper corner of the retort, descends at the back, comes forward under the partition m^2 to the front of the retort, crosses in an opening through the lower vertical partition m^3 at the front, traverses backward again in the right lower corner, ascends at the back through an opening at the rear end of the right horizontal partition m^4, and comes forward to the front and escapes. It rises through the pipe *d* into the next retort, in which it traverses in a corresponding manner, so that by the time it is discharged from the second retort E through the pipe *e* it is thoroughly mixed and heated. A valve, *e′*, is provided, which may turn the heated gas directly upward into the hydraulic main when required for charging the coal-retort or for any other reason. When the coal-retort G is properly charged and closed the valve *e′* is turned to direct the hot gases from the retorts below into and through it. I have devoted much attention to the form and construction of retorts for uses of this kind, and believe that the best construction for the coal-retort G is to have a horizontal partition, G′, extending nearly to the back at about the middle height, as represented, and charge only the lower half with bituminous coal in the ordinary manner, allowing the gas evolved therefrom to mix at the high temperature experienced therein with the gas from the retort below, and to circulate at a continued high temperature through the whole length of the retort in the upper half thereof; but this is not essential. It may be expedient to fill both chambers of the retort with gas-producing coal, or to connect together two or some other number of coal-distilling retorts. In either case I carry the mixture of gases and superheated vapor from the retorts below through the retort or retorts in which bituminous coal is distilled, and present the mixture to the coal-gas at the moment of its liberation. By this means, instead of simply heating the vapor of naptha with the small quantity of permanent gases resulting from the decomposition of water, I heat it in intimate union with the large quantity of gases resulting from the distillation of the coal. I believe that the nascent gas, at the moment of its liberation from the coal, is in a different condition from that which it maintains afterward. It is peculiarly susceptible at that stage of union with the gases which I present thereto.

The gas thus produced, after thoroughly mixing all the particles at a high temperature in the top of the same retort G, or any other retorts or chambers provided, is conducted away, to be afterward passed through such condensing and purifying material as the use to which it is to be applied shall require. It makes a permanent gas. I propose to regulate the introduction of the steam into the decomposing-vessel A, and the flow of the hydrocarbon liquid or vapor through the pipe *e*, by a valve, *a′*, which may be perfectly controlled.

The partitions m^1 m^2, &c., need not fit with absolute tightness within the inclosing-walls of their retorts D E. I esteem it important that they be formed separately, so as to be capable of removal for more effectually clearing the interior of the retort when required, and also to allow of a ready change of the divided retorts into ordinary retorts when required, for treating coal in the ordinary manner. I can use successfully for this purpose retorts having division permanently joined.

I do not confine myself to the employment of the horizontal partition G′ in the retort G; but I esteem that form of retort and the mode of working it—by placing the principal charge in the lower portion thereof—as preferable. I propose, instead of leaving the space above the partition G′ entirely empty, to have it partially filled with coke. It may be charged in the form of coke or charged in the form of bituminous coal, and allowed to become coke, as it rapidly will. Whichever method be adopted I propose to leave the coke there, believing that it aids to impart the heat of the surfaces to the passing gas, for the purpose of making a more thorough union between the gases.

I claim as my invention—

1. In the manufacture of illuminating-gas, the process of fixing the petroleum vapor and combining it with ordinary coal-gas, which consists in heating the same to or near the temperature at which coal is distilled by conducting it successively through a series of chambers or passages moderately heated, and then conducting it through a retort in which coal is being distilled, as specified.

2. In the manufacture of illuminating-gas, the process of fixing the hydrogen gas and petroleum vapor, and combining them with ordinary coal-gas, which consists in passing the hydrogen and petroleum vapor together through a succession of passages or chambers of a gradually-increasing temperature, and finally through a retort in which coal is being distilled.

3. In combination with a controlling-valve, *a′*, steam-decomposing apparatus A, and coal-distilling apparatus G, a series of two or more intermediate connected retorts, D E, as herein specified.

4. In combination with a series of cham-

bers or retorts, D E, the valve *e'*, arranged as shown, for conducting at will a constant stream of mingled hydrogen and petroleum vapor, flowing through the same, either directly into the hydraulic main or into a retort, G, in which coal is being distilled, as specified.

In testimony whereof I have hereunto set my hand this 16th day of September, 1874, in the presence of two subscribing witnesses.

IRA N. STANLEY.

Witnesses:

THOMAS D. STETSON,

WM. C. DEY.