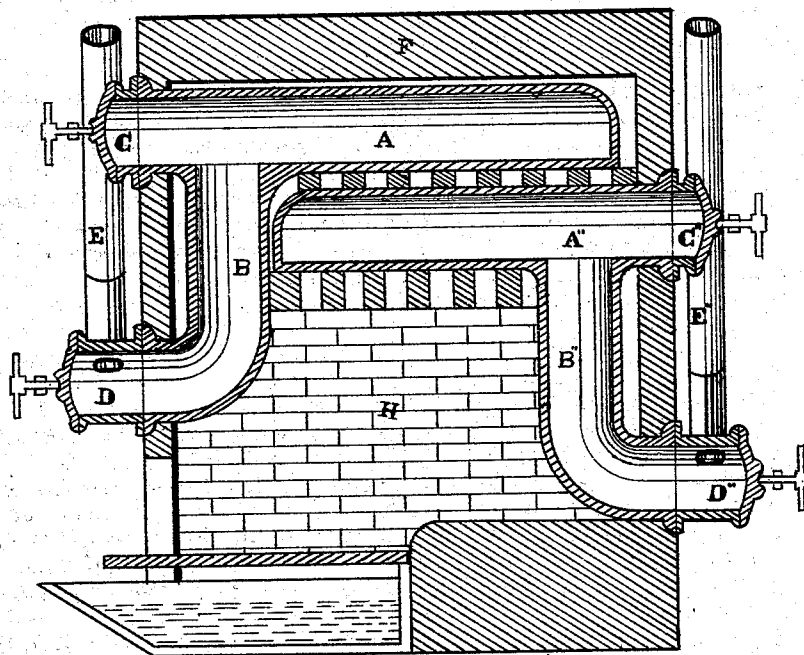
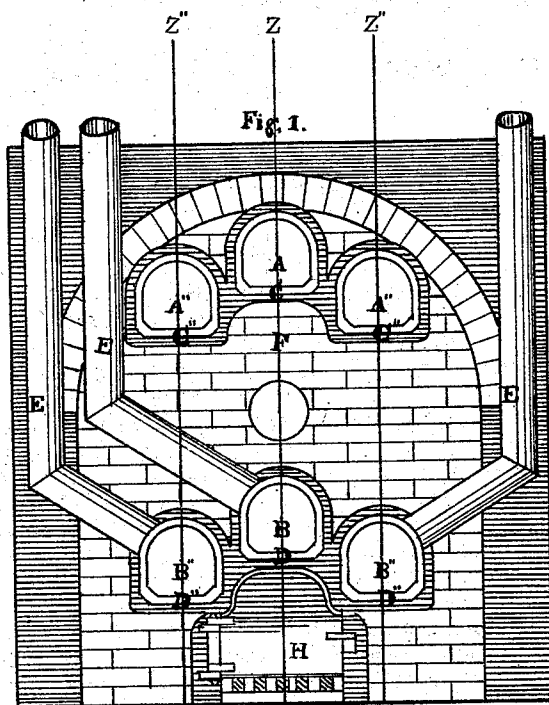


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Processes and Apparatus for the Production of
Inflammable Gas.

No. 154,131.

Patented Aug. 18, 1874.



WITNESSES

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Fig. 2.

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IMPROVEMENT IN PROCESSES AND APPARATUS FOR THE PRODUCTION OF INFLAMMABLE GAS.

Specification forming part of Letters Patent No. **154,131**, dated August 18, 1874; application filed June 22, 1874.

To all whom it may concern:

Be it known that I, WILLIAM ELMER, of the city, county, and State of New York, have invented a Process and Apparatus Combined for the Production of Inflammable Gas from Coal, or other material adapted to this purpose, of which the following is a specification:

The process consists in eliminating from coal or other suitable material, in the gaseous form, the hydrogen and carbon susceptible of displacement by distillation contained therein, in such a manner as to avoid the waste of these elements by the formation of non-inflammable gases and condensable compounds.

The nature of my invention consists in subjecting gas-coal, or other hydrocarbons, to the process of distillation in a retort containing both a horizontal and vertical chamber, by means of which the volatile products given off from a fresh charge of coal in the horizontal chamber are gasified by passing directly through a more highly-heated and partially-carbonized charge of the same material still emitting gas in the vertical chamber.

By this means the volatile products eliminated from the coal while in the volatile condition, and before losing the heat acquired in the process of distillation, are converted into inflammable gas without the waste of the gas-producing elements.

In the ordinary manufacture of gas for illuminating purposes, the waste of gas-producing material is known to be immense, and to arise from the formation of compounds other than inflammable gases, generated during the manufacture of illuminating-gas, and compounds, too, that contain the very elements required for the production of gas, and which are, indeed, so numerous as to amount to a far greater proportion of gas-producing elements than exist in the gas finally obtained.

The object of my invention is to obviate these defects, so as to utilize all the gas-producing elements contained in gas-coal or other hydrocarbons used for the production of gas.

To accomplish this object, I employ the following-described process and apparatus:

Figure 1 represents a front elevation of the bench, the same being alike on both sides, except that in this figure the fire-box H is shown

as it would appear on the opposite side. Fig. 2 represents a vertical section of the same through the line Z, also through the line Z' Z".

As the arrangement of the retorts A B, A' B'', and A'' B'' are precisely alike, therefore the description of one will answer for all.

The arrangement of these retorts is substantially as shown in Fig. 2, A A'' being the distilling retort or chamber, located in bench F, in a horizontal position, connected with a vertical chamber, B B'', located in the same bench, provided with mouth-piece D D'', and with stand-pipe E E'', which latter conveys the gas to the hydraulic main, as in the ordinary manner. Chamber A is also provided with a mouth-piece, C C'', but no stand-pipe; therefore all the gas generated in this chamber must descend through chamber B B'', and escape through stand-pipe E E'', as above stated.

Before entering into the details of the process I desire to employ in combination with this apparatus, I wish to point out the following advantages of the said apparatus in an economical point of view: I avoid the necessity of employing two separate benches (placed back to back, as in the ordinary gas-works) by utilizing the room in a single bench, which may be done by enlarging the bench to a trifling extent, so that one fire can be made to carbonize as much material as two separate fires, which are necessary when two benches are employed.

To make this better understood, the fire-box H in my apparatus is made to sufficiently heat six of the double-chamber retorts A B, while the bench F is but little larger in any of its dimensions than an ordinary six-retort bench, which can only carbonize one-half the amount of material in the same space of time; besides, there are but three stand-pipes at each side of the bench, while all the coke is withdrawn from the lowest portion of the bench, thus not only simplifying the apparatus, but at the same time rendering the operation of gas-making more agreeable, and also reducing the cost of construction of works to a great extent.

Any number of these retorts may be employed, instead of the six shown to describe the substantial features of the invention.

The coal or other material employed in this process for the production of gas is first introduced in the horizontal chamber, and there subjected to the process of distillation for a sufficient length of time to convert most of the volatile hydrocarbons contained therein into permanent inflammable gas by passing these products through the hot material contained in the vertical chamber, after which the whole charge of coal in the horizontal chamber will be drawn to the front end of the horizontal chamber, and thus delivered into the vertical chamber, after which a new or fresh charge of material will be introduced into the horizontal chamber, and thus both will continue to yield gas until the former-mentioned charge is drawn out of the vertical chamber. The length of time required to properly carbonize the material will greatly depend on the temperature employed. The horizontal chamber, being charged with cold material, is only designed to partially carbonize it. Indeed, it is almost impossible to do otherwise in a reasonable length of time, so great is the temperature diminished upon receiving every fresh charge. But it will be readily observed in my process that the temperature of the vertical chamber is but little diminished upon receipt of the already hot charge from the horizontal one. This being the case, the said vertical chamber will eventually arrive at a temperature sufficient to convert all of the volatile constituents of the material employed into gas; therefore the temperature of these two chambers must be regulated according to the nature of the material employed, thus preventing the formation of those useless compounds formed in the old process, and which, for the most part, contain hydrogen. For example, in the old process, a portion of the hydrogen present combines with a portion of the oxygen, forming aqueous vapor; another with a portion of the sulphur, forming sulphureted hydrogen; another portion combines with the nitrogen, forming ammonia, and another portion is appropriated in the formation of coal-tar and other similar compounds, both solid and fluid, thus constituting an immense waste of both hydrogen and carbon, which, by proper treatment, could have been permanently liberated in the gaseous form.

For the purpose of liberating the hydrogen contained in the coal or other material subjected to the process herein described, the volatile products given off from such material by distillation in the horizontal chamber, and before losing their volatile condition and the heat acquired in the process of distillation, are passed, as before stated, directly through a more highly-heated chamber and in contact

with the highly-heated coal still emitting gas contained therein, thus liberating in the gaseous form the hydrogen, both in the free state and combined with carbon.

It will thus be seen that in my process the distillate from a fresh charge of coal is passed through a hot charge of the same material contained in the vertical chamber while this material is still emitting gas. By this means the distillate in question is decomposed without undue loss of its luminiferous constituents therein contained; but if the coal through which it is passed has been completely reduced to coke or has ceased to yield gas, it would in this condition act similarly to charcoal and other like carbonaceous substances, which readily absorb and decompose olefiant gas and other rich hydrocarbons.

Among other advantages of my process over the old for the manufacture of gas, the following may be mentioned: First, a much greater yield of gas is obtained from any given quantity or quality of material employed. This is accounted for by the saving of a vast amount of material converted into gas, which material is lost as gas-producing agents by the formation of certain compounds formed in the old process. Second, the gas produced by my process is of a permanent character, being more free of condensable products than gas made in the ordinary manner. This is accounted for by the subjection of all the volatile products to a heat sufficient to convert them into fixed gas. Therefore,

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. The process of generating inflammable gases from coal or other hydrocarbons by means of a retort containing two chambers, one horizontal and the other vertical, and arranged in such a manner that the distillate given off from the material in the horizontal chamber will pass down through a more highly-heated and partially-carbonized charge of the same material still emitting gas in the vertical chamber.

2. A retort or a bench of retorts containing both a horizontal and a vertical chamber, for the purpose of shifting the charge of material from the former to the latter, for the purposes set forth in the foregoing specification.

3. The mode of arranging the retorts in bench F, substantially as shown in Fig. 2, for the purposes set forth in the foregoing specification.

WILLIAM ELMER.

Witnesses:

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S. B. GOODALE.