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C. ELLIS.

PROCESS OF GENERATING COMBUSTIBLE GAS.

APPLICATION FILED FEB. 9, 1905.

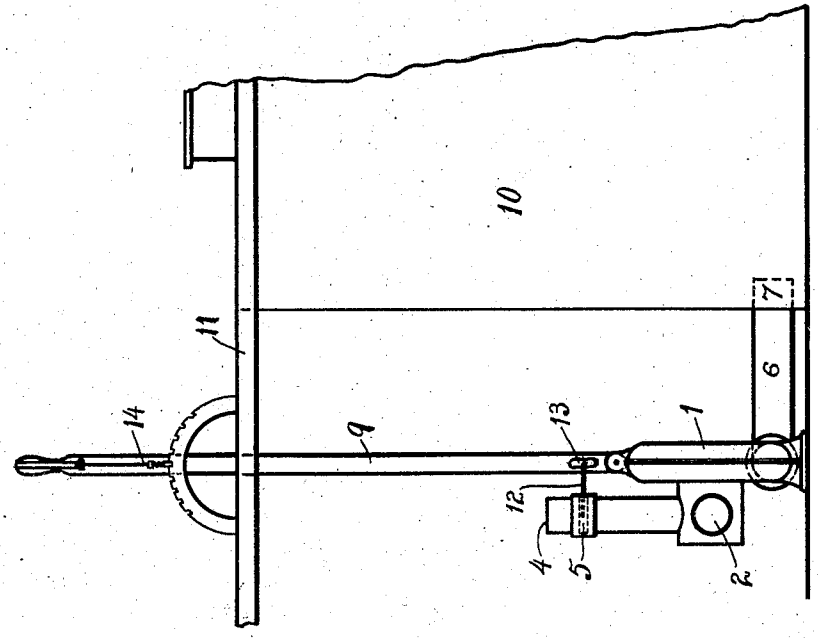

Fig. 1.

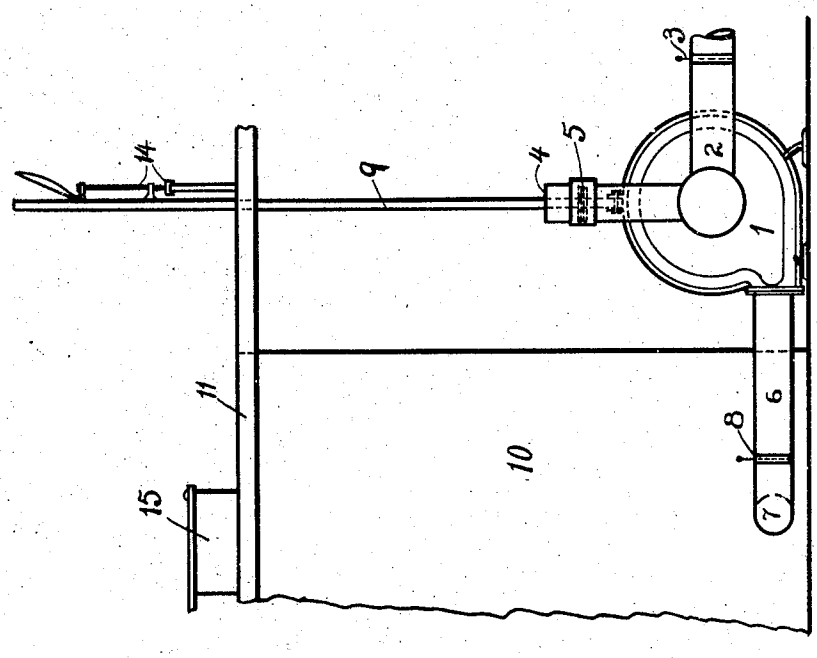

Fig. 2.

WITNESSES:

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UNITED STATES PATENT OFFICE.

CARLETON ELLIS, OF NEW YORK, N. Y., ASSIGNOR TO ELDRED PROCESS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PROCESS OF GENERATING COMBUSTIBLE GAS.

SPECIFICATION forming part of Letters Patent No. 790,488, dated May 23, 1905.

Application filed February 9, 1905. Serial No. 244,882.

To all whom it may concern:

Be it known that I, CARLETON ELLIS, a citizen of the United States, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Processes of Generating Combustible Gas, of which the following is a specification.

The object of this invention is to provide a method for the regulation and control of gas-producers without the necessity of using steam in the production of so-called "producer-gas," by which carbon dioxid is made the essential endothermic or temperature-regulating agent in the operation of the gas-producing system.

The present invention has for its object the more specific method of handling or utilizing stack-gases to effect a temperature-control applicable in the use particularly of bituminous coals in which the distillation of the volatile hydrocarbons is an important feature of the gas-producing operation, and for that reason must be given due consideration if a producer-gas of the high calorific and heat-imparting value is to be secured.

I have found that in the regulation of temperature of a gas-producer by means of carbon dioxid obtained from products of combustion a gas-producer may be run at an even temperature for a long period of time without the formation of an objectionable amount of clinker and soot, and that it will deliver a combustible gas of very high calorific value, and that in comparison the gas obtained from a steam-operated producer works very poorly. Doubtless this is due to the passage of considerable free steam through the mass of fuel in the producer and into the combustible gas. The deadening action of this steam on the flame at the point where the gas is burned is very evident and the dry or anhydrous gas or gas containing substantially no steam-forming elements burns with a far brighter, more vivid, and intense flame than one containing free steam and hydrogen. In the production of the gas when soft coal is used, I have found it desirable to periodically vary the amount of carbon dioxid used in the draft-current passing through the producer. At the time when the fuel is admitted to the producer a vigorous distillation of the hydrocarbons occurs. This free evolution of combustible matter at comparatively low temperatures causes a sudden increase in the calorific value of the gas immediately after the addition of the coal. For that reason the flame shows some variation in intensity at the time of the coal addition to the producer, and these fluctuations are considered undesirable, and economy of fuel in the producer and efficiency of operation at the furnace would be better attained if the gas could be delivered in a stream of uniform unvarying composition.

I have found with my process that the control of the temperature of the gas-producer is easily secured by means of carbon dioxid. It seems to be a far more responsive agent than steam for this purpose. An increase of carbon dioxid in the draft-gases of only a small per cent. will almost instantaneously effect a marked temperature change in the gas-producer. I have discovered that if at the time of addition of fuel to the producer the temperature be reduced somewhat from the normal the distillation of volatile hydrocarbon goes on more slowly than would be the case if this reduction in temperature were not made, and I have found that by reducing the temperature at the time of addition of the charge of coal and that by subsequently gradually raising the temperature as the volatile hydrocarbons are driven off I can secure a gradual evolution of the hydrocarbons which impart to the flame its heat-radiant qualities and can therefore secure a gas of greater uniformity of constitution. To carry this into effect I make additions to the draft-current entering the producer of greater or less amounts of carbon dioxid, according to circumstances—that is to say, on the addition of fuel to the producer I increase the amount of carbon dioxid, thus cooling the producer and preventing too-rapid distillation of the hydrocarbons, as the more volatile of these compounds gradually distil off and the less volatile or more difficultly-evaporated ones re-

main. I then decrease the percentage of carbon dioxid, thus increasing the oxygen, and consequently increasing the temperature of the producer, with the result that the hydrocarbons distilled only at high temperatures are now driven off and only coke remains, at which time a fresh charge of coal may be added and the operation repeated as before. Such a method of operation would not be easily possible with a producer operated by steam, owing to the fact that the temperature of the producer is not so easily controlled by steam as by the endothermic action of carbon dioxid. The fact that the temperature of the producer responds so quickly to changes in the carbon-dioxid content of the draft-current makes the process which I have described of easy applicability to the purpose aforesaid.

My invention consists in a method for the regulation of gas-producers to obtain a uniform distillation of the volatile hydrocarbons, which involves the periodical variation of the carbon-dioxid content of the draft-current supplied to the mass of gas-producing fuel, and a mode of application is hereinafter set forth to illustrate the manner in which such process may be readily carried into effect and by which practical results as regards the economy of fuel and general efficiency of operation may be attained.

In the accompanying diagrammatic drawings, Figures 1 and 2 show a fan-blower 1 with a pipe connection 2 on its inlet side, through which gases carrying carbon dioxid are drawn to the fan. These gases may be taken from any convenient stack, furnace, or kiln, such as a lime or cement kiln, or from any source from whence carbon dioxid as a waste product is ordinarily discharged. The pipe 2 is shown with a valve 3 for adjustment. On the stack-gas-inlet side of the fan is also placed an air-inlet 4. The valve 5 is situated in this air-inlet pipe, by means of which the air-supply is regulated. The exhaust side of the fan connects, by means of pipe 6, to a gas-producer 10 at 7. A valve 8 serves for regulation of the volume of the gases delivered to the gas-producer. A lever 9, having its fulcrum at the fan 1, is shown extending up through the charging-platform 11 of the producer 10. Connected to this lever and working in the slot 13 is a rod 12, attached to the valve 5, whereby adjustment of the air-opening may be conveniently made by a workman standing on the platform 11 and moving the lever 9. A ratchet arrangement (shown at 14) serves to adjust this lever to any desired position.

The process is operated as follows: A mass of incandescent fuel may be supposed to be undergoing combustion in the producer, with the fan delivering thereto a mixture of stack-gas and air in such proportions or relative amounts as suffice to keep the temperature below the point at which clinkering takes place in any serious amount. The valve 3 may be left wide open provided the pipe 2 is so proportioned that an excessive volume of stack-gas is not drawn in under such circumstances. On the addition of a fresh charge of coal the temperature should be lowered, and to do this the lever 9 is drawn forward to partly close the valve 5 of the air-inlet 4. The speed of fan being unchanged, the pull on the gases coming from the stack through pipe 2 is now increased and a greater volume of carbon dioxid is propelled into the gas-producer. An immediate lowering of the temperature results, and the distillation of the volatile hydrocarbons proceeds uniformly. Gradually the lever is reversed, thereby increasing the air-opening, and consequently increasing the proportion of oxygen in the draft-current. Finally, when distillation has been completed, more coal may be added and the carbon dioxid increased and decreased as before. This periodical change in the relative amount of carbon dioxid I find to be of great value in the employment of stack-gases for the regulation of gas-producers. I find that great economy in fuel is secured and the operation of a plant using such a system is in many ways facilitated.

I do not limit myself to the particular mode of application herein described, as various other methods apparent to one familiar with the operation of gas-producing systems may be used without departing from the scope of this invention.

What I claim is—

1. Process for the regulation and control of the temperature of gas-producers which consists in passing through a mass of ignited fuel a gaseous mixture composed substantially of air and products of combustion, and in varying the relative proportions of oxygen and carbon dioxid therein to secure a uniform distillation of the volatile hydrocarbons of the fuel, by increasing the proportion of carbon dioxid at the time of addition of fresh fuel.

2. In the operation of gas-producers, process for the regulation and control of the temperature thereof by carbon dioxid to secure a uniform distillation of the volatile hydrocarbons of the fuel, which consists in intermittently varying the said carbon dioxid in the draft-current supplied to the producer to produce a relatively low temperature at the time of addition of fresh fuel.

3. Process for the regulation of gas-producer temperature, to secure a uniform distillation of the volatile hydrocarbons in the fuel, which consists in supplying to a mass of ignited fuel a draft-current containing carbon dioxid and in varying in predetermined manner at frequent intervals the amount of said carbon dioxid in the draft-current to create a relatively low temperature at the time of the addition of fresh fuel to the gas-producing mass and in subsequently producing a

higher temperature to effect the gradual evolution of the products of distillation.

4. Process for the generation of combustible gas which consists in passing through a mass of ignited fuel a draft-current of varying composition in which carbon dioxid is periodically increased below the normal or average amount at the time of addition of fresh fuel to said mass of ignited fuel, to thereby retard and make more uniform the distillation of the volatile hydrocarbons from the fuel.

Signed at New York city, in the county of New York and State of New York, this 8th day of February, A. D. 1905.

CARLETON ELLIS.

Witnesses:
WARREN E. DIXON,
A. M. SENIOR.