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W. C. FINCK.

PROCESS OF GENERATING AND DELIVERING GAS UNDER UNIFORM PRESSURE.

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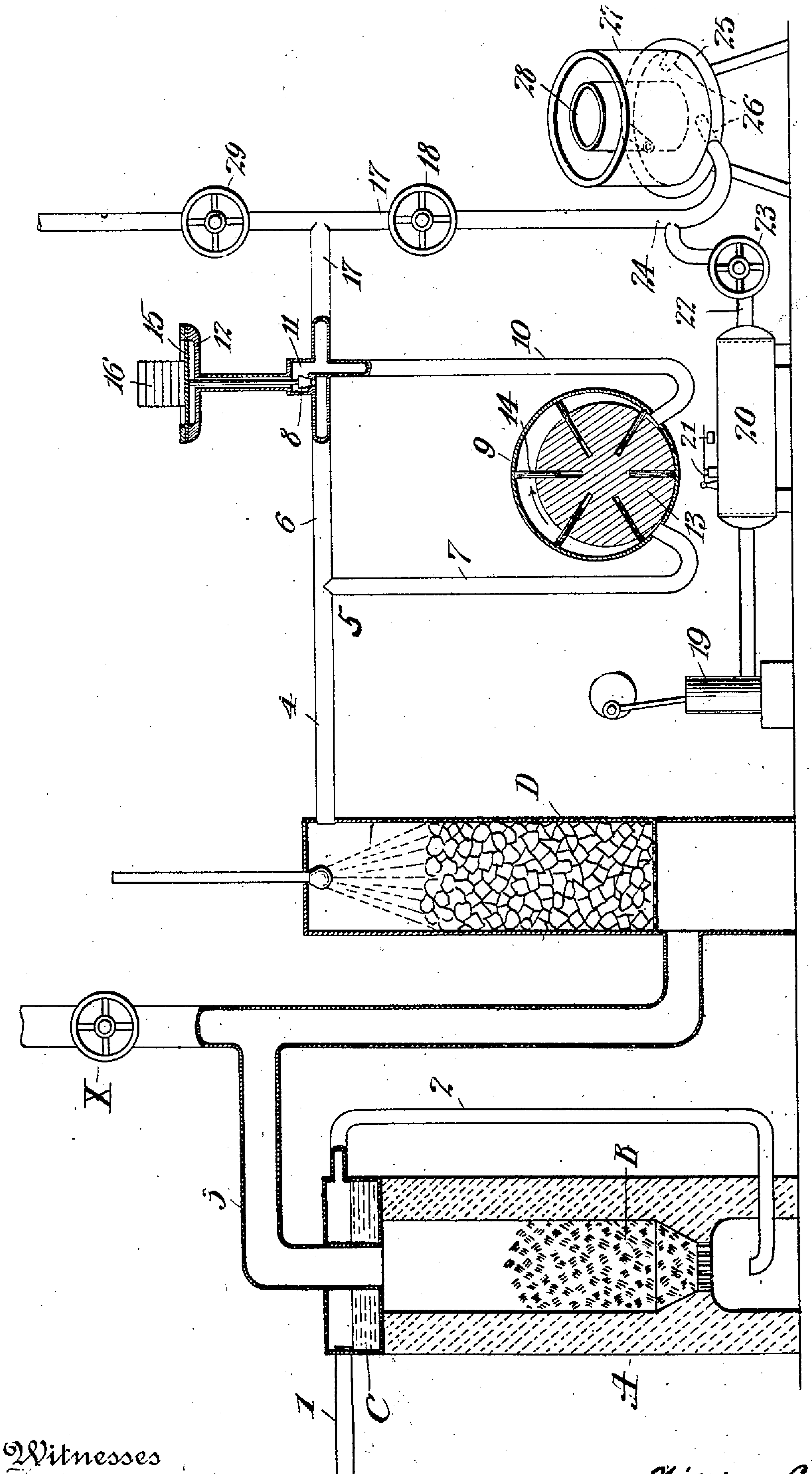

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PROCESS OF GENERATING AND DELIVERING GAS UNDER UNIFORM PRESSURE.

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To all whom it may concern:

Be it known that I, WILLIAM C. FINCK, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Generation and Delivery of Gas Under Uniform Pressure to a Point of Consumption, of which the following is a full, clear, and exact description.

My invention relates to a process for generating gas and delivering it under constant pressure.

While producer gas has been extensively applied to the operation of engines, and other uses, so far as I am aware, there is no practical system by which producer gas can be employed for melting and annealing, particularly in buildings subject to the ordinary insurance regulations.

In my present invention I aim to devise a system applicable to the purposes above mentioned, and one that shall be cheap, compact, and very simple in operation, so as to be applicable to the uses of ordinary persons not skilled in the art.

With these objects in view my invention consists in the method hereinafter set forth and shown, and finally particularly pointed out in the appended claims.

The drawing illustrates a diagrammatic view of the essential parts of a plant embodying the principles of my invention.

A well known form of producer gas generator comprises a small hermetically closed furnace with a water pan or water jacket incorporated therein, and pipes by which a supply of air is led across the surface of the warm water and then fed through the grate and through the fuel bed. Such a generator produces gas having special qualities and is entirely different from illuminating gas. The product is partly a coal and partly a water gas and contains a very large proportion of nitrogen and carbon dioxid, and as a result its heating value is only about one-quarter of ordinary illuminating gas. It can be used with gas engines specially constructed with very large cylinders and high compression and capable of giving a high proportion of gas to air in the mixture. In this case the suction of the engine furnishes the means for maintaining the current flow and supporting the combustion within the generator.

When it is attempted to burn producer gas, entirely new conditions arise. In the first place, means must be provided for giving a suction of about four pounds so as to maintain the draft or current through the generator and keep it in action. Secondly, the gas must be raised to a constant pressure suitable to its nature which is considerably higher than ordinary illuminating gas and amounting to about one and one-quarter pounds in practice. These results can of course be accomplished by the use of pumps and a gasometer of sufficient capacity. The use of a gasometer is, however, quite out of the question in home or private plants on account of insurance regulations. It is further out of the question because the constant attention of an operator is required to keep the proper amount of gas in the gasometer.

The object of my invention is to make producer gas available in a private plant for melting and annealing and other burners.

In carrying out the invention I make use of a system of piping combined with a pump by which a suitable suction is created in the generator, and the gas is impelled to the delivery burners under the required pressure without the use of any reservoirs, gasometers, or like devices.

Referring to the drawing, A denotes the generator having a fuel bed B, and a water pan C. While any construction of generator is applicable, a very simple construction, as diagrammatically indicated, I have found in practice to be quite sufficient. In this form the air is admitted from the atmosphere through the pipe 1, passing over the surface of the water in the pan C, through the pipe 2, fuel bed B, and pipe 3. In this way the oxygen of the air is converted into carbon monoxid, and such vapor as the air carries, into carbon monoxid and hydrogen, making a rather poor, but very cheap gas, capable of being burned under certain circumstances.

D indicates the scrubber, and I have employed for this purpose a simple casing filled with coke over which water trickles. This is the ordinary form of scrubber.

At the upper part of the scrubber I tap a pipe connection 4, which is led to connections specially arranged and forming an important feature of my invention. The pipe 4 divides at the point 5 into two branches 6 and 7, the branch 6 leading to a valve 8, while the branch 7 leads into a rotary pump 9.

10 designates a delivery branch of the pump which terminates in a connection 11 to a diaphragm casing 12. The valve 8 is specially arranged to open and close under certain conditions which will be later described.

The pump 9 must be of a character capable of maintaining a pressure of about eleven pounds absolute in the pipe 7, and must be capable of maintaining at least two pounds gage pressure in the pipe 10. This amounts to a pressure rise of about six pounds through the pump. It is evident that a centrifugal or fan blower is not adapted for this use, since such blowers are incapable of raising the pressure to this degree. A piston pump is also unsuitable because of the intermittent character of its delivery. While it is possible that varying forms of pump may be devised for satisfying the requirements, so far as I am aware, the only construction which will give the necessary six pounds raise, and at the same time deliver its output in absolutely steady flow, is the form diagrammatically shown, having an eccentric drum with blades slidably projected therefrom. Of course I do not claim anything novel in this construction of pump, but merely in its combination in the system. As indicated in the drawing, the rotary element 13 has blades 14 radially impelled therefrom, and eccentrically rotates within the casing 9 in the direction of the arrow. On account of the plurality of blades, it is evident that the gaseous current is impelled through in an almost absolutely uniform stream at the same time that its pressure is raised about six pounds absolute.

The output of the pump 9 is, of course, a constant volume, and means must be provided for compensating for the varying requirements of the burners, and the melting and annealing processes. This I accomplish by the mechanism of the valve 8. The casing 12 has a flexible diaphragm 15 thereon of any convenient diameter, preferably about eight inches, and the valve 8 is connected to this diaphragm so as to be opened and closed by the movements thereof.

16 designate weights, and in practice I put on about sixty or sixty-five pounds of iron so that the weights are effective to bear down the diaphragm 15 and the valve 8 upon its seat, unless the pressure within the receiver 12 amounts to one and one-quarter pounds, or other fixed amount of about this value. By having the diaphragm 15 of substantially large diameter I am enabled to secure a very sensitive adjustment of the valve 8 which closes in case the pressure drops the least amount below a fixed value in the chamber 12, and opens in case the pressure within the chamber 12 rises to any degree above such fixed value. Inasmuch as the chamber 12 is in constant communication with the connection 11 and the pipe 10, the pressures in the latter exactly correspond to those in the chamber 12. At the point 17 is located a branch connection from the pipe 10, and 18 denotes a valve within this branch connection.

In addition to the pump 9 above described I provide an additional pump 19 for which there are no particular requirements, and which may be of any description. The pump 19 serves to compress air within a reservoir or tank 20 having a safety valve 21 set at about one and one-half pounds or thereabouts. The pump 19 is of sufficient capacity to supply all the needs of the reservoir, any surplus issuing harmlessly through the safety or relief valve 21.

22 indicates a pipe connection from the reservoir, and 23 indicates a valve within such pipe connection. The pipes 17 and 22 are united at the point 24, and their respective gaseous and air currents pass together through the pipe 25 which extends annularly around into the form of a complete circumference or circle, and has delivery openings 26 tangentially disposed therein. These delivery openings project within a furnace chamber 27.

28 designates a melting pot within the furnace chamber.

The operation is as follows: The process may be commenced by building a fire B, and opening the chimney valve X so as to create a draft and get the fire burning properly, or the pump 9 may be started and create a forced draft for getting the initial combustion. After a time an incandescent body of fuel B is obtained in the furnace A after which the chimney valve X is closed, and the pump started, if this has not been already done, so that air is drawn through the inlet 1 of the generator A over the surface of the water in the pan C, through the fuel bed B, pipe 3, scrubber D, connections 4, 7, pump 9, and pipes 10 and 17. When the apparatus is started into proper operation, the valve 29 is closed and the producer gas immediately acquires a certain gage pressure in the pipe 10. This pressure is immediately transmitted to the diaphragm chamber 12, and as soon as it amounts to a fixed value of about one and one-quarter pounds gage pressure, the force of the weights 16 is overcome and the valve 8 raised off of its seat. This immediately provides an outlet for the gases within pipe 10 which flow back to the suction side of the pump 7.

It is evident that the valve 8 will operate to permit only so much of the gas within the pipe 10 to pass back into the suction side of the pump as is necessary to keep the pressure at the fixed value of about one and one-quarter pounds. At the same time no escape of the poisonous gases is allowed to take place to vitiate the atmosphere or form explosive or dangerous mixtures. It is now

merely necessary to open the valves 18 and 23, whereupon a large volume of the producer gas at one and one-quarter pounds pressure, and air from the receiver 20 at about one and one-half pounds pressure will become mixed in the pipe 25 and issue through the various nozzles 26 into the furnace chamber.

By virtue of the above arrangement a sufficient amount of the producer gas and air are brought together within the confined space of the melting chamber to develop a large heat unit value, and in practice a sufficient amount of heat is generated for melting and annealing purposes. It is of course necessary to have two factors present. First and most important, the ability to regulate the respective supplies of air and gas finely to any percentage, as it is only with exact percentages that fuel gas can be made to burn. It is additionally necessary to have absolutely constant pressures of about the amounts indicated, which do not vary for different quantities used, as fluctuating pressures change the quantities of air and gas delivered, and thereby the percentage of the mixture formed, so that the flame is liable to go out by reason of such improper percentages. While I do not regard the utilization of producer gas for melting and annealing, broadly stated, as constituting my invention, I believe that it is novel with me to provide a system by which producer gas can be delivered in any quantity at absolutely unvarying pressure without the use of a gasometer.

It will be further observed that my system is absolutely automatic and self contained, and does not necessitate any source of steam supply or compressed air for feeding the generator, as is common with gas producers of the ordinary illuminating gas type. The system is accordingly specially applicable to the use of private installations where skilled services are not available for its management, and insurance conditions prohibit gas reservoirs, gasometers, and such devices.

While I have shown the invention as applied to a form of burner for melting and annealing, I desire to include other burners which may be used coincidentally with or separately from the annealing furnace.

What I claim, is:—

The process for generating and delivering gas to a point of consumption under a uniform pressure which consists in creating a partial vacuum on the inlet side of a pressure pump, connecting such inlet with a fuel chamber whereby air is sucked through the fuel chamber, the air having previously passed across the surface of warm water, the gas being delivered from the pressure pump against a weighted valve so that the valve is not operated unless a certain predetermined pressure at the outlet side of the pump is exceeded, the stream of gas being then divided in case such pressure is exceeded, by the operation of said valve so that part of the stream passes to the point of consumption under a fixed pressure, while the remainder returns to the inlet side of the pump, and finally adding air to the gaseous stream at a point beyond said valve and at a pressure greater than the pressure of said gas at the outlet side of the pump.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

WILLIAM C. FINCK

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