J. H. HIRT.

PROCESS OF PRODUCING GAS.

APPLICATION FILED FEB. 14, 1910.

1,110,782. Patented Sept. 15, 1914.

2 SHEETS—SHEET 1.

FIG. 1.

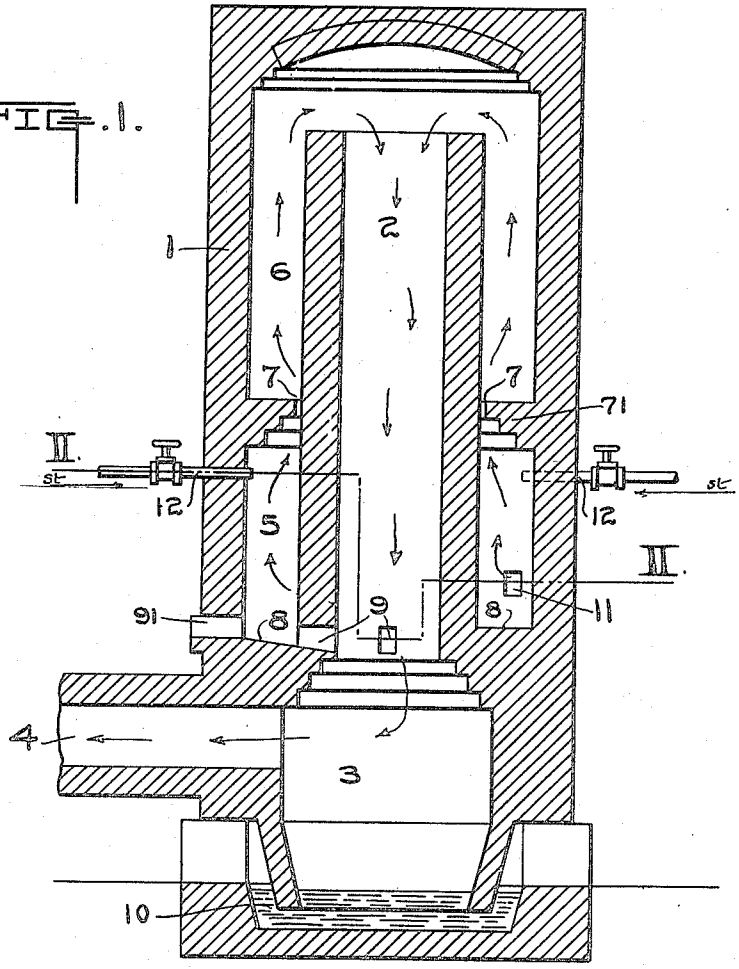
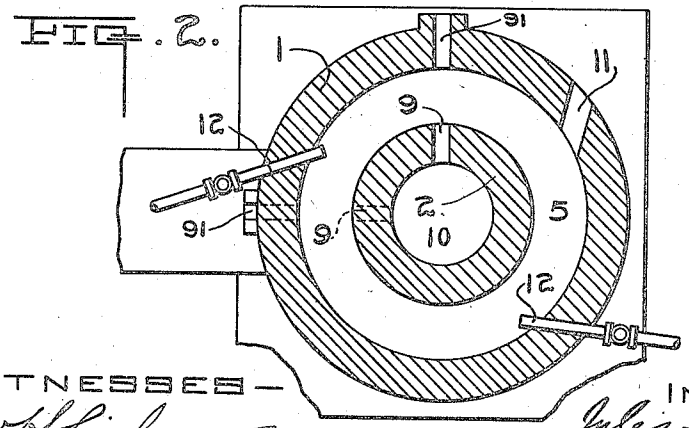


FIG. 2.



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2 SHEETS—SHEET 2.

FIG. 3.

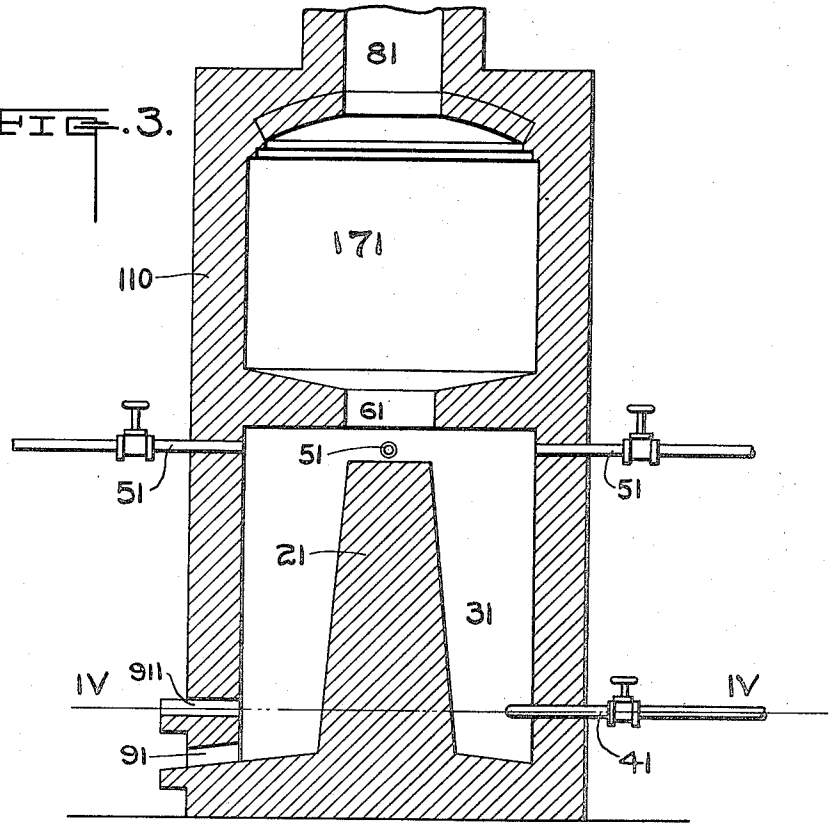
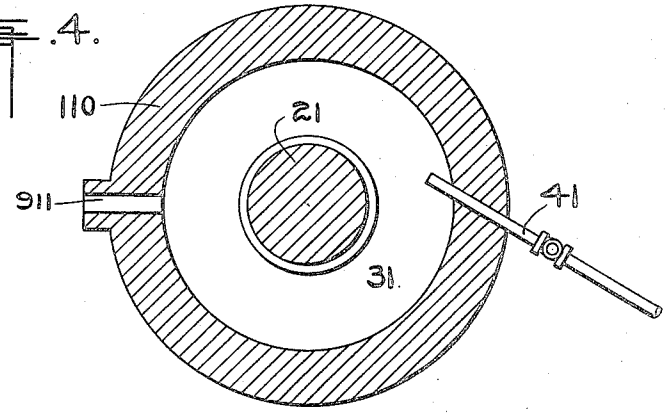


FIG. 4.



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UNITED STATES PATENT OFFICE.

JULES H. HIRT, OF EL PASO, TEXAS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALLIS-CHALMERS MANUFACTURING COMPANY, A CORPORATION OF DELAWARE.

PROCESS OF PRODUCING GAS.

1,110,782. Specification of Letters Patent. Patented Sept. 15, 1914.

Application filed February 14, 1910. Serial No. 543,726.

To all whom it may concern:

Be it known that I, JULES H. HIRT, a citizen of the United States, residing at El Paso, in the county of El Paso and State of Texas, have invented a certain new and useful Improvement in Processes of Producing Gas, of which the following is a specification.

This invention relates to improvements in the process of making producer gas.

The object of the invention is to produce a gas that is rich in carbon monoxid, by a continuous process, where the gas-forming combustible material is admitted at one part of the gas generating chamber and producer gas is removed from another part of said chamber. The process provides for the proper reduction of the high temperature incident to the carrying out of the process.

The accompanying drawings illustrate two forms of gas producer by means of which the process may be carried out. The drawings will serve only to clearly ascertain the process and are not in any sense to be understood as limiting the process to either form of apparatus.

In the drawings—Figure 1 is a central vertical section of one form of gas producer; Fig. 2 is a section of the producer shown in Fig. 1 taken on the line 2—2 of said figure; Fig. 3 is a central vertical section of a modified form of gas producer; and Fig. 4 is a transverse section of the producer of Fig. 3 taken on the line 4—4 of that figure.

Referring to the producer shown in Figs 1 and 2 of the drawing, the outer shell 1 is preferably circular and is so mounted as to open up at the bottom into a water seal 10. A chamber 3 is formed in the lower part of the shell 1 and opens at the bottom into the water seal 10 and near the top into the off-take pipe 4. The chamber 3 is of reduced diameter at the top and there communicates with the lower end of hollow column 2 which extends upwardly within the shell 1 to a point near the top of the hollow interior portion of the shell 1. This hollow interior portion of the shell 1 is formed into two chambers 6, 5, by an annular ledge 71 projecting inwardly from the shell 1. The chambers 6, 5, are annular in form by reason of the location of the hollow columns 2 within the shell 1. An annular communicating passage 7 is formed between the ledge 71 and the outside of column 2 and constitutes a centrally disposed passage through which said column extends. A tangentially disposed inlet 11 for gas-forming combustible material mixed with air is formed in the shell 1 near the bottom of chamber 5. Other tangentially disposed valve controlled inlets 12 are passed through the shell 1 near the top of chamber 5. Radial slag ports 9 pierce the lower end of column 2 from the bottom of chamber 5. Poke holes 91 pierce the shell 1 so as to register with slag ports 9. These poke holes 91 will normally be closed by any convenient means not shown. The floor 8 of chamber 5 is slightly inclined with its lowest parts adjacent slag ports 9.

Referring to the producer shown in Figs. 3 and 4 of the drawing, the shell 110 is closed at the bottom instead of opening into a water seal, and the lower chamber therein is omitted. The column 21 is in this case solid and extends centrally up from the bottom of the shell 110. The shell 110 is divided interiorly into two chambers 31, 171, by an annular ledge projecting inwardly from the shell 110. A column 21 extends upwardly to a point adjacent central opening 61 in the annular ledge. The upper chamber 171 opens into off-take pipe 81 at the top. A tangentially disposed valved inlet 41 pierces shell 110 near the bottom of chamber 31. Other tangentially disposed inlets 51 pierce the shell 110 near the top of chamber 31. A slag port 91 through shell 110 communicates with chamber 31 at the bottom thereof. A poke hole 911 also pierces shell 110 adjacent slag port 91.

Operation: Referring to the producer shown in Figs. 1 and 2 of the drawing, finely divided gas-forming combustible material is introduced under pressure through the inlet 11 into combustion chamber 5, sufficient air to produce complete combustion being supplied until a high temperature is attained in the said chamber. The volume of air admitted is then decreased in such degree that carbon dioxid ceases to be produced and the resultant gas is carbon monoxid at the temperature of incandescence. The highest temperature is attained in the upper part of the combustion chamber 5 and the gases and material swirl about column 2 within said chamber, and the resultant gas or gases pass through annular passage 7, and, swirling about column 2 in chamber 6, thence pass downwardly through column 2, chamber 3,

and out through off-take pipe 4 to any point desired for storage or use. Steam or other form of moisture or any other endothermic agent is admitted through inlets 12 to the upper part of chamber 5, increases the swirling action of the combustible material and gases about column 2, and at the high temperature decomposes in the presence of the highly heated carbon, forming hydrogen, carbon monoxid, and methane or marsh gas. The formation of the marsh gas is made possible, or its decomposition is prevented by the introduction of the steam or other form of moisture or endothermic agent, undoubtedly due to the reduction of the temperature by its introduction. This is proven by the results of analyses disclosing that the gas produced contains a higher percentage of carbon monoxid and methane or marsh gas, and a smaller percentage of carbon dioxid than has heretofore been possible to obtain in a gas producer. The reduction of temperature of course serves to preserve the walls of the furnace from destruction by the high temperatures attained.

The central location of the annular passage 7 as compared with the major portion of the combustion chamber 5, together with the swirling of the combustible material and gases in the combustion chamber 5, prevent the passage of solid materials from the combustion chamber. This apparatus as disclosed herein is broadly claimed in application S. N. 465,424, filed Nov. 30, 1908, and specifically in application Serial No. 543,725, filed Feb. 14, 1910. Any excess of such solid material, and also the fused impurities and ash, pass through slag ports 9 and drop in melted condition into the water in water seal 10. Should there be any clogging of the slag ports 9, this may be remedied by the insertion of a poker through these ports by introducing same through poke holes 91 after opening the latter.

Referring to the producer shown in Figs. 3 and 4 of the drawing, finely divided gas-forming combustible material and air are introduced through inlet 41 producing a swirl thereof in chamber 31 about central column 21, are ignited in any convenient way, and complete combustion to carbon dioxid gas takes place and heats the interior of the chamber 31 to a high temperature. At this time the volume of air is decreased in such degree that carbon dioxid ceases to be produced and the resulting gas is carbon monoxid in incandescent state. This passes through opening 61 to chamber 171 and thence through off-take pipe 81 to any point for storage or use. Into the upper part of chamber 31 steam or other form of moisture or any other suitable endothermic agent is admitted through inlets 51 serving the same functions and producing similar results to those attained by the admission of steam through inlets 12 in the producer shown in Figs. 1 and 2.

Excess solid combustible material, fused impurities and ash are removed through slag port 91 to the exterior of the producer. Poke hole 911 may be used for the introduction of a poker to break up slag and clear slag port 91.

Actual test has demonstrated that gas may be generated within fifteen minutes after starting the apparatus, and that two tons of finely divided material can be gasified in one hour.

In the operation of either form of producer herein disclosed it will be seen that the process, the subject of this invention, is carried out. In other words, in either form of gas producer the mixture of gas-forming combustible material and air is ignited and is caused to swirl in the gas generating chamber, and is caused to contract at or near the point of discharge from the said chamber, and near this point of contraction moisture is introduced into the swirling mixture.

It is claimed and desired to secure by Letters Patent,—

1. In the art of producing gas, causing an ignited mixture of gas-forming combustible material and air to swirl and to have an upward travel while in motion, causing the upper portions of said swirling mixture to contract at a point adjacent the axis of the swirling mixture, and introducing moisture to the mixture near said point of contraction.

2. In the art of producing gas, causing an ignited mixture of gas-forming combustible material and air to swirl and to have an upward travel while in motion, causing all the outer upper portions of said swirling mixture to contract centripetally of the swirling mixture and subsequently taking off gas for use.

3. In the art of producing gas, causing an ignited mixture of gas-forming combustible material and air to swirl and to have an upward travel while in motion, causing the upper portions of said swirling mixture to contract at a point adjacent the axis of the swirling mixture, and reducing the temperature of the mixture near said point of contraction.

4. In the art of producing gas, causing an ignited mixture of gas-forming combustible material and air to swirl and to have an upward travel while in motion, causing the upper portions of said swirling mixture to move centripetally, and reducing the temperature of the upper portions of said mixture.

5. In the art of producing gas, causing an ignited mixture of gas-forming combustible material and air to swirl and to have an upward travel while in motion, causing the upper portions of said swirling mixture to

contract at a point adjacent the axis of the swirling mixture, and introducing an endothermic agent to the mixture near said point of contraction.

6. In the art of producing gas, causing a mixture of gas-forming combustible material and air to swirl and to have an upward travel while in motion, igniting the mixture to form a gas, separating the gas from the solid particles in the upper portions of said mixture by causing substantially all of the gas to move centripetally, and removing the gas after segregation.

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

JULES H. HIRT.

Witnesses:
LEON E. HIRT,
C. CADENA.