H. I. LEA.

GAS PRODUCER.

APPLICATION FILED MAR. 14, 1906.

900,862.

Patented Oct. 13, 1908.

2 SHEETS—SHEET 1.

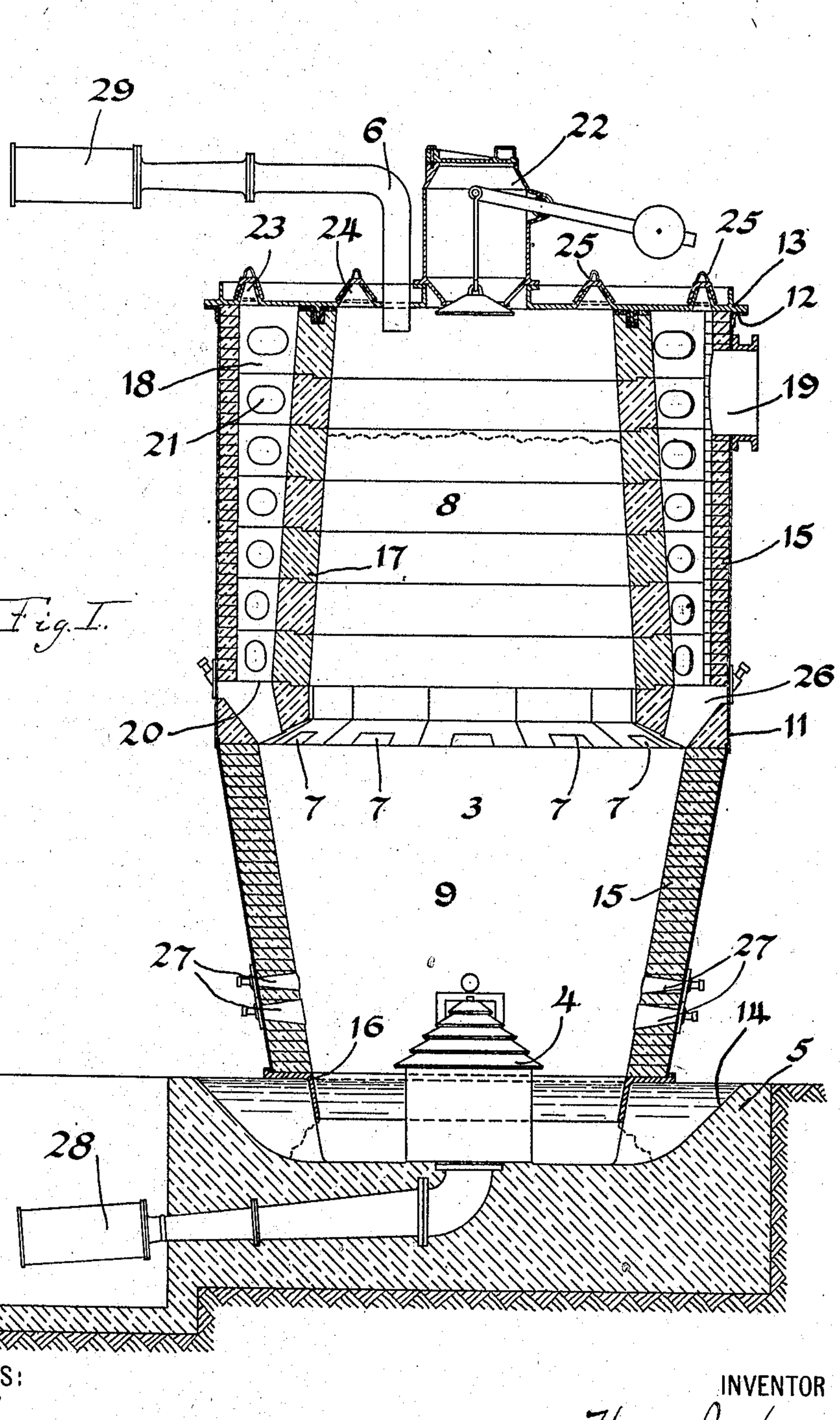

Fig. I.

WITNESSES:

B. M. Stevens.

E. M. McCallister.

INVENTOR

Henry I. Lea.

BY Jno. S. Brown

ATTORNEY

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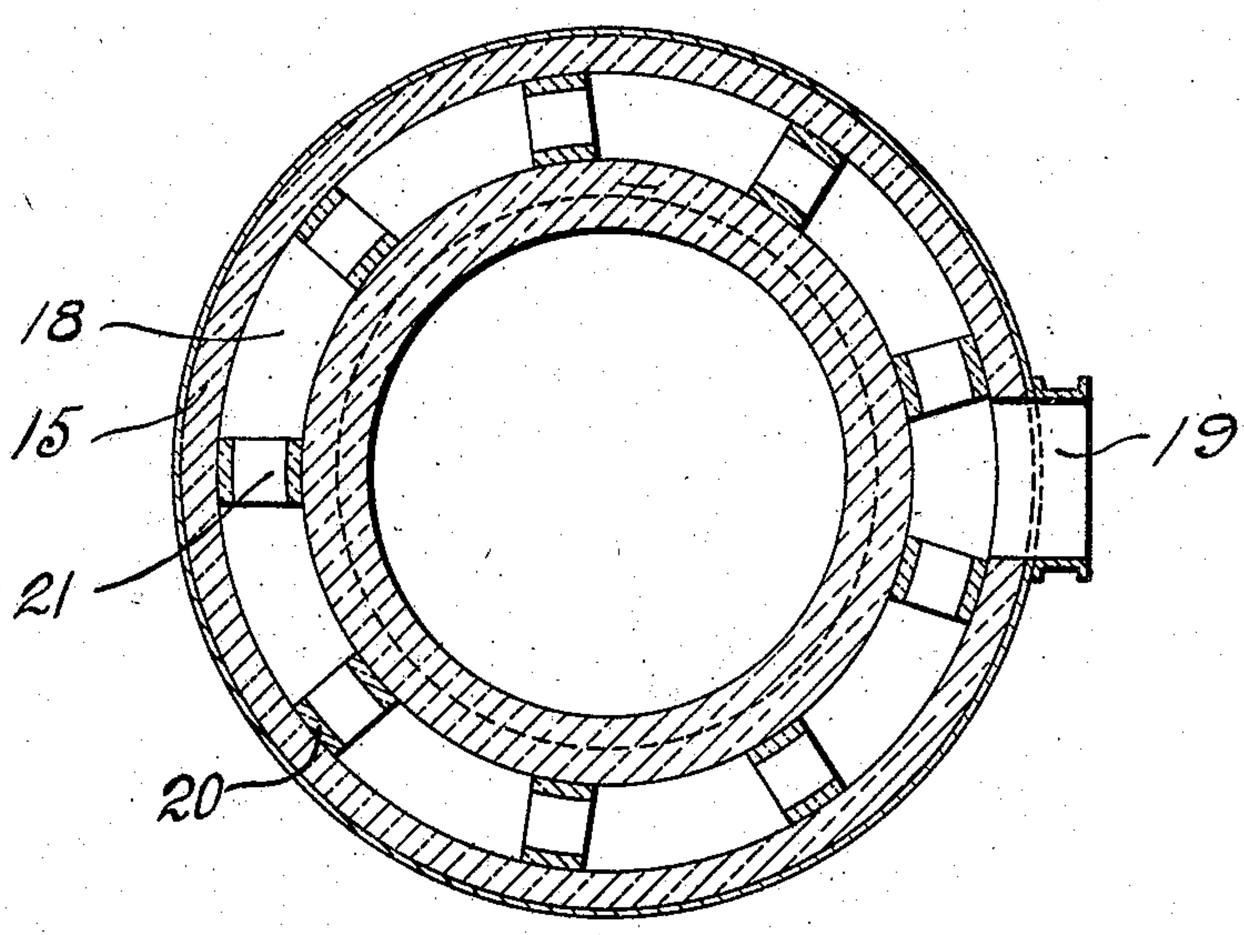

Fig. 2

WITNESSES:

R. F. McIntyre

E. M. Callister.

INVENTOR

Henry I. Lea

BY Jno. D. Green.

his ATTORNEY in fact

UNITED STATES PATENT OFFICE.

HENRY I. LEA, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE MACHINE COMPANY, A CORPORATION OF PENNSYLVANIA.

GAS-PRODUCER.

No. 900,862. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed March 14, 1906. Serial No. 306,008.

To all whom it may concern:

Be it known that I, HENRY I. LEA, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Gas-Producers, of which the following is a specification.

This invention relates to gas producers and has for an object the production of a producer particularly adapted to utilize bituminous coal, but which is capable of effectively utilizing a large variety of other fuel in the production of a tar-free gas.

The object of this invention is the production of a gas producer in which means are provided for utilizing the sensible heat of the gases generated for fixing the hydrocarbon vapors into permanent gases.

A further object is the production of a producer in which means are provided for utilizing a portion of the sensible heat of the gases generated, in assisting the distillation of the fuel contained in the gas-generating chamber and in preheating the blast.

The embodiment of my invention comprises an up and down draft producer from which the gases generated are discharged through centrally-arranged gas outlet ports which communicate with an annular fixing chamber located within the exterior casing of the producer and surrounding the upper portion of the gas-generating chamber.

In the drawing accompanying this application and forming a part thereof, a producer illustrating my invention is shown in Fig. 1, in vertical section. Fig. 2 is a horizontal section of the producer illustrated in Fig. 1.

The producer is provided with a gas-generating chamber 3, which is provided with a blast twyer 4 extending through a foundation 5, which supports the producer, and a blast twyer 6, which extends through the top plate of the producer. A row of offtake ports 7, from which the gases generated are discharged, divides the chamber 3 into a down draft generating chamber 8, which is provided with the blast twyer 6 and an up draft generating chamber 9, which is provided with the blast twyer 4.

A cylindrical shell 11 incloses the gas-generating chamber and is provided at the top with a suitable flange angle 12 to which the top plate 13 is secured. The shell 11 extends downwardly into a water pan 14, which is formed in the foundation 5 and which is adapted, by being filled with water, to seal the interior of the producer in such a way that the ash discharged from the generating chamber into the water pan may be removed without affecting the operation of the producer or allowing the escape of gas.

Within shell 11 is a refractory lining 15, resting on base ring 16, which, in turn, is carried by piers, (not shown), built up from foundation 5 in water pan 14. A refractory lining 17, supported by the lining 15, incloses the down draft generating chamber 8 and is so arranged that an annular chamber 18 is maintained between it and the lining 15. A discharge port 19 extends through the lining 15 and shell 11 near the top of the producer and communicates with the annular chamber 18, which communicates with the offtake ports 7. The lining 17 is preferably conical in shape and a suitable number of wing walls 20, arranged between it and the lining 15, are provided to insure rigidity of construction. The wing walls 20 are provided with a suitable number of openings 21, which permit the gas entering the ports 7 to travel through the chamber 18 and be discharged from the discharge port 19, which may connected with a gas main or other suitable passage.

The top plate 13 of the producer comprises a water pan in which a desired depth of water is maintained and through which the blast twyer extends. A suitable fuel-feeding device 22 is attached to a plate 13 and is adapted to supply fuel through the top plate to the gas-generating chamber 8. Suitable sight or poke holes 23 and 24, which are provided with suitable water-sealed covers 25, extend through the top portion and communicate with the annular chamber 18 and the gas-generating chamber 8 respectively.

Suitable poke holes 26 extend through the shell 11 and the lining 15 and are located adjacent to the offtake ports 7 and are so constructed that the fuel in the gas generating chamber 9 may be thoroughly stirred by poking rods inserted therethrough. Sight holes 27 extend through the bottom portion of the shell 11 and the lining 15 at approximately the ash-line level. The blast twyer 4, which extends into the gas-generating chamber 9, communicates with a blower 28 and is adapted to supply a blast of air and

steam or air and products of combustion in regulable amounts to the gas-generating chamber 9. The blast twyer 6, which extends through the top plate 13, is provided with a blower 29 similar to the blower 28 and is adapted to supply a regulable blast of steam and air or air and products of combustion to the chamber 8.

The producer is a combination of an up draft with a down draft producer, each section being adapted to operate independently of the other, thus allowing of that adjustment of gasification essential to the maintenance of proper working conditions. When bituminous fuels are being used, the gases from chamber 8 will be composed of straight producer gas, water gas and products of destructive distillation; from the chamber 9 will be obtained producer gas and water gas only. The gases generated in the upper and lower portions of the producer are mixed in the offtake ports 7 and are discharged into the annular chamber 18. The sensible heat of the gases generated in both ends of the producer, as well as the radiant heat from fuel in chamber 8, is available for breaking up and fixing any hydrocarbon vapors which may be present in the gas passing through the annular chamber 18. A portion of the sensible heat of the gases passing through the annular chamber 18 is transmitted through the refractory lining 17 and assists to some extent in distilling or driving off the volatile matter from the green fuel introduced to the top portion of the producer. The space between the top portion of the fuel bed in the gas-generating chamber and the top plate 13 of the producer is relatively large, and for this reason, the blast entering through the twyer will travel at a relatively slow rate from the twyer to the fuel bed and will be heated by radiation from the refractory lining 17 before it reaches the green fuel. The sensible heat of the gases generated in the producer, therefore, performs the three functions of fixing hydrocarbon vapors in the outgoing gases, of assisting in the volatilization of the green fuel and of preheating the blast supplied to the fuel. The wing walls, in conjunction with the lining 17 and the upper portion of the lining 15, serve, in a measure, the same purpose as the checker brick in a water gas superheater.

The lower portion of the producer generates straight producer gas and water gas and completes the gasification of such particles of carbon as are not consumed in the upper portion of the generating chamber. There is little or no chance for the formation of tarry vapors in the lower portion of the fuel bed, as the green fuel fed into the top of the producer will be stripped of all its volatile matter before it has traveled half way from the top of the fuel bed to the offtake ports 7. It is advisable, however, to have a relatively large amount of sensible heat in the gases passing through the fixing chamber and for this reason the gases from the lower section are mixed with the gases from the upper section. The combined sectional area of the gas offtake ports 7 is relatively large, thereby allowing a slow travel of the gases, which decreases the tendency toward choking the ports. As the offtake ports are so arranged that no gas can reach them without passing through considerable depth of incandescent fuel, the chance of getting a mixture of tar and lampblack in the outgoing gases is practically eliminated.

The conical shape of the generating chamber prevents, to some extent, bridging of the fuel bed, but a stirring arm may be provided if needed and any type of fuel-feeding device, automatic or otherwise, may be utilized and various other changes may be made and still fall within the spirit and scope of this invention.

What I claim is:

In a gas producer, an updraft gas generating section, a downdraft gas generating section superimposed thereon and having a heat-conducting lining, a plurality of outlet ports located intermediate of said sections, a fixing chamber surrounding said downdraft section, communicating with said outlet ports, and formed by said heat-conducting lining and the outer wall or shell of the producer of the downdraft section and a plurality of wing walls located between the producer shell and the heat-conducting lining, forming independent flues and a gas outlet at the upper end of the fixing chamber and means of communication between said flues and said gas outlet.

In testimony whereof, I have hereunto subscribed my name this 13th day of March, 1906.

HENRY I. LEA.

Witnesses:
CHARLES W. MCGHEE,
E. W. MCCALLISTER.