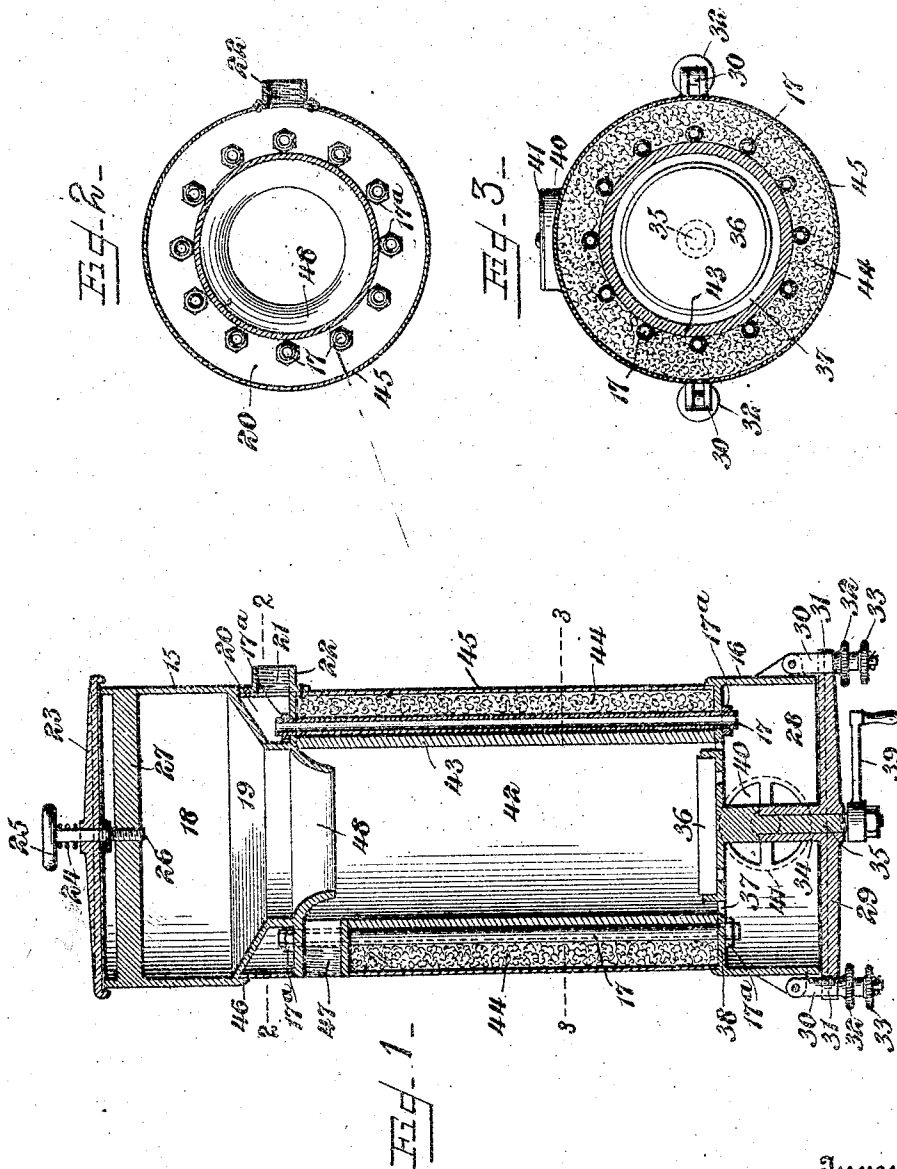


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W. M. CROSS.  
GAS GENERATOR,  
APPLICATION FILED APR. 24, 1906.



Witnesses  
Chas. H. Curand  
Louis Gulik

Inventor  
Walter M. Cross.  
By D. H. Figgins  
Attorney

# UNITED STATES PATENT OFFICE.

WALTER M. CROSS, OF KANSAS CITY, MISSOURI.

## GAS-GENERATOR.

No. 869,232.

Specification of Letters Patent.

Patented Oct. 29, 1907.

Application filed April 24, 1906. Serial No. 313,409.

*To all whom it may concern:*

Be it known that I, WALTER M. CROSS, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a new and useful Gas-Generating Apparatus, of which the following is a specification.

My present invention relates to a gas generating apparatus and is designed more particularly for the equipment of self-propelled vehicles.

The primary object of the invention is to produce an apparatus for generating what is known as producer gas from a body of coal in a novel manner which will insure the heating of the air to a high temperature before it is admitted to the generator, thus avoiding cooling of the latter and facilitating the production of gas rich in hydrogen.

Another object of the invention is to produce a generator of simple and durable construction composed of the least possible number of parts assembled in a manner to facilitate their disorganization for purposes of cleaning and repair, and their re-assembly, without the employment of skilled labor.

Another object is to so dispose the coal hopper with reference to an annular air chamber in communication with the air inlet, that the cool air, while initially heated in said chamber, will also serve to prevent the wall of the hopper from being raised to a high temperature and thus aid in preventing the ignition of the coal before the latter is fed to the combustion chamber.

A still further object is to devise a novel form of mounting for the grate, whereby the latter may be readily manipulated from the exterior of the generator or entirely withdrawn from the generator, as circumstances may require.

To the accomplishment of the foregoing objects, and others subordinate thereto, the preferred embodiment of the invention resides in those features of construction and arrangement to be hereinafter described, illustrated in the accompanying drawings, and succinctly defined in the appended claims.

In said drawings—Figure 1 is a sectional view of the generator. Fig. 2 is a sectional view on the line 2—2 of Fig. 1. Fig. 3 is a similar view on the line 3—3 of Fig. 1.

Each part is indicated by the same reference numeral throughout the views.

The generator comprises top and bottom members 15 and 16 disposed in spaced relation and connected by hollow tie-rods 17 which constitute tubes or conduits for the passage of moistened air. The upper member 15 of the generator is preferably in the form of a hollow casting defining a fuel chamber 18 having a hopper bottom 19 surrounded by an annular air chamber 20 having at one side thereof an air inlet 21 and a pipe connection 22. The open top of the fuel chamber 18 is closed by a cap 23. The cap 23 is urged firmly upon

its seat by a spring 24 bearing at one end against the cap 23 and at its opposite end against the hand wheel 25 of a cap retaining device having the form of a screw 26 having its lower end screwed to a cross-bar 27 of the member 15. That portion of the screw 26 which passes through the cap is of plain cylindrical form, as shown, in order to permit the screw to move endwise for the purpose of regulating the tension of the spring 24. By unscrewing the screw 26, the cap 23 may be removed to facilitate the introduction of fuel or to give free vent to the apparatus in order to prevent the same from cooling down when the motor is at a standstill. The cap is accurately fitted, however, so as to absolutely exclude air when the motor is running.

The upper ends of the air tubes 17 open into the annular upper air chamber 20 and their lower ends open into a lower air chamber 28 defined within the lower member 16 of the generator. The open lower side of the member 16 is closed by a cap 29 retained in place by hinged bolts 30 carried by the wall of the member 16 and received within notches 31 in the outer edge of the cap. When the cap 29 is in place, as shown in Fig. 2, and engaged by the bolts 30, it is retained by nuts 32 secured upon the bolts 30 below the cap and locked against displacement by lock nuts 33.

Rising from the cap 29 at the center thereof is a bearing sleeve 34 through which extends the stem or standard 35 of a grate 36 located within an enlarged central opening 37 in the top wall 38 of the member 16. To facilitate the manipulation of the grate, the stem 35 thereof is provided at a point below the cap 29 with a crank 39. This arrangement renders the grate readily accessible for manipulation, while the generator is in operation, and at the same time enables it to be entirely removed from the generator with the cap 29, to facilitate cleaning and repair.

In the wall of the lower air chamber 28 is provided a vent 40 closed by a cover 41. The vent 40 is normally closed, but is designed to be opened to permit a natural draft when the engine is not running, or to facilitate the removal of ashes if such becomes desirable before the full charge of coal has been consumed.

The gas producing or generating chamber 42 is located between the upper and lower members of the generator between which is interposed a cylindrical wall 43 of fire clay or other suitable material. The wall 43 is located just within the series of air tubes 17 and is disposed in closely adjacent relation thereto, so that the heat generated within the chamber 42, by the combustion of the coal, will heat the air tubes to a high temperature. The waste heat of the generating chamber is thus utilized to heat the moist air immediately prior to its delivery to the lower air chamber 28, from whence it passes to the generating chamber 42. In order to minimize the loss of heat by radiation from the tubes 17, the latter are insulated by asbestos or other suitable

packing 44 entirely surrounding the generating chamber and tubes and confined by a shell 45 extending between the upper and lower members 15 and 16 and retained by flanges 46 with which said members are provided.

Below the upper air chamber 20, the upper member 15 is provided with a pipe connection 47 extending from the shell 45 to the inner side of the wall 43 and forming a gas outlet at the upper end of the generating chamber 42. This gas outlet 47 is protected, to prevent the clogging thereof, by the tapered lower end 48 of the hopper 19, it being observed that this lower end of the hopper 19 extends nearly to the lower side of the gas outlet and is sufficiently tapered to produce a surrounding space which will not be occupied by the fuel, thus permitting free escape of the gas by way of the outlet 47. The hollow tie-rods or air tubes 17 may be screwed or secured in any other suitable manner to the members 15 and 16, but by preference, these tubes are passed through openings in the walls of the members and are provided with nuts 17<sup>a</sup> which may be screwed up to urge the members 15 and 16 against the opposite ends of the wall 43.

The operation of the apparatus is as follows: Assuming that a body of incandescent fuel is located in the chamber 42, air passes to the chamber 20 through the inlet 21 where it serves to cool the wall of the hopper 19 and is initially heated. The escape of the producer gas from the outlet 47 induces a draft which draws the air down through the tube 17 from the upper air chamber 20. During its passage through the tubes 17 the moist air is heated to a high degree and from the tubes it finds its way to the lower air chamber 28 and thence to the combustion chamber 42 which latter, by reason of the previous heating of the air, is not cooled by the passage of the air thereto.

The grate may be operated from the exterior of the generator by the manipulation of the handle 39 or by loosening the nuts 32 and 33, and swinging the hangers 39 outward, the cap 29 may be removed and with it the grate 36, when it is desired to gain access to the interior of the generator to clean or repair the latter.

It is thought that from the foregoing description the construction and operation of my apparatus will be apparent. It should be understood, however, that while the construction illustrated and described is deemed at this time to be preferable, I reserve the right to effect such changes, modifications, and variations of the illustrated structure as may come fairly within the scope of the protection prayed.

What I claim is--

1. A gas generator, comprising an upper end member of hollow cylindrical form, provided with an annular bottom wall and with a hopper downwardly tapered from the side wall of the member, at a point above the bottom wall and intersecting the inner edge of the bottom wall, to define a fuel receptacle above the hopper, and an annular air chamber below the fuel chamber and defined between the side and bottom walls of the member and the wall of the hopper, said member being formed with an air inlet communicating with the air chamber above the bottom wall, and with a gas outlet located below the bottom wall and opposite the lower portion of the hopper, a hollow lower end member having a grate opening in its top wall and a grate located in said opening, inner and outer concentric cylinders interposed between the end members, and hollow tie-rods having their ends extended

through and secured to the bottom wall of the upper member and the top wall of the lower member and serving to hold said members firmly against the opposite ends of the inner and outer cylinders, said tie-rods being located intermediate of the cylinders and closely adjacent to the inner cylinder.

2. A gas generator comprising separate upper and lower hollow members of like diameter; the upper member having an annular bottom wall and a downwardly tapered hopper constituting the hopper bottom of a fuel receptacle and the top and inner side wall of an annular air chamber underlying the fuel receptacle, and the lower end member having an annular top wall corresponding to the annular bottom wall of the upper member, inner and outer concentric cylinders interposed between the annular walls of the end members to define a generating chamber within the inner cylinder and an annular space between the cylinders, hollow tie-rods extended through the annular walls of the end members between the inner and outer cylinders but disposed closely adjacent to the inner cylinder to be heated, insulating material interposed between the hollow tie-rods in the outer cylinder, a grate located at the bottom of the generating chamber, an air inlet for the air chamber of the upper member, and a gas outlet for the generating chamber.

3. A gas generator comprising two separate and distinct upper and lower end members of hollow cylindrical form and of the same diameter, intermediate concentric cylinders separating the end members, hollow tie-rods constituting the sole connection between the end members and serving to draw the same against the opposite ends of the cylinders, the upper end member having an annular bottom wall, an air inlet immediately above the bottom wall, a gas outlet immediately below the bottom wall, and a hopper wall extending from the side wall of the upper member intermediate of the ends thereof and intersecting the inner edge of the bottom wall and extended below the same and opposite the gas outlet, and the lower end member having an annular top wall corresponding with the annular bottom wall of the upper member and likewise imposed against the ends of the inner and outer cylinders, removable caps closing the outer ends of the upper and lower end members, and a grate carried by the cap of the lower member and surrounded by the annular upper wall of said member.

4. A gas generator comprising an upper end member having an annular bottom wall, and a hopper downwardly tapered from the side wall of the member and intersecting the inner edge of the bottom wall to define a fuel receptacle above the hopper, and an annular air chamber below the fuel chamber and surrounding the hopper, said upper member being formed with an air inlet and a gas outlet, a hollow lower end member having a grate opening in its top wall and a grate located in said opening, inner and outer cylinders interposed between the end members, and hollow tie-rods having their ends extended through the bottom wall of the upper member and the top wall of the lower member, said tie-rods being located intermediate of the cylinders and closely adjacent to the inner cylinder.

5. A generator, comprising a generating chamber, a hollow member supporting said chamber and having a grate opening at the bottom of the generating chamber, a removable cap closing the bottom of the hollow member, a grate supported by the cap and located in the grate opening, and a grate operating device located below the cap to facilitate the manipulation of the grate when the cap is in place.

6. A generator, comprising a generating chamber, a hollow member supporting said chamber and having a grate opening, a removable cap closing the lower side of the hollow member, a grate located in the grate opening and having a stem afforded a bearing in the cap, and a crank connected to the stem below the cap to facilitate the manipulation of the grate when the cap is in place.

7. A generator, comprising a generating chamber, a hollow member supporting said chamber and having a grate opening in its upper wall, a cap closing the lower side of the hollow member, hinged bolts carried by said member and provided with nuts for the retention of the

cap, a grate supported by the cap and located in the grate opening, and a crank located below the cap and connected to the grate.

- 5 8. A gas generator comprising separate upper and lower members, the upper member having a bottom wall and a downwardly tapered hopper, said hopper constituting the hopper bottom of a fuel receptacle and the top and inner side wall of an air chamber underlying the fuel receptacle, and the lower end member having a top wall corresponding to the bottom wall of the upper member, inner and outer walls interposed between the end members to define a generating chamber within the inner wall and a space between the inner and outer walls, hollow tie-rods extending between the upper and lower members but disposed closely adjacent to the inner wall to be heated, a grate located at the bottom of the generating chamber, an air inlet for the air chamber of the upper member, and a gas outlet for the generating chamber.

- 10 9. A gas generator comprising two separate and distinct upper and lower end members of hollow cylindrical form, intermediate cylinders separating the end members, hollow tie-rods serving to draw the end members against the opposite ends of the cylinders, the upper end member having an annular bottom wall, an air inlet above the bottom wall, a gas outlet below the bottom wall, and

a hopper wall dividing the upper member into a fuel receptacle and an air chamber and extended opposite the gas outlet, and the lower end member having an annular top wall corresponding with the annular bottom wall of the upper member, and a grate located in substantially the plane of the annular top wall of the bottom member.

10. A generator comprising two cylindrical end members each having its outer end open and its inner end provided with a transverse annular wall, a cylinder defining a generating chamber, air tubes retaining the annular walls of the end members against the opposite ends of the cylinder, removable caps closing the open outer ends of the end members, a grate carried by one cap and located in the plane of the transverse annular wall of the adjacent end member, and a hopper dividing the upper member into a fuel receptacle and a surrounding air chamber, an air inlet for the air chamber and a gas outlet for the generating chamber.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WALTER M. CROSS.

Witnesses:

LEWIS E. KNERR,  
O. P. BLOP