June 1, 1937. O. ZEISLOFT ET AL 2,082,530

GAS PRODUCER

Filed March 25, 1935 3 Sheets-Sheet 1

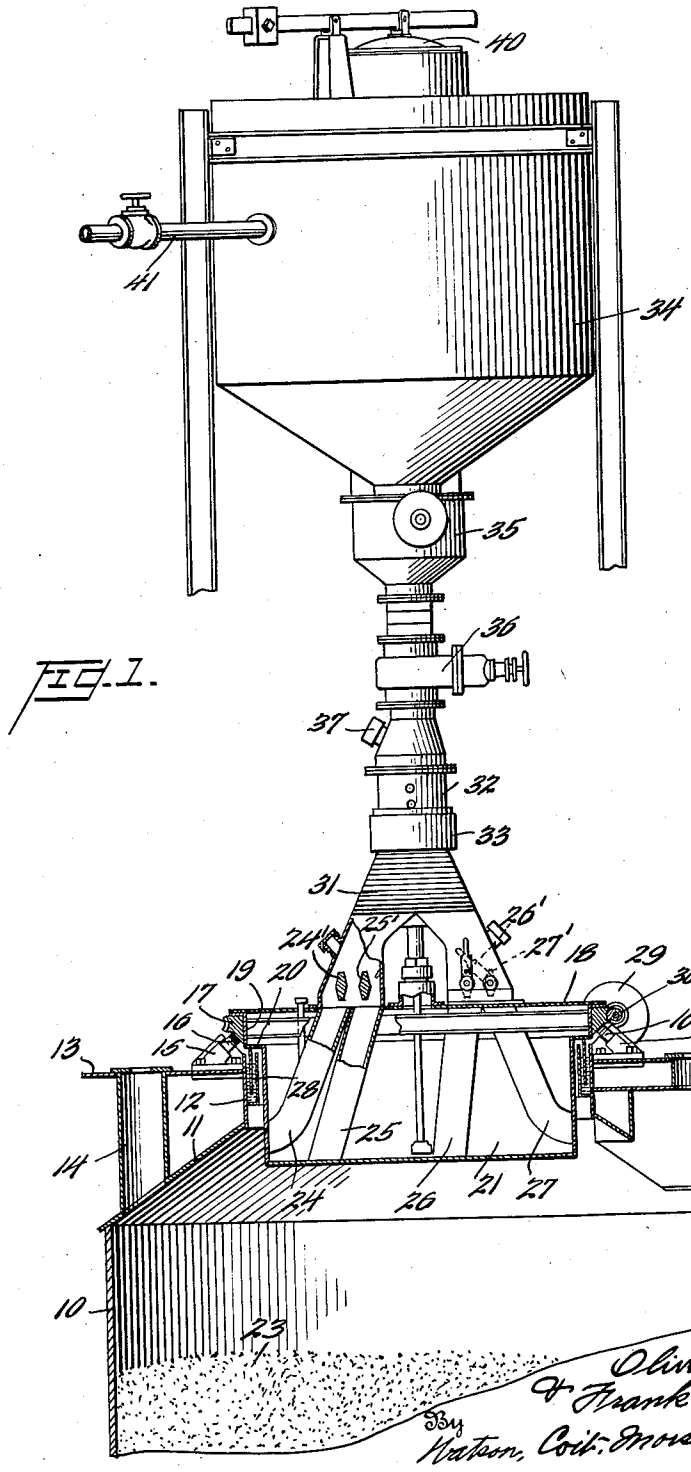

FIG. 1.

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FIG. 5.

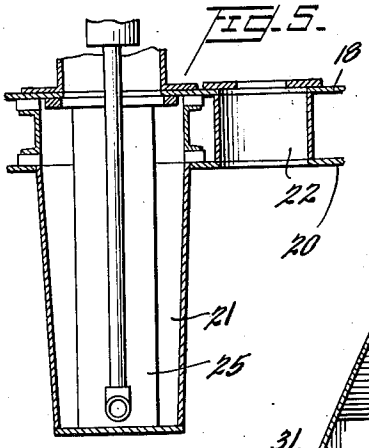

FIG. 4.

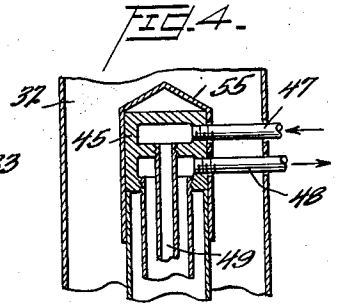

FIG. 2.

FIG. 3.

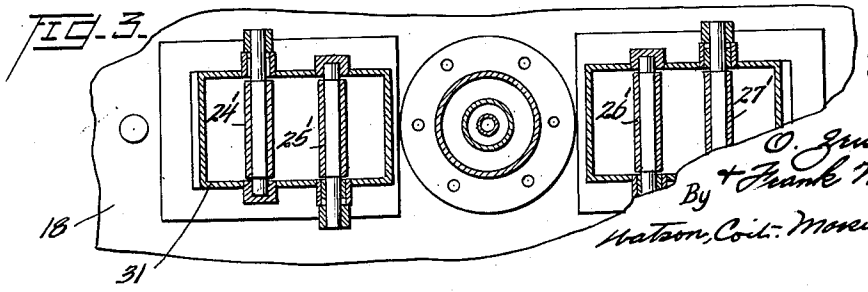

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FIG. 6.

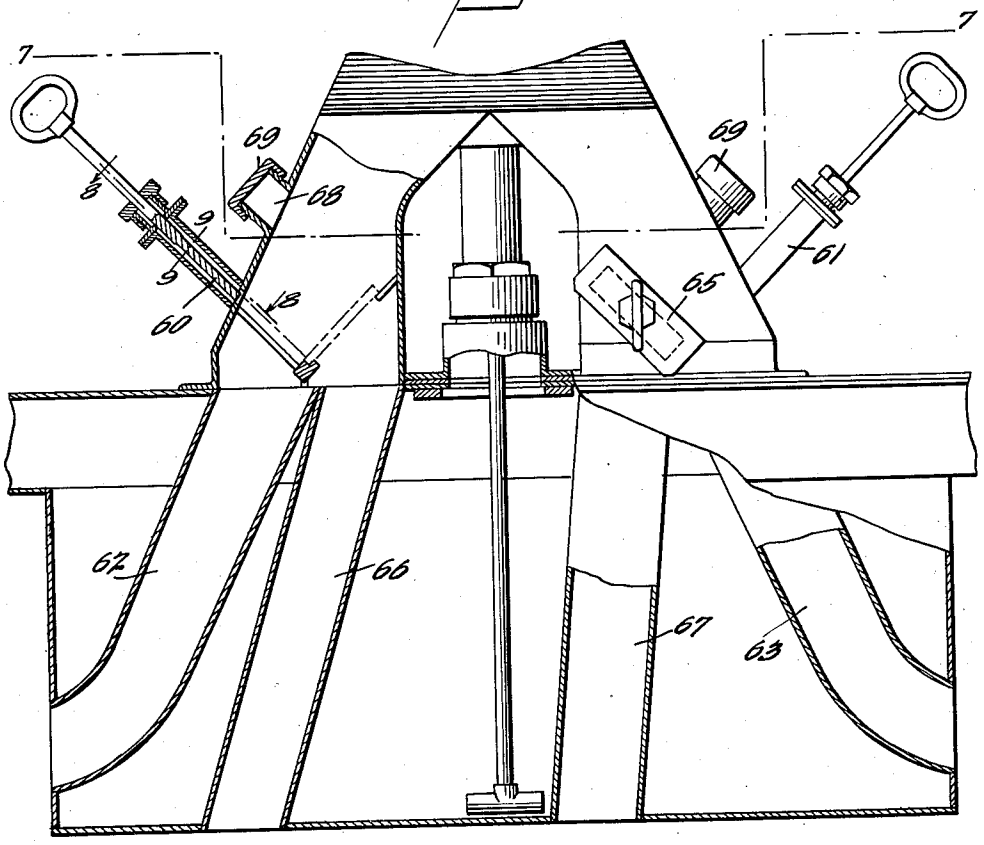

FIG. 7.

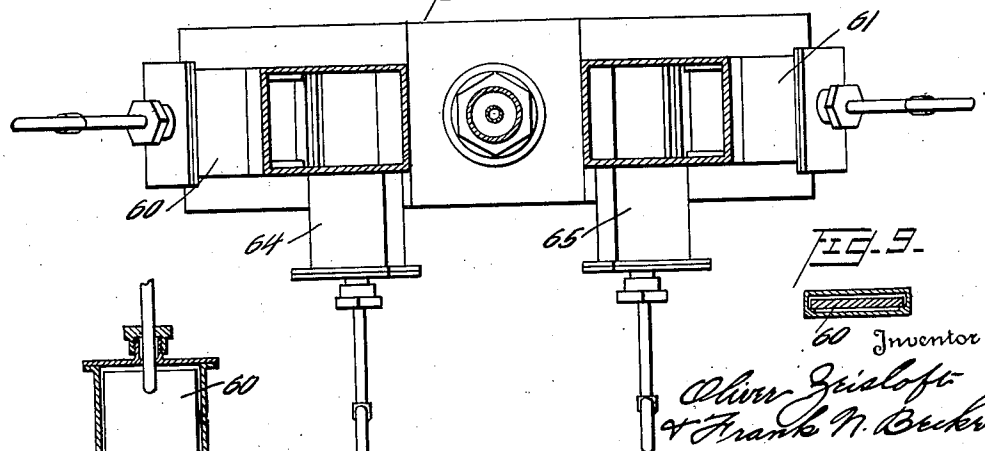

FIG. 8.

FIG. 9.

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GAS PRODUCER

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Application March 25, 1935, Serial No. 12,966

5 Claims. (Cl. 48—86)

The present invention relates to gas producers and particularly to gas producers of the rotating top type.

As is well-known, it is difficult to maintain the rate of combustion in a gas producer entirely uniform throughout the entire combustion zone. Due to various causes, particularly the formation of clinkers in the ash zone of the producer which tend to bring about increased air supplies to various portions of the combustion zone, combustion in certain of these areas proceeds at a more rapid rate than in other areas. This in turn causes the fuel bed to burn through to the upper surface at one or more points and disturbs the continuity of operation of the producer. Various means have been resorted to heretofore to eliminate so far as possible the tendency of the fuel to burn in this unbalanced and non-uniform manner, such for instance as stirring devices of novel type, and fuel feeding devices designed and intended to prevent the burning through of the fuel bed to its upper surface at any point by so distributing the incoming fuel as to make this impossible.

The present invention relates more particularly to the last mentioned type of means and contemplates the provision of a novel and improved producer of the rotating top type in which mechanism is provided for feeding fresh coal into the producer in such manner as to maintain a layer of unburned fuel of the proper depth over all portions of the combustion zone, thereby ensuring operation of the producer in the desired theoretical manner. To effect this desired result, the rotatable producer top is so formed as to have a plurality of fuel feeding conduits extending downwardly therethrough, these conduits being sufficiently elongated as to give definite directions to fuel particles passing therethrough and being angularly disposed with reference to the axis of rotation of the producer top so that, by rotating the producer top, one or other of the conduits may be brought into position to direct fuel to any particular area of the fuel bed surface desired. These fuel feeding conduits are water cooled by a novel water cooling means to prevent burning or warping due to close proximity to the fuel bed.

The fuel supply means located above the producer includes a storage hopper the outlet orifice of which is concentric with the axis of rotation of the producer top and means is provided for maintaining this orifice in constant communication with the inlet openings of the several fuel feeding conduits in the top for all angular positions of the top. Control devices are provided for individually controlling the flow of fuel through the various fuel feeding conduits. In addition there is a main coal cut-off gate or valve associated with the hopper whereby the flow of coal from the hopper may be interrupted when desired. Positioned below this last mentioned coal cut-off gate and at an intermediate point in the main supply conduit is a gas tight valve the function of which is to close the main fuel supply conduit against the passage of gas from the producer prior to the time when the lid of the hopper is lifted for charging purposes. By providing separate coal cut-off and gas intercepting valves, neither is called upon to perform the functions of the other and it is thus possible to utilize any suitable coal cut-off valve regardless of whether or not it is gas tight and to also use a gas intercepting valve of any desired type, the efficiency of which will not be reduced by contact with coal, causing wearing of its seating surfaces, etc. Means is provided for introducing steam into the hopper to drive downwardly the gas contained therein and completely free the fuel feeding system, above the gas tight valve, of gas, prior to opening of the hopper lid for charging purposes.

Other novel features and advantages of the invention will be perceived. In the accompanying drawings, one form of the invention is illustrated by way of example but it will be appreciated that in adapting the invention to producers of various types the design and arrangement of its component elements may be considerably modified to suit conditions.

In the drawings:

Figure 1 is a side elevation of a producer of the cylindrical shell stationary type to which the invention has been applied, portions of the producer top being broken away to show the interior thereof;

Figure 2 is an axial section through portion of the fuel feeding means, illustrated upon a somewhat larger scale;

Figure 3 is a section on line 3—3 of Figure 2;

Figure 4 is a section on line 4—4 of Figure 2;

Figure 5 is a section on line 5—5 of Figure 2;

Figure 6 is a view, partly in elevation, and partly broken away, of a producer top embodying a somewhat modified form of fuel distributing means;

Figure 7 is a section on line 7—7 of Figure 6; and

Figures 8 and 9 are sections on lines 8—8 and 9—9, respectively, of Figure 6.

The shell of the gas producer, illustrated in Figure 1 of the drawings, is indicated at 10 and it will be understood that this shell is preferably water cooled although such water cooling means is not illustrated. The shell includes a frusto conical upper portion 11 terminating in an axial cylindrical section 12. Encircling the cylindrical section 12 is the horizontally disposed platform 13, which platform may be provided with apertures through which slice bars or pokers may be inserted, if desired, into the interior of the producer, the vertical tubular members 14 concentric with these apertures extending downwardly through apertures formed in the conical portion 11 of the top, the ends of tubes 14 being secured to platform 13 and cone 11 as by welding, to prevent gas leakage. These poke holes will be normally covered with plates in the customary manner to prevent outflow of gas.

Also encircling the cylindrical portion 12 of the producer shell, and secured upon the upper surface of the horizontal platform 13, is an annular roller race 15 for supporting a series of rollers 16 with their axes equally inclined to, and intersecting, the producer axis, as shown. Resting upon this series of rollers is the ring 17 which carries the rotating producer top. This top comprises essentially a circular disc-like horizontally disposed upper member 18, a cylindrical flange 19 depending therefrom, and the outer surface of which snugly fits the inner surface of ring 17, and a bottom plate indicated at 20 in Figure 5. This bottom plate 20 is a disc-like member generally similar to the top plate 18 except in that it is slightly smaller and is diagrammatically slotted. To the edges of the transversely extending slot formed in the bottom plate, which slot is substantially rectangular in form, are secured the upper edges of a depending box-like structure 21 which extends downwardly through the cylindrical part 12 of the producer shell and well into the conical section 11 thereof. The space enclosed by the top plate 18, side 19, and bottom plate 20, together with the communicating space enclosed by the walls of the box-like structure 21, is rendered water-tight in the process of manufacture and comprises in reality a water containing chamber into which cooling water may be introduced and heated water withdrawn, during the operation of the producer, to prevent the producer top from becoming too highly heated during its operation. Suitable poking or inspection apertures, such as indicated at 22, (Figure 5), may be provided in the rotatable producer top if desired.

Extending through the producer top, including the box-like structure 21, are a plurality of conduits, four in number in the embodiment of the invention illustrated, by means of which fuel may be passed through the top from time to time as required and caused to fall on the desired areas of the surface of the fuel bed within the cylindrical shell 10 of the producer, this fuel bed being indicated at 23. The fuel feeding conduits, just above mentioned, are indicated at 24, 25, 26, and 27, respectively, and it will be perceived that these conduits are relatively elongated, sufficiently so at least, as to give direction to particles of fuel which pass therethrough, and are arranged at various angles to each other and to the axis of rotation of the producer top. Conduits 24 and 27 are disposed at approximately the same angles to the vertical and the lower ends of these conduits are outwardly turned in order that fuel passing downwardly therethrough will be thrown outwardly toward the outer areas of the fuel bed surface. Fuel feeding conduit 25 is so directed as to supply fuel to the zone intermediate the axis of the producer and the shell 10 thereof and fuel feeding conduit 26 is so directed as to direct fuel to the approximate center of the fuel bed. It will be understood that by rotating the producer top, the discharge ends of these conduits are caused to move in circular paths about the producer axis so that any selected area of the fuel bed surface may be supplied with additional fuel.

A water seal intermediate the rotating producer top and the stationary cylindrical member 12 of the shell is indicated at 28, this water sealing device being of conventional nature. The producer top may be rotated by hand or by mechanical power and, in the event that it is desired to rotate the top by power, this may be conveniently done with the aid of an electric motor 29, the motor rotating a worm 30 the teeth of which mesh with teeth formed upon the outer periphery of ring 17 of the rotatable top. By means of the roller bearings 16, inclined in the manner illustrated, not only is the weight of the top transmitted to the producer shell but likewise any lateral thrust which may be developed during the operation of motor 29 or other means for effecting rotation of the producer top resisted.

The upper ends of the conduits 24, 25, 26 and 27 are preferably grouped in pairs, as shown, and the upper ends of fuel feeding conduits 24 and 25 are in constant communication with one branch of a branched or bifurcated fuel supply conduit 31, the upper ends of conduits 26 and 27 being in open communication with the other branch of this conduit. The lower ends of conduit 31 are securely fastened to the upper plate 18 of the producer top and the upper cylindrical end of this conduit is disposed concentrically with respect to the axis of the rotating producer top and has sliding engagement with the lower end of a stationary fuel supply conduit 32, a water seal 33 preventing gas leakage through the joint between these two members.

Conduit 32 extends vertically upwardly and communicates at its upper end with the delivery port of the fuel storage hopper 34, which may be mounted upon any suitable support. Intermediate hopper 34 and its lower end, the conduit 32 is provided with a coal or fuel shut-off valve, the outer casing of which is indicated at 35, and just below this valve is positioned a gas intercepting or shut-off valve 36, any suitable types of fuel cut-off and gas intercepting valves being employed, the first serving to interrupt the flow of fuel from the hopper into the stationary supply conduit 32, when desired, and the second being employed to prevent gases developed in the producer from passing upwardly through conduit 32 when the hopper is to be charged. A removable closure is indicated at 37 and, when this is removed, access may be had to the interior of supply conduit 32, as may be necessary for the insertion of tools to dislodge large lumps of coal or frozen agglomerations of small lumps.

At its top the hopper 34 is provided with a charging opening which is normally closed by a gas-tight lid 40 and at any desired point the hopper wall is pierced to provide an aperture for the reception of the end of a steam pipe, such for instance as indicated at 41 and by means of which steam may be introduced into the hopper when desired. When the hopper is to be recharged with fresh fuel, the fuel cut-off valve 35 is first closed to interrupt the flow of fuel

from the hopper to supply conduit 32. With the lid 40 still in place, steam is then introduced into the hopper under pressure greater than that existing in the producer, whereupon the gases which have collected in the hopper are displaced by the steam and forced downwardly into the producer. The gas intercepting valve 36 may then be closed, (provided that the level of the coal column in supply conduit 32 has fallen below the level of the valve 36), thus making it impossible for the gases from the producer to again pass upwardly into the hopper. The steam supply is then cut off, whereupon the lid 40 may be raised and fresh fuel introduced into the hopper without danger of permitting the escape of any noxious gases. After the charging of the hopper, lid 40 is replaced and valves 35 and 36 reopened.

Fuel thus introduced into the hopper is not allowed to pass uncontrolled into the producer shell, each of the fuel feeding conduits 24, 25, 26, and 27 having associated therewith a control valve, these control valves being indicated at 24', 25', 26' and 27', respectively. All valves are shown in Figure 2 to be in open position. Suitable operating handles are provided whereby the attendant is enabled to open or close the several valves individually at will and thus control the passage of fuel through the fuel feeding conduits just below the same, respectively. By observing from time to time the condition of the upper surface of the fuel bed 23, the operator can ascertain the exact areas where fresh fuel is needed and can, by suitably rotating the top, and manipulating the several control valves just mentioned, supply fresh fuel at the exact points desired.

The means for supplying cooling water to the producer top, and withdrawing heated water, will now be described. Supported centrally in the stationary fuel supply conduit 32, and positioned just above the water seal 33, is a head or manifold 45 divided by a central horizontal partition 46 into upper and lower compartments. Cooling water is passed through a conduit 47 into the upper compartment and heated water is withdrawn from the lower compartment through a conduit 48. Extending axially downward from the upper compartment is the cold water pipe 49, the lower or discharge end of which is located adjacent the bottom plate or floor of the box-like structure 21 previously referred to. The cooled water is therefore discharged into this space adjacent the lower ends of the fuel feeding conduits. Heated water will pass upwardly into the short cylindrical member 50 secured to the top plate 18 and thence into the hot water escape pipe 51 which extends upwardly into the lower compartment of head or manifold 45. A stuffing box 52 prevents leakage through the joint between members 50 and 51 while permitting free relative rotation of these members. A stuffing box may be provided intermediate the ends of the cold water pipe 49, if desired, to permit rotation of the lower end of this pipe relative to the upper end, in the event that it is desired to attach branch pipes to the lower end of the cold water supply pipe. By the system of piping just described a supply of cooling water to the top may be maintained at all times, quite regardless of the rotatory movements of the top. A pointed hood or cap 55 is supported upon the manifold 45 to shield this manifold from falling fuel and also to direct the fuel laterally in the conduit.

The form of the invention illustrated in Figures 6 to 9 inclusive is generally similar to that just described except in that the valves for controlling the flow of fuel through the respective fuel feeding conduits in the rotating top are of different form and construction. Thus, instead of being butterfly valves, they are formed as slide or gate valves. Valves 60 and 61 for the two outer fuel feeding conduits 62 and 63 are slidable downwardly and inwardly, while valves 64 and 65 controlling the flow through the inner fuel feeding conduits 66 and 67, respectively, are horizontally slidable, though disposed in planes which make angles with the horizontal, as shown. Suitable valve supporting and seating means are provided and also suitable operating handles, as disclosed. Ports, such as indicated at 68, may be provided for the introduction of suitable tools for clearing the valves, breaking lumps, etc., these ports being normally closed by caps such as indicated at 69. Other forms of control means for regulating the flow of fuel through the several fuel feeding conduits may be employed if desired and the arrangement of these conduits and specific means for circulating cooling water around the same may be considerably modified without departure from the invention.

Also the other details of construction of the producer top may be considerably modified in applying the invention. For instance, its diameter may be increased to approximately that of the shell of the producer or, in other words, the rotatable top may be substantially coextensive in area with a horizontal cross section through the producer, as are many producer tops of the rotating type.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. The combination with the stationary cylindrical shell of a gas producer, disposed with its axis vertical, of a top supported thereon so as to be revoluble in a horizontal plane about the vertical axis of the producer shell, a single stationary fuel supply conduit disposed above the top and having its circular fuel discharge port coaxial with the producer shell and top, a plurality of fuel feeding conduits supported by an extending through the top, the longitudinal axes of said conduits being so disposed with respect to each other and to the producer axis, that fuel passed downwardly through the several conduits respectively, is deposited upon different areas of the fuel bed surface, and means rotatable with the producer top for conducting fuel from the discharge port of the fuel supply conduit to said fuel feeding conduits.

2. The combination with the stationary cylindrical shell of a gas producer, disposed with its axis vertical, of a top supported thereon so as to be revoluble in a horizontal plane about the vertical axis of the producer shell, a single stationary fuel supply conduit disposed above to top and having its circular fuel discharge port coaxial with the producer shell and top, a plurality of fuel feeding conduits supported by and extending through the top, the longitudinal axes of said conduits being so disposed with respect to each other and to the producer axis, that fuel passed downwardly through the several conduits respectively, is deposited upon different areas of the fuel bed surface, means rotatable with the top for conducting fuel from the discharge port of the fuel supply conduit to said fuel feeding conduits respectively, and valves carried by said means for

controlling the flow of fuel through the several conduits individually.

3. The combination with the stationary cylindrical shell of a gas producer, disposed with its axis vertical, of a top supported thereon so as to be revoluble in a horizontal plane about the vertical axis of the producer shell, a single stationary fuel supply conduit disposed above the top and having its circular fuel discharge port coaxial with the producer shell and top, a plurality of fuel feeding conduits supported by and extending through the top, the longitudinal axes of said conduits being so disposed with respect to each other and to the producer axis, that fuel passed downwardly through the several conduits respectively, is deposited upon different areas of the fuel bed surface, means rotatable with the top for conducting fuel from the discharge port of the fuel supply conduit to said fuel feeding conduits respectively, and valves carried by said means for controlling the flow of fuel through the several conduits individually, one such valve being mounted directly above inlet end of each conduit.

4. The combination with the stationary shell of a gas producer of a revoluble top supported thereon, a single stationary fuel supply conduit disposed above the top and having its circular fuel discharge port coaxial with the producer shell and top, a plurality of fuel feeding conduits supported by and extending through the top, the longitudinal axes of said conduits being so disposed with respect to each other and to the producer axis that fuel passed downwardly through the several conduits, respectively, is deposited upon different areas of the fuel bed surface, means for conducting fuel from the discharge port of the fuel supply conduit to said fuel feeding conduits, and means for water cooling said fuel feeding conduits throughout the entire length thereof.

5. The combination with the stationary shell of a gas producer of a revoluble top supported thereon, a single stationary fuel supply conduit disposed above the top and having its circular fuel discharge port coaxial with the producer shell and top, a plurality of fuel feeding conduits supported by and extending through the top, the longitudinal axes of said conduits being so disposed with respect to each other and to the producer axis that fuel passed downwardly through the several conduits, respectively, is deposited upon different areas of the fuel bed surface, means for conducting fuel from the discharge port of the fuel supply conduit to said fuel feeding conduits, and means for water cooling said fuel feeding conduits throughout the entire length thereof, said water cooling means comprising a relatively narrow and deep water chamber depending from said producer top and rotatable therewith, and enclosing said fuel feeding conduits, and means for circulating water through said chamber.

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