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GAS PRODUCER

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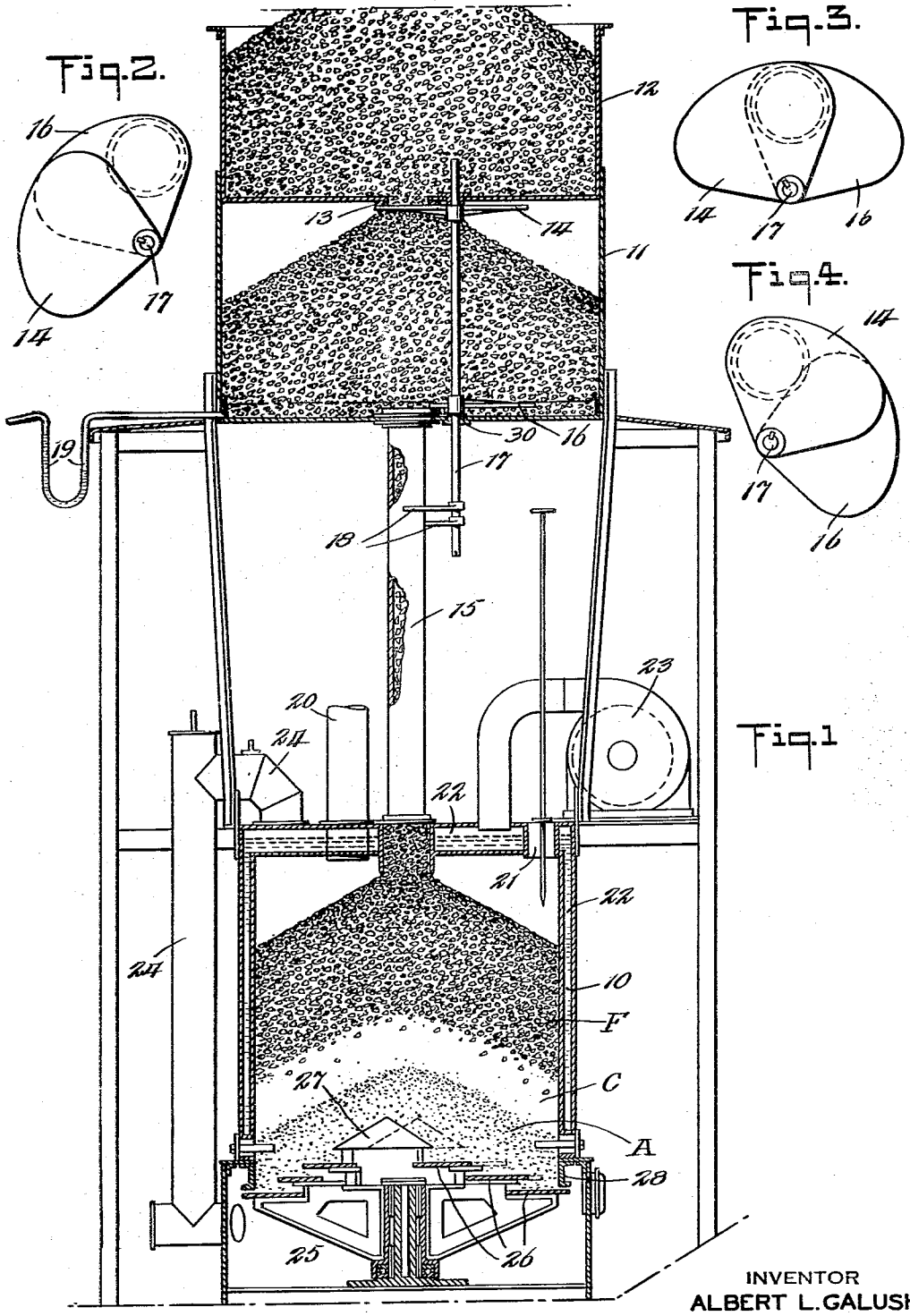


Fig. 1

Fig. 2.

Fig. 3.

Fig. 4.

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GAS PRODUCER

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9 Claims. (Cl. 48—86)

This invention has to do with the delivery of fuel to a gas producer and the removal of ash therefrom. The aim is to maintain a substantially uniform depth of fuel at all points in the combustion chamber, to simplify and render more nearly automatic the fuel feed and the ash discharge, and to utilize a rotary grate in conjunction with an overhead fuel feed in a way to correlate and cause an interdependence of the actions of both to the end that the fuel may be burned more efficiently.

An illustrative embodiment of the invention is described hereinafter with reference to the accompanying drawing in which are shown in Fig. 1, in central vertical section, the combustion chamber, rotary grate, and overhead fuel feed apparatus of a gas producer. Figs. 2, 3 and 4 are diagrammatic plans of the cut-off valves for the fuel feed.

Supported sufficiently above the combustion chamber 10 or producer proper to permit a man to work in the space between, is the feed bin 11 and thereabove is a storage bin 12. The latter is open at the top to receive fuel from a conveyor or other means of delivery from cars or from the main storage area. The feed bin beneath the storage bin is supplied from the latter through a valved port 13 and delivers to a single chute 15 when the valve 16 at the top of the chute is open. The two valves 14 and 16 are horizontally slidable and are interconnected as by mounting them on one operating stem 17, so that when the valve stem 17 is turned in either direction within the limits set by the engagement of the actuating arms 18 with the chute, the two valves move together, but they are so mounted that both cannot be open at the same time. When the valve 14 between bins is open (as shown in Fig. 2) to permit replenishment of the feed bin 11, the chute valve 16 is closed to prevent escape of gas; when the chute valve 16 is open for delivery to the producer, as indicated in Fig. 4, the valve 14 between bins prevents escape of whatever gas leaks through the fuel. The cut-off valves are of such shape that in an intermediate position both will be closed, as indicated in Fig. 3.

The bins are of a size to hold a supply of fuel for a considerable period of operation, twenty-four hours or more; hence the storage need be filled but once a day or less often.

The floor of the feed bin has an upstanding flange at its edge to which the shell forming the wall of the bin is secured. Just below the top edge of this flange, a hole is tapped for a U-tube 19 by way of which excess water collecting from the fuel may pass out, leaving however enough water below the level of this drain to seal the joint 30 where the valve stem 17 passes through the bottom of the coal bin. Normally there will be gas in this tube 19 and by noting the difference between the levels of liquid in the legs of the tube, the gas pressure in the feed bin may be ascertained.

The single chute 15 leads into the center of the top wall of the combustion chamber 10 and extends below that wall to insure a gas accumulation space above the fuel. The gas off-take pipe 20 communicates with this space. There are poke holes 21 extending through both walls of the water chamber 22 that jackets the combustion chamber on its top and side. A blower 23 delivers air to the water chamber where it absorbs moisture before passing off through the conduit 24 to the space 25 beneath the grate, whence it flows up to the fuel bed. When the producer is in operation, the fuel bed is made up of a layer of ash A, a layer C in which combustion is in progress, and a top layer F of unburned fuel.

The grate is of the construction described in my co-pending application Serial No. 294,132 filed July 20, 1928, now Patent 1,891,809, dated December 20, 1932, and is characterized by its vertically spaced annular horizontal plates 26 of progressively smaller size. Each plate overlaps the inner edge of the one beneath it and the conical cap 27 overlaps the top plate. The outer margin of the lowermost plate is preferably concentric with the grate axis, which is in the center of the circle defined by the wall of the combustion chamber, and underlies the heavy bosh ring 28 at the lower rim of the said wall. The inner rim of this lower plate is eccentric of the grate axis as are the inner rims of the other plates, and as the outer rim of each plate above the lowest is substantially concentric with the inner edge of the plate beneath is, the outer edges of these other plates are eccentric of the grate axis. The inner rims of the plates above the lowermost one may or may not be eccentric of their respective peripheries, but in any event the eccentricities of both inner and outer rims of all the plates are in a single radial direction. Any suitable driving mechanism may be used to turn the grate. Preferably it has the capability of variation in the rate of rotation.

This grate provides a full horizontal supporting area for the fuel but, by reason of the vertical clearance between plates, ash can be received between them for discharge over their inner margins. Due to the eccentricity of the inner mar-

gins, the rotation of the grate causes these margins to move laterally as well as rotarily. The retreat of the edges of the grate plates from the walls of the combustion chamber permits ash to fall down from each upper plate to a lower one; the corresponding advance of the edges of the several grate plates towards the walls of the combustion chamber causes those edges to cut into the ash and to break up the clinkers and to force ash inwardly through the spaces between the horizontal plates and consequently to discharge ash over the inner rims of the plates into the ash pit below. Thus the discharge over each inner rim takes place progressively along an annular belt represented by the area between circles concentric with the grate axis and tangent to the inner rim of the plate at its points nearest to and farthest from the axis. Since the rims of the several plates are spaced radially, the discharge takes place over the full area of the fuel bed, each plate caring for a certain annular region.

It will be observed that the grate moves in a space that is substantially conical, that is to say, the surface, developed during the rotation of the grate by a line from the top of the cap plate to the rim of the grate, is a cone. The use of a single central chute, giving, as it does, a conical top surface to the fuel bed, in conjunction with a conical grate tends to give a more nearly uniform depth of fuel on the grate. To secure even greater uniformity, I so relate the sizes of the several plates 26 and the spacing between them that the slope of the cone thus defined, which is practically the slope of the grate itself, is substantially equal to the angle of repose of the fuel used. Strict equality of these slopes is not necessary but they must so approach equality as to give an approximate uniformity of depth, having in mind the object in view and the variations in slope of the fuel from time to time. Since the slope of a conical top surface of the fuel bed represents the angle of repose of the fuel, and since the chute is in line with the grate axis, this construction of the grate insures a substantially uniform depth of the fuel bed, an important factor in securing uniform burning and avoiding dead spots.

The rate at which fuel is delivered depends upon the rate at which the fuel bed is lowered; hence the feeding is automatically governed, and the need of the close attention commonly required is avoided. The grate gives a continuous and uniform discharge of ash by which the lowering of the firebed is governed and, by varying the speed of the grate, the rate of discharge and its incident, the rate of fuel feed, may be varied. Conversely, the action of the grate is affected by this type of fuel feed since the column of coal in the chute and the coal in the feed bin exert a pressure on the fuel bed in the combustion chamber itself, retarding the fuel bed in its tendency to turn with the grate. This tendency is a matter of concern, particularly in producers of large grate area.

The action of the grate depends upon relative movement between the plates and the fuel bed but on the other hand a slow rotation of the fuel bed, for instance of the order of one rotation in a day, is desirable as it distributes the effect of non-uniform draft, different rates of burning and other non-uniform factors affecting different regions in the fuel bed to a different extent. It is found that the added pressure from the fuel in the chute, always exerted in this continuous feed, is of importance in keeping the fuel bed from turning faster than is advantageous.

Particularly in the large sizes of producers, it is desirable to add ash brakes further to restrain the fuel bed from turning. The preferred construction of these is set forth in my application for patent filed on even date herewith. They are especially useful when the grate is provided with stirrer arms, as disclosed in my pending application Serial No. 294,132 now Patent 1,891,809, mentioned above and also in the application just referred to as being filed herewith. These stirrer arms cut through the fuel, breaking clinkers and mixing dead spots with the surrounding region where combustion is in progress. They are desirable for that reason but they increase the drag on the fuel bed. The ash brakes counteract this rotative tendency of the stirrer arms.

I claim:

1. In a gas producer, a producer gas generating chamber, a feed bin and a storage bin arranged to provide a working space between the feed bin and chamber, and a continuous chute passing from the feed bin to the chamber through the working space in combination with gate valves mounted to be operated simultaneously from the working space to control the flow of fuel from the storage bin to the feed bin, and from the latter to the chute, one valve being closed when the other is open.

2. In a gas producer, a producer gas generating chamber, a storage bin, a feed bin and a chute from the feed bin to the chamber in combination with gate valves mounted to be operated simultaneously to control the flow of fuel from the storage bin to the feed bin and from the latter to the chute one valve being closed when the other is open.

3. In a gas producer, a producer gas generating chamber, chute, feed bin, and storage bin in combination with control valves for the flow of fuel from the storage bin to the feed bin and from the latter to the chute, in combination with an operating stem for said valves passing through the floor of the feed bin and a water seal for said stem at said floor.

4. In a gas producer, a producer gas generating chamber, a fuel feed bin and a chute connecting the two with a valve controlling the passage from the feed bin to the chute, an operating stem for said valve passing through the floor of the feed bin and a water seal for said operating stem at said floor.

5. In a producer plant, a gas producer having a rotary grate forming a full supporting surface for a fuel bed and arranged to discharge ash substantially continuously, a fuel feed bin and a continuous chute connecting the feed bin with the gas producer, said parts being arranged to provide a working space between the gas producer and feed bin, free from gas leaking joints.

6. In a producer plant, a gas producer having a rotary grate of conical outline affording a full supporting area for a fuel bed and arranged to discharge ash through itself and an overhead fuel feed means, said means comprising a bin and a single chute directly connecting said gas producer and bin and discharging substantially centrally of said producer whereby the operation of said grate regulates the supply of fuel by said chute.

7. In a producer plant, a gas producer having a rotary grate comprising a number of annular horizontal plates of progressively smaller size from bottom to top and vertically spaced to receive ash between them for discharge over their inner margins and a cap member spaced above

and arranged over the opening in the plate beneath it, said grate having a conical outline, and an overhead fuel feed means comprising a bin and a single chute directly connecting said bin and gas producer discharging substantially centrally of said producer whereby the operation of said grate regulates the supply of fuel by said chute.

8. In a producer plant, a gas producer having a rotary grate affording a full supporting area for a fuel bed, said grate having a conical outline inclined substantially equal to the angle of repose of the fuel and arranged to discharge ash through itself and an overhead fuel feed means comprising a bin and a single chute discharging fuel from the bin by gravity to a point in the gas producer substantially in line with the axis of rotation of the grate whereby the operation of said grate regulates the supply of fuel by said chute.

9. In a producer plant, a gas producer having a rotary grate affording a full supporting area for a fuel bed and arranged to discharge ash continuously during rotation and an overhead fuel supply comprising a bin and an unobstructed chute leading down therefrom to a point above the grate and arranged to deliver fuel continuously by gravity as the fuel bed is lowered, whereby the pressure of the fuel in said chute is effective to retard rotation of the fuel bed with said grate and the operation of said grate regulates the supply of fuel by said chute.

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