

June 15, 1937.

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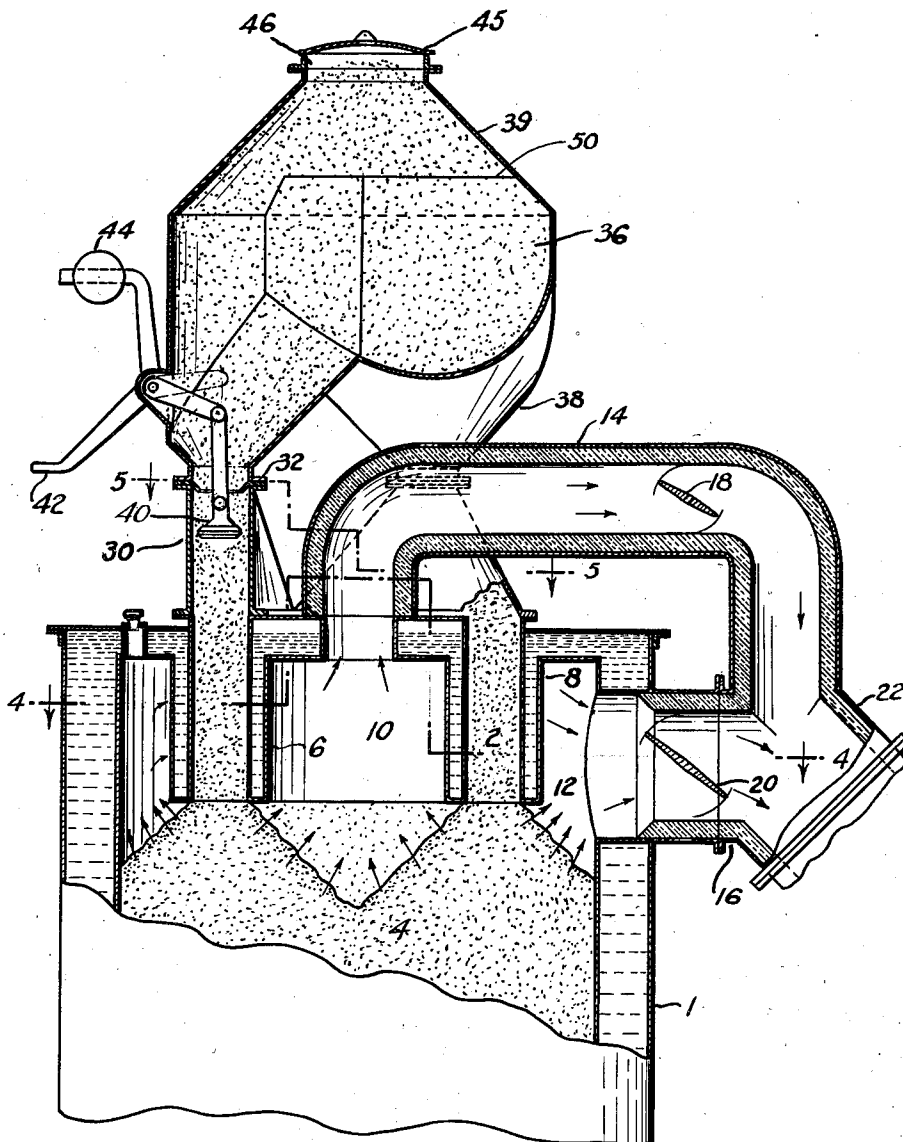
2,083,711

GAS PRODUCER

Filed March 27, 1935

3 Sheets-Sheet 1

FIG. 1



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FIG. 3

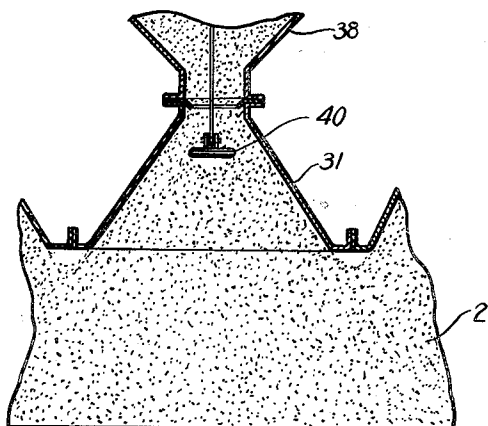
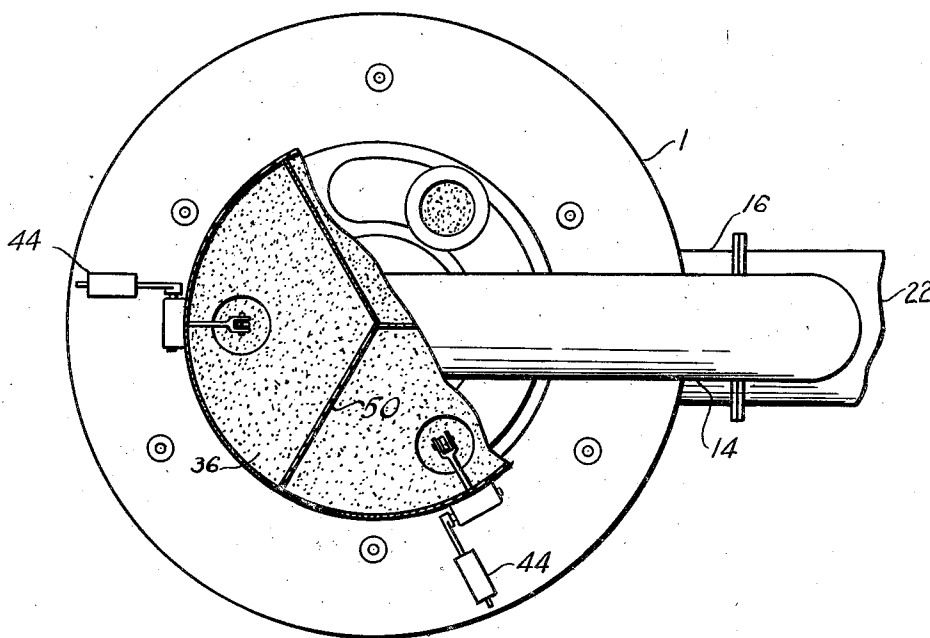


FIG. 2



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FIG. 5

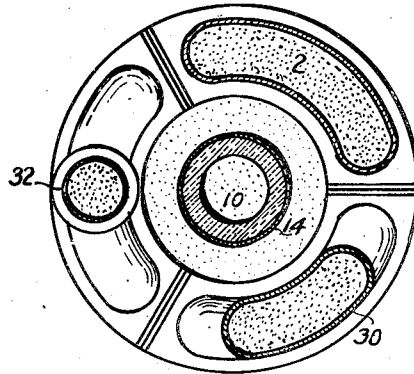
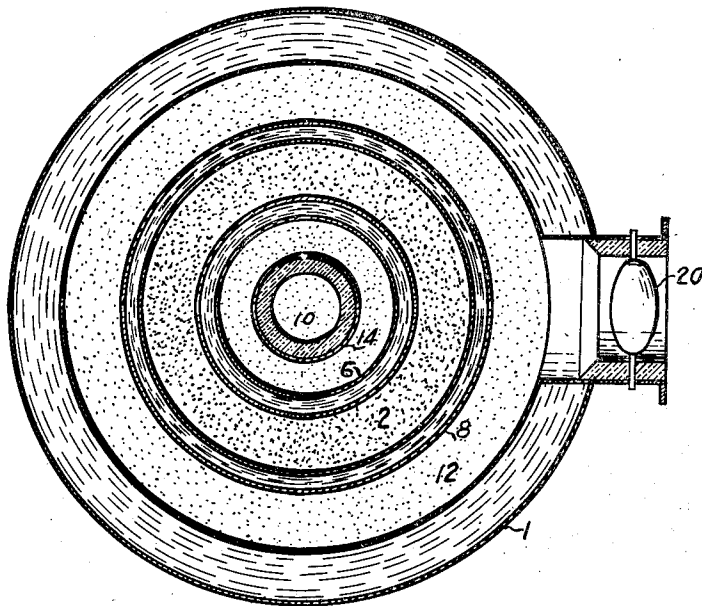


FIG. 4



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UNITED STATES PATENT OFFICE

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GAS PRODUCER

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8 Claims. (Cl. 48-86)

The present invention relates to an improved gas producer and method of controlling the operation of the producer, and more particularly to a producer wherein small fuel may be efficiently gasified.

In a gas producer the efficiency increases as the size of the fuel is reduced, the smaller fuel gasifying more rapidly and burning more thoroughly due to the greater surface area presented to the steam and air in proportion to its bulk. It is impractical, however, to utilize nothing but small material as the back pressure would become so great that the advantage gained by the rapid gasification is offset. It has been the practice to mix the small and large materials, but the peak of possible efficiency has not been reached because the tendency of the smaller material to segregate from the larger fuel has heretofore resulted in a fuel bed of uneven density. Attempts were made in some types of producers to control combustion by increasing the height of the fuel bed over the less dense portions of the fire and so utilize the varying thickness of the fuel bed to redirect the gas flow therethrough. The varying resistance thus offered to the path of the gases through the fire resulted in blow holes, clinkering or slagging, off-setting the advantage gained by the exposure of a greater fuel surface.

The present invention is intended to overcome the foregoing difficulties by providing means for controlling the combustion by controlling the gas flow independently of the fire bed whereby fuel varying widely in size may be simultaneously used, and particularly fuel such as coke screenings varying from $1\frac{1}{2}$ inches down to minute particles. Another object is a producer wherein the smallest material used in a mixture will be as efficiently gasified as the largest. Another object is a machine wherein the tendency of the fuel to segregate into its various sizes, as it is fed to the fuel bed, is reduced to a minimum. A still further object is a producer wherein the direction and paths of flow of the gases to and through the denser rather than thinner portion of the fuel bed is controlled by controlling the gas flow therethrough and without changing the air and steam supply. These and other objects of the invention will be readily understood from the following description with reference to the accompanying drawings.

Fig. 1 is a view partially in section of one embodiment of the invention;

Fig. 2 is a plan view partially in section of the embodiment shown in Fig. 1;

Fig. 3 is a partial development of the magazine feed;

Fig. 4 is a section on the line 4-4 of Fig. 1; Fig. 5 is a sectional view taken on line 5-5 of Fig. 1.

Referring to the drawings, 1 represents the water cooled shell of a gas producer. The lower section of the producer comprising the grate, steam and air inlets and ash remover has been omitted as this structure is well known and is not modified by the present invention. In the present invention the space above the fuel bed is divided to form a plurality of separate gas chambers, with means for controlling the gas flow from the chambers. In the embodiment illustrated this is accomplished by providing concentric walls 6 and 8, spaced inwardly from the outer wall 1 and outwardly from the center to form a magazine 2 which feeds a ring of fuel to the top of the fuel bed 4, dividing the upper section of the producer into gas chamber 10 having a gas take-off 14 leading therefrom and gas chamber 12 having a take-off 16 leading therefrom. The take-offs are provided with control dampers 18 and 20 respectively, the two take-offs joining beyond the dampers into a common main 22. The magazine 2 is preferably made of a casting which may be water cooled to prevent the burning away of the lower periphery thereof.

Magazine 2 is provided with a plurality of pyramid-like connecting members 30 each of which connects to a throat 32 of a hopper 36 and is adapted to direct fuel from the hopper to the magazine. The slope 31 (Fig. 3) of the wall of the member from the throat to the magazine is slightly less than the angle of repose of the fuel being used, which causes the fuel in 2 to lie close to the walls in the intervals between the charging periods through the valve 42. During such intervals, the mass of fuel descends vertically by gravity, as the lower portion of the fuel bed is consumed in gasification, thereby avoiding a space between the fuel in chamber 31 and the sloped top walls thereof and thus effectively reducing the tendency of the large pieces to roll through such space and segregate from the smaller ones. The connecting members are preferably in vertical alinement with the concentric walls 6 and 8 (Fig. 1) and substantially form a part of the magazine, the combined opening at the base being substantially equal to that of the magazine so the fuel flow therefrom will meet and completely fill the ring. By providing a plurality of connecting members with sloping walls so that they are spaced apart at the

throats or apices access may readily be had to the center of the machine, and take-off 14 lead between two rather than through one, eliminating interfering with the fuel flow into the magazine. Fuel is preferably fed to the magazine from a hopper 36 provided with a chute 38 connecting with each throat 32. The slope of the walls of the chutes 38 is greater than the angle of repose of the fuel causing a steady flow toward the throat whereas the angle of the top wall 39 is less than the angle of repose to prevent rolling and segregating thereof as the fuel drops through the hopper. The hopper is further subdivided by partition walls 50 so that each throat 10 receives its supply independent of the other. The hopper is provided with a cap 45 and cap opening 46, the cap opening being centrally located with respect to partition walls 50 whereby as the fuel is fed thereto it will divide out into each partition assuring a fairly even mix in each, preventing a run of one size being completely fed to one section of the ring.

A closure member 40 is provided to close throat 32 during the filling of the hopper, the closure being operable by a handle 42 exterior of the hopper, and balanced by a suitable counter weight 44. As the closure members operate with the weight of the fuel they may be readily reopened when the hopper is filled.

The provision of the multiple gas chambers with means for controlling the gas flow therefrom enables thorough regulation of combustion through control of the direction of gas flow through the fire bed without variation of the steam and air input. As the small material tends to drop vertically, and the large material tends to roll over the smaller particles, a fuel bed of different densities will result. If segregation of the fuel results the steam and air will follow through the less dense portions, resulting in incomplete combustion of the dense fuel, and blow holes in the less dense fuel. In accordance with the present invention if this occurs and the center of the fire 4 becomes thin with the greater volume of gas passing through gas chamber 10 to off-take 14, the gas flow through the fuel bed may be redirected by checking damper 18 forcing the flow to find an outlet through gas chamber 12 whereby the steam and air will likewise be redirected and forced through the dense portion of the bed and correct for the uneven combustion. Any suitable indicating device, such as a flow meter, may be installed in each take-off for readily determining the flow therethrough. Thus by proper manipulation of dampers 18 and 20 the flow of gases from the separate gas chambers may readily be controlled to control the direction of gases through the fire bed with an increase in capacity of the machine as minute particles of fuel may be mixed with larger fuel and efficient gasification obtained.

It is understood that the embodiment illustrated showing the upper section of the generator divided by a single ring feed, and provided with multiple throat feed means is preferred but that other or further divisions depending on the size or type of producer can be made, wherein a plurality of gas chambers with controlled take-offs are utilized to accomplish the purposes set forth herein.

It is also evident to those skilled in the art that the invention permits of various modifications without departing from the spirit thereof or scope of the appended claims.

What I claim is:

1. A gas producer comprising a fuel chamber, a magazine comprising concentric walls adapted to feed a ring of fuel to the fuel bed, said magazine being spaced inwardly from the outer wall of the producer and dividing the portion above the fuel bed into an inner and an outer gas off-take chamber, a take-off leading from each off-take chamber, a hopper for supplying fuel to the magazine, said hopper being provided with a plurality of discharge throats, a plurality of pyramid-like members connecting the hopper throats and the magazine, said members having their bases alined with and in aggregate of substantially the same opening as the magazine and having their walls diverging upwardly and terminating at the discharge throats at an angle to prevent rolling and segregating of the fuel as it drops into and through the pyramid-like members.

2. A gas producer comprising a combustion chamber, a magazine for feeding fuel to the chamber, a hopper supplying fuel to the magazine, pyramid-like connecting members between said hopper and magazine to direct fuel from the hopper to the magazine, said members being spaced apart at the hopper and spreading out to substantially the size of the magazine at their base at an angle whereby the fuel in the members will fill out laterally therein to the lateral walls thereof up to the top level of any fuel therein and the fuel therefrom will meet and completely fill the magazine.

3. A gas producer comprising: a combustion chamber; a magazine for feeding fuel to the chamber; a hopper for supplying fuel to the magazine having chute-means connected with throat-means and having a top wall, the chute-means sloping towards the throat-means at an angle greater than the angle of repose of the fuel for steady flow thereof, and the top wall being disposed at an angle less than the angle of repose of the fuel to prevent rolling and segregation as the fuel drops through the hopper; conduit-means connected at its upper part with the throat-means and at its lower part with the magazine, the conduit-means having its base opening substantially equal to that of the magazine so that fuel therefrom will completely fill the magazine and having its upper walls converging towards the throat-means and sloped at an angle less than the angle of repose of the fuel to avoid lateral spaces between the fuel and the upper walls through which large pieces might roll and segregate.

4. A gas producer comprising: a combustion chamber; a magazine for feeding fuel to the chamber; a hopper for supplying fuel to the magazine having throat-means; conduit-means connected at its upper part with the throat-means and at its lower part with the magazine, the conduit-means having its base opening substantially equal to that of the magazine so that fuel therefrom will completely fill the magazine and having its upper walls converging towards the throat-means and sloped at an angle less than the angle of repose of the fuel to avoid lateral spaces between the fuel and the upper walls through which large pieces might roll and segregate.

5. A gas producer comprising: a combustion chamber; a ring-magazine for feeding fuel to the chamber; a hopper for supplying fuel to the magazine having a plurality of chutes, a plurality of throats therefor, and a top wall, the

chutes each sloping towards their throats at an angle greater than the angle of repose of the fuel for steady flow thereof, and the top wall being disposed at an angle less than the angle of repose of the fuel to prevent rolling and segregation as the fuel drops through the hopper; a plurality of conduits each connected at its upper part to one of said throats and each connected at its base to the magazine, the combined openings of the bases of the conduits being substantially equal to the effective cross-sectional area of the magazine so that the fuel from the conduits will completely fill the magazine and the upper walls of the conduits converging towards their throats and being sloped at an angle less than the angle of repose of the fuel to avoid lateral spaces between the fuel and the upper walls through which fuel might roll and segregate.

6. A gas producer comprising: a combustion chamber; a ring-magazine for feeding fuel to the chamber; a hopper for supplying fuel to the magazine having a plurality of throats therefor; a plurality of conduits each connected at its

upper part to one of said throats and each connected at its base to the magazine, the combined openings of the bases of the conduits being substantially equal to the effective cross-sectional area of the magazine so that the fuel from the conduits will completely fill the magazine, and the upper walls of the conduits converging towards their throats and being sloped at an angle less than the angle of repose of the fuel to avoid lateral spaces between the fuel and the upper walls through which fuel might roll and segregate.

7. Apparatus as claimed in claim 6 and in which the conduits are in vertical alignment concentrically with the ring-magazine.

8. Apparatus as claimed in claim 5 and in which the hopper is subdivided by partition walls for maintaining the supply to each throat independently of that of the other throats and is provided with a common fuel inlet centrally located with respect to the several partition walls whereby fuel fed thereto will be divided equally by the partitions.

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