

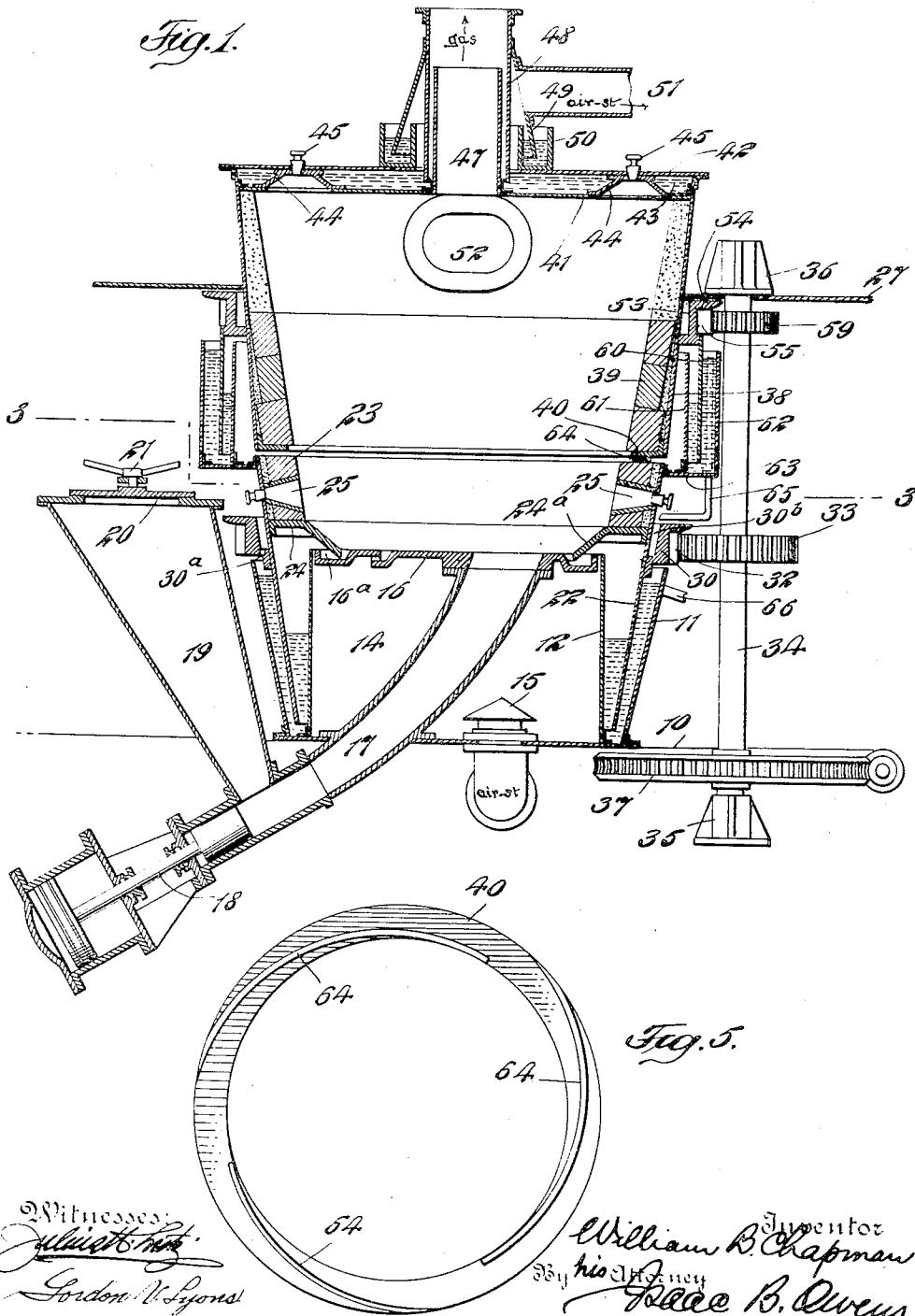
W. B. CHAPMAN.
GAS PRODUCER.

APPLICATION FILED MAR. 5, 1910. RENEWED JULY 12, 1912.

1,049,994.

Patented Jan. 7, 1913.

4 SHEETS—SHEET 1.



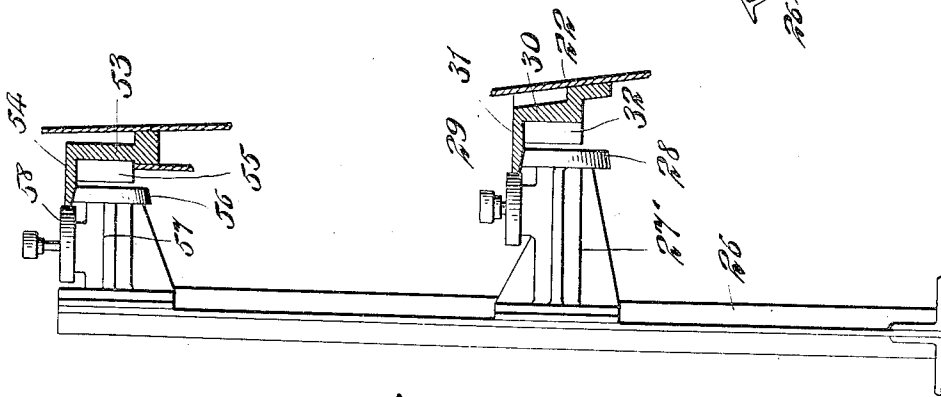
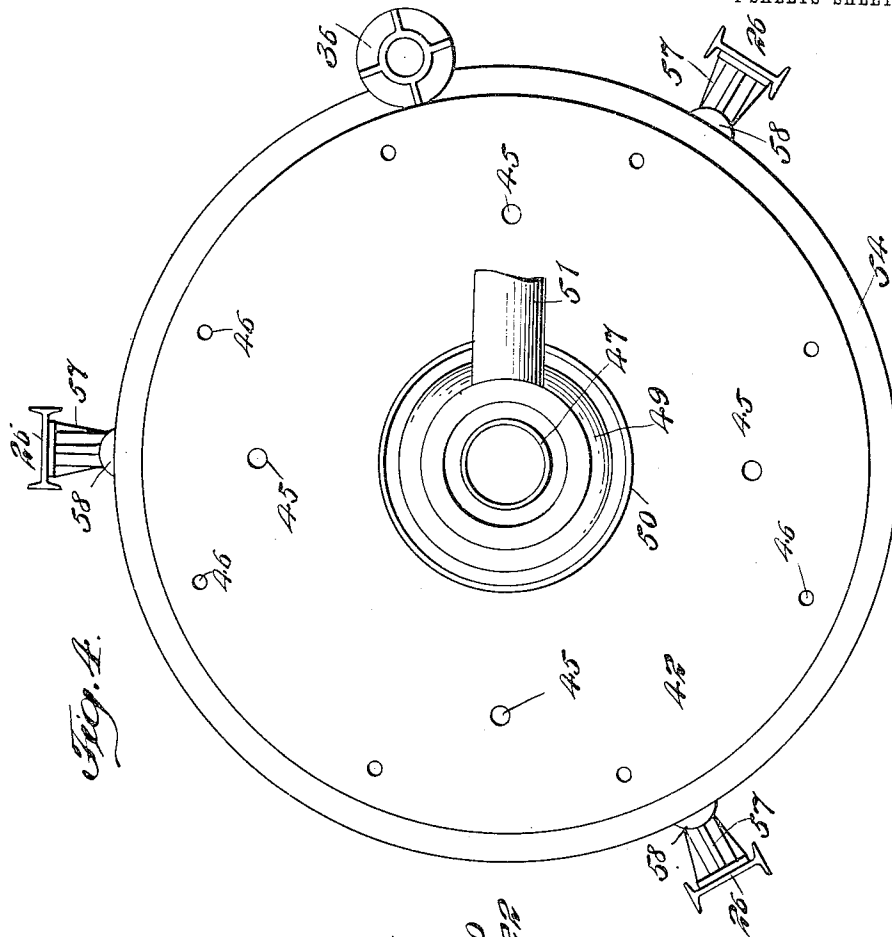
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4 SHEETS-SHEET 2.



Witnesses:
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Fig. 2.

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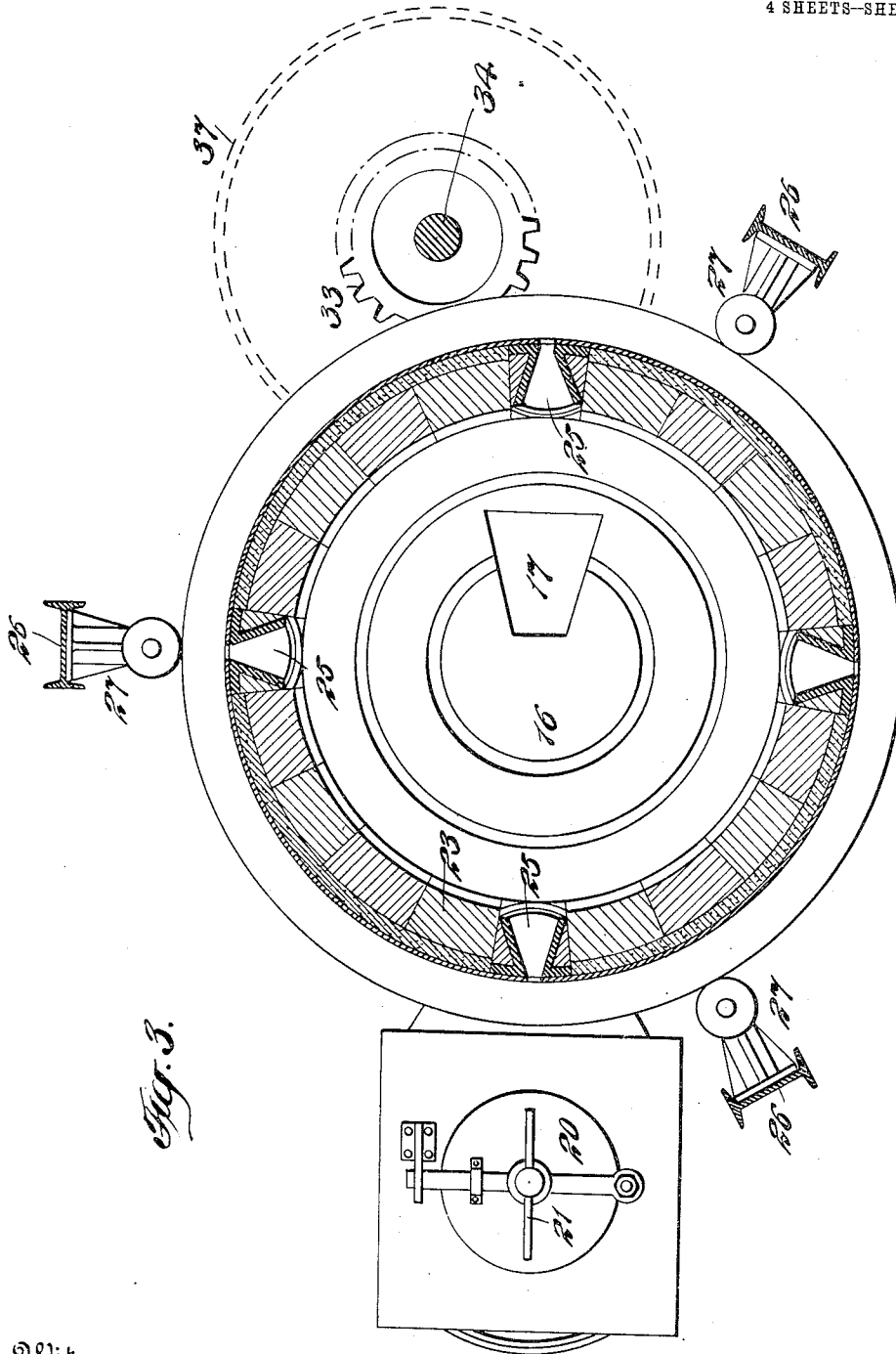
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4 SHEETS--SHEET 3.



Aug. 3.

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4 SHEETS—SHEET 4.

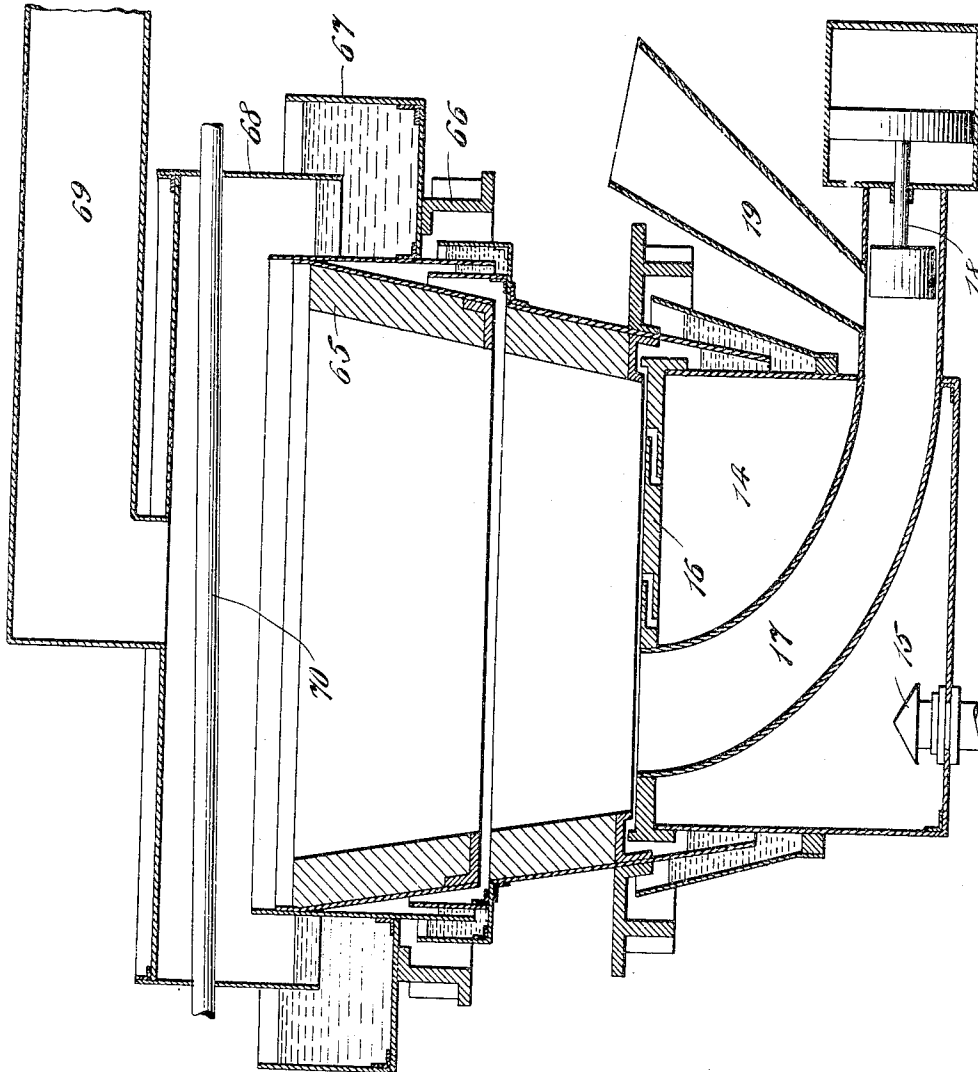


Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM B. CHAPMAN, OF NEW YORK, N. Y., ASSIGNOR TO CHAPMAN ENGINEERING CO., OF NEW YORK, N. Y.

GAS-PRODUCER.

1,049,994.

Specification of Letters Patent.

Patented Jan. 7, 1913.

Application filed March 5, 1910, Serial No. 547,514. Renewed July 12, 1912. Serial No. 709,063.

To all whom it may concern:

Be it known that I, WILLIAM B. CHAPMAN, of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Gas-Producers, of which the following is a full, clear, and exact specification, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to gas producers principally of the type in which the fuel is forced in from below the grate, though it involves features which are applicable to producers of other types.

One of the important features of my invention is the means by which the coal is caused to lie evenly and uniformly in the producers and the ramming of a solid column of green coal up through to the top of the fire prevented, which latter effect would disturb if not entirely prevent the proper operation of the producer.

Another feature of my invention relates to the effectual sealing of the fuel supply, so that in the case of pressure producers the fire will not be allowed to burn back into the supply conduit.

Still a further feature relates to the organization of the body of the producer, involving the use of relatively rotating sections, whereby the contents of the producer are thoroughly agitated and caking and clinkering of the fuel and the formation of the blow holes are prevented. And a further feature is a novel arrangement of parts by which the ash is automatically expelled from the producer by the pressure of the incoming coal from below.

The invention involves various other features of importance, all of which will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is now had to the accompanying drawings which represent, as examples, the preferred forms of the invention and in which;—

Figure 1 is a vertical section of the invention; Fig. 2 is a detail elevation of the means for mounting the rotating sections of the

producer; Fig. 3 is a sectional plan on the line 3—3 of Fig. 1; Fig. 4 is a plan view; Fig. 5 is an inverted plan view of a detailed part; and Fig. 6 is a sectional view of a modification.

10 indicates the base line or foundation on which the producer is mounted and on which is erected an outwardly-flaring water pan 11 rising to a considerable height and having the cross-sectional form of the producer, in this case circular. Inside of the water pan 11 are erected cylindrical walls 12 forming a closed air chamber 14. The walls 11 and 12 are rigid and of metal and they form between them an annular chamber adapted to receive water, as shown in the drawings, constituting a water seal, all of which will fully appear hereinafter. In the bottom of the chamber 14 is an inlet means 15 for the draft current and the top of the chamber 14 is covered by a grate 16 which has the necessary openings for the passage of the draft current and an annular indented peripheral portion 16^a, the purpose of which will fully appear hereinafter. Through the bottom of the air chamber 14 the conduit 17 for the fuel feed passes, said conduit extending upward at an inclination and opening through the grate 16 eccentrically thereto. The conduit flares upward or is trumpet-shaped so that the fuel will not clog or jam in the conduit. 18 indicates a ram or other appliance for forcing the fuel through the conduit and immediately ahead of the piston thereof is the fuel magazine 19. This is provided with a cover 20 and a fastening means 21 therefor, by which the cover may be secured air tight on the hopper, for the purpose which will fully appear hereinafter.

The body of the producer is constructed of two superimposed, upwardly flaring rotating sections, the lower of which is constructed of a metal shell 22, which extends down into the water chamber between the walls 11 and 12 and completes the water seal at this point. Within the metal shell 22 is a refractory lining 23 sustained by an annular metal ring 24 fastened to the shell 22 and having a downwardly and inwardly extending portion 24^a which projects into the

annular indented portion 16^a of the grate and thereby prevents the entry of the fuel into the water chamber between the walls 11 and 12. The lower section is also provided with various peep or poke holes 25 plainly shown in Fig. 3 and indicated by sectional lines in Fig. 1. These are normally closed by plugs as will be understood.

Rising from the base 10 are three stanchions 26 which extend to the floor 27 about the producer and are fastened thereto. These stanchions are provided with brackets 27', which have, each of them, rollers 28 and 29, the former on horizontal axes and the latter on vertical axes. Attached to and encircling the shell 22 of the lower section of the producer body is an annulus 30 which has an overhanging flange 31 bearing on the rollers 28 and thrusting against the rollers 29. The rollers 28 therefore rotatably support the lower body section of the producer, while the rollers 29 take the side thrust thereof and maintain it in proper position in respect to the other parts of the producer. The annulus 30 is also provided with spur gear teeth 32 which are in mesh with a spur gear 33 (see Figs. 1 and 3). The spur gear 33 is carried on a shaft 34 extending vertically and mounted in a step bearing 35 at its lower end, while its upper end is held in the cap bearing 36 on the floor 27.

37 indicates a worm and worm wheel drive for the shaft 34. The annulus 30 has an opening or openings 30^a, leading from a chamber 30^b, formed between the annulus and the producer shell. This chamber is adapted to receive water and the same drips through the opening 30^a into the seal between the walls 11 and 12, thus supplying said seal with water.

The upper body section of the producer has a metal shell 38 carrying a refractory lining 39 supported by a ring 40, which is attached to said shell 38. The non-conducting or refractory lining 39 terminates at a point above the fire line, while the metal lining 38 continues above the floor and supports a head 41. If desired a mortar or cement coating may be applied to the shell 38 above the refractory fire brick. Above the head is a cover plate 42 spaced therefrom and fastened to the shell 38 to form a flat water chamber 43. Through this chamber peep holes 44 extend affording a view into the interior of the producer by the plugs 45 in the usual manner. The cover 42 is also provided (see Fig. 4) with air holes 46 permitting atmospheric air to be drawn into the top of the chamber 43 above the water therein. Rising centrally from the head 41 and covering an opening therein is a pipe 47 which is carried by the head 41, said head and cover plate 42 rotating, it will be seen, with the upper section of the producer. Over the pipe 47 and extending down into

the water in the chamber 43, to be sealed thereby, is a gas outlet pipe 48. This pipe is stationary and is suitably supported and carries a skirt 49 which dips into an annular water chamber 50, formed on and rotating with the cover 42. From the skirt 49 an outlet pipe 51 passes. This pipe is adapted to carry off hot air and water vapor constituting the draft current of the producer, which current is led by suitable means (not shown) into the inlet device 15. The air is drawn in through the holes 46 and carried under the cover 42 with the vapor rising from the water in the chamber 43 through the annular space surrounding the gas outlet pipe 48 and up into the outlet pipe 51. The gas generated in the producer passes from the pipe 47 up into and out through the gas outlet pipe 48.

52 indicates a suitably covered manhole through which the ash, which in this type of producer forms in the top thereof, may be drawn out onto the floor 27.

The annulus 53 is fastened to the metal shell 38 of the upper section and surrounds the same. It has an overhanging top flange 54 and spur gear teeth 55, said flange 54, as shown in Fig. 2, bears on rollers 56 similar to the rollers 28 and carried by a bracket 57 similar to the brackets 27' and attached to the stanchions 26. The brackets 57 also carry side thrust rollers 58 engaged by the edge of the flange 54. The gear teeth 55 are in mesh with the spur gear 59 attached to the shaft 34. Owing to the difference of the ratio of the gears 32 and 33 on one hand and 55 and 59 on the other hand, the two sections of the body of the producer are rotated at different speeds, both of which in practice are extremely slow, and thereby a twisting action is brought about in the body of the fuel within the producer at a point which is preferably in the incandescent zone thereof. Attached to the annulus 53 and projecting down therefrom is an annular skirt 60, which extends into a water chamber formed by two concentric walls 61 and 62 supported at their base by a flange 63 attached to the shell 22 of the lower producer section. In this manner a water seal is effected between the two sections of the producer body, which seal, however, like the seal at the base does not interfere with the rotation of the sections. The producer is here illustrated as of the pressure type and therefore the water in the seals is shown higher on the atmosphere side than on the pressure side.

Fig. 5, being an inverted plan view of the ring 40, exposes the underside thereof and illustrates tangential ribs 64. These ribs are also indicated in Fig. 1. They are integral with or fastened to the ring 40 and rotate over the upper edge of the refractory lining 23 of the lower section. Said ribs are so

disposed that they sweep inwardly and back into the producer any fuel or ash which might enter the crevice between the two sections of the body of the producer. From the water seal formed by the walls 61 and 62 an overflow pipe 65 passes which leads the water from the top of said water seal downward into the chamber 30^b of the annulus 30 and from which the water escapes to the lower seal as explained. 66 indicates an overflow pipe from said lower seal.

The operation of the producer thus far described may be traced as follows: The parts are adjusted, as shown, and by the ram 18 fuel is forced through the conduit 17 into the producer and lies on the grate 16. The producer sections, or at least the lower one, should be rotated meanwhile with the result that, as the fuel accumulates sufficiently to engage the walls 23 and flange 24^a, the fuel body is rotated over the grate and is caused to pass by and over the mouth of the conduit 17. This causes the fuel to be spread out uniformly on the grate in the lower part of the producer. When the coal or other fuel has sufficiently accumulated in the producer a fire is kindled in the fuel igniting the green coal and spreading the fire evenly over the surface of the grate. The operation of the producer now becomes normal, its two sections rotating diversely or relatively, either at different speeds or in different directions. Producer gas is formed in the lower part of the producer, and the volatile hydrocarbon content given off in the fire zone unites with the air of the draft current and is acted on by the hot fire rendering it permanent, the net product of these operations passing off as producer gas through the pipe 47. The magazine 19 is filled from time to time, as may be required, and is closed air tight at other times, so that it will be impossible for the current to pass through the conduit 17. An air current so passing would be of great disadvantage, since the fire would gradually work its way back into the conduit. It will be observed that by introducing the conduit 17 eccentrically into the producer body and by rotating the whole of the body of the fuel above it, the coal is caused to spread out evenly and uniformly and the ram is prevented from forcing a column directly through the contents of the producer, which deleterious effect would be produced were the conduit, for example, axially arranged. The diversely rotating sections twist the incandescent zone of fuel and cause the same to lie compactly, destroying any blow holes in their inception and preventing caking and clinkering in the fire.

In the form of the invention shown in the first five figures it is intended to remove the ash manually by a rake or other instrument passed into the producer, the producer

being shut down at intervals to admit of such operation. It is possible, however, and in some cases will be preferable, to allow the ash to be expelled automatically and an arrangement admitting of this is illustrated in Fig. 6. There the top section 65 is open, being unprovided with a hood and above the annulus 66 it carries an annular ash chamber 67 into which dips the depending skirt of an inverted pan or hood 68 constituting the hood of the producer. From this hood a gas outlet pipe 69 passes and across the interior of the hood from side to side extends a water cooled beam 70. This beam is spaced from the top of the hood as shown. In other respects the construction shown in Fig. 6 is substantially that illustrated in the other figures. In the modification the action of the ram forces the whole body of fuel gradually upward and the ash spills out over the upper edge of the section 65 into the ash pan 67. This will tend to arch up the ash into the outer part of the hood 68 and the beam 70 is provided for the purpose of breaking down this arch and keeping clear the gas outlet and opening. The ash thus introduced into the pan 67 may be removed at any time without necessarily interrupting continuous operation of the producer.

The walls of the producer flare upward as the drawings show and this makes the upward movement of the fuel easy, preventing clogging or packing of the coal. Attention is also called to the fact that the grate need not necessarily be used in the form shown and may be greatly varied in construction. Indeed, it may be omitted and a bed of ash or porous mass of refractory material employed in its stead. Attention is also called to the water seal between the two sections of the producer; should the ash leak through the clearance it will not escape the seal to clog the same, but will be confined by the wall 61 and removed therefrom at will upon the separation of the parts during the cleaning of the producer.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. An under-feed gas producer having means for moving the body of fuel in the producer past the fuel entrance.

2. An under-feed gas producer having means for relatively moving the body of fuel in the producer and the fuel entrance.

3. An under-feed gas producer having means for relatively rotating the fuel entrance and the body of fuel within the producer.

4. An under-feed gas producer having means for rotating the body of fuel in the producer and a fuel entrance means eccentric to the center of such rotation.

5. An under-feed gas producer having a

- rotating body section and a fuel entrance eccentric thereto.
6. An under-feed gas producer having a grate, a rotating body section above the same, an annular lip projecting from the lower edge of the body section inward to the grate and a fuel feed conduit passing upward to the grate.
7. An under-feed gas producer having a grate, a rotating body section above the same, an annular lip projecting from the lower edge of the body section inward to the grate and a fuel feed conduit passing upward to the grate, said entrance being eccentrically located, for the purpose specified.
8. An under-feed gas producer having an air chamber with a draft current inlet, a grate at the top of said chamber, a fuel entrance conduit passing through the chamber up to and opening at the grate and rotating producer sections above the grate.
9. An under-feed gas producer having an air chamber with a draft current inlet, a grate at the top of said chamber, a fuel entrance conduit passing through the chamber up to and opening at the grate, a rotating producer section above the grate and a water seal between said section and the base of the producer.
10. An under-feed gas producer having an air chamber with a draft current inlet, a grate at the top of said chamber, a fuel entrance conduit passing through the chamber up to and opening at the grate, a rotating producer section above the grate and a water seal between said section and the base of the producer, said water seal surrounding the air chamber.
11. An under feed gas producer having an air chamber with a draft current inlet, a grate at the top of said chamber, a fuel entrance conduit passing through the chamber up to and opening at the grate, a rotating producer section above the grate and an annular lip projecting inwardly from the lower end of said section toward the grate.
12. A gas producer having a grate with an indented peripheral portion, a rotating producer section above the grate and an annular lip projecting from the producer section toward the grate and into said indented portion thereof.
13. A gas producer having a grate with an indented peripheral portion, a rotating producer section above the grate, an annular lip projecting from the producer section toward the grate and into said indented portion thereof and a water seal between said section and the base of the producer.
14. A gas producer having a grate with an indented peripheral portion, a rotating producer section above the grate, an annular lip projecting from the producer section toward the grate and into the indented portion thereof, walls forming an air chamber below the grate, additional walls forming a water chamber around the air chamber and a skirt on the producer section and projecting into said water chamber.
15. A gas producer chamber having relatively rotating sections and a diagonal plow on one of the said sections in the clearance between the two, said plow serving to sweep ash from said clearance.
16. A gas producer having a grate, means forming an air chamber below the grate, an air inlet means in said chamber, two rotating producer sections above the grate, means for sealing the same, a fuel entrance conduit passing through the air chamber and grate, a producer top rotating with the upper producer section, a stationary gas outlet at the center of said top and means for sealing the connection of said gas outlet and the top.
17. A gas producer having two relatively rotating sections, a water seal between them, the seal forming parts including a wall forming a clear chamber between the seal and joint between the producer sections in which chamber the ashes leaking through the joint may be received, means normally tending to prevent the entrance of ashes to said chamber.
18. A gas producer having two relatively rotating sections, a water seal between them, the seal forming parts including a wall forming a clear chamber between the seal and joint between the producer sections in which chamber the ashes leaking through the joint may be received and a plow between the said chamber sections and serving to throw the ash off the clearance space.
19. An underfeed gas producer having a peripheral wall and means for effecting a relative movement of said wall and the fuel entrance.
20. An underfeed gas producer having a grate, a body section above the same, an annular lip projecting from the lower edge of the body section inward to the grate, a fuel feed conduit passing upward to the grate and means for relatively rotating said conduit and said body section.
21. An underfeed gas producer having an air chamber with a draft current inlet, a grate at the top of said chamber, a fuel entrance conduit passing through the chamber up to the opening at the grate, a body section above the grate and means for effecting a relative movement of said conduit in respect to said body section to distribute the fuel within the latter.
22. An underfeed gas producer having a body section, means for delivering fuel thereto at the lower portion thereof, and means for relatively moving said body section and said means to effect a distribution of the fuel within the body.

23. An underfeed gas producer having a
body section, means for delivering fuel to
the lower portion thereof, gas outlet means
at the upper portion thereof, an ash outlet
5 means adjacent the upper portion and means
for effecting a relative movement of said
section and said fuel delivering means.

In testimony whereof I have signed my
name to this specification in the presence
of two subscribing witnesses.

WILLIAM B. CHAPMAN.

Witnesses:

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F. C. MARTIN.