

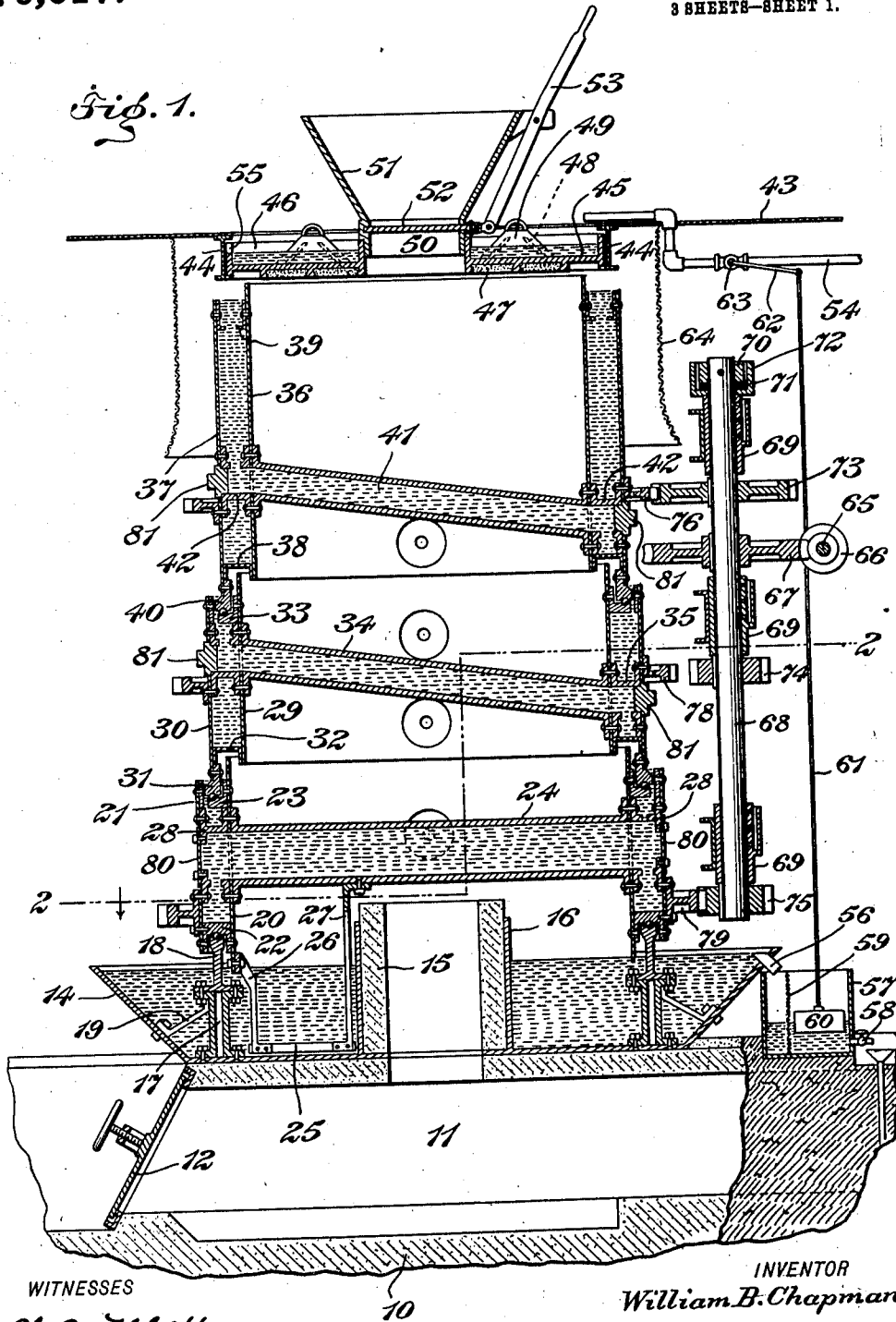
W. B. CHAPMAN.
GAS PRODUCER.

APPLICATION FILED AUG. 1, 1906. RENEWED FEB. 3, 1910.

970,017.

Patented Sept. 13, 1910.

3 SHEETS—SHEET 1.



WITNESSES

W. C. Abbott
Ethel J. McLaughlin

INVENTOR

William B. Chapman

BY

Isaac B. Owens
ATTORNEY

W. B. CHAPMAN.
GAS PRODUCER.

APPLICATION FILED AUG. 1, 1906. RENEWED FEB. 3, 1910.

970,017.

Patented Sept. 13, 1910.

3 SHEETS—SHEET 2.

Fig. 2.

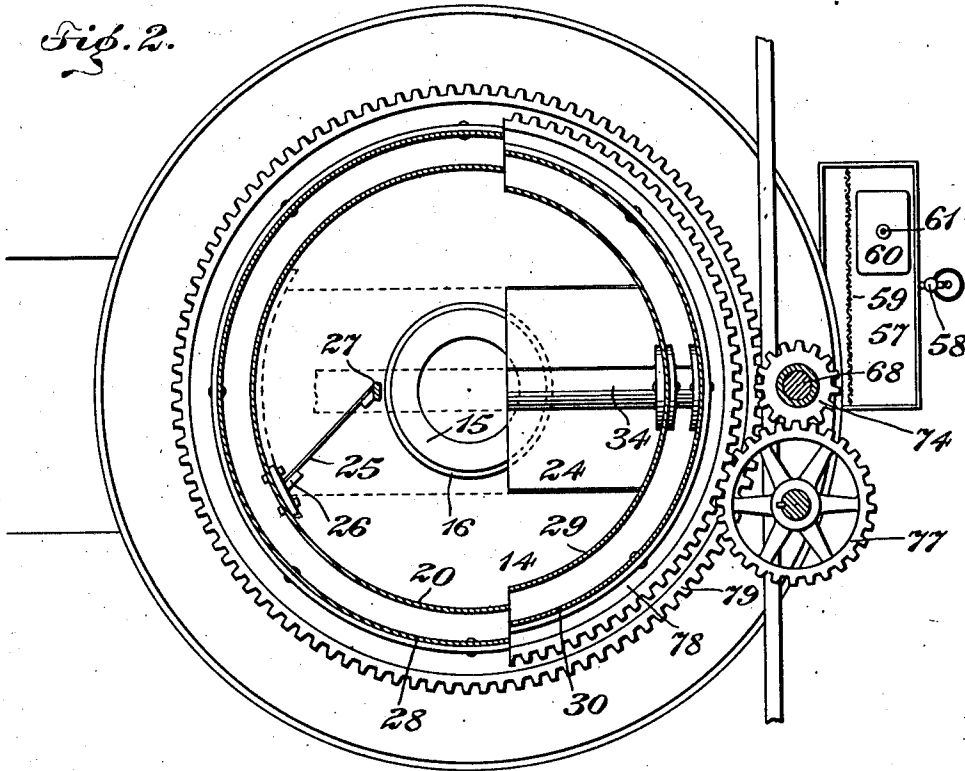


Fig. 3.

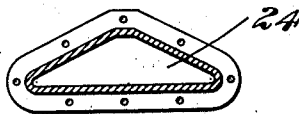
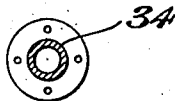


Fig. 4.



WITNESSES

W. C. Abbott

Ethel S. McLaughlin

INVENTOR

William B. Chapman

BY

David B. Owens
ATTORNEY

W. B. CHAPMAN.
GAS PRODUCER.

APPLICATION FILED AUG. 1, 1906. RENEWED FEB. 3, 1910.

970,017.

Patented Sept. 13, 1910.

3 SHEETS—SHEET 3.

Fig. 6.

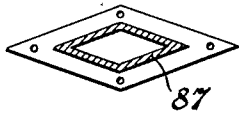


Fig. 7.

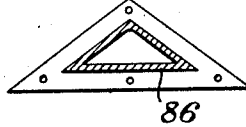


Fig. 5.

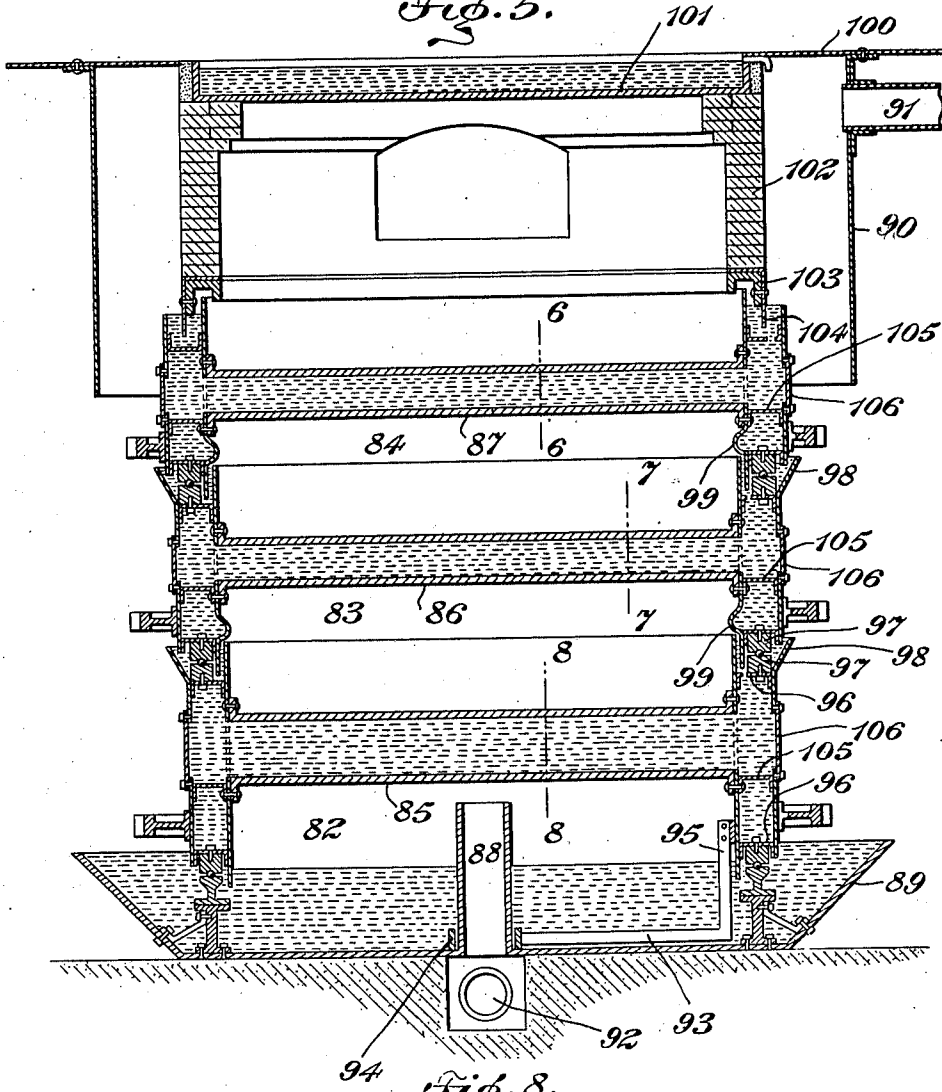
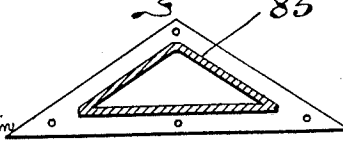


Fig. 8.



WITNESSES

W. C. Abbott
Ethel J. McLaughlin

INVENTOR

William B. Chapman

BY

Isaac B. Owens
ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM B. CHAPMAN, OF NEW YORK, N. Y., ASSIGNOR TO WALTER B. HOPPING,
TRUSTEE, OF NEW YORK, N. Y.

GAS-PRODUCER.

970,017.

Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed August 1, 1906, Serial No. 328,806. Renewed February 3, 1910. Serial No. 541,869.

To all whom it may concern:

Be it known that I, WILLIAM B. CHAPMAN, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, in the county of Kings 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 description, such as will enable others skilled in the art to make and use the same.

Primarily the object of my invention is to construct an automatically agitated water cooled gas producer adapted to both power and heating purposes and which may be of either the up-draft or down-draft type.

It is further an object of my invention to provide in such a producer for the thorough agitation of the fuel and ashes, and this end I attain by constructing the producer of a number of circular super-imposed sections which are rotated diversely or oppositely to each other, and which carry peculiarly constructed water cooled agitating beams, causing the material in the producer to be thoroughly and continuously agitated, and insuring uniform combustion within the producer and uniform production of gas.

A further object of the invention is to improve the cooling system, and I effect this by constructing the sides of the body of the producer with inner and outer walls furnishing the water circulation space between them, arrange to receive the water and permit it to overflow from one section to the other. The water thus circulating through the various sections of the producer keeps the same at proper temperature, and prevents burning the iron work. At the same time vapor is formed from the cooling water and this may be collected in an apron or hood which overhangs the upper part of the producer, from which hood the vapor is drawn with the air into the producer to supply the fuel with steam or moisture as will be understood.

A further object of the invention is to construct the metallic parts of the producer in a durable manner without unnecessary complication, and in attaining this end I form the water cooled agitating beams of cast iron steel, which span the producer sections and which are riveted or otherwise fastened to the inner walls of the producer.

These inner walls are braced against the corresponding outer walls by suitable webs or collars, which render the structure extremely firm and which may be cheaply and readily constructed and placed in position.

Other objects are involved looking to the improvement of the producer in various ways, and all features of my invention will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is now had to the accompanying drawings, which illustrate as an example the preferred embodiment of my invention, and in which drawings—

Figure 1 is a vertical section of a down-draft suction gas producer, constructed according to my invention; Fig. 2 is an irregular sectional plan view on the line 2—2 of Fig. 1; Fig. 3 is a cross section of the lower agitating beam; Fig. 4 is a cross section of one of the upper agitating beams; Fig. 5 is a vertical section taken through an up-draft gas producer, constructed according to my invention; Fig. 6 is a cross section of the upper agitating beam on the line 6—6 of Fig. 5; Fig. 7 is a cross section of the intermediate agitating beam on the line 7—7 of Fig. 5; and Fig. 8 is a cross section of the lower or main agitating beam, on the line 8—8 of Fig. 5.

Referring first to Figs. 1 to 4 illustrating the down-draft producer, it will be observed that the producer is constructed on a suitable foundation 10, in which is arranged a gas outlet duct 11.

12 indicates a manhole and closure by which access may be gained to the interior of the duct 11 for the purpose of cleaning the same.

Erected on the foundation 10 is a water sealed ash pan 14, through the center of which the down-draft gas outlet flue 15 passes. This flue is constructed of fire brick or other refractory material, and is covered by a metallic collar 16, which extends from the upper part of the flue down to the bottom of the pan 14 to prevent the water from percolating through the fire brick, of which the flue 15 is formed. Erected on the bottom of the pan 14 are a number, preferably four, of pedestals 17. These support an annular track or ball race 18, on which the lower rotating section of the producer bears and by which the producer sections are sup-

ported. The legs 17 are braced against the walls of the pan by means of brackets 19, as shown.

The lower producer section is circular in form and is constructed of an inner metallic wall 20 and an outer metallic wall 21. These walls are held rigidly together, and spaced from each other by annular ball races 22 and 23, of which the former is in the lower part of the section and the latter in the upper part. The ball race 22 coacts with the annular track or race 18, and the inner wall 20 of the section extends downwardly inside of the race 18 and considerably below its upper edge, for the purpose of forming a water seal at the lower edge of the said lower section. Correspondingly the upper edge of the inner wall 20 is extended upwardly to insure the maintenance of a water seal at the upper edge of the section, and to prevent this seal from being broken by the suction exerted through the producer, all of which will fully appear hereinafter.

Extending diametrically across the interior of the lower section of the producer is the lower or main agitating beam 24. This is shown in cross section in Fig. 3 and has a wide flat bottom, as shown, and inclining top walls. The width of this agitating beam 24 is sufficient to cover the mouth of the flue 15, and serves not only to agitate the ash in the producer but to prevent the ash from entering the gas outlet flue. The agitating beam 24 in rotating with the lower producer section runs through the ash which is contained within this section, and the inclined upper wall of the beam serves to produce an undulating effect on the ashes. The incline at the rear or following side of the agitating beam enables the ash to drop gradually from the top of the beam and prevents the formation of a cavity or pocket behind the beam, which cavity or pocket, if formed, would offer a free flow for the gases and prevent uniform combustion of the fuel.

25 indicates an ash plow which operates over the bottom of the pan, and which, as shown in Fig. 2, is disposed tangentially to the outlet flue 15, so that upon movement of the plow through the pan the ashes are forced outward to and over the periphery thereof. This plow 25 is supported by two arms 26 and 27 fastened respectively to the lower portion of the inner wall 20 of the lower producer section and to the underside of the agitating beam 24. The ends of the beam 24 are flanged and riveted, or otherwise fastened, to the inner wall 20 of the producer section.

Secured within the lower producer section respectively at the ends of the agitating beam 24 are cast iron or otherwise constructed thimbles 28. These serve the double purpose of strengthening the producer

section at the point of its connection with the agitating beam, and also of forming continuations of the hollow beam, said thimbles being provided with openings therein, as shown in Fig. 1, permitting the free circulation of water into and through the beam.

The intermediate producer section is located directly above the lower section, and is formed of an inner wall 29 and an outer wall 30 similar to the walls 20 and 21, excepting that the intermediate section is less in height and diameter than the lower section and the outer wall of the intermediate section lies in a plane intermediate the plane of the walls 20 and 21, while the inner wall lies inside of the plane of the wall 20. The lower edge of the outer wall 30 of the intermediate section is provided with an annular ball race 31 projecting downwardly therefrom and entering the space between the upper portions of the walls 20 and 21 in position to coact with the upper ball race 23 of the lower section, thus rotatably mounting the intermediate section on the rotatable lower section. The upper ball race 23 of the lower section is formed with an orifice to provide the free circulation of water, and the lower section being full of water as indicated in Fig. 1 a water seal is formed between the two sections. The upwardly extended edge of the inner wall 20 insures the maintenance of this seal, and prevents the water being sucked up over the edge of the inner wall by the suction exerted within the producer. The intermediate section is made water-tight at its bottom by means of an annular channel iron 32, which is fastened suitably between the inner and outer walls 29 and 30, this channel iron section being located directly above the annular ball race 31. At the upper portion of the intermediate section the walls thereof are braced firmly against each other by means of a ball race 33, and this, the same as the race 23, is orificed to permit the free circulation of water.

The agitating beam 34 of the intermediate section is shown in Fig. 4 and is round in cross section. Said beam, unlike the beam 24, is arranged on an incline so as more effectively to agitate the material within the producer. At the point of this intermediate section the material is the incandescent coal, and the inclined beam 34 turning continuously through the same effectually agitates the same, insuring thorough combustion and compact disposition of the fuel. The ends of the beam 34 are flanged, as shown, and riveted to the inner wall 29 of the intermediate section, and within the intermediate section adjacent to the ends of said beam cast iron thimbles or collars 35 are arranged, which are similar in construction and purpose to the collars 28.

The upper section of the producer is shown as being of greater height than the two lower sections, and is composed of an inner wall 36 and an outer wall 37. At their lower edges these walls are fastened together and a water-tight connection formed by an annular channel iron connection 38, and at the top the walls are fastened together by a similar section 39, but this section is orificed at various points, as shown in Fig. 1, to enable the cooling water to circulate freely between the two walls 36 and 37. The upper section of the producer is smaller in diameter than the intermediate section, the outer wall 37 occupying a position intermediate the plane of the two walls 29 and 30, while the inner wall 36 occupies a position inward of the plane of the wall 29. Said outer wall 37 carries at its lower edge below the channel 38 an annular ball race 40, which projects into the space between the outer edges of the walls 29 and 30 of the intermediate section, and coacts with the ball race 33 rotatably to mount the upper section of the producer.

41 indicates the agitating beam of the upper section which is similar in cross section to the beam 34, and flanged at its ends to be fastened to the inner wall 36 as previously described. At the ends of the beam 41 in the space between the walls 36 and 37 thimbles or collars 42 are arranged, and these are similar in form and construction to the collars 28 and 35 previously described. The beam 41, like the beam 34, is arranged on an incline, and sweeps through the green coal which occupies the upper section of the producer, thoroughly agitating the same and causing it to be fed compactly toward the incandescent zone of fuel which is immediately below it.

43 indicates a charging floor which is constructed above the producer and supported independently thereof. Forming part of the supporting frame of this floor are two I-beams 44, and these support the top 45 of the producer. Said top is constructed of cast iron and has a water pan on its top, the same being formed by flanges 46 rising from the edge of the top. The under side of the top 45 is covered with fire brick, as indicated at 47, and preferably this is secured to the top when the same is cast in the mold. This is effected by placing the fire brick sections 47 in the bottom of the mold spaced apart before the metal is run into the same, and the metal when run into the mold is caused to fill and set between the fire brick sections thus permanently fastening them to the top. Said top is provided with barring-down openings which are covered by frusto-conical shields 48, indicated by broken lines in Fig. 1, and over these shields are arranged cups 49 which with the water in the pan on the top of the producer form water seals

preventing the escape of gas through the openings. Said cups, however, may be readily removed exposing the barring-down openings, so that a poker or other tool may be introduced into the producer to agitate the contents thereof, to remove clinkers, and for like purposes. The fuel is charged into the producer through an opening 50 in the top 45, and this opening is surrounded by a hopper 51 and commanded by a gate 52, which slides across the bottom of the opening and which is fitted with a lever 53 facilitating the manipulation of the gate.

The cooling water is fed into the pan on the top 45 from a supply pipe 54, and from this point the water overflows through an opening 55 entering the space between the walls of the upper section of the producer. The cold water thus supplied descends to the lower part of this section, while the heated water therein rises, bringing about effective circulation which is assisted by the inclination of the agitating beam 41. The heated water overflows from the upper edge of the upper producer section down the outer side of the wall 37 thereof, and into the space between the walls of the intermediate section. In this section the water circulates as in the upper section and again overflows, entering the space between the walls of the lower section. From this section the water overflows into the pan 14, and from this pan the waste water passes out through the outlet 56 into a reservoir 57. The flow of water from this reservoir is controlled by a valve 58, and a screen 59 is arranged in the reservoir preventing foreign matter from collecting and clogging the outlet through the valve.

60 indicates a float of water borne in the reservoir 57, and to which is connected a rod 61 which extends up to and is connected with an arm 62 on the stem of a butterfly or other form of valve 63. By means of this device the position of the valve 63 may be varied to control the flow of water through the supply pipe 54. By adjusting the valve 58 so that a certain predetermined quantity of water will pass through the same in a given time the position of the float 60 may be regulated at will, and consequently the position of the valve 63, thus accurately regulating the flow of water through the supply pipe 54 and, therefore, regulating the supply of water to the producer. In this manner waste of water may be prevented, and by keeping down the amount of water flowing to the producer the cooling is not carried to such an extent as to decrease the thermal efficiency of the producer. At the same time a better effect in the generation of vapor is secured, and as this vapor rises from the sides of the producer it is collected in a flexible hood or apron 64 which depends from the charging floor

43 and envelops the upper portion of the producer. This vapor is thus drawn into the producer with the necessary quantity of air through the space between the upper edge of the upper producer section and the under side of the top 45. Reference to Fig. 1 will show that an air and vapor supply space is thus provided, and that the top of the producer, with its appurtenant parts, is supported independently of the three rotating producer sections.

The motion for rotating the producer sections is derived from a prime mover shaft 65, shown in cross section in Fig. 1. To this shaft a worm 66 is secured, and said worm meshes with a worm wheel 67 fastened to a vertical shaft 68 rotatably carried in bearing 69. At its top the shaft 68 is provided with a collar 70 fastened thereto, and under this collar a plurality of anti-friction rings 71 are arranged. These rings bear against the bottom of an oil reservoir 72 which is supported by the bearings 69, and in this manner axial movement of the shaft 68 is prevented. Fastened to the shaft 68 are three spur gear wheels 73, 74 and 75. The upper gear 73 meshes with an annular rack or spur gear 76 secured to the upper producer section. The intermediate gear 74 meshes, as shown in Fig. 2, with an intermediate gear 77, which in turn meshes with an annular spur or rack 78 fastened to the intermediate producer section, in this manner imparting to said intermediate producer section rotation in a direction opposite to that in which the upper section of the producer rotates. The lower gear 75 meshes directly with an annular rack or spur 79 fastened to the lower section of the producer, and hence drives the same in the same direction that the upper section is driven. It will thus be seen that rotary motion is imparted continuously to the three independently revoluble producer sections, the top and bottom sections rotating in one direction and the intermediate section rotating oppositely, thus causing the three agitating beams to turn continuously through the ash bed, the incandescent zone and the green fuel zone, thoroughly agitating the contents of the producer and causing the same to burn uniformly and to lie compactly, so that blow-holes or "chimneys" will not be formed in the fuel to the detriment of the gas producing process, as will be fully understood by persons skilled in the art.

In the operation of the producer, the fuel is charged into the same through the hopper and charging opening, and fire started in the usual way, suction being exerted through the conduit 11 and flue 15, drawing air and steam vapor into the top of the producer through the open space under the top wall 45 thereof. The air and steam vapors

passing down through the fuel bed support combustion in the producer, and bring about the usual gas producer operation, which is to say, the partial combustion of the fuel and the generation of what is technically known as producer or fuel gas. Owing to the thorough and uniform agitation which I have provided for the operations within the producer are carried on effectively, and the result is uniform production of a high grade of producer gas such as may be advantageously employed for power purposes. The water circulating through the producer keeps the temperature of the same sufficiently low to prevent injury to the metallic parts, and also results in the generation of steam or vapor which is collected in the hood 64 and drawn into the producer with beneficial results, as will be understood from the prior art.

The hood 64 is preferably made of flexible metal, such as a fabric, so that it may be lifted out of the way when desired, although it may be made of metal or other rigid material.

The outer walls of the three producer sections are provided with handholes to permit access to the interior for the purpose of cleaning the agitating beams 24, 34 and 41, and these manholes, in the case of the lower section, are closed by cover plates 80, and in the case of the two upper sections by plugs 81.

The up-draft producer shown in Figs. 5 to 8 has three rotating producer sections 82, 83 and 84, similar in general form and operation to the rotating sections of the down-draft producer. The agitating beams 85, 86 and 87 of the up-draft producer are shown in cross section in Figs. 6, 7 and 8. The lower agitating beam is of a width sufficient to cover the air and vapor supply nozzle 88 which enters the bottom of the producer through the ash pan 89, and the upper walls of the beam 85 are inclined essentially the same as the beam 24 before described and for essentially the same purpose. The beam 86, as shown in Fig. 7, is of the same cross sectional form, but said beam is relatively small, and the beam 87 is lozenge shape in cross section, the purpose of this cross sectional formation being to bring about thorough undulatory agitation of the material within the producer, insuring at the same time that this material closes together immediately after the beam passes, preventing the formation of the pockets before referred to. The three sections of this producer are rotating the same as the sections of the down-draft producer, and the gearing for effecting this result is omitted from Fig. 5. A hood 90, similar to the hood 64 is employed, this hood surrounding the upper part of the producer to collect the vapor from the cooling water, and from this hood

a conduit 91 runs communicating with a supply conduit 92 at the bottom of the producer which leads to the nozzle 88, and in this manner the necessary air and vapor are drawn into the lower part of the producer. 93 indicates the ash plow which sweeps over the bottom of the pan 89 for the purpose of throwing the ash outward, and which has a collar 94 loosely surrounding the nozzle 88. The outer end of the plow is held by an arm 95 which is fastened to the lower producer section 82, as shown in Fig. 5. The three rotary producer sections 82, 83 and 84, unlike the rotary sections of the down-draft producer, gradually increase in diameter upward from the bottom section, and the inner and outer walls of these sections are connected together by channel iron sections 96, which not only fasten the walls together but carry cast iron ball races 97. With this construction should the ball races fracture connection between the walls of the producer sections will not be disturbed, nor will leakage of the cooling water follow. The water is collected in the producer sections as it overflows from the section above by means of outwardly projecting ledges 98, and coal, ashes, etc., are prevented from falling into the water space of the producer sections by means of the outwardly bulged portions 99 of the inner walls of the producer sections, which outwardly bulged portions are water cooled, as shown, and overhang the edges of the upper and intermediate producer sections covering the same, so that coal and ashes cannot enter. These portions 99 extend continuously around the producer sections, and having sloping sides, as shown, avoid the formation of arches in the producer, and also avoid interfering with the operation of barring down or raking the producer. 100 indicates the charging floor which is sustained above the producer independently of the rotating sections. This floor carries a top 101 which is provided with charging means, and barring down holes similar to those shown in Fig. 1, and which for the purpose of simplicity of illustration have been omitted from Fig. 5. Sustained below the top 101 is a masonry cap 102, which extends downward to the upper edge of the upper section 84 and which has a channel iron 103 at its lower edge into which projects the upper edge of the inner wall of the section 84. The channel iron 103 carries a downwardly projecting wall 104 which enters the space between the walls and forms a water seal. A similar water seal is effected between the edges of the three rotating producer sections, as will be seen from Fig. 5. The three producer sections 82, 83 and 84 are braced by means of thimbles or collars 105 secured thereon at the ends of the agitating beams in essentially the same manner as the collars

28, 35 and 42 before described, and said sections 82, 83 and 84 are provided with hand-holes and covers 106 also similar to the corresponding parts shown in Fig. 1.

The operation of the producer shown in Figs. 5 to 8 is similar to that of the down-draft producer shown in Figs. 1 to 4, and will, it is thought, be fully understood from the foregoing description.

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

1. A gas producer having a rotatable producer section, with spaced inner and outer walls, a hollow agitator beam extending across the producer section and fastened to the inner wall thereof, said beam communicating with the space between the walls of the section, and a bracing member fastened between the walls of the producer section adjacent to the end of the beam.

2. A gas producer having a rotatable producer section, with spaced inner and outer walls, a hollow agitator beam extending across the producer section and fastened to the inner wall thereof, said beam communicating with the space between the walls of the section, and a hollow orificed bracing member fastened between the walls of the producer section adjacent to the end of the beam.

3. A gas producer having a rotatable producer section, with spaced inner and outer walls, a hollow agitator beam extending across the producer section and fastened to the inner wall thereof, said beam communicating with the space between the walls of the section, a hollow orificed bracing member secured between the walls of the producer section and communicating with the interior of the agitator beam, the outer wall of the section having a manhole opposite the bracing member, and a cover for the manhole.

4. A gas producer having an annular track, a rotatable producer section having inner and outer walls, and a member fastened to and between said walls at the lower portion thereof to seal the same and bearing on the track.

5. A gas producer having an ash pan, an annular track located therein, a rotatable producer section having inner and outer walls, the inner wall projecting downwardly inside of the track below the upper edge of the pan, and a member fastened to and between the walls of said section to seal the same and bearing on the track or race.

6. A gas producer having three super-imposed independently rotatable sections, means for non-uniformly rotating them, and an agitator beam extending across each section.

7. A gas producer having a plurality of super-imposed independently rotatable sec-

tions, means for non-uniformly rotating them, and an agitator beam extending across each section.

8. A gas producer having a plurality of rotatable super-imposed sections of gradually increasing diameter, each constructed of inner and outer walls, one wall of each section being projected between the walls of the section below to form a water seal between them, and bearing members attached to said projected walls and coacting with similar members on the adjacent sections.

9. A gas producer having a plurality of super-imposed rotatable sections increasing in diameter, and each having inner and outer walls, the lower edges of the outer walls of the upper sections being projected between the walls of the sections below to form a water seal and such lower edges being provided with supports for the sections to which they are attached.

10. A gas producer having a plurality of super-imposed rotatable sections increasing in diameter, each having inner and outer walls, the lower edges of the outer walls of the upper sections being projected between the walls of the sections below to form a water seal, and bearing members fastened to said lower edges of the outer walls and coacting with similar members on the sections below.

11. A gas producer having a pan, a rotatable producer section mounted over the same, an agitating beam carried by and extending across the said section, and a tangential plow moving over the bottom of the pan and attached to the side of the producer section and to the agitator beam.

12. A gas producer having a rotatable producer section with spaced inner and outer walls, a hollow agitator beam extending across the producer section and fastened to the inner wall thereof, said beam communicating with the space between the walls of the section and a hollow bracing member fastened between the walls of the producer section directly opposite the beam and communicating therewith.

13. A gas producer having a rotatable producer section with spaced inner and outer walls, a hollow agitator beam extending across the producer section and fastened to the inner wall thereof, said beam communicating with the space between the walls of the section and a hollow bracing member fastened between the walls of the producer section directly opposite the beam and communicating therewith, the outer wall of the producer section having a manhole opposite the hollow bracing member and a cover for said manhole.

14. A gas producer having an ash pan, a track sustained therein, superimposed rotatable producer sections, the lowermost of which is mounted on said track each pro-

ducer section constructed of inner and outer walls spaced to form a water chamber and the sections having certain of their walls projected past or overlapping each other to form waterseals between the sections, means for rotatably sustaining the sections one on the other and means for rotating the sections.

15. A gas producer having an ash pan, a track sustained therein, superimposed rotatable producer sections, the lowermost of which is mounted on said track each producer section constructed of inner and outer walls spaced to form a water chamber and the sections having certain of their walls projected past or overlapping each other to form waterseals between the sections, means for rotatably sustaining the sections one on the other, means for rotating the sections, and hollow agitating beams extending across said sections and communicating with the water chambers thereof.

16. A gas producer having a plurality of rotatable body sections superimposed and directly contiguous to each other and means for sustaining said sections the one by the other.

16. A gas producer having a plurality of rotatable body sections directly contiguous to each other, means for sustaining the lower section and means for sustaining the upper section or sections directly on the section or sections below them.

18. A gas producer having a plurality of rotatable body sections superimposed and directly contiguous to each other, said sections each having inner and outer walls forming water chambers and means between such walls of one section to be engaged by a projecting wall of a contiguous section whereby to sustain said sections on each other.

19. A gas producer having a vertical water jacketed section of its wall revoluble around the central axis of the producer and a hollow agitator carried by said section and extending across the same from side to side and communicating at its ends with the water jacket.

20. A gas producer having a rotatable water cooled section and a hollow agitating arm attached thereto and extending across the same from side to side, said arm communicating at both ends with a water cooled section, for the purpose specified.

21. A gas producer having a plurality of superimposed rotary sections, means for causing a down draft in the producer, an outlet flue at the bottom of the producer, means for rotating the producer sections non-uniformly, and an agitator carried by and extending across the bottom section and capping the outlet flue.

22. A gas producer having a plurality of superimposed rotary sections, means for

causing a down draft in the producer, an outlet flue at the bottom of the producer, means for rotating the producer sections non-uniformly and a horizontally disposed

5 agitator carried by each section.

23. A gas producer having a plurality of superimposed rotary sections, means for causing a down draft in the producer, an outlet flue at the bottom of the producer, means for rotating the producer sections

10 non-uniformly and a horizontally disposed agitator carried by each section, one of said agitators capping the outlet flue.

24. A gas producer having a plurality of superimposed rotary sections, means for causing a down draft in the producer, an outlet flue at the bottom of the producer, means for rotating the producer sections non-uniformly and a horizontally disposed

20 agitator carried by each section, the agitator of the bottom section extending across the same from side to side and capping the outlet flue.

25. A gas producer having a plurality of superimposed independently rotatable sections, a gas outlet flue at the bottom of the producer, an agitator carried by the upper producer section and a water cooled agitator carried by the bottom producer section, the

30 latter agitator capping the outlet flue.

26. A gas producer having three superimposed relatively rotatable producer sections, agitators carried by the two upper sections, a flue in the bottom of the producer and an agitator beam carried by the bottom producer section and capping the flue.

27. A gas producer having superimposed rotary sections and means for sustaining the upper section on the lower section.

40 28. A gas producer having superimposed rotary sections, means for sustaining the lower section on the base and means for sustaining the upper section on the lower section.

45 29. A gas producer having a rotatable producer section, with spaced inner and outer walls, and a hollow agitator beam extending across the producer section from side to side and fastened at its ends to the inner wall thereof, said beam communicating at each end with the space between the walls of the section.

30. A gas producer having a rotatable producer section, with spaced inner and outer walls, a hollow agitator beam extending across the producer section and fastened to the inner wall thereof, said beam communicating with the space between the walls of the section, the outer wall of the producer section having a manhole therein opposite the end of the beam, and a closure for the manhole.

31. A gas producer having a plurality of rotary superimposed cylindric or non-tapering sections, said sections decreasing in diameter from one end to the other of the producer.

32. A gas producer having a plurality of rotary superimposed cylindric or non-tapering sections gradually decreasing in diameter from the base upward.

33. A gas producer having a series of superimposed independent rotatable cylindric sections decreasing in diameter from the base upward, means for creating a down draft in the producer and a water seal between said sections.

34. A gas producer having a plurality of rotary superimposed sections gradually decreasing in diameter from the base upward, each section being formed of outer and inner walls and a wall of one section being projected between the walls of the adjacent sections to form a seal.

35. A gas producer having a plurality of rotary superimposed sections of varying diameter each section being formed of inner and outer walls, a wall of one section being projected between the walls of the adjacent section to form a seal and means for rotatably mounting one section on the other.

36. A gas producer having a plurality of rotary superimposed sections gradually decreasing in diameter from the base upward, each section being formed of outer and inner walls, a wall of one section being projected between the walls of the adjacent sections to form a seal, and means for rotatably mounting one section on the other.

WILLIAM B. CHAPMAN.

Witnesses:

ISAAC B. OWENS,
E. I. McLAUGHLIN.