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J. G. NASH.

GAS PRODUCER.

APPLICATION FILED SEPT. 6, 1904.

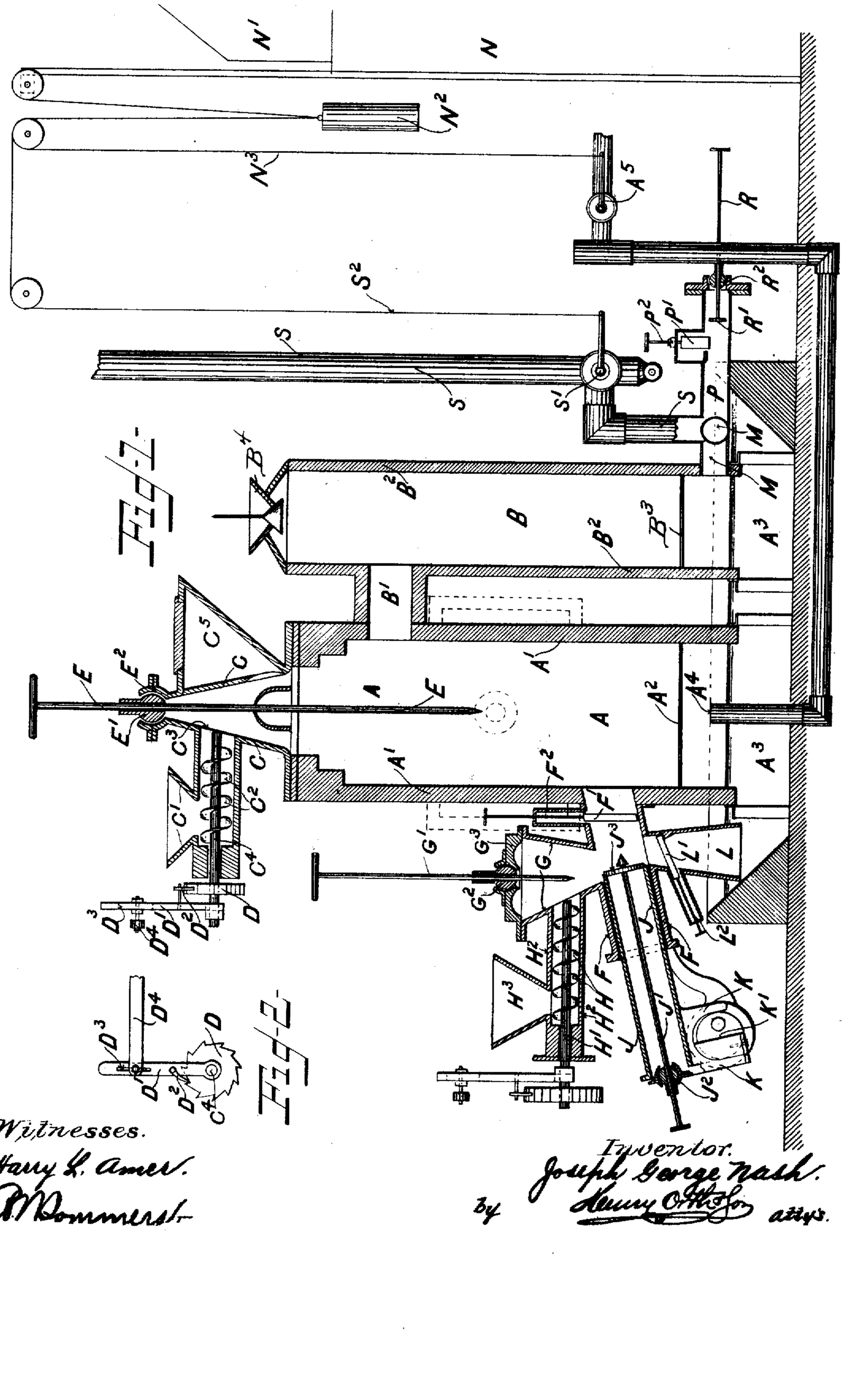

Fig. 1.

Fig. 2.

Witnesses.

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GAS-PRODUCER.

No. 829,541. Specification of Letters Patent Patented Aug. 28, 1906.

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To all whom it may concern:

Be it known that I, JOSEPH GEORGE NASH, engineer, a subject of the King of Great Britain, and a resident of Hindmarsh Square, Adelaide, in the State of South Australia, in the Commonwealth of Australia, have invented certain new and useful Improvements in Gas-Producers, of which the following is a specification.

The object of my present invention is to provide a gas-producer for the generation from bituminous coal of a gas free from tar and other impurities, whereby the extensive use of scrubbers and purifiers may be obviated and a gas obtained particularly adapted for motive-power purposes with explosive-engines. I accomplish this object by providing certain improvements in the combination and arrangement of parts constituting a gas-producer, and more particularly by certain improvements in the feed device, by which the solid fuel is fed to the producer-chambers, as hereinafter described, and illustrated in the drawings, in which—

Figure 1 is a side sectional elevation of a gas-producer plant embodying my invention, certain parts and connections being shown diagrammatically for the convenience of illustration; and Fig. 2 is a detail view of the ratchet device for operating portions of the feeding mechanism.

Though my invention is herein shown and described as relating to a double gas-producer in which two chambers are provided, connected together by means of a flue, it will be well understood that it is equally applicable to what are known as "single" producers, having one chamber only.

A is the first chamber, constructed in the ordinary way and lined with fire-bricks A′ or other refractory material. This chamber A is provided with a grate A^2, a well A^3, and inlets A^4 for the introduction of an air-blast. The chamber A communicates with a second chamber B by means of a horizontal flue B′. This second chamber B is also lined with fire-bricks B^2 or other refractory material. The first chamber A is adapted to maintain a column of solid fuel which when fired becomes incandescent, and into this incandescent body the bituminous coal is fed, preferably in a small or semipowdered condition. The coal coming into the body of incandescent coke is split up into its constituent gases, and when two chambers are provided, as shown in the drawings, the said gas is passed out through the column of coke arranged in the second chamber B. This chamber is also provided near its base with a grate B^3, which supports a body of fuel fed into the chamber through a well-known form of hopper B^4 at the top. This chamber is not an essential element to the present invention, as the chamber A may alone be used. Its function, however, consists in its arrangement with the first chamber, whereby the heat of combustion from the first chamber is transported to the column of fuel in the second chamber through the flue B′ by means of the air-blast A^4. The hopper B^4 will sufficiently close the top of the chamber B to cause a draft down through the grate B^3 and will keep the fuel, after once being ignited, in the second chamber in a state of incandescence. Thus the hydrocarbon gases generated in the first chamber are caused to pass through this incandescent body of fuel and are thereby enriched with carbon monoxid and hydrogen, producing a good serviceable gas particularly applicable to motive-power purposes. The top of the chamber A is provided with a casting which contains in one and the same piece an improved feed device and a mounting for a poking-rod, as hereinafter described. This casting consists of a central casing C, (preferably conical-shaped, as shown,) which delivers into the open top of the chamber A.

The feeding device consists of a hopper C′, having a conveyer-screw C^2, which discharges through openings C^3 in the side of the central casing C. In this way a continuous stream of solid fuel may be continuously fed into the chamber A through the said casing C. The conveyer-screws C^2 are actuated by a ratchet device, as shown more particularly in Fig. 2. This ratchet device consists of a ratchet-wheel D, mounted upon the shaft C^4. An arm D′ is provided upon the shaft C^4, as shown in Fig. 2, having a pawl D^2 engaging the ratchet-wheel D. The arm D′ is slotted at D^3, having a pin held in place by a set-screw or nut, by which its position may be regulated and by which the connecting-rod D^4 for imparting the reciprocating motion may be caused to impart any length of stroke required and the speed of the conveyer-screws C^2 adjusted accordingly, with corresponding adjustment of the rate of feed of the fuel. At the same time the casting at the top of the producer-chamber is provided with an additional hopper C^5, through which the solid

fuel (in most cases coke) is fed for establishing within the producer-chamber the incandescent body. The automatic feed discharging through the central casing C at the top of the chamber may be adapted for continuously feeding in a small quantity of coke by which the incandescent body may be always maintained at a proper heat. Furthermore, any necessary bituminous coal may be fed in through this casing C with or without coke.

For the purpose of providing means whereby the fuel when it becomes caked may be operated with a poking-rod without opening or interfering with the feeding devices I provide a special construction of bearing for the said poking-rod. Thus the casing C at the top of the chamber A is provided with a poking-rod E, mounted within a ball E', working in a socket E^2, as shown in the drawings. It will thus be seen that the body of incandescent fuel within the chamber A may be at any time broken and prevented from caking, thereby allowing of any powdered coal working down through the interstices thereof, with an additional generation of gas, the ball-and-socket joint allowing of a free operation of the rod E, while the continuous feed of fuel need not be at any time interrupted.

I have found in practice that if the bituminous coal is delivered immediately into that portion of the producer-chamber where the temperature is comparatively high—that is to say, into the center of the body of incandescent fuel—the tar and other solid products are burnt and split up into gases, with a consequent increase in the quantity of gas obtained and a minimum formation of tar and other solid impurities. For this purpose I provide means for feeding the coal or other like fuel through the side of the producer-chamber into a body of incandescent fuel at a point a short distance above the grate A^2 and at the zone of highest temperature.

In practice any number and description of feeding devices may be adopted, according to the size of the producer-chamber and convenience in operation. Furthermore, this arrangement of feeding devices may also be utilized, as hereinafter described, for the purpose of forming coke for use in the producer-chamber for building up and maintaining the body of incandescent fuel. For this purpose I provide a feeding device arranged upon the side of the producer-chamber A. This feeding device consists of a cylinder F, arranged upon the side of the chamber A and discharging into the interior thereof at a short distance above the grate and at about the point which forms the zone of highest temperature on the body of incandescent fuel. This cylinder F is provided with a trap-door or valve F' at its entrance to the chamber A, operated by a screw-rod F^1 or other convenient means. At the top of the cylinder F is arranged a hopper G, having a poking-rod G', mounted in a ball-and-socket joint G^2 within the cover G^3. This hopper G may, if necessary, be also provided with an automatic and continuous-feed device consisting of a conveyer-screw H, mounted on a shaft H' and working in a cylindrical casing H^2, having a hopper H^3, and actuated by a ratchet-operating device similar to that actuating the conveyer-screw C^2, arranged at the top of the producer-chamber and as shown more particularly in Fig. 2.

Within the cylinder F works a hollow piston or plunger J, having a reciprocating or forward movement, actuated by any convenient means for the purpose of feeding forward the coal or other fuel. The piston or plunger J is provided with a poking-rod J', mounted in a ball and socket J^2 and having at its inner end a plate J^3, which fits upon the inner end of the hollow piston J. The piston or plunger J has a reciprocating movement, imparted by any mechanical means, such as a rack or screw or by an eccentric or cranked pin, as shown. For this purpose the piston or plunger J is provided with two downwardly-projecting lugs K, between which works an eccentric K'. The end of the piston or plunger J is thus adapted to move backward or forward beneath the opening of the hopper G, and thereby feeds forward the bituminous coal into the interior of the generator-chamber A.

In operation the coal is fed in through the hopper G into the cylinder F and is passed forward by means of the reciprocating piston or plunger J. In this way the coal is automatically and continuously delivered into the center of the body of incandescent fuel within the chamber A at about the zone of highest temperature. The coal being delivered into the body of incandescent coke at this point, the tar and other elements which produce impurities are split up by the excessive heat into constituent gases, with consequent increase of the gas generated. At the same time the poking-rod J' may be used for breaking up the body of incandescent coke and admitting of the entrance thereto of the coal as fed in through the cylinder F. By reference to the accompanying drawings it will be seen that the feeding device is shown arranged at a slight angle inclined upward for the purpose of giving the coal an upward thrust as fed into the interior of the chamber A; but it will be well understood that this feeding device may be arranged at any angle, as may be most convenient in practice.

In combination with the feeding device arranged at the side of the generator-chamber I also provide means for coking the coal at suitable intervals. For this purpose the cylinder F is provided with a downwardly-projecting vent L, discharging into a well of water, and preferably the well A^3 arranged

at the bottom of the generator-chamber A. This discharge-vent L is provided with a trap-door or valve L′, operated by a screw L², by which its entrance may be opened or closed, as required. Thus in practice a body of coal may be allowed to rest at the entrance of the cylinder F, and the valve or trap-door F′ being left open the heat and flames from the interior of the chamber A serve to coke the said coal. At the same time the gases arising therefrom are caused to pass up through the chamber A and the body of incandescent fuel therein, correspondingly enriching and increasing the amount of gas generated. When the coal has been sufficiently coked, it may be discharged through the discharge-vent L by opening the valve or trap-door L′. The poking-rod G′ in the cover G³ of the hopper G may be used for the purpose of assisting in the delivery of the coke through the opening into the discharge-vent L. The coke discharges through the discharge-vent L into the well of water and is thereby chilled, while at the same time the steam generated therefrom passes up through the cylinder F into the interior of the chamber A. When the body of incandescent coke within the chamber A becomes depleted, the coke discharged through the vent L may be utilized for feeding into the interior of the chamber A through the hopper C⁵, arranged at the top thereof. I am thus enabled to manufacture the coke required for continually replenishing the chambers and maintaining the proper height of the incandescent body within the chambers.

The producer-chambers are provided with a delivery-pipe for the withdrawal of the gas generated. In the plant, as shown, the second chamber B is provided with a pipe M at the bottom, leading to the gasometer N. The delivery-pipe M is provided with an attachment which consists of a horizontal cylinder P, having a trap-door P′, operated by a screw P². By means of this valve or trap-door P′ the cylinder P may be closed when the generation of the gas is proceeding under ordinary circumstances. At the outer end of the cylinder P is provided a poking-rod R, having a flat end R′ and working in a ball and socket R³, similar in construction to the poking-rod J′ before described. Thus by raising the valve or trap-door P′ the poking-rod R may be operated into the interior of the generating-chamber B and the solid and caked products accumulating around the opening thereof and the bottom of the discharge-pipe M may be raked forward into the cylinder P and thence discharged, and in this way the pipe M may be kept clean and an uninterrupted delivery of the gas to the gasometer N maintained. This pipe M is also provided with a branch or supplementary pipe or flue S. The supplementary flue S has a control-valve S′, whereby such surplus gas is withdrawn and discharged and prevented from being delivered into the gasometer. In order to provide an automatic control of the producer according to the amount of gas generated, in addition to the automatic supply of fuel, I provide means for regulating the supply of air and the discharge of the gas according to the amount of gas in the gasometer N. In the accompanying drawings a portion only of the gasometer N is shown. The dome N′ (or preferably counterweights N²) is connected, by means of a cord or chain N³, to the valve A⁵, controlling the air-blast through the inlet A⁴ in such manner that as the dome N′ rises the valve A⁵ partially cuts off the supply of air to the blast through the inlet A⁴. At the same time a further cord or chain S² connects to the valve S′ upon the supplementary flue S, which is provided for the purpose of drawing off the surplus gas generated. The operation of this valve S′ is opposite to that of the valve A⁵—that is to say, the rising of the dome N′ serves to open the valve S′ through the medium of the cord or chain S². In this way the surplus gas generated is drawn off through the supplementary flue S and discharged, and thereby prevented from passing into the gasometer N. I have found in practice that by regulating the cords or chain N³ and S² with the inlet A⁴ and the valve S′, so as to permit of a small continuous circulation of air through the valve A⁵ and gas through S′, a uniform quality of gas may be automatically obtained, and for this purpose, therefore, so arrange the regulation of the cords or valves that the latter may not be entirely closed with the operation of the dome. When upon the gas being withdrawn the dome N′ descends, the valves A⁵ and S′ are opened and closed, respectively, (by springs or other convenient means,) and the generation of gas thus automatically controlled.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a gas-producer, the combination with a producer-chamber, of a feeding device comprising a cylinder, a hopper discharging into the latter, a hollow plunger adapted to reciprocate in the cylinder, and a poker mounted in the plunger.

2. In a gas-producer, the combination with a producer-chamber, of a feeding device comprising a cylinder, a hopper discharging into the latter, a hollow plunger mounted in the cylinder, means to reciprocate said plunger, a poker mounted in the latter, and a plate carried by the poker adapted to cover the end of the plunger.

3. In a gas-producer, the combination with a producer-chamber, of a feeding device comprising a cylinder, a hopper discharging

into the latter, a vent communicating with said cylinder, a hollow plunger mounted in the latter, means to reciprocate said plunger, a poker in the latter and a plate mounted on the end of the poker adapted to close one end of the plunger.

4. In a gas-producer, the combination with a producer-chamber, of a feeding device comprising a cylinder entering said chamber at a point a short distance above the zone of highest temperature, a hopper discharging into the cylinder, a valve in the latter between the hopper and chamber, a vent in the cylinder beneath the hopper, a valve in said vent, a hollow plunger reciprocably mounted in the cylinder, a poker in the latter, and a plate mounted on the poker adapted to close the plunger.

5. In a gas-producer, the combination with a producer-chamber, of a feeding device arranged at the side of said chamber at the zone of highest temperature comprising a cylinder opening into said chamber, a hopper discharging into the cylinder, a conveyer for feeding said hopper, a poker in the latter, a valve in the cylinder between the hopper and chamber, a plunger mounted in said cylinder, means for reciprocating said plunger, and a poker mounted in the latter.

6. In a gas-producer, the combination with a feeding device arranged upon the side of the producer-chamber, discharging into the same at the zone of highest temperature, of a coking attachment communicating with said feeding device, and a well for the reception of coke from said attachment.

7. In a gas-producer, the combination with a producer-chamber, of a feed-cylinder communicating with said chamber, a well, and a vent connecting said cylinder and well.

8. In a gas-producer, the combination with a producer-chamber, of a feed-cylinder communicating with said chamber, a well, a vent connecting said cylinder and well, a valve in said vent and a valve in the cylinder between the vent and chamber.

9. In a gas-producer, the combination of a producer-chamber, a feed-hopper discharging into the top thereof, a poker in said hopper, a feed-cylinder discharging into the side of the chamber, a valve in the cylinder, a hopper discharging into the cylinder, a conveyer for supplying the last-named hopper, a poker for the latter, a plunger in the cylinder, a poker for the plunger, means for reciprocating the plunger, and a valved coking-vent communicating with the cylinder.

10. In a gas-producer, the combination of a producer-chamber, a delivery-pipe therefor, a supplementary flue communicating with the delivery-pipe, a separate chamber communicating with the latter, and a scraper in said chamber adapted to clean the delivery-pipe.

11. In a gas-producer, the combination of a producer-chamber, a delivery-pipe therefor, a supplementary flue branching from the delivery-pipe, a chamber communicating with the latter, a scraper in said chamber adapted to clean the delivery-pipe and a valve interposed in the chamber between the pipe and scraper.

12. In a gas-producer, the combination with a producer-chamber, a generator and a delivery-pipe connecting the two, of an air-blast communicating with the producer-chamber, a supplementary flue leading from the delivery-pipe, a valve in the supplementary pipe and in the air-blast, and means to simultaneously operate said valves.

13. In a gas-producer, the combination with a producer-chamber, a gasometer and a delivery-pipe connecting the two, of an air-blast communicating with the producer-chamber, a supplementary flue leading from the delivery-pipe, a normally closed valve in the supplementary pipe, a normally opened valve in the air-blast, and means connecting the valves with the movable member of the gasometer, whereby said valves are simultaneously opened and closed.

14. In a gas-producer, the combination with a producer-chamber, a gasometer and a delivery-pipe connecting the two, of an air-blast communicating with the producer-chamber, a supplementary flue leading from the delivery-pipe, a normally closed valve in the supplementary pipe, a normally opened valve in the air-blast, chains connecting the valves with the movable member of the gasometer and a weight suspended on said chains to control the operation of the valves on the movement of said movable member.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH GEORGE NASH.

Witnesses:

CHARLES STANLEY BURGESS,

ARTHUR WHITRIDGE BOWEN.