No. 704,527. Patented July 15, 1902.

W. J. EVANS & F. KLEPETKO.

GAS PRODUCER.

(Application filed Nov. 12, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

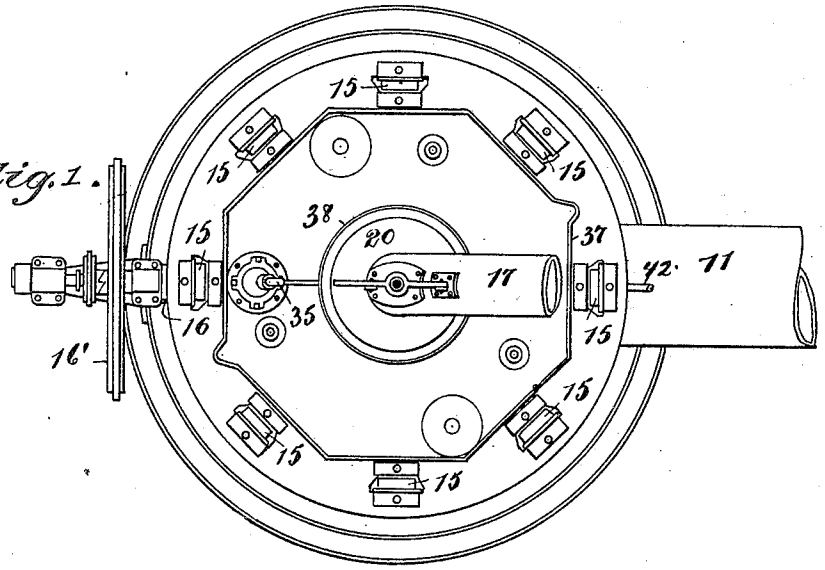
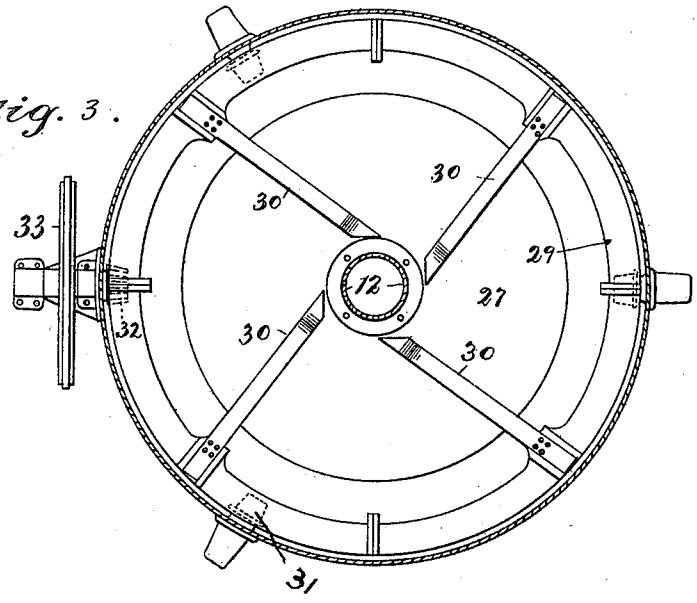


Fig. 3.



WITNESSES

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Fig. 2.

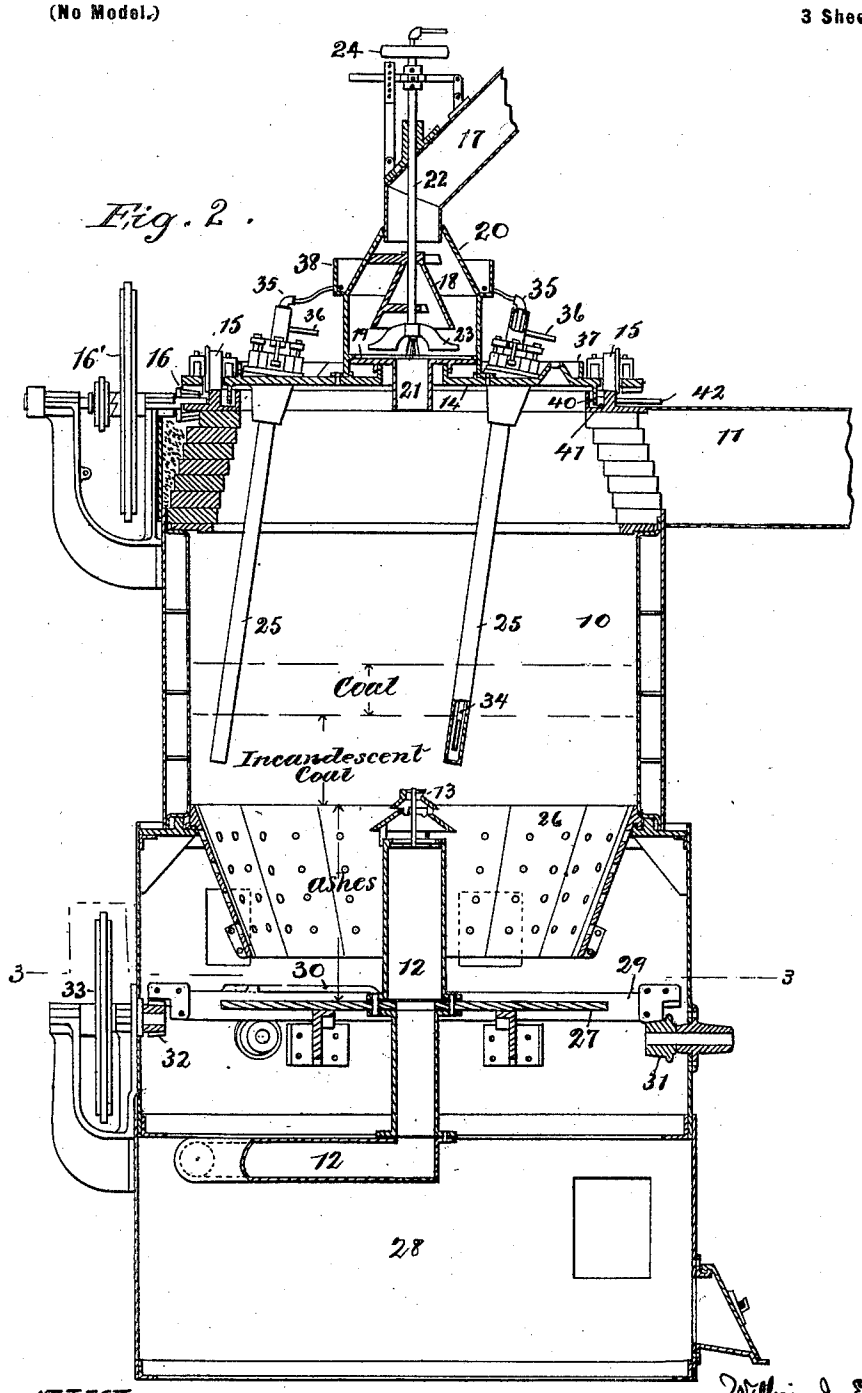

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Fig. 4.

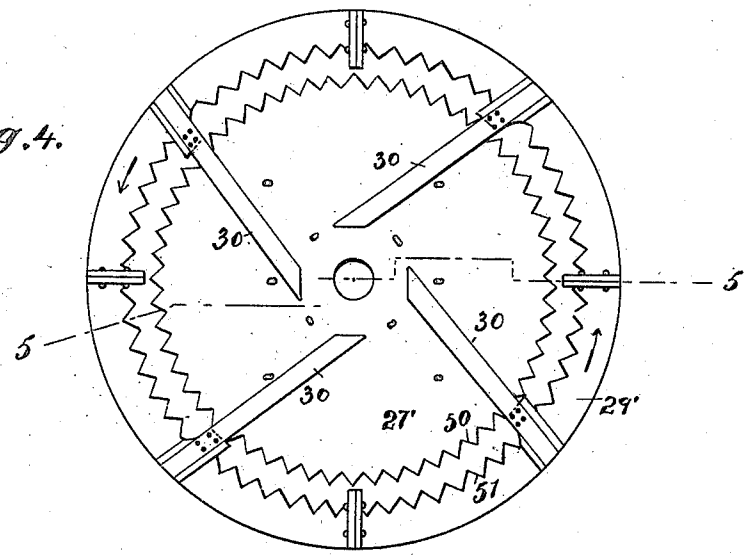
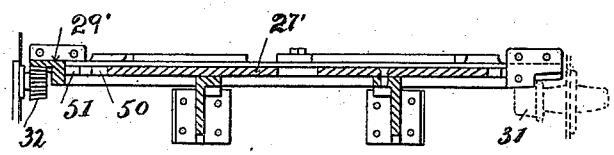


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM J. EVANS AND FRANK KLEPETKO, OF GREATFALLS, MONTANA.

GAS-PRODUCER.

SPECIFICATION forming part of Letters Patent No. 704,527, dated July 15, 1902.

Application filed November 12, 1897. Serial No. 658,229. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM J. EVANS and FRANK KLEPETKO, engineers, of Greatfalls, Cascade county, in the State of Montana, have invented certain new and useful Improvements in and Relating to Gas-Producers, of which the following is a description, reference being had to the accompanying drawings.

The invention relates to apparatus employed for the production of combustible gas for metallurgical or other operations formed by the distillation of coal or other solid fuel or by the action of air and steam upon incandescent solid fuel; and it relates more particularly to the class of apparatus in which the solid fuel when freshly introduced into the producer lies upon a bed of incandescent fuel, through which the air or air and steam pass in order to produce the necessary temperature and effect the production of gas.

The principal objects of the invention are to form a gas-producer convenient, simple, economical, and efficient in its structure and operation and to accomplish automatic coal-feeding, an automatic poking and stirring action, and an automatic ash and clinker cleaning action, to make the producer continuous and to a large extent automatic in its action, to cause it to produce a uniform quality and quantity of gas, and to accomplish certain other objects, which will be apparent from the following description.

In almost all gas-producers now in use it is necessary in order to produce a good quality of gas to agitate and distribute and to poke the coal, which is fed by hand, the furnace being charged at intervals. Mechanical continuous charging devices have been described in print, but have not, so far as we are aware, gone successfully into use. During poking and charging in the usual manner considerable gas escapes from the poke-hole and charging-hopper, causing a considerable loss. It is also very disagreeable work for the men, as they frequently have to stand while at work directly over the escaping gas. On account of this escaping gas the work of stirring and poking the furnace is so disagreeable that the constant attention which should be given to the furnace in order to make good gas can rarely be enforced. Irregularity in charging and also irregularity of stirring and poking the coal cause the production of gas to vary both in quality and in quantity, inasmuch as gas is generated in the best manner only when the coal is being stirred or agitated over the incandescent bed of the furnace.

Our invention contemplates the fulfilment of each one of the foregoing requirements in a simple and efficient manner.

The accompanying drawings illustrate one preferred embodiment of the invention.

Figure 1 is a top view of the producer. Fig. 2 is a central vertical section of the same. Fig. 3 is a horizontal section below the planes 3 3 of Fig. 2. Figs. 4 and 5 are details of preferred ash and clinker mechanism.

Throughout the drawings like figures of reference indicate like or similar parts.

The furnace of the producer is indicated at 10, the gas-discharging passage at 11. The conduit or passage for introducing air, steam, or air and steam to the incandescent coal is shown at 12, surmounted by the hood or twyer at 13. The top of the furnace 14 rotates upon wheels or rollers 15, which run on the circular rail or track, as shown, which surmounts the wall of the furnace. A rotary motion is given to the top by means of the suitably-driven beveled gear 16, which meshes with gear-teeth on the under face of the top 14. The furnace shown is particularly adapted for slack or nut coal, which is fed by gravity down the chute 17, where it falls onto a deflecting-cone 18 and thence onto the plate or table 19, which forms the bottom of the hopper 20. The cone 18 prevents the coal falling directly through the central pipe 21 into the furnace 10. Directly above this pipe 21 extends the hollow shaft 22, which carries on its lower end the feeding-arms 23. The shaft 22 may be fixed or may be rotated by means of a pulley 24 or in any other convenient manner. The movement of the arms 23 relative to the table or plate 19, which forms the bottom of the hopper 20 and relates with the top 14 of the furnace, feeds the coal at a uniform rate to the opening or pipe 21, allowing it to fall into the center of the furnace upon the bed of incandescent coal, thus giving a continuous supply of coal. The top of the furnace or combustion-chamber 10 is pro-

vided with stirring-arms or pokers 25, which are preferably set at an inclination, as shown in the drawings, and extend down into the incandescent bed of coal. The rotation of the top 14 causes these stirrers or pokers 25 to agitate the coal-bed and keep it loose. The coal falls from the opening 21 into the center of the furnace or combustion-chamber 10, and the revolving movement of the pokers 25 distributes it evenly over the incandescent coal, causing the fresh coal to pass from the center of the furnace toward the outer edge, the coal becoming gasified during its passage over the incandescent bed. The continuous removal of the ashes from beneath the incandescent bed causes a gradual and continuous settling of the coal, and as the upper coal loses its gas and becomes red-hot it settles down and forms part of the incandescent bed of fuel, thus constantly renewing it. Lower down the coal gradually loses its heat and becomes ash and clinkers.

We have indicated in Fig. 2 of the drawings the position of the strata of coal, incandescent coal, and ashes, though of course the thickness of the several layers will vary with the amount of coal and air supplied. The lower portion of the combustion-chamber 10 terminates in a perforated ash-hopper 26, which is open at the bottom and is supported some distance above the stationary bottom plate 27, through the center of which the air or steam supply pipe 12 preferably passes. Beneath the bottom plate 27 is the ash-pit 28, the walls of which form the downward-extending continuation of the walls of the combustion-chamber 10 and are, of course, gas-tight. Supported with this ash-pit or ash-chamber 28 is a rotating annular support 29, which carries arms 30, which extend inward toward the air-pipe 12 and lie directly above the plate 27. The annular support or ring 29 may travel upon the supporting guide-rollers 31 and be driven by a bevel-gear 32, turned by the pulley-wheel 33 and meshing with gear-teeth on the under side of the ring 29. The ring 29 may be made in sections, as shown in the drawings, and should preferably, if made with smooth face, as in Fig. 3, leave a space of eight or ten inches between the inner surface of the ring 29 and the edge of bottom plate 27. The arms 30, carried by the ring 29, move over the bottom plate 27 through the ashes and clinkers, continually removing the fine ashes which keep dropping down onto the plate 27. Owing to the slant and action of the arms 30 the ashes fall from the edge of the plate into the ash-pit 28, whence they may be removed from time to time by sluicing with water, which of course may be done without allowing the escape of gas.

In Figs. 4 and 5 are shown details of the preferred arrangement of the ash and clinker removing mechanism, by which the clinkers are broken or ground between toothed edges provided on the plate 27 and the ring 29. By this means the removal of the clinkers and their reduction to such fragments as may readily be sluiced from the ash-pit are assured. This feature of toothed edges between relatively moving bottom plate or grating and surrounding bodies is applicable also to rotary plates or tables and stationary teeth set to coöperate therewith. The teeth of the plate or table 27, Figs. 4 and 5, are shown at 50 and those of the ring 29 at 51. The clear space between opposing teeth may preferably be three inches or less, which will insure the grinding or breaking of clinkers exceeding that size, whereas it is advisable, as already stated, that a considerably greater space be allowed where such teeth are not provided in order to prevent the possible retention of large clinkers above the smooth edges. In other respects than those mentioned the details of parts shown in Figs. 4 and 5 may be identical with Fig. 3.

The stirring-arms or pokers 25 are hollow and closed at the lower end. Within each of them extends a water-pipe 34, which is open at the bottom and supplied with water by the pipe 35 or in any other desired manner. The water passes down through the pipe 34 and up around the pipe 34 in the surrounding space within the hollow poker 25 and flows out through the overflow 36 directly onto the top of the producer 14. The top of the producer is provided with a flange 37, which enables it to retain water, causing the water to spread over the surface of the top and keep it cool. In order to keep the hopper 20 cool, it may be surrounded by a pan 38, kept filled with water. From this pan the water may be passed through connections 35 into the cooling-pipes 34, as already described. Between the revolving top 14 of the producer and the walls of the chamber 10 the gas is sealed or trapped by an annular water seal. This is preferably formed by means of a flange 40, depending from the top 14 and extending down into a channel or trough 41, which is filled with water by the overflow from the upper side of the top 14.

At 42 is shown an overflow-pipe from the trough 41 at such height as to prevent the water overflowing into the combustion-chamber.

We attach great importance to the means by which the coal may be fed into the furnace 10 continually through the opening 21 without the gas from the generator escaping in the reverse direction. Through the hollow shaft 22 steam or other fluid under pressure—such, for instance, as air, but preferably steam—is directed into the opening 21 under sufficient pressure to prevent the gas escaping from the furnace. The expansion and momentum of the jet of steam or air issuing from the pipe or shaft 22 at even a moderate velocity are adequate for this purpose, as the pressure of gas within the generator does not, as a rule, exceed one inch, (meaning thereby the pressure of a column of water one inch

high.) If greater pressures are used, the power of the steam-jet may be increased proportionately.

By means of the apparatus described a continuous and very uniform feeding of coal through the apparatus and continuous stirring and poking of the coal are effected, and thereby a continuous and uniform production of high-grade carbon gas is produced, such as has not to our knowledge been heretofore obtained in any gas-producers with which we are acquainted. We desire it to be understood that the details and forms of the several elements of our apparatus may be widely varied without affecting the principles of operation or the spirit of our invention as has been set forth above, and without attempting to enumerate the many modifications which readily occur to any skilled mechanic we claim as follows, meaning thereby that the terms of each claim shall be understood by reference to the specification without regard to any defining limitations contained in any other or more specific claim.

We claim—

1. In a gas-producer, the combination of the gas-chamber walls and top relatively rotary, a water seal between said walls and top, means for confining a body of water upon the said top, an overflow from the said top to the said seal, and an overflow device for the said seal, substantially as set forth.

2. In a gas-producer, the combination of the gas-chamber walls and top relatively rotary, a water seal between said walls and top, means for confining a body of water upon the said top, an overflow from the said top to the said seal, a mechanical stirrer or poker carried by the said top and provided with cooling-passages, and fluid connections supplying water thereto and discharging onto the said top, substantially as set forth.

3. In a gas-producer, the combination of the gas-chamber walls and top relatively rotary, a water seal between said walls and top, means for confining a body of water upon the said top, a mechanical stirrer or poker carried by the said top and provided with cooling-passages, fluid connections leading to said passages and delivering from said passages onto the said top, and an overflow from the said top to the said seal, substantially as set forth.

4. In combination in a gas-producer, the top thereof provided with stirrers or pokers having cooling-passages, coal-feeding mechanism carried by said top, a water-holding receptacle for cooling the said coal-feeding mechanism, and fluid connections leading therefrom to the cooling-passages of the said stirrers or pokers, substantially as set forth.

5. In combination in a gas-producer, a coal-feeding opening in the top thereof, means for delivering the coal around but not into the said opening, and coal-feeding arms feeding the coal in a centripetal direction to the said opening, substantially as set forth.

6. In combination in a gas-producer, a coal-feeding opening in the top thereof, means for delivering the coal around but not into the said opening, including a spreading cone which overhangs the said opening, and coal-feeding arms extending beneath the said cone feeding the coal in a centripetal direction to the said opening, substantially as set forth.

7. In combination in a gas-producer, a coal-feeding opening in the top thereof, means for delivering the coal around but not into the said opening, including a spreading device which overhangs the said opening, coal-feeding arms above said opening, and jet-producing mechanism directed downward from above the said opening, substantially as set forth.

8. In combination in apparatus for feeding coal to a gas-producer, an opening through which the coal is fed, means for producing dynamic counter-pressure in such opening in opposition to the static pressure without the producer, a spreading deflector above the said opening, means for delivering coal by gravity onto the said deflector, and mechanical means for feeding the coal from around the said deflector to said opening, substantially as described.

In testimony whereof we have hereunto set our hands this 4th day of November, 1897.

WILLIAM J. EVANS.
FRANK KLEPETKO.

Witnesses:
GEO. K. FISCHER,
JAMES O'GRADY.