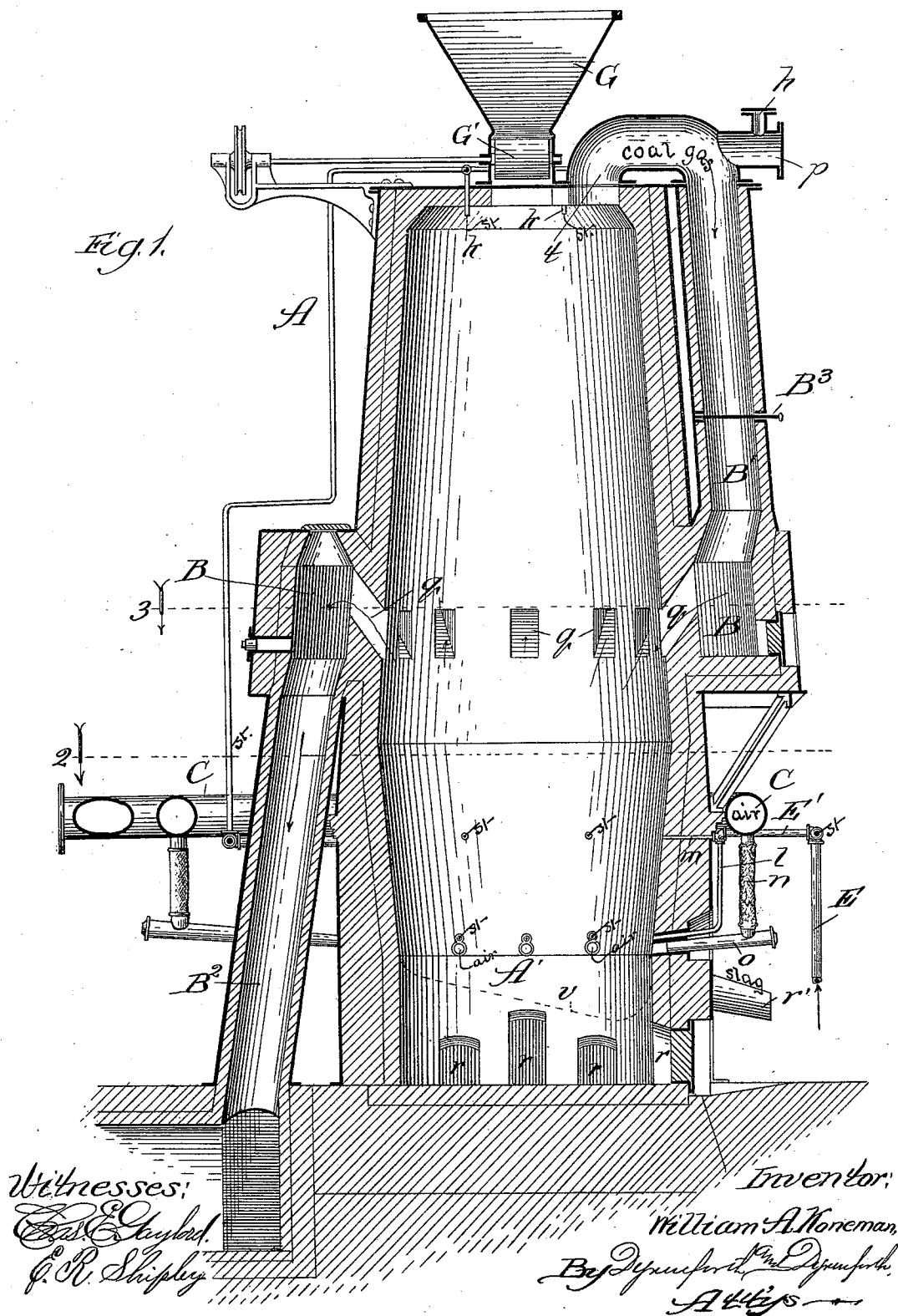


2 Sheets—Sheet 1.

No. 520,687.

Patented May 29, 1894.



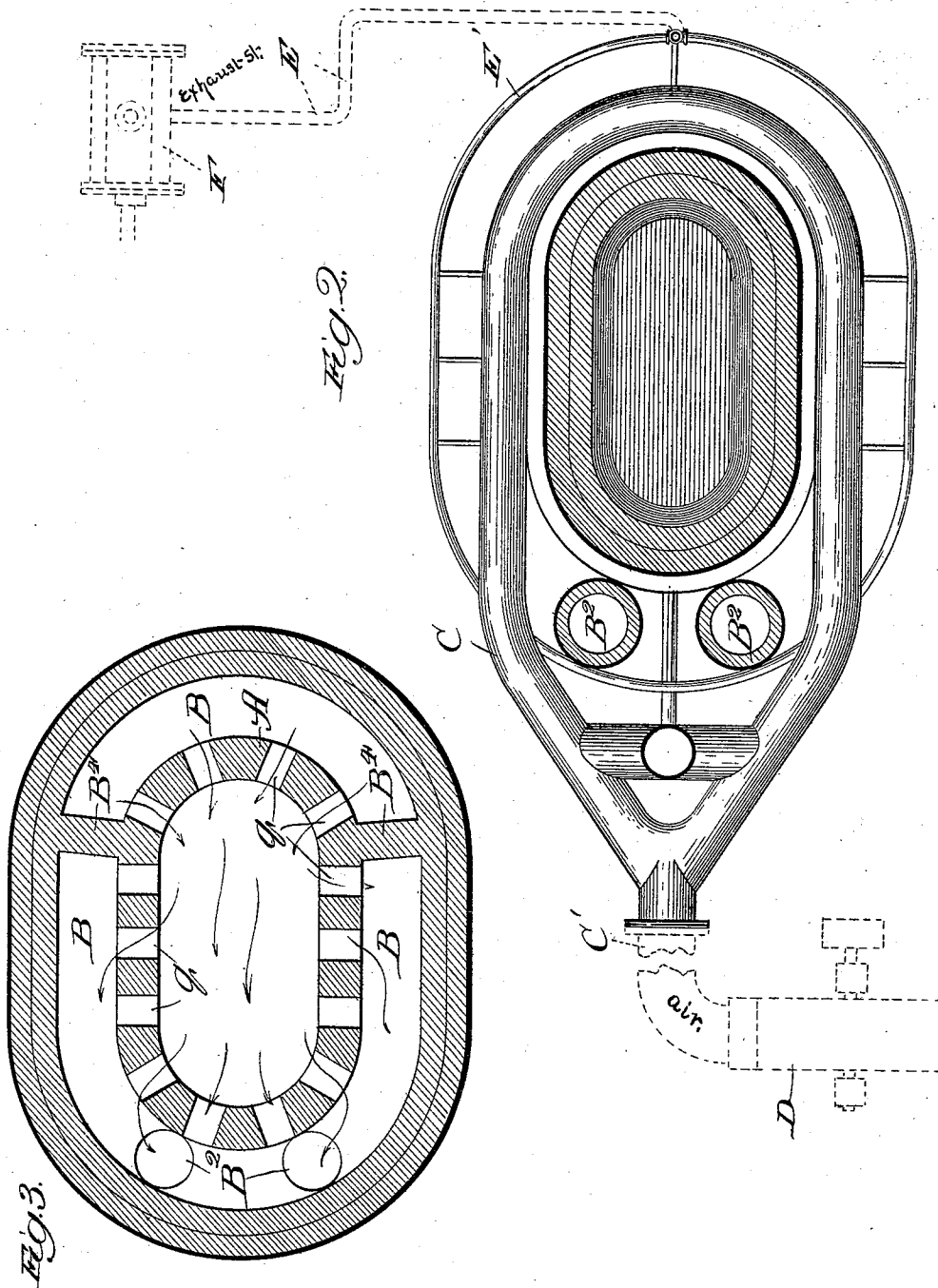
(No Model.)

2 Sheets—Sheet 2.

W. A. KONEMAN.
GAS MAKING APPARATUS.

No. 520,687.

Patented May 29, 1894.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. KONEMAN, OF CHICAGO, ILLINOIS.

GAS-MAKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 520,687, dated May 29, 1894.

Application filed June 24, 1893. Serial No. 478,685. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KONEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Gas-Making Apparatus, of which the following is a specification.

The object of my invention is to provide an improved apparatus for manufacturing gas according to a process for simultaneously and continuously generating, in the same apparatus, a retort-gas and a producer or water gas. The process referred to involves blasting a bed of bituminous coal to incandescence with air, or air and steam, forced through it to generate a producer-gas, or a water-gas, and leading it off from a point below the top of the bed, the portion of which above the leading-off point of such gas is heated by conduction from below, the passage being prevented of the blast-currents through the upper portion of the fuel, from which gas is thus distilled, by a more gradual heating of the coal, and passed off at the top, the upper portion of the bed of coal being thereby coked and allowed to sink by gravity into the lower or "generating" portion of the chamber for subjection to the blast for producing the gas led off from a point below the base of the "retorting chamber" as aforesaid.

More particularly stated, the object of my present improvement is to provide an apparatus, in which to carry on the process referred to, with means whereby the gas of distillation, or retorted gas, shall be withdrawn from the top of the bed and passed, on its way to the outlet from the apparatus, through and subjected to the heat of, the lower incandescent mass of the bed of fuel, thereby to fix the retort-gas and the more intimately to mix it with the producer or water gas product led off from below the top of the bed. It is particularly in the provision of suitable means for thus directing the gas of distillation through the lower incandescent mass of the bed of fuel to the outlet, that the construction of my present apparatus differs from that of my patent, No. 500,333, of June 27, 1893.

Referring to the accompanying drawings—Figure 1 shows my improved apparatus in vertical sectional elevation. Fig. 2 is a plan

sectional view of the same, the section being taken at the line 2 on Fig. 1 and regarded as indicated by an arrow, with the steam-supply and air-blast apparatus in dotted representation; and Fig. 3, a plan section taken at the line 3 on Fig. 1 and viewed in the direction of the arrow.

The generator may be a fire-brick structure preferably of the general elliptical shape in cross-section illustrated; and it should be of considerable height (say thirty feet or more) as the successful practice of the process referred to requires the provision of a generator-chamber A in which a high column of coal or other carbonaceous fuel may be maintained. The chamber should, moreover, taper somewhat, as represented, both upward and downward from about its transverse center, the lower taper, however, extending to a point short of the base, from which the walls of the chamber should be straight and form a pit A' provided with doors *r* through which to remove the contents of the pit, which may be ashes, though I also provide a spout *r'* for drawing off liquid slag formed with the ashes if a flux be fed with the coal, in which latter case the steam-supply through the tuyeres, hereinafter referred to, is shut off.

About the exterior of the chamber A near and preferably above its center I form what may be termed a gas confining and mixing chamber B, communicating through ports *q* with the generating chamber, from the upper end of which, on one side, a connecting passage B' leads to the chamber B; and I prefer to provide the passage B' with a draw-off outlet *p*. Within the chamber B and flanking the communication therewith of the passage B' are walls B⁴ which obstruct the flow through that chamber of the gas of distillation from the top of the fuel-bed, thereby forcing it to pass through the lower incandescent portion of the fuel-bed to reach the ultimate outlet shown as a down-take B³, extending from the under side of the chamber B at the side thereof farthest from the passage B' and which is preferably duplicated, as represented.

An air-blast leads into the chamber A near its base through tuyeres *o*, the air being conducted thereto through branches *n* of a conduit C encircling the generator-shell and into

which leads the blast-outlet pipe C' of a fan D. The steam-supply may come through the exhaust-pipe E of an engine serving to drive the fan D and of which the cylinder F is indicated in Fig. 2; and the exhaust-pipe E leads into a branch E' encircling the structure below the air-pipe C, and from it lead sub-branches *m* into the chamber A through its walls some distance above the plane of the tuyeres and preferably also branches *l* into the tuyeres and branches *k* downward into the top of the generator.

The generator should be surmounted, as shown, by a hopper G of the automatic-feed variety, which may involve any suitable or well-known construction of such a hopper.

Following is a description of the operation of my improved apparatus: The chamber A being charged with coal and the charge (which should be maintained to extend nearly to the top of the chamber) being blasted through the tuyeres, steam is admitted from the pipes *m* and also, if desired, from the pipes *l*; and the hopper is actuated to deposit fresh supplies of coal, as required, on the bed in the generator-chamber. The resultant gas passes through ports *q* into the chamber B and thence discharges through the down-takes B², sufficient, however, rising in the passage B' to the top of the bed in the generator to exert and maintain a degree of pressure thereon, against the uprising currents, sufficing to prevent such intense heating of the upper portion of the bed as would tend to suddenly disintegrate the fresh coal deposits, the result of which would be to liberate and drive off the volatile constituents before they undergo adequate subjection to heat to be thoroughly gasified. The pressure, on the top of the fuel-bed, of the gas so generated, by preventing the currents generated by the blast from rising through the fuel above the line of the ports *q*, causes that fuel to become heated by conduction from below and by the sensible heat of the gas on top, thereby effecting slow distillation of the fuel above the ports *q*; and the gas-product of such distillation, which rises through the mass against the gas-pressure from the passage B' on the top of the bed, enters that passage as a pure, high-grade illuminating gas. From the passage B' the retorted gas passes through the incandescent portion of the fuel-bed to the down-takes B², by entering the chamber B, whence the walls B⁴ direct it out of that chamber into the adjacent portion of the fuel-bed, through which it must pass, and be thus the more thoroughly fixed and mixed with the lower grade of gas, in order to reach the down-takes.

Inasmuch as the more important feature of my invention consists in taking the high-grade gas resulting from the described distillation and passing it through an incandescent portion of the fuel-bed to the downtake, it is not indispensably necessary that the apparatus shall involve the incircling chamber

B as means whereby to lead off the low-grade gas and of enforcing the described passage through the incandescent portion of the fuel-bed of the high-grade gas of distillation, since the passage B' may lead into the chamber A at the plane where the ports *q* are shown to be provided in the encircling-chamber construction, as through a chamber forming that much of the chamber B as extends between the walls B⁴.

A valve B³ may be provided in the passage B' to regulate the flow to and pressure on the top of the fuel-bed, or to entirely close the passage, as in generating the gas of upper distillation, which is largely of the nature of marsh-gas, to be led off by itself, through the outlet *p*, if desired, for separate use, as for purposes requiring especially high illuminating and heating gas provision in the form of test-tubes *h* being made for drawing off the upper gas from the chamber B for examination; and the mixture of the different grades of the generated gases in the apparatus affords a fuel-gas of very good quality.

The downward and upward flaring construction of the chamber A is advantageous in maintaining the mass of the bed, which tends to shrink by consumption, compact in the lower tapering portion, whereby it is crowded against the walls and thus prevents the currents generated by the air-blast from passing up mainly along the walls and forces their more uniform distribution through the entire mass of the bed. The downward flare of the upper portion, on the other hand, is afforded to provide greater area for the fuel in its descent to accommodate its expansion during the coking action; and, especially, to afford a passage to the lower or generating portion of the chamber at least as great in horizontal area as the coke-receiving upper end of such generating portion of the chamber, whereby the coke may freely feed into it by gravity from the retort-chamber.

The grateless pit A', with the doors *r*, is a feature of advantage, since it permits the removal of any ashes at the base of the fire to be accomplished without injury to the condition of the bed. When the fuel is fluxed, however, as hereinbefore mentioned, a bottom may be formed in the pit, of ashes or other material, extending up to the line *v*, which is near the plane of the spout *r'*.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a gas-manufacturing apparatus, the combination of the shell containing a lower generating chamber and an upper retorting chamber, a circumferential chamber B surrounding the shell externally thereof and containing the walls B⁴, ports *q* affording communication between the said generating chamber and circumferential chamber, a passage B' connecting the chamber B, from between said walls therein, with the upper end of the retorting chamber, blasting means for

the lower generating chamber and an outlet for the gas from the said circumferential chamber, substantially as described.

2. In a gas-manufacturing apparatus the combination of the shell containing a chamber A having its walls tapering in opposite directions from near the transverse center of the said chamber and forming an upper retorting chamber and a lower generating chamber, a circumferential chamber B surrounding the shell externally thereof and containing walls B', ports *q* affording communication between the said generating chamber and circumferential chamber, a passage B' connecting the chamber B from between said walls therein, with the upper end of the retorting chamber, blasting means for the lower generating chamber and an outlet for the gas from the said circumferential chamber, substantially as described.

3. In a gas-manufacturing apparatus, the

combination of the shell containing an ash-pit in its base provided with cleaning-doors *r*, a lower generating chamber above the ash-pit and having unobstructed communication therewith for the free passage of ashes, and an upper retorting chamber, a circumferential chamber B surrounding the shell externally thereof and containing walls B', ports *q* affording communication between said generating chamber and circumferential chamber, a passage B' connecting the chamber B from between the said walls therein with the upper end of the retorting chamber, blasting means for the lower generating chamber, and an outlet for the gas from the said circumferential chamber, substantially as described.

WILLIAM A. KONEMAN.

In presence of--

M. J. FROST,

W. N. WILLIAMS.