

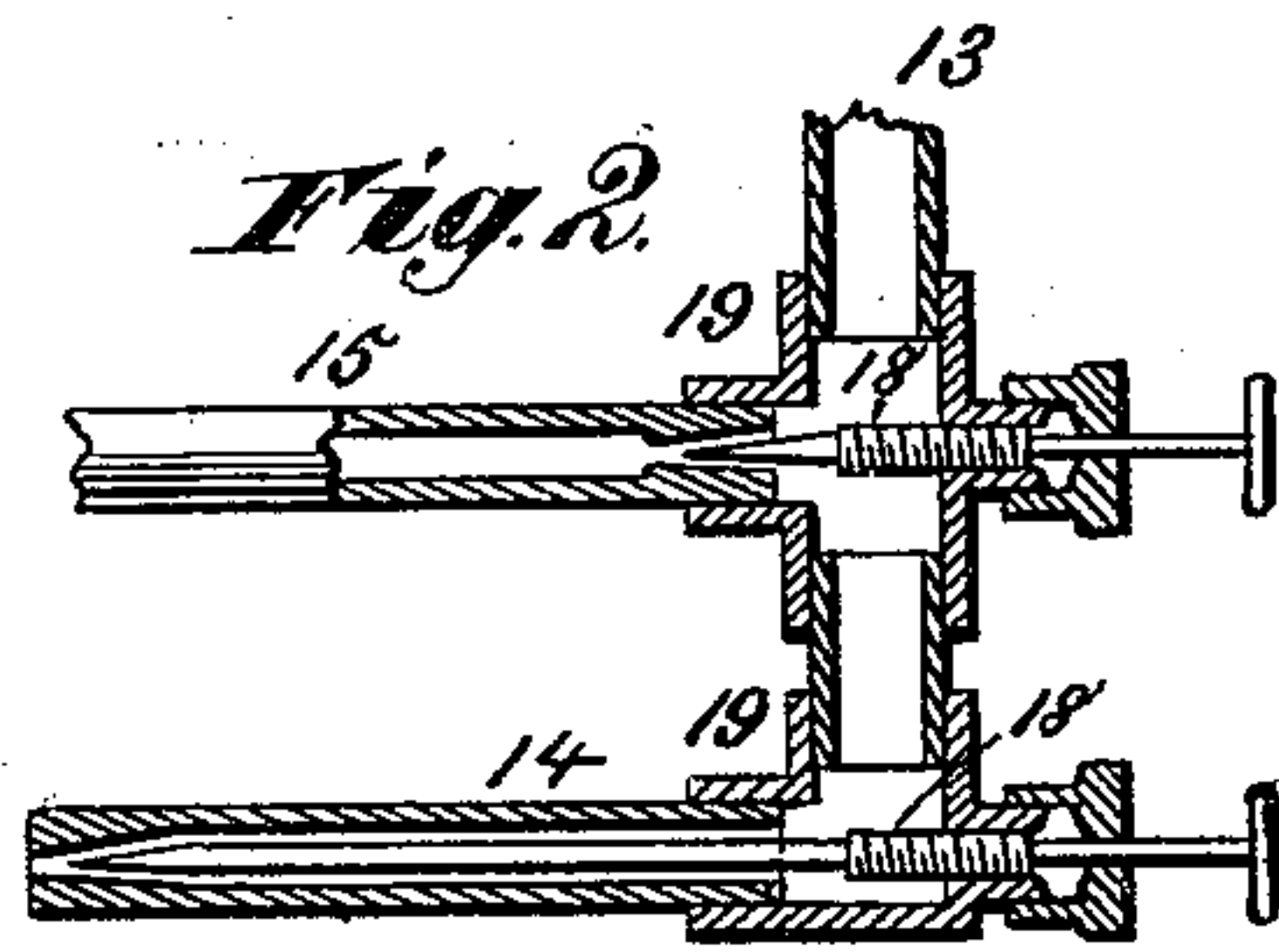
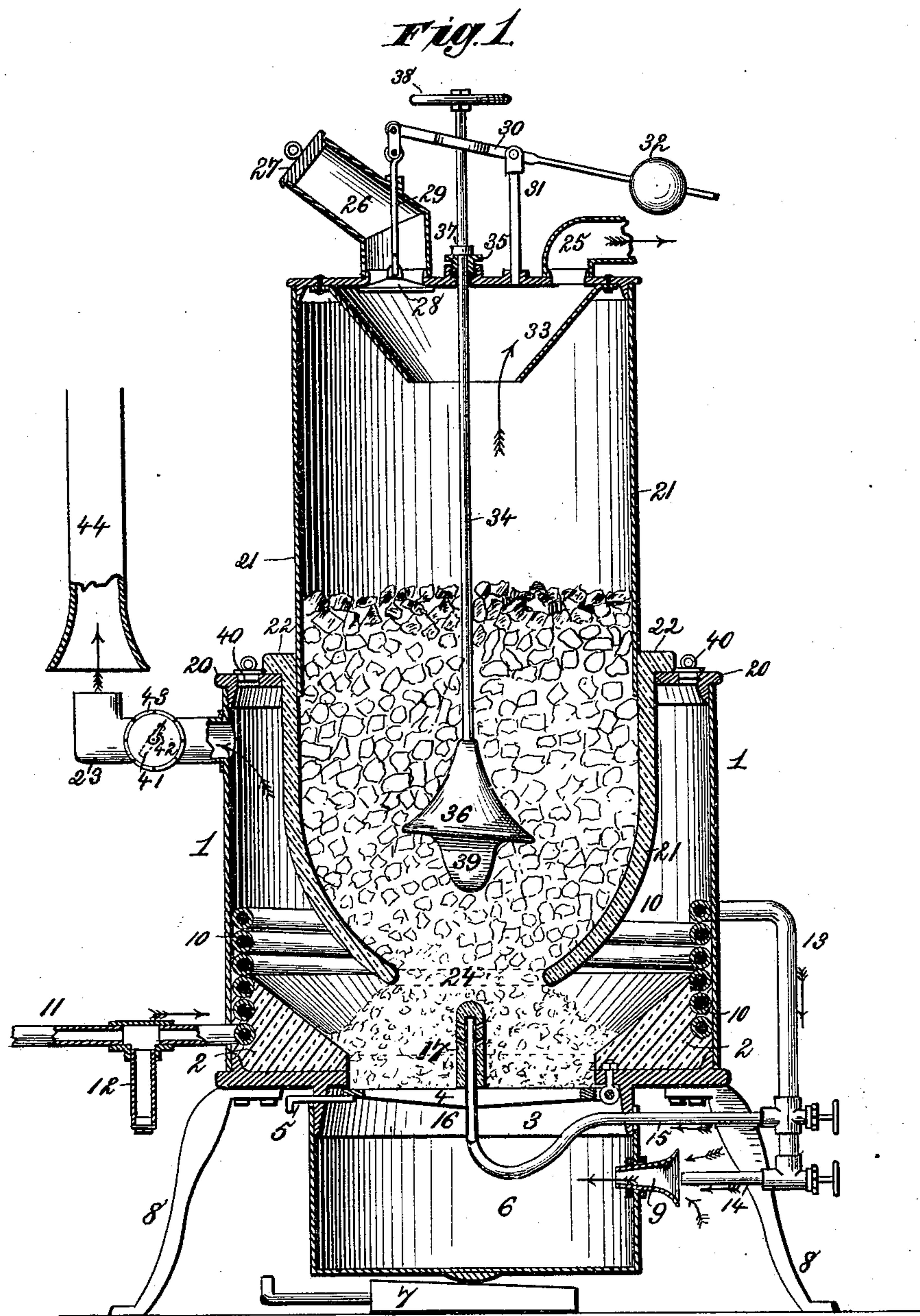
(No Model.)

J. KIDD.

APPARATUS FOR MANUFACTURING NON LUMINOUS HEATING GAS.

No. 332,087.

Patented Dec. 8, 1885.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MANUFACTURING NON-LUMINOUS HEATING-GAS.

SPECIFICATION forming part of Letters Patent No. 332,087, dated December 8, 1885.

Application filed July 22, 1885. Serial No. 172,321. (No model.)

To all whom it may concern:

Be it known that I, JOSHUA KIDD, a subject of the Queen of Great Britain, residing at Fern Bank, Wandsworth Common, in the county of Surrey, England, have invented new and useful Improvements in Apparatus for Manufacturing Non - Luminous Heating - Gas, of which the following is a specification.

This invention relates to the manufacture of a non-luminous heating-gas by the injection of steam and atmospheric air into a solid mass of incandescent carbonaceous fuel contained in a gas-generator, the lower open end of which is inclosed in a fire-box.

The invention consists in the combination, with a fire-box, of a gas-generator having an open lower end inclosed in said fire-box, and of a steam-superheating coil, and air and steam nozzles arranged to promote intense combustion and provide for the ready access of steam to the solid mass of incandescent fuel contained in the fire-box and generator, as will hereinafter be set forth.

In the annexed drawings, illustrating my invention, Figure 1 is a sectional elevation of my improved apparatus for manufacturing a non-luminous heating-gas from the decomposition of steam and an incandescent carbonaceous fuel. Fig. 2 is a sectional detail view.

Referring to the drawings, which represent one form of my improved gas-generating apparatus, the numeral 1 is used to designate a furnace or fire-box, preferably composed of cast metal, with a partial or entire lining, 2, of fire-brick or other refractory material. The furnace or fire-box 1 may have a cylindrical or other approved form, with a central grate-opening in its bottom, preferably surrounded by a depending annular rim or flange, 3. Within this flange or rim 3 is hinged a dumping-grate, 4, that is sustained in a horizontal position by a removable pin, 5, passed through said rim. Beneath the grate 4 and rim 3 I may arrange an ash-box, 6, adapted to fit closely around said rim, and held in contact therewith by means of a wedge or lever, 7, as shown in the drawings. By withdrawing the wedge or lever 7 from beneath the ash-box 6 the latter can be lowered and removed whenever desired. With this form of ash-box the furnace will be supported by legs 8 of some length, as shown. This construction, how-

ever, is not essential, as it is obvious that the space beneath the furnace or fire-box may be inclosed by air-tight doors, with any convenient form of ash-box and with suitable provision for draft. The ash-box 6, as shown, is provided on one side with an air-nozzle, 9, which may, however, be arranged otherwise in the event of inclosing the space beneath the fire-box with doors, as above indicated. Within the fire-box 1 is arranged a pipe-coil, 10, for the reception of water or steam, and adapted to serve both as a steam generator and superheater. This coil is connected at its inlet end by means of a pipe, 11, with any convenient water or steam supply. In the pipe 11, near the coil, is an equalizing-drop, 12, that contains a small quantity of water or steam sufficient to counterbalance a fluctuation of pressure in the pipe-coil, and thereby prevent or lessen the tendency to gurgling, blowing, and hissing noises in said coil and connections. When the pipe-coil 10 is supplied with water through the pipe 11, from any convenient source, it will serve both as a steam generator and superheater, or said coil may be supplied with steam from a boiler, and be then used as a superheater only.

The outlet end of the steam-coil 10 is connected to a downward-extended pipe, 13, having lateral valved branches 14 and 15, forming steam-exit nozzles. One of these branches or nozzles, as 14, is conducted to a point opposite the enlarged external open end of the air-nozzle 9, as shown in Fig. 1, and serves to promote the draft of the furnace, and assists combustion in a well-known manner. The other branch pipe, a steam-nozzle, 15, is passed through the rim 3, and curved upward with a vertical extension, 16, that is passed between two of the grate-bars at or about the center of the grate, and thence into the lower part of the fire-box. This vertical extension 16 of the steam-nozzle 15 is perforated laterally near its end for the exit of steam to the incandescent fuel in the fire-box. It is also preferably covered at the end with a perforated nipple or sheathing, 17, of porcelain or other refractory material, to protect it from the intense heat of the surrounding mass of incandescent fuel. Each of the steam-nozzles 14 and 15 is provided with a jet-valve, 18, in the form of a pointed rotary spindle sup-

ported in a suitable casting or T-connection, as 19, the pointed end of one valve-spindle being adapted to close a reduced opening at the extremity of the lower or short nozzle, 14, while the upper valve-spindle is shorter and controls a reduced opening in the rear end of the upper nozzle or pipe, 15, as shown in Fig. 2.

The top of the fire-box 1 is provided with a movable ring, 20, that supports my improved gas-generator 21, which is suspended within the fire-box by means of a flange, 22, resting on said ring. The lower portion or half of the gas-generator 21 is preferably composed of cast metal, fire-clay, or some durable material capable of withstanding a high degree of heat. It is also preferably made in the shape of a deep bowl with rounded sides, as shown, to expose a greater surface to heat and admit of its more equable distribution. This construction of the lower part of the gas-generator also serves to deflect the waste products of combustion—such as nitrogen, carbonic acid, smoke, &c.—outward and upward to the upper part of the fire-box, where they find an exit through a pipe, 23, provided with a suitable damper. In the lower end of the gas-generator 21 is an opening, 24, that communicates with the fire-box above the grate, so that the carbonaceous fuel placed in the gas-generator also extends into the fire-box, the lower portion of the mass of fuel being supported by the grate and by the lower portion of the fire-box lining.

The upper portion of the gas-generator 21 may be made of sheet metal or other suitable material in a cylindrical form, and is provided with a gas-delivery pipe, 25, and with a feed-hopper, 26, through which fuel is introduced. The upper end of the hopper 26 is closed by a plug, lid, or cover, 27, and the opening at its lower end is controlled by a drop-valve, 28, the valve-rod 29 being connected to one end of a balance-lever, 30, that is fulcrumed at 31, and carries a weight, 32, at its opposite end. This construction enables the gas-generator to be supplied with fuel without escape of gas. It will be observed that the valve 28 is held up against the lower end of the hopper by means of the weight 32, so that no gas can ordinarily pass into the hopper. When it is desired to supply the generator 21 with additional fuel, the hopper lid or cover 27 is withdrawn, and after the fuel has been put into the hopper the lid is replaced, the gravity of the weight 32 being sufficient to sustain both the valve 28 and the superimposed fuel. After replacing the lid 27 the weight 32 is raised, so as to lower the valve 28 and permit the fuel to fall into the body of the gas-generator without any loss of gas. It is obvious that this arrangement of hopper and valve may be varied in several ways with the same result. Beneath the gas-delivery pipe 25 and hopper 26, within the upper part of the gas-generator, is suspended a conoidal deflector, 33, the walls of which converged downward to its lower open end. This deflector serves to distribute the heated gas at the up-

per part of the generator and relieve the pressure at the delivery-opening.

A vertical rod, 34, is passed down into the generator through a gas-tight joint, 35, in the top, and carries at its lower end a weighted stirrer, 36, by which the partly-consumed fuel can be worked down toward the grate and made to present a solid mass of incandescent carbonaceous material to the action of the upward currents of air, steam, and carbonic acid from which the gas is generated. The stirrer-rod 34 is supported by a collar or shoulder, 37, that rests on the top of the gas-tight joint 35, and at its upper end it is provided with a hand-wheel, 38, by which the stirrer 36 is rotated when required. It will be observed that this stirrer 36 has the form of an irregular cone with a slightly-concaved surface, and that it carries at the bottom a depending knob or projection, 39, of irregular form. As the incandescent fuel in the gas-generator 21 becomes honey-combed and loosened by combustion, it may be worked down and packed into a solid mass by simply rotating the stirrer 36, whose irregular conoidal form gradually disengages the lumps of incandescent material, forces them downward, and packs them closely together. By this means a solid incandescent mass of carbonaceous material is readily maintained in the generator, which results in more perfect decomposition of the entering steam and in the production of a gas that is rich in heating qualities. The conoidal stirrer 36, being suspended centrally in the lower part of the gas-generator, also serves as a deflector to arrest the direct upward passage of carbonic-acid gas, and by retarding its progress and retaining it in contact with the incandescent carbon assists in its rapid conversion into the more valuable carbonic-oxide gas.

From time to time, as required, the fuel in the gas-generator can be readily renewed through the hopper 26 without loss of gas, as already explained. The fuel on the grate can also be renewed directly, if desired, through openings in the ring 20 at the top of the fire-box, said openings being provided with plugs 40, by which they are closed.

In the production of heating-gas by the apparatus, a fire of anthracite coal or other carbonaceous fuel is started on the grate 4, the ash-box 6 being first removed, and the damper 41 in the fire-box flues 23 being partly opened to afford a draft. The generator 21 may be partly filled with carbonaceous fuel at this time or not, as may be preferred. By leaving the damper or valve 41 open an exit is also afforded for the nitrogen and other undesirable products of combustion. This valve 41 is provided with an index, 42, and dial 43, by which its position may be observed. After the fire upon the grate is started the ash-box 6 is put in place and secured by the lever 7 or otherwise, and a jet of steam may be thrown from the steam-nozzle 14 into the mouth of the air-nozzle 9, so as to promote combustion. Care must now be taken to see that the gas-

generator 21 is filled to a depth of about thirty inches with a solid mass of anthracite coal or other carbonaceous fuel, and after the furnace has become well heated and its contents in a state of incandescence, or sooner, if desired, steam will be admitted through the steam-nozzle 15 and its extension 16 directly into the fire-box. The damper-valve 41 may now be partly closed, but not entirely, as an exit must be afforded in that direction for the escape of nitrogen and other invaluable products of combustion. These are conducted by the flue or pipe 23 to any suitable chimney, or, preferably, to a point below but not in contact with the lower open end of a flue or chimney, 44, an interval between the flues 23 and 44 being left to prevent too great a draft. The access of steam and air to the solid mass of incandescent fuel in the gas-generator maintains the required intensity of combustion and decomposes the steam with the liberation of hydrogen gas and carbonic acid, which latter is rapidly converted into carbonic-oxide gas by contact with the incandescent carbon in the gas-generator. By the employment of superheated steam as provided by the steam-coil 10, located in the fire-box, this effect is greatly facilitated, with increased rapidity and economy of production, and with the result of obtaining a non-luminous gas of great heating-power.

During the combustion of the fuel in the gas-generator said fuel is subjected at intervals to the stirring action of the rotary conoidal stirrer 36, and is thereby gradually worked down to the lower part of the generator and made to present a solid incandescent surface to the action of the entering air and steam. The gas thus produced is permanent, and may be conveyed through the delivery-pipe 25 to any convenient place of storage, or directly to any desired point for immediate use.

It will be observed that by means of the valved outlets and the valved steam-nozzles any required pressure or intensity of action can be readily maintained in the apparatus, while the arrangement of a fire-box inclosing the lower open end of a gas-generator with a steam-nozzle projected directly into the said fire-box results in greatly facilitating the economical production of a gas of high calorific value.

What I claim is—

1. In an apparatus for making gas, the combination, with a fire-box having a grate, a valved outlet for the products of combustion, and openings for introducing fuel, of a gas-generator having its lower open end inclosed in said fire-box and provided at the top with a gas-exit and a steam-nozzle projecting vertically beneath the lower open end of said gas-generator, substantially as described.

2. The combination of a fire-box having an outlet provided with a valve, an ash-box provided with an air-nozzle, a gas-generator having its lower open end inclosed in the fire-box and provided at the top with a gas-exit, and a steam-nozzle projecting vertically beneath

the lower open end of the gas-generator, substantially as described.

3. The combination of a fire-box, an air-nozzle, a gas-generator having its open lower end inclosed in said fire-box, a steam-coil inclosed in the fire-box, and steam-nozzles connected with said coil, one of said nozzles being arranged to inject steam through the air-nozzle and the other arranged to inject steam directly into the fire-box, substantially as described.

4. The combination, with a fire-box and a steam-coil located therein, of a feed-pipe having a drop, as 12, to hold water or steam, substantially as described.

5. The combination, with a fire-box and a gas-generator having its lower open end inclosed therein, of a rotary stirrer located in said generator and consisting of an irregular weighted body attached by a rod passed through the upper end of the generator, substantially as described.

6. The combination of a fire-box, a gas-generator having its lower end bowl-shaped, provided with a central opening, the lower end of said generator being inclosed in the fire-box, and an irregular conoidal stirrer suspended in said generator, substantially as described.

7. The combination of a fire-box, a gas-generator having its lower open end inclosed in said fire-box, said generator being provided at the top with an outlet or delivery pipe, a conoidal deflector arranged in the upper end of said generator, and a rotary stirrer located in the lower part of the generator, substantially as described.

8. The combination, with the fire-box 1, having a grate, 4, valved outlet 23, and fuel-openings 40, of the gas-generator 21, having its lower end inclosed in said fire-box and provided at the bottom with an opening, 24, and at the top with a hopper, 26, and gas-exit 25, a rotary stirrer, 36, suspended in said gas-generator, and a steam-nozzle, 16, projecting vertically beneath the lower open end of the generator, substantially as described.

9. The combination of a fire-box, 1, having fuel-openings and valved outlet, a gas-generator, 21, having its lower open end inclosed in said fire-box and provided at the top with a gas exit, 25, an ash-box, 6, removably secured beneath the fire-box grate and provided with an inlet air-nozzle, 9, a steam-coil, 10, located in the fire-box and surrounding the lower end of the gas-generator, a steam-nozzle, 14, leading from said coil to the ash-box air-nozzle, and a steam-nozzle, 15, leading from said coil into the fire-box and projecting vertically beneath the lower end of the gas-generator, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOSHUA KIDD.

Witnesses:

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J. A. RUTHERFORD.