

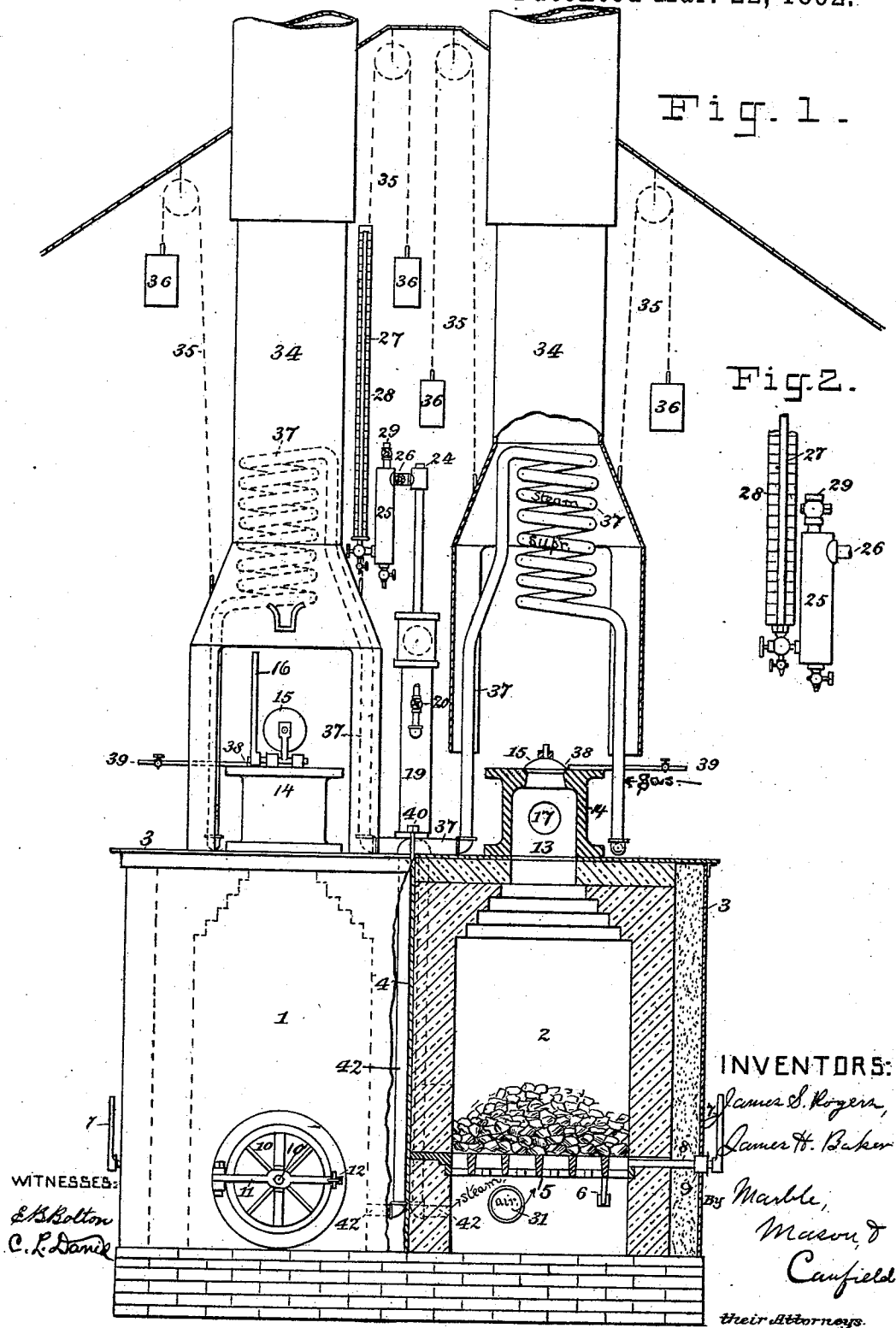
(No Model.)

3 Sheets—Sheet 1.

J. S. ROGERS & J. H. BAKER.
APPARATUS FOR THE MANUFACTURE OF GAS.

No. 471,398.

Patented Mar. 22, 1892.



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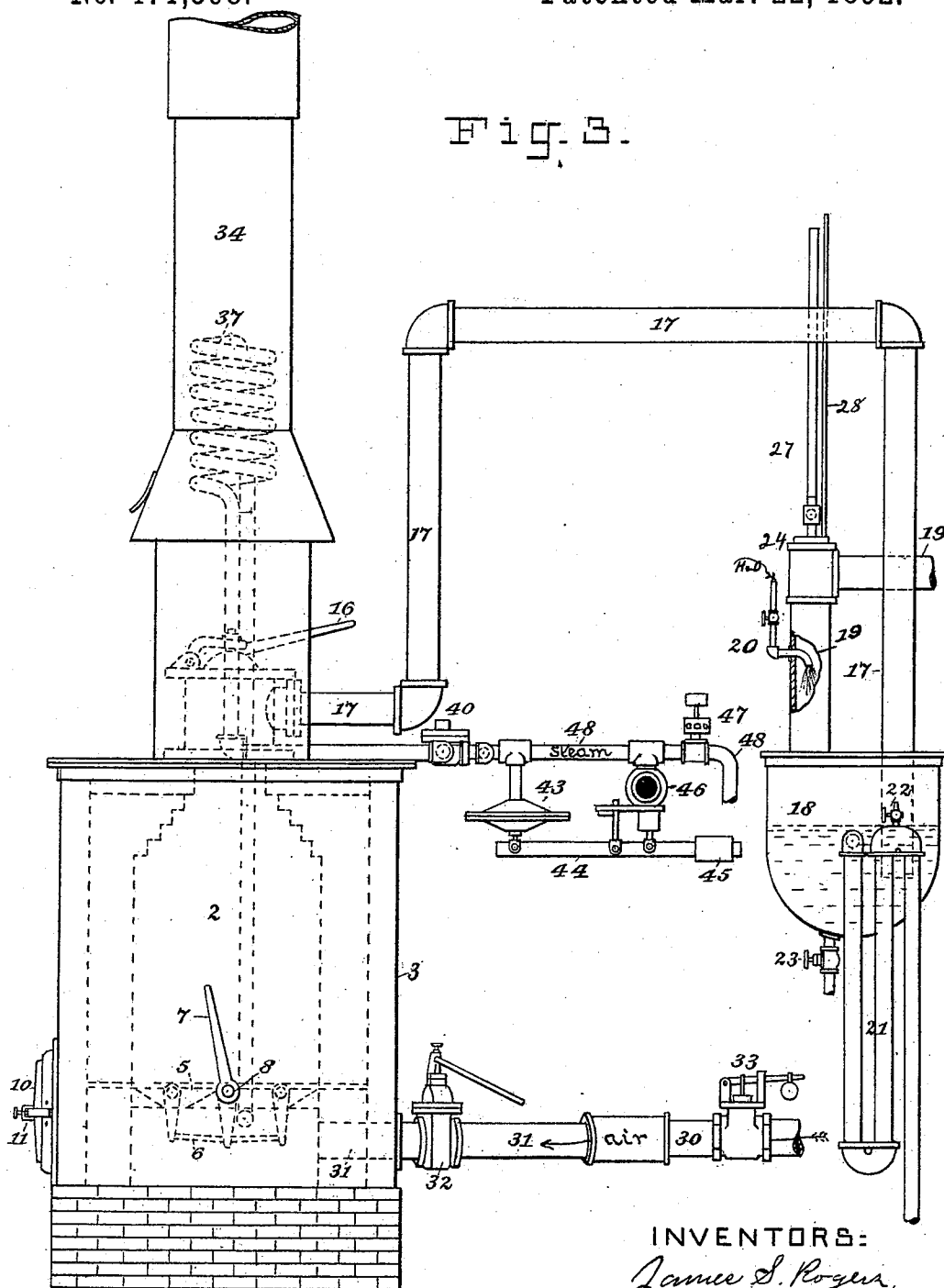
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Fig. 3.



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3 Sheets—Sheet 3.

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Fig. 4.

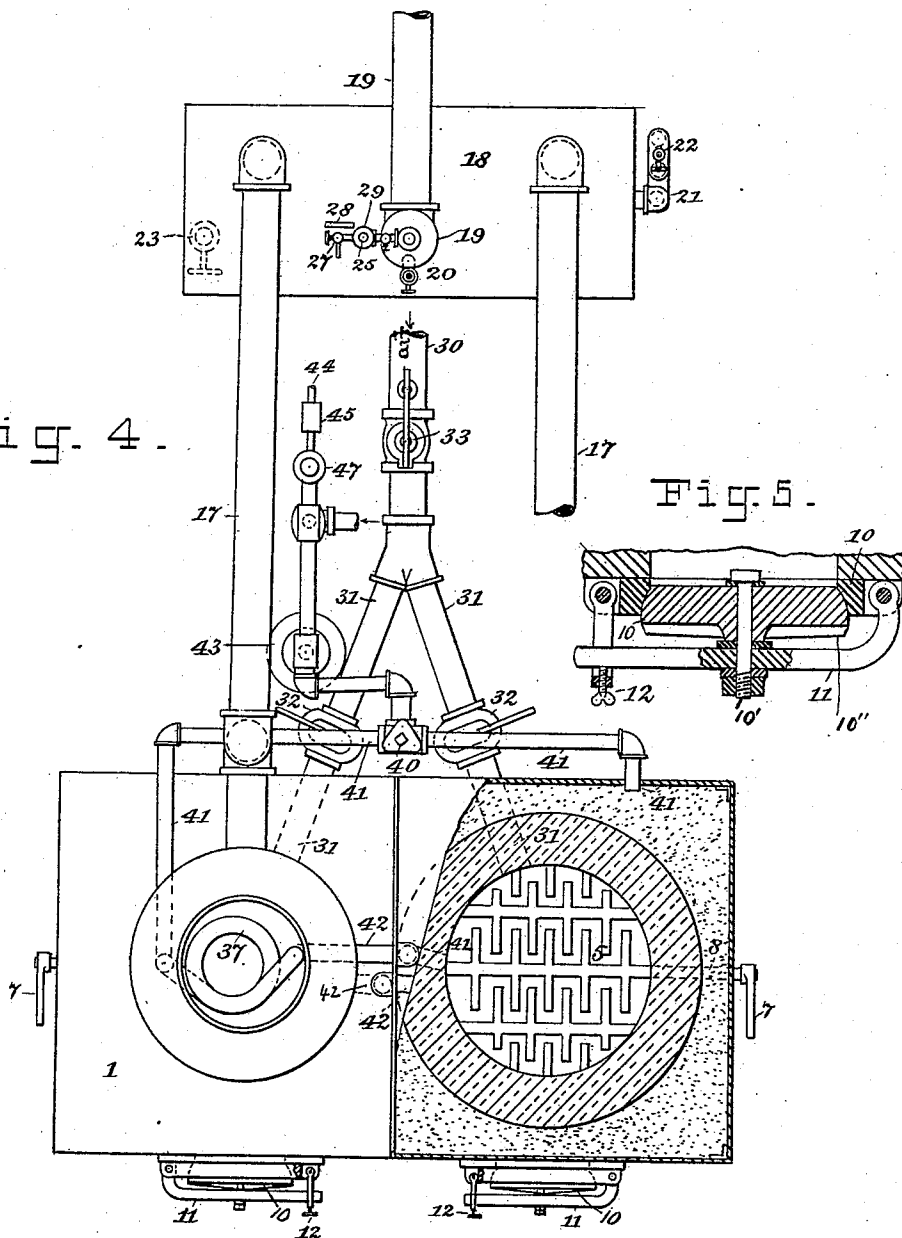


Fig. 5.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 471,398, dated March 22, 1892.

Application filed January 5, 1891. Serial No. 376,821. (No model.)

To all whom it may concern:

Be it known that we, JAMES S. ROGERS and JAMES H. BAKER, citizens of the United States, residing at Saratoga Springs, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Apparatus for Manufacturing Combustible Gases; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part hereof.

This invention consists of an improved apparatus for the manufacture or generation of combustible gases by a continuous process from steam by passing the same through incandescent coal or other carbonaceous material, the apparatus being so constructed and arranged as to admit of the continuous and rapid generation of the gas at a greatly-reduced cost over the processes now in use.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, wherein similar reference-numerals designate like or equivalent parts wherever found throughout the several views, and in which—

Figure 1 represents a front elevation of the improved apparatus, certain parts being shown in section and others broken away; Fig. 2 a detail, Fig. 3 a side view, and Fig. 4 a top plan view, of the apparatus, portions of which are shown in section. Fig. 5 is a detail section.

In this apparatus two or more cupolas of any desired shape and size are placed near each other, or preferably inclosed in a common shell, which surrounds both. Each generator is separately lined with fire-brick or other similar material, and a space between the lining and the outside shell is filled with finely-pulverized lime or other non-conducting material. Each generator is provided with a shaking and dumping grate, by means of which ashes and clinkers can be shaken into the ash-pit even while the generation of gas is going on, and with a feed-hole at the top, which also answers for a draft-flue, and with a pipe for conducting the gas therefrom

as fast as made. A separate smoke-stack or escape-flue for the products of combustion is provided for each generator, which serves the double purpose of an escape-flue and an inclosure for a steam-coil, whereby steam may be superheated before being conducted into the generator, and a single blower or fan supplies either or both of the generators with an air-blast, and by means of automatic valves and attachments the blower or fan can be kept constantly running while the charge of steam is being shifted from one generator to the other, and the pressure of steam going into the generator can be kept uniform, while the quantity admitted will be in exact proportion to the amount used.

Referring to the drawings, the reference-numerals 1 and 2 designate two generators of cylindrical or other preferred shape inclosed in an iron shell 3 and separated from each other by an iron partition 4. These generators may be made entirely separate, if necessary, and placed at any desired distance apart.

The grates 5 are made in sections with interlocking bars, and these sections are rocked backward and forward by means of connecting-links 6 and a lever 7, working on the arm 8. The arm 8 passes through the side of the generator, as shown, and, being provided with a stuffing-box 9 to prevent the escape of steam from the ash-pit, the ashes, clinkers, and other substances can be dumped or shaken down at any time even while the charge of steam is on the generator.

The door 10 to the ash-pit is made circular in shape with a beveled edge at the circumference, which fits into a corresponding seat in the door-frame, which is fastened to the shell of the generator. This door 10 is pivoted centrally, as at 10', on an arm 11, which is hinged to one side of the frame and secured at the opposite side by means of a clamp-screw 12, the outer side of the door being grooved, as at 10'' for receiving a lever by which the door can be rotated on its axial fastening to the arm 11, thus removing any dirt that may be on the jointed edges and allowing the joint to be made tight.

The feed-hole 13, Fig. 1, is extended upward by a T or casing 14, through which fuel is fed into the generator, and which serves, also, as

a flue for the escaping products of combustion while blowing up the fire. The annular hole or opening in the top of this casing is concaved to form a tight joint in connection
 5 with the valve 15, the inner surface of which is correspondingly beveled. This valve is operated by a lever 16, connected with the arm to which the valve is attached, which is hinged, as shown in Figs. 1 and 3, to the top of the
 10 casing or T 14, and the valve and lever are sufficiently heavy to withstand any proper pressure from within and act as a safety valve or vent if from any cause an undue pressure should take place within the generator. A
 15 pipe 17, Figs. 1 and 3, connects the casing or T 14 with a hydraulic seal 18.

Each generator is provided with a similar pipe 17, and these pipes each extend below the water-level in the seal 18, thus preventing the hydrogen or other gases from working back into the generator, which is being "blown up" in the operation of the apparatus, as hereinafter described. A pipe 19, connected with the hydraulic seal at the top
 25 and above the water-level, serves as a discharge-conduit, through which all the gas produced by the generators is conducted to the place or places of storage or use. At some point, as 20, in pipe 19 water is admitted in a
 30 jet or spray, which serves the double purpose of washing and cooling the gases and of supplying the hydraulic seal with water. The seal is thus kept full up to the point of connection of the trap 21, Fig. 3, which takes off
 35 the overflow, and a petcock 22 in the trap 21 prevents siphonage, while a waste cock or valve 23 is employed for drawing off all the water in the seal when desired.

A pressure-indicator is placed at some convenient point on pipe 19, as at 24, which consists of a reservoir 25, connected with pipe 19 by a pipe 26, and to this is connected a glass
 40 gage 27, attached to a graduated scale 28. The reservoir 25 being filled with water through a valve 29 and the valve closed, the pressure
 45 of the gases in pipe 19 as it passes through pipe 26 acts upon the water in the reservoir 25 and forces it up into the glass gage 27. When this indicator shows less than the required
 50 pressure, it indicates that it is time to shift the charge.

An air-blast pipe 30, having branches 31, leads from a blower or fan (not shown) to the several generators and communication there-
 55 with by the branches 31 is made below the grate, as shown in Fig. 1. The flow of air through these pipes to the generators is admitted, excluded, or regulated by means of valves 32 and at some convenient point on
 60 pipe 30 is placed a safety-valve 33, which allows of the continuous running of the blower or fan, the air being forced out of this valve when all other ports are closed.

The smoke-stacks 34 are made telescopic, 65 the lower inner parts being suspended by chains 35 and counterbalanced by weights 36. The stack is made in this way to facilitate

feeding coal into the generator and also to exclude cold air from the interior of the stack, thus preventing the cooling of the steam-coil
 70 hereinafter described when the generator is being blown up, this being done by drawing the hood attached to the lower adjustable part of the stack close down to the top of the casing or T 14. 75

Within each stack is placed a coil of pipe 37, through which steam is passed for superheating before being admitted to the generator. These coils are heated by gases arising from the generators while being blown up, 80 and these gases are kept ignited by a gas-jet 38, kept constantly burning at the draft-hole of each generator, the gas to supply this jet being supplied by a pipe 39 from any convenient source. The coil in the stack which is
 85 being blown up in the operation of the apparatus is always used to superheat the steam for the opposite or adjacent generator, which has already been prepared for making gas. Steam is admitted to these coils by means of
 90 a three-way cock 40 and branch pipes 41, the three-way cock being so constructed that steam can be thrown by it into either coil or shut off from either or both. The steam-coil in the stack of generator 1 is in communica-
 95 tion with generator 2 below the grate by means of a pipe 42, which extends from the coil through the top of the casing of generator 2, and, passing down behind the brick lining, enters the ash-pit just below the grate, 100 and the steam-coil in the stack of generator 2 communicates with generator 1 in the same manner, a pipe 42, leading therefrom through the casing of generator 1 near the top, extend-
 105 ing down behind the brick lining and entering the generator below the grate.

At a point between the boiler or steam-supply and the three-way cock 40 is a steam-pressure regulator consisting of a diaphragm-pressure regulator 43, a lever 44, a movable weight
 110 45, a regulating-valve 46, and a safety-valve 47. This regulator can be set at any desired pressure by moving the weight 45 on the lever 44 toward the end for increasing and toward the diaphragm for decreasing the pressure. 115 The safety-valve 47 is placed in the steam-pipe 48 to permit the escape of steam in case of any disarrangement of the governing-valve.

The operation of the apparatus is as follows: Having supplied the generators with coal and
 120 lighted the fires, with the ash-pit doors and the top or draft-hole covers all open, light the gas-jets 38, close the ash-pit door of the generator first to be blown up, and start the blower, first having closed all valves or openings
 125 but that at the top of the generator which is to receive the first blast and the valves 32 in the air-pipe 31, leading thereto. When first starting, each generator may be blown up at the same time, if necessary. Having got the
 130 fire in proper condition and the fuel heated to incandescence, shut off the air-blast and turn it onto the other generator, proceeding as in the first instance. The gas-jets 38 should

be kept continually burning. If generator 1 is the first ready, turn the three-way cock so as to let steam into the coil in the stack of generator 2. This generator being in the process of blowing up, the heat of the burning gases superheats the steam in such coil, and the steam so superheated flows through the pipe 42, through the top of the casing of generator 1, and, passing down through said pipe, flows into the ash-pit below the grate thereof, and, arising through the coal, becomes gasified or converted into combustible gases and passes through pipe 17 into the seal 18 and thence through pipe 19 to the place of use or storage. During this operation the valve 15 is of course closed, it being kept open only during the operation of blowing up. Whenever it is time to shift the charge, which may be indicated by the pressure-regulator in the gas-pipe 19, the generator 1 having been first charged, it is only necessary to reverse the operation described with reference to generator 1, the valve 15 on generator 1 being opened, the air-blast turned on, and the steam from the coil in the stack of generator 1 being superheated by the blowing up thereof and discharged into generator 2, the governor-valve 15 and air-blast valves of which have been closed.

It will be observed that Fig. 1 of the drawings shows the governor-valve 15 of generator 1 open, as in the process of blowing up, and that of generator 2 closed, or in the position to receive the steam charge. It will thus be seen that by this apparatus the continuous generation of gas goes on at all times when the apparatus is in operation, the shifting of the steam charge from one generator to the other being instantaneous and effected by the movement of a single valve, and while the steam charge is on one generator the other, being supplied with fuel and blown up, is ready to receive the steam charge at any time. The valves in the air-blast pipes 31 may be operated by a single attachment, if necessary, or singly. Should the steam-pressure regulator connected with pipe 48 fail to work from any cause, the pressure will at once operate the safety-valve 47, and thus prevent undue pressure in the generator, and the glass gage previously described shows at all times the pressure in the gas-main. Should the out-flow of gas be cut off, it will be seen that the automatic arrangements described will close the steam-inlet, and no more gas will be made until the pressure from within is relieved; but if more than the regular amount of gas is wanted the valve will instantly open and allow more steam to enter.

It is evident that many changes in the construction, arrangement, and combination of the various elements of this improved apparatus may be made without departing from the scope of the invention, which is not limited to the exact form of construction shown and described, but which is regarded as covering any form of apparatus constructed and operating substantially in the same manner.

Having fully described our invention, its construction and operation, we claim, and desire to secure by Letters Patent, the following, viz:

1. In an apparatus for manufacturing combustible gases, the combination of adjacent cupolas or generators, each of which is provided with a separate stack or escape-flue and a steam-coil located therein, the steam-coil in the stack of each generator being in communication with an adjacent generator, and means for operating the generators and conveying the gas therefrom, substantially as shown and described.

2. In an apparatus for manufacturing combustible gases, the combination of adjacent cupolas or generators, each of which is provided with a separate stack or escape-flue and a steam-coil located therein, an air-blast supply also in communication with each generator, means for directing the air into either, the steam-coils in the stack of one generator being in communication with an adjacent generator, and means for operating the generators and conveying the gas therefrom, substantially as shown and described.

3. In an apparatus for manufacturing combustible gases, the combination of adjacent cupolas or generators, each of which is provided with a stack or escape-flue and a steam-coil located therein, each coil being in communication with a supply-pipe provided with a pressure-regulator and the steam-coil in the stack of one generator being in communication with the adjacent generator, and means for conveying the gas from the generators, substantially as shown and described.

4. In an apparatus for manufacturing combustible gases, the combination of adjacent cupolas or generators, each of which is provided with a stack or escape-flue and a steam-coil located therein, each steam-coil being in communication with a single supply-pipe provided with a pressure-regulator, air-blast-supply pipes in communication with each generator and with a single supply-pipe provided with a safety-valve, means for directing the steam from the coil in the stack of one generator into the adjacent generator and for directing the air-blast into either or both generators, each generator being also provided with a controlling cover or valve, and means for conveying the gas therefrom, substantially as shown and described.

5. In an apparatus for manufacturing combustible gases, the combination of adjacent cupolas or generators, each of which is provided with a stack or escape-flue and a steam-coil located therein, an air-blast supply also in communication with each generator, the steam-coil in the stack of one generator being in communication with an adjacent generator and each generator being also provided with covers or controlling-valves, and means for conveying the gas therefrom.

6. In an apparatus for manufacturing combustible gases, the combination, with a gener-

ator provided with an opening or flue in the top thereof through which the hot gases may escape, of a hinged cover or governor for said opening and a gas jet or burner located at or near the edge of said opening, substantially as shown and described.

7. In an apparatus for manufacturing combustible gas, the combination, with a cupola or generator, of a telescopic stack or escape-flue, the lower portion of which is counterbalanced and provided with a hood adapted to cover or inclose the opening in the top of the generator, a valve or cover by which said opening may be closed when desired, and a gas-burner located at or near the opening, substantially as shown and described.

8. In an apparatus for manufacturing combustible gases, the combination, with adjacent cupolas or generators, as 1 and 2, each being provided with covers or valves, as 15, and stacks or escape-flues, as 34, and steam-coils located therein, of means for supplying air to each or all the generators and steam to each coil, the steam-coil in the stack of one generator being in communication with the adjacent generator, each generator being also provided with means for conveying the gas therefrom, substantially as shown and described.

9. In an apparatus for manufacturing combustible gases, the combination, with adjacent cupolas or generators, each of which is pro-

vided with telescopic stacks or escape-flues, the lower portion of which is counterbalanced and adapted to inclose the opening in the top of the generators through which the hot gases escape, of a steam-coil supported in each stack, the coil in the stack of one generator being in communication with the adjacent generator, each generator being also provided with a cover or valve and means for conveying the gas therefrom, substantially as shown and described.

10. In an apparatus for manufacturing combustible gases, the combination of a series of cupolas or generators, each of which is provided with a steam-supply so arranged as to be heated by the products of combustion or heated gases escaping therefrom, the steam-supply heated by one generator being in communication with another generator, and means for operating the generators and conveying the gas therefrom, substantially as shown and described.

Signed at Saratoga Springs, in the county of Saratoga and State of New York this 31st day of December, A. D. 1890.

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