

(No Model.)

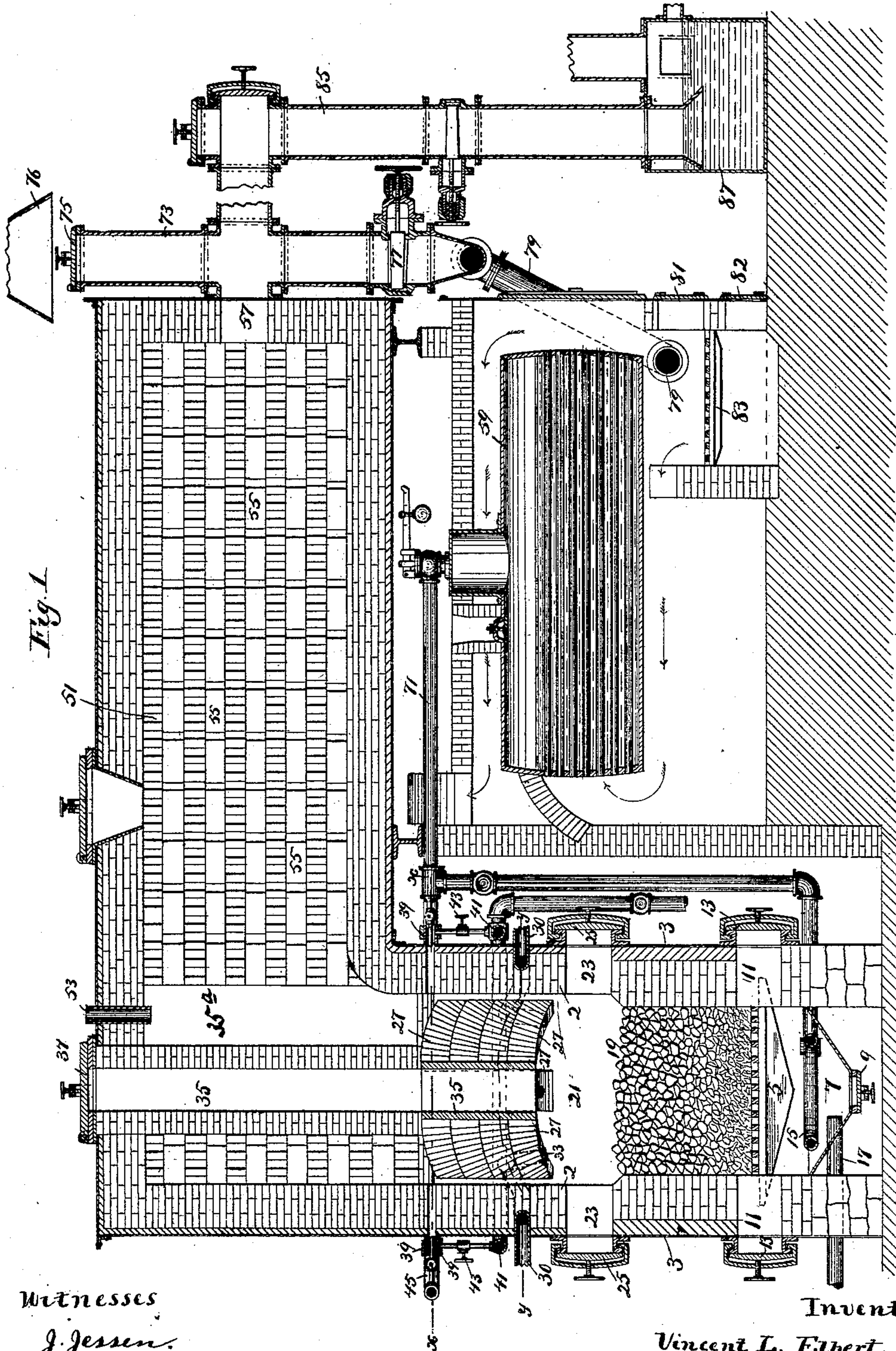
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V. L. ELBERT.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 411,022.

Patented Sept. 17, 1889.



Witnesses

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A. M. Gashill

Inventor.

Vincent L. Elbert.

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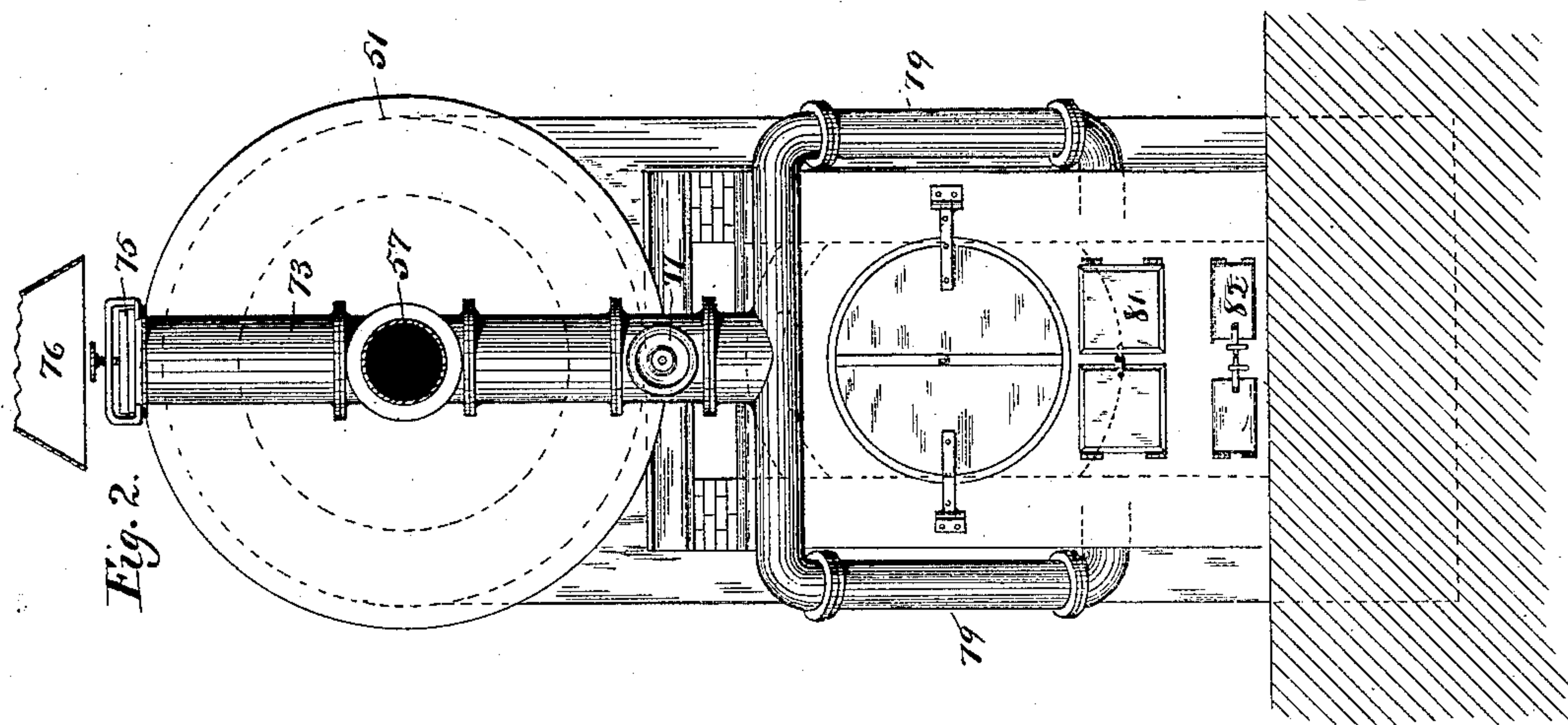
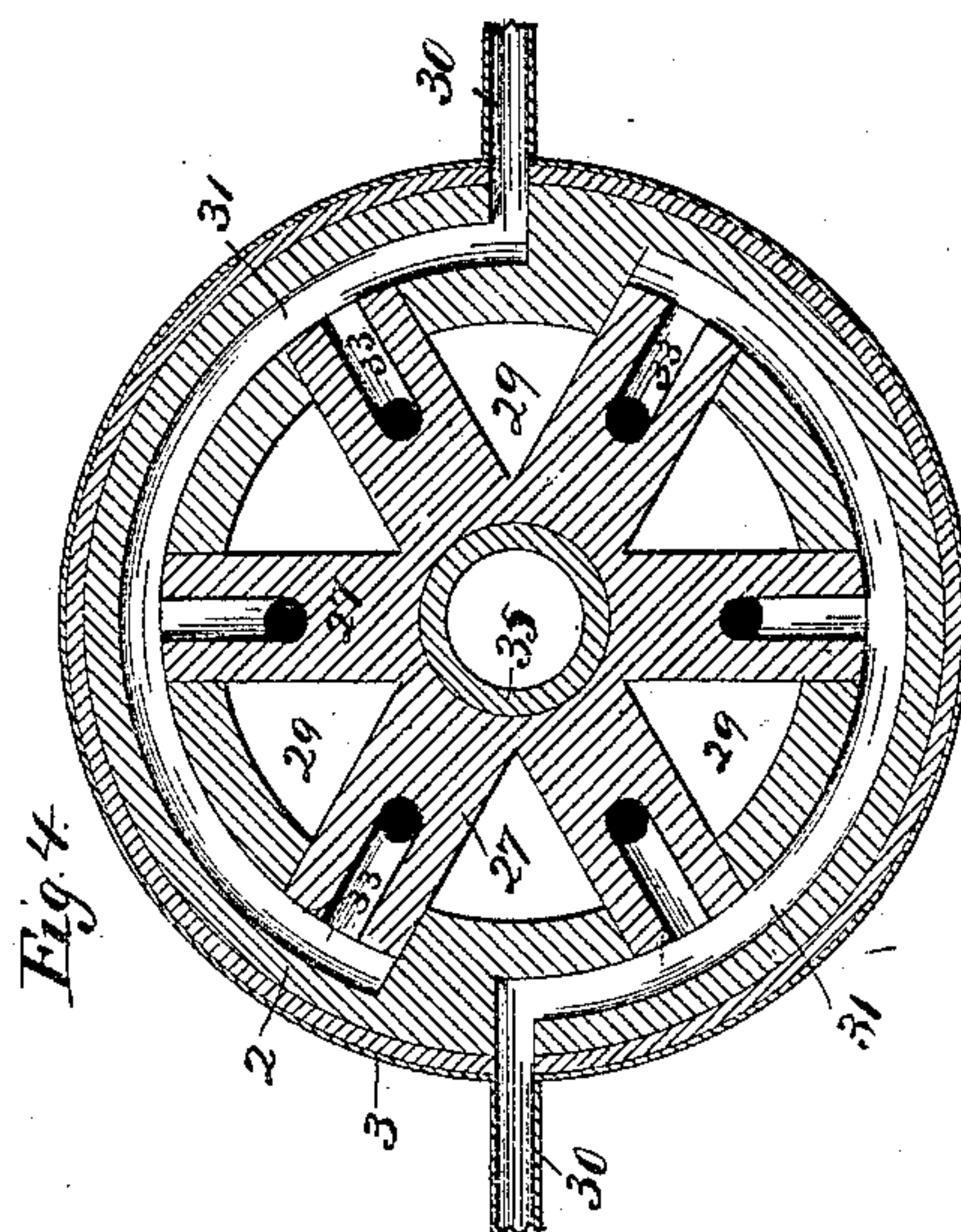
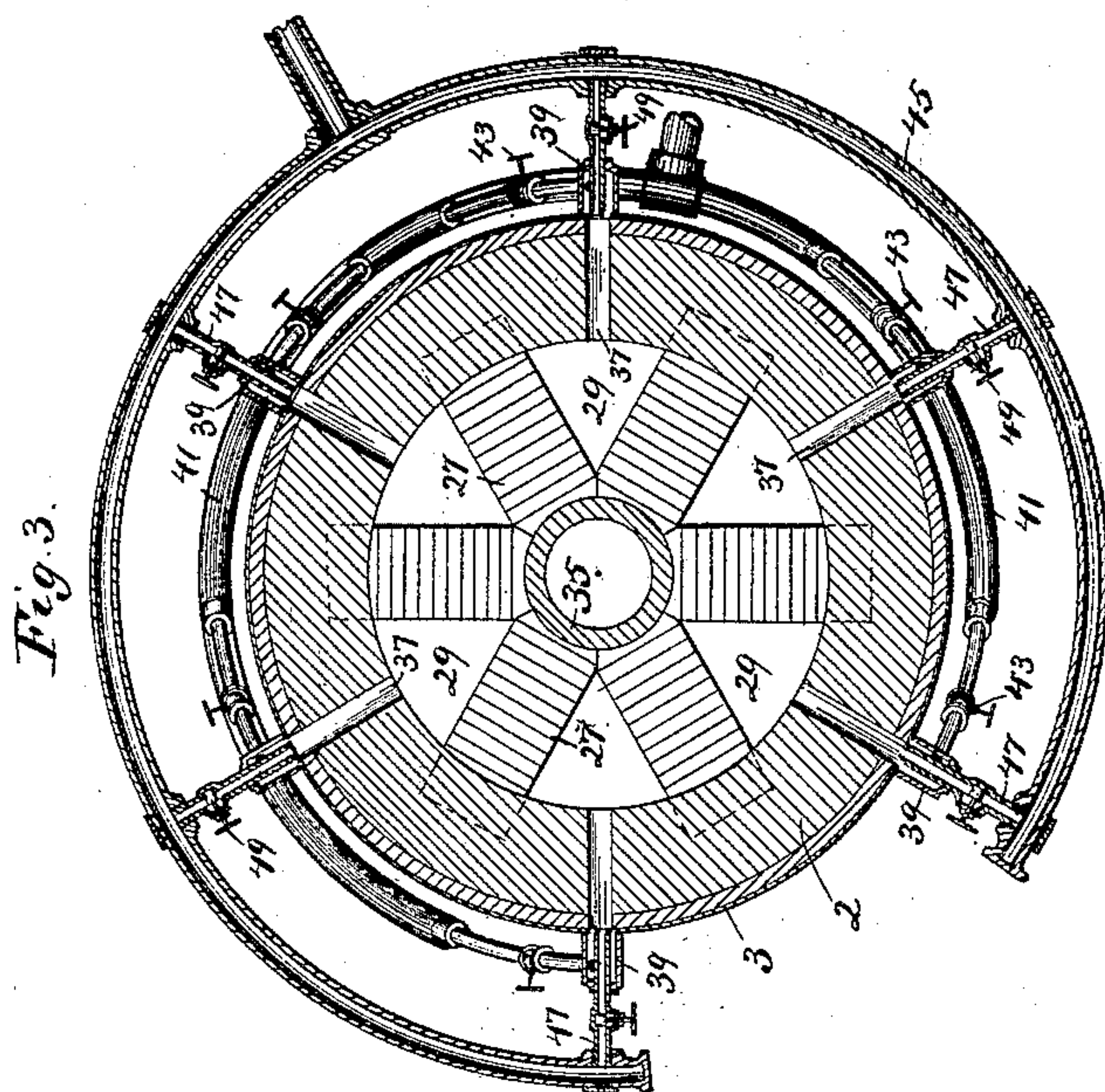
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UNITED STATES PATENT OFFICE.

VINCENT L. ELBERT, OF MINNEAPOLIS, MINNESOTA.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 411,022, dated September 17, 1889.

Application filed January 28, 1889. Serial No. 297,762. (No model.)

To all whom it may concern:

Be it known that I, VINCENT L. ELBERT, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas, of which the following is a specification.

My invention relates to improvements in apparatus for the manufacture of gas, and particularly for the manufacture of water-gas for illuminating purposes or fuel-gas for heating purposes, or for lighting by incandescent burners; and the invention consists, generally, in the construction and combination hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a longitudinal vertical section of my apparatus. Fig. 2 is a front elevation of the same, the seal and the pipe leading thereto being omitted. Fig. 3 is a horizontal section on line x of Fig. 1. Fig. 4 is a horizontal section on line y of Fig. 1.

In the drawings, 2 represents the brick walls of the cupola, which inclose both the combustion-chambers and the superheater. Outside of the wall 2 is a metallic casing 3, which preferably covers the entire outer surface of the structure. The main portion of the structure consists of an upright and preferably cylindrical chamber, to the upper end of which is joined a horizontal and preferably cylindrical chamber, for the purpose hereinafter described.

The lower part of the upright chamber is provided with a grate 5, beneath which is an ash-hopper 7, preferably provided with a lid 9, through which the ashes may be removed when desired.

Openings 11 are preferably provided in the wall of the cupola, preferably opposite the grate 5. These openings are provided with suitable doors 13. Through these doors access may be had to the fire for the purpose of clinkering it or shaking the grate without dumping it.

A steam-pipe 15 and an air-pipe 17 both extend into the space between the hopper 7 and the grate, for a purpose hereinafter mentioned.

Above the grate 5 is the fuel-chamber 19. This chamber may be of any suitable size, and above it is an open space 21, which I designate the "coaling-chamber," and which is provided with openings 23, having the doors 25, which may be used when it is necessary to spread the coal or coke in the chamber, or for any other purpose for which it is necessary to have access to this chamber.

Above the fuel-chamber is arranged the arch or arches 27, provided with a series of legs, between which are the series of passage-ways 29, through which the water-gas must pass after it leaves the fuel-chamber.

Passage-ways 31 extend around the wall of the cupola and communicate with openings 33, which preferably extend about half-way to the center of the arches and open through the under sides of the arches into the top of the coaling-chamber.

Pipes 30 connect with the passages 31, and by this means separate blasts of air may be introduced into the upper part of the fuel-chamber.

A magazine 35 extends from the top of the structure downward through the center of the arches into the top of the chamber beneath the arches.

A suitable door 37 is arranged at the top of the magazine, and through this door and the magazine coal or coke may be supplied to the fuel-chamber.

I also prefer to provide openings 37, which extend through the wall of the cupola and open into the passage-ways or spaces between the legs of the arches 27. Oil-pipes 39 communicate with these openings, and a pipe 41 supplies oil to the pipes 39.

Valves 43 are provided for controlling the supply of oil to each of the pipes 39.

A steam-pipe 45 extends around the outside of the cupola and communicates with a series of pipes 47. These pipes 47 preferably extend centrally through the pipes 39, and thus communicate with the openings 37. Valves 49 may be provided in the pipes 47. The openings 37 extend, preferably, through the wall of the cupola near the tops of the arches 27. They may be a short distance above or below the tops of the arches.

The space above the arches 27 and sur-

rounding the magazine 35 is preferably filled or partially filled with superheater-bricks, and the superheater-chamber proper 51 preferably communicates with this space above the arches and extends horizontally therefrom. This superheater-chamber may be of any suitable size and length. I prefer to leave a space 35^a between the magazine 35 and the end of the superheater-chamber free from brick, as shown in Fig. 1, and to arrange a blast-pipe 53, extending into this space. The superheater-chamber is filled with fire-brick 55, and at the end farthest from the combustion-chamber it is provided with an opening 57 to permit the passage of the gas from the superheater-chamber. In the space beneath the horizontal portion of the superheater I prefer to set a suitable boiler 59, which will be used to supply steam for running the air-blast and for making the water-gas. I prefer to heat this boiler by means of the waste gases from the superheater, as hereinafter described. This boiler may have any preferred setting.

A pipe 71 is connected with the steam-dome of the boiler and conducts steam to the pipes 15 and 45.

The opening 57 in the end of the superheater communicates with the pipe 73, which is provided at its upper end with the door 75 beneath the stack 76 and at its lower end with the valve 77.

Beneath the valve 77 the pipe 73 connects with the pipe 79, which extends through the walls of the furnace into the space beneath the boiler, either above or below the grate.

The fire-box is provided with the usual doors 81 and 82 and with a grate 83, so that other fuel may be used for heating the boiler when desired.

To the pipe 73, preferably directly opposite the opening 57, is connected a suitable pipe 85, which leads to the usual seal 87.

The means for supplying the air-currents to the pipes 17, 30, and 53 I have not shown, as any suitable means may be used for this purpose.

The operation of making gas with my apparatus is as follows: The fuel-chamber is filled with coal or coke, which is heated to incandescence by the primary blast of air which enters the space beneath the grate through the pipe 17, from whence it passes up through the body of coal into the coaling-chamber.

For a time the gas after passing through the superheater will be permitted to escape through the door at the top of the pipe 73. After a time this door will be closed and the gases will be burned in the cupola. The carbonic-oxide gas passing from the fuel-chamber meets the secondary air-blast, which passes through the openings on the under side of the arches. This secondary air-blast being distributed in this way around the top of the fuel-chamber, supplies the necessary oxygen for the combustion of the carbonic-oxide gas. The heated gases pass through

the spaces between the arches and into and through the superheater. The secondary air-blast will not usually furnish enough oxygen for the combustion of the entire amount of carbonic-oxide gas that will pass from the fuel-chamber directly after a fresh supply of coal has been added. In this case a third or complementary air-blast is introduced into the chamber above the arches through the pipe 53. The products of the combustion pass through the fixing-chamber or superheater and raise the fire-brick therein to the required temperature. After passing through the superheater, the products of combustion are led through the pipe 73 and the pipe 79 into the fire-box of the boiler, and are utilized in generating steam in the boiler. After the fuel in the fuel-chamber has been brought to the proper state of incandescence and the fire-brick in the fixing-chamber to the desired temperature the air-blasts are shut off, the valve 77 is closed, and the valve in the pipe 85 is opened. Steam is then supplied from the boiler and pipe 71 to the pipe 15 beneath the grate 5. It passes from this pipe through the grate and up through the mass of incandescent fuel. The steam is decomposed and the hydrogen unites with the carbon of the coal, forming a water-gas. This gas passes up through the separate passage ways or spaces between the legs of the arches, and while in these passage-ways it meets the hydrocarbon vapor from the crude oil or naphtha that is supplied to the pipe 39. The hydrocarbon and the water-gas are intimately mixed and pass together into the superheater, where they are dried or fixed into a permanent gas of any desired candle-power, and from the superheater it passes to the seal through the pipe 35. The hydrocarbon vapor may be forced through the pipes 39 by a steam-pump or by hydrostatic pressure, and as it passes through the walls of the cupola a small stream of steam is passed with it, thereby completely vaporizing the hydrocarbon and combining with any solid carbon which may adhere to the superheater-brick.

One of the main objects of this apparatus is to save all the heat possible by utilizing it in every way, and thereby to obtain a saving of the coal both under the boiler and in the cupola. In addition to the saving obtained by using the waste gases from the superheater for heating the boiler there is also considerable saving from direct radiation from the arrangement of the boiler beneath the superheater.

This apparatus may, if desired, be used for the manufacture of fuel-gas for heating purposes only.

I claim as my invention—

1. In an apparatus for the manufacture of gas, the combination, with a combustion-chamber and a superheater, of radiating arches between said combustion-chamber and superheater formed with openings 33, extending vertically and laterally through the leg of

said arches, passage-ways 31, extending around the wall of the cupola and communicating with said openings 33, and pipes 30, connecting with said passage-ways for forcing separate
5 blasts of air through said openings into the combustion-chamber, substantially as and for the purposes set forth.

2. In an apparatus for the manufacture of gas, the combination, with a combustion-chamber and a superheater connected therewith,
10 of a series of arches above said combustion-chamber, with passages between the legs of the arches for the passage of gases from the combustion-chamber to the superheater, and
15 a magazine 35, extending downward through said arches and opening into said combustion-chamber, substantially as described.

3. In an apparatus for the manufacture of gas, the combination, with a cupola having a combustion-chamber and arches over
20 said combustion-chamber, having passages between the legs of the arches for the flow of gases from the combustion-chamber, of a horizontal superheater-chamber connected with the cupola above said arches, a boiler arranged under-
25 neath said superheater-chamber, the pipe 73, communicating with the end of said superheater-chamber, and the pipe 79, connecting said pipe 73 with the space beneath the boiler,
30 whereby the waste gases from the superheater-chamber may be used to heat said boiler, and thus supply steam for the cupola, and the ra-

diated heat of the boiler is utilized in heating the superheater-chamber, substantially as described.

4. In an apparatus for the manufacture of gas, the combination, with the cupola 2, having the combustion-chamber 1, the series of arches 27, the fuel-magazine 35, extending
35 through said arches, steam and oil pipes opening into the passages between the legs of said arches, and air-passages in said arches opening
40 into the combustion-chamber, of the superheater-chamber 51, connected with the cupola and arranged with an inclosed space 35^a be-
45 tween said chamber and magazine 35, and the air-pipe 53, opening into said space, substantially as and for the purposes set forth.

5. In an apparatus for the manufacture of gas, the combination, with the cupola 2, of
50 the horizontal superheater-chamber 51, arranged at one side of the cupola, the boiler 59, arranged underneath the superheater-chamber, the pipe 79, adapted to convey the waste gases of the superheater underneath the
55 boiler, and the pipe 71, arranged to convey steam from said boiler to the steam-pipes of the cupola, substantially as described.

In testimony whereof I have hereunto set my hand this 20th day of November, 1888.

VINCENT L. ELBERT.

In presence of—

T. D. MERWIN,

A. C. PAUL.