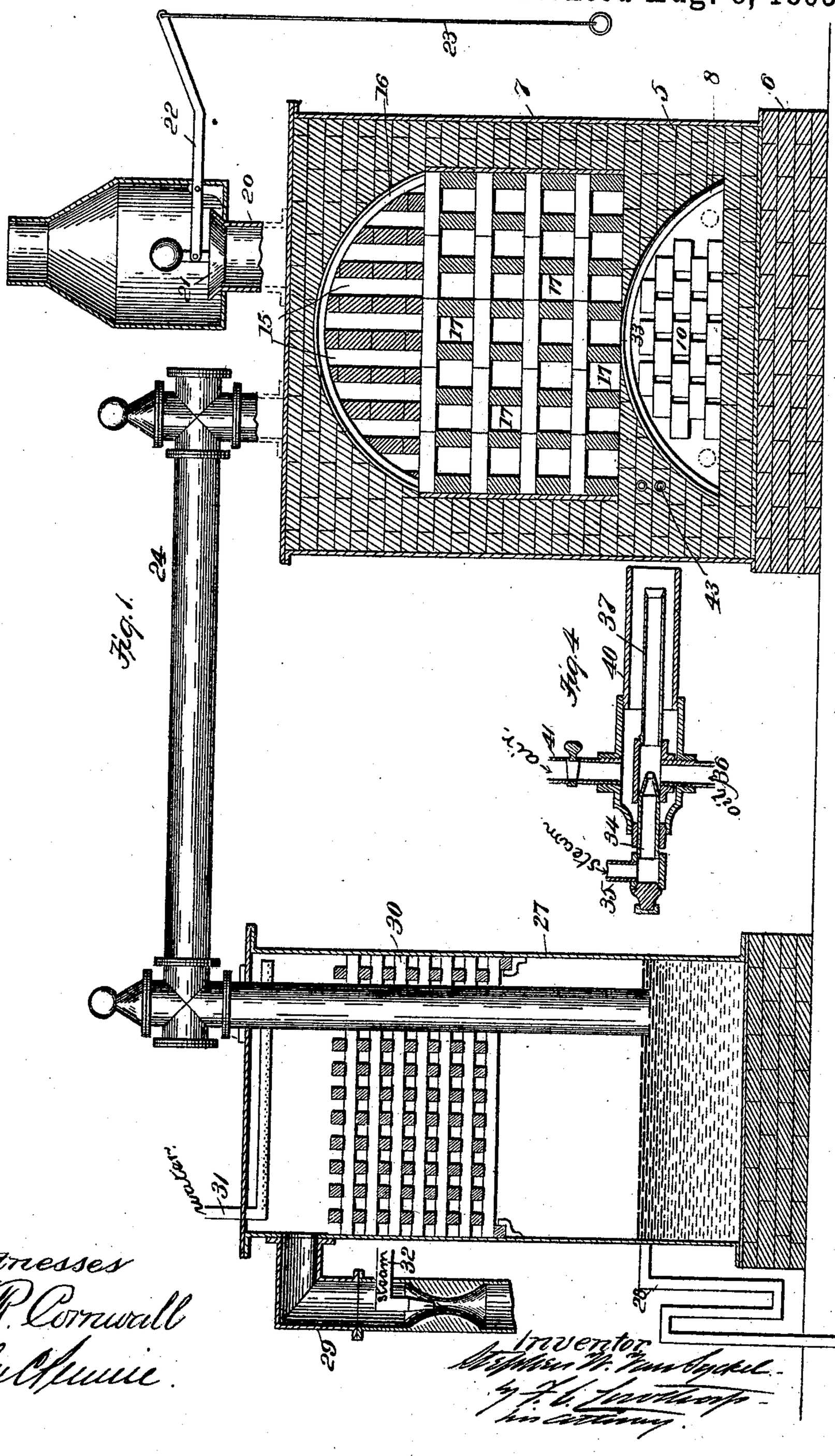
(No Model.)

2 Sheets—Sheet 1.

S. W. VAN SYCKEL.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 502,791. Patented Aug. 8, 1893.



Witnesses
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John C. Purnell.

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his attorney.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 3

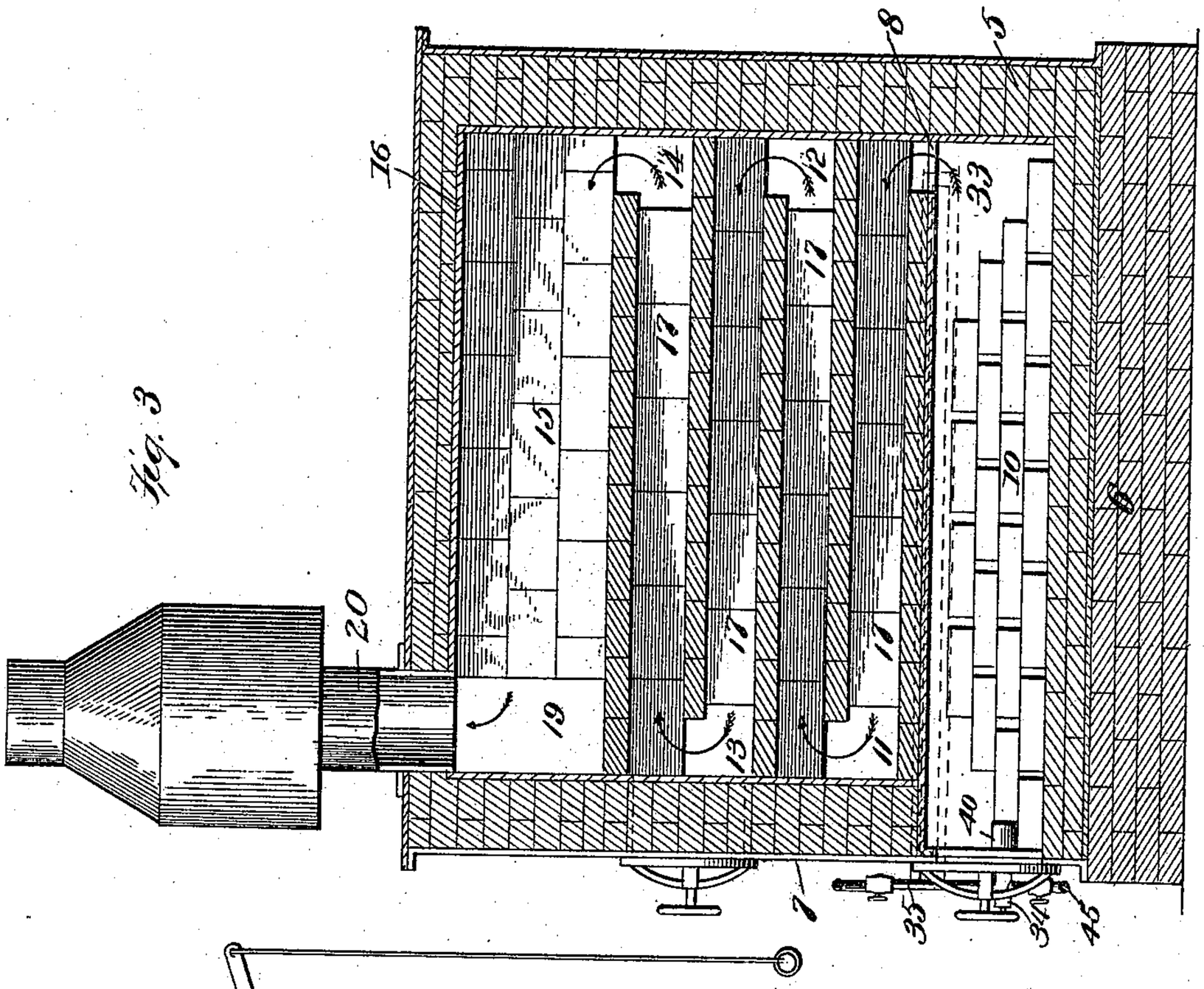
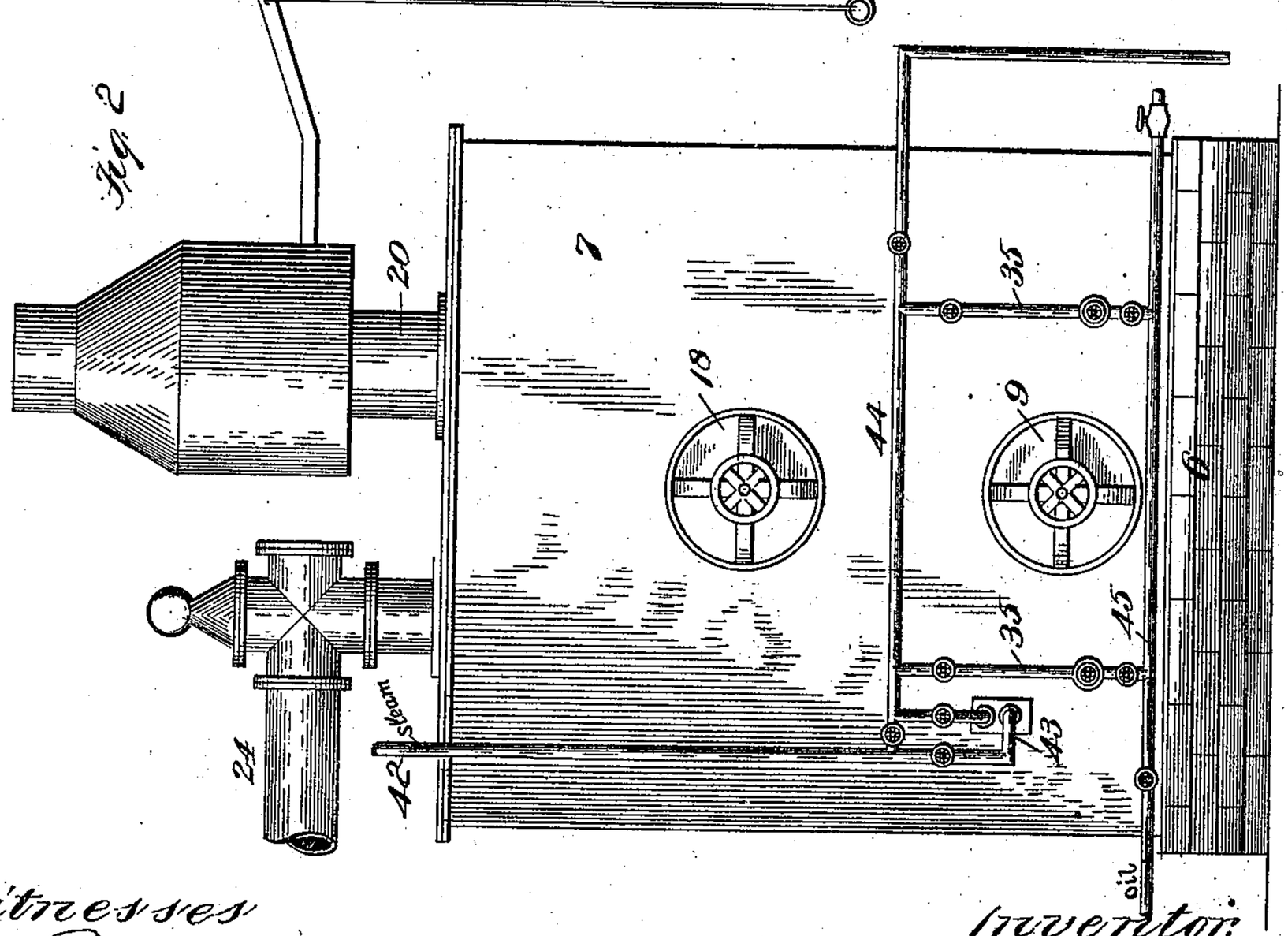


Fig. 2



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Inventor:
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by F. P. Cornwall
his attorney.

UNITED STATES PATENT OFFICE.

STEPHEN W. VAN SYCKEL, OF HOPEWELL, NEW JERSEY.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 502,791, dated August 8, 1893.

Application filed February 11, 1892. Renewed January 11, 1893. Serial No. 458,024. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN W. VAN SYCKEL, a citizen of the United States, residing at Hopewell, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas; and I 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.

My invention relates to certain new and useful improvements in apparatus for the manufacture of gas for illuminating and heating purposes; and more particularly to the manufacture of gas from oil and steam.

The practice of my invention involves an alternating process, such as that described in the United States Patent No. 454,531, of June 23, 1891, granted to me as the assignee of Charles Stilwell, and wherein the interior of the gas-generating chamber and its contents of refractory material are first brought to a high degree of incandescence by the active combustion therein of a steam-injected oil blast, and the heat thus absorbed or stored up within the furnace is employed, in the second stage of the operation, after combustion has ceased, in generating gas from a like steam-injected blast; the heating-up stage and the gas-generating stage of the operation alternating during the furnace run.

My present invention involves improvements in the apparatus employed for carrying out this alternating process.

In the accompanying drawings, Figure 1 represents a cross-sectional view of a gas-generating furnace, embodying my invention, together with its accessory scrubber and exhauster, some of the parts being shown in elevation. Fig. 2 represents a front elevation of the gas-generating furnace. Fig. 3 represents a longitudinal section and partial elevation of the same; and Fig. 4 represents, in longitudinal section, and on a larger scale, the construction of the preferred form of burner or injector used in connection with my invention.

Similar numerals of reference indicate similar parts throughout the several views.

Referring to the drawings, 5 indicates the brick lining or masonry work of a gas generator, mounted upon a suitable foundation 6, and provided with a gas-tight metallic casing 7. At the bottom of the generator, is a basal chamber formed by the arch 8, and accessible by means of the closing plate 9. Within this basal chamber is contained a body of refractory checker-work fire-brick 10, piled up as shown so as to present a large heating surface. At its extreme end the basal chamber communicates with the proximate ends of a set of horizontal multiple flues located side by side, and discharging into a cross-flue 11 which in turn communicates with the ends of a similar set of horizontal multiple flues, discharging into a like cross-flue 12. Additional superposed sets of horizontal multiple flues having connecting cross-flues 13, 14, are likewise arranged within the generator, the several superposed sets of multiple flues being thus connected in zig-zag order back and forth across the generator. It will be noted that the flooring or horizontal partitions between the sets of flues are made up of single courses of fire-brick, laid upon their flat faces, and that the dividing walls between the members of each sets of flues are made up of single courses of fire-brick set edge-wise and spaced apart so as to form the flues. In this manner, I am enabled to provide flues of the desired uniformity and regularity, the work of construction being of great simplicity, and involving a minimum amount of skill and labor on the part of the workmen employed to build up or repair the flues. At the same time, the multiple flues expose a large heating surface to the passage of the gases and products of combustion passing through them in the operation of the invention.

At the upper part of the furnace, I construct a super-heater consisting of a series of flues connected with the cross-flue 14, and of varying heights. These flues 15 are surmounted by an arch 16, and the partitions between the said flues present a largely increased extent of heating surface to that of any one of the sets of horizontal multiple flues 17 below them. They are located at the point where the products of combustion leave the generator, and, by reason of the large extent of heating surface referred to, they absorb and retain a very large amount of heat, while at the same time not materially interfering

with the draft of the generator, as would be the case if the smaller flues below were continued in zig-zag order to the full height of the generator. The dividing walls, moreover, serve as an additional means of support to the arch 16, and thereby add strength and stability to the general structure.

The casing 7 is provided with a removable plate 18, upon whose removal, the flues may be made accessible for repairs, by breaking down and removing a part of the masonry at the front of the generator. The flues 15 discharge into a cross-flue 19 from which projects a stack 20, for discharging the products of combustion into the atmosphere, said stack being provided with a weighted valve 21 having a pivoted lever 22 and operating rod 23, whereby the stack may be closed gas-tight during the gas-making stage of the operation. A gas exit pipe 24 also communicates with the said cross-flue 19. The gas-exit pipe 24 enters a suitable scrubber, as 27 and dips below the water-level therein as shown, said water level being kept constant by a seal 28. In the form of scrubber illustrated in the drawings the gas on its way to the pipe 29 leading to the holder, is broken up by the grid-like structure 30, made up of wooden bars laid in alternate courses opposite in direction and spaced apart as shown. A perforated spray pipe 31 distributes a shower or spray of water upon the structure 30 and the gases rising through it, and effects the condensation and removal of condensible and sooty particles from the gas. To establish and maintain a proper exhaust during the gas making stage of the operation, I employ a steam jet 32 within the pipe 29 and located in front of a contraction in said pipe.

Within the basal chamber or combustion chamber 33, I insert the discharge ends of two injector burners, preferably of the type illustrated in Fig. 4. I do not confine myself to the specific form of injector burner shown, as I may employ a different arrangement of oil and steam injector than that illustrated. I prefer, however, the employment of the particular injector referred to, as I have secured the best results when employing the same. The injector consists of a steam jet 34 supplied from a steam pipe 35, said steam jet having its discharge orifice located above an oil supply pipe 36 so as to draw oil up from said pipe and project it into the oil and steam mixing pipe 37. The pipe 37 is surrounded by a concentric pipe 40 supplied with air, preferably preheated by means of the pipe 41. With a given steam pressure, this injector burner can be set to supply a flame of the desired calorific power.

The steam supply may be derived from any suitable generator and is supplied through a pipe 42 which is provided with a continuation 43 embedded in the masonry of the generator above the arch of the basal chamber 33; so that the steam in passing through the pipe extension 43 will be heated to a high temperature, but without 43 being brought into contact with the products of combustion so as to be oxidized thereby. A branch pipe 44 from the steam supply pipe connects with the depending pipes 35 leading to the injector burners, and a pipe 45 supplies crude petroleum or other liquid hydrocarbon of a like character to the oil inlet pipe of the injector burner. It will be noted that suitable valves are provided for controlling, regulating or entirely cutting off the flow of steam or oil through the several pipes, according to the necessities of the case.

The operation of the invention is as follows: The stack valve being opened, a small fire is started in the combustion chamber 33 by means of waste or other material. Steam is then admitted through the inlet pipe 42, super-heater 43, branch 44 and depending pipes 35, into the injector burners. The steam draws in oil from the oil supply pipes of the injector burners, and together with said oil issues through the opening in front of the jet nozzle, and finally issues into the combustion chamber, drawing in with it a quantity of air through the surrounding air pipe. The mingled jet of steam, oil and air becomes ignited and produces a flame of intense heat. The supply of air, may, if desired, be further increased by opening the door of the combustion chamber to a greater or less extent. The flame from the injector burners strikes the mass of checker-work fire-brick within the combustion chamber and rapidly brings it to a high state of incandescence, generally approximating a cherry-red heat, and sometimes exceeding that degree, according to the particular character of the hydrocarbon employed. The products of combustion pass from the combustion chamber in a zig-zag direction through the super-posed sets of multiple flues 17 and in their passage through said zig-zag sets of multiple flues, they give up to the walls thereof a great quantity of heat; the products of combustion then pass through the single set of super-heater flues 15 imparting to the more extended surface of the latter practically all of their remaining available heat, and finally passing out through the stack into the atmosphere. When the apparatus is brought to the requisite degree of heat for decomposing steam and oil and recombining their constituent elements into permanent fixed gases, the supply of steam, oil and air is temporarily cut off from the combustion chamber, thereby extinguishing the fire therein. The door to the combustion chamber and the stack-valve are also closed, and thereupon steam and oil, but not air, is admitted through the injectors into the combustion chamber. The jets of steam and oil thus admitted strike the highly heated refractory material in the combustion chambers and are decomposed thereby into gases which pass through the flues 17 and 15, and the exhauster is put in operation. The gas thereupon passes to the scrubber and thence

into the gas holder. The gas on its passage through the flues 15 and 17, becomes fixed and combined into permanent gas of high candle power. At the conclusion of the gas-making run, which generally lasts from about twenty to twenty-five minutes, under normal conditions, the apparatus is heated up as before, preliminary to a succeeding gas-making run. The apparatus is thus used alternately in preparing for the making of gas, and in the actual making and storing of the gas.

Having thus described my invention, what I claim is—

1. A gas generator, provided at its base with a combustion chamber having a filling of refractory material; a series of superposed sets of horizontal multiple flues communicating with the combustion chambers, the members of each set being arranged side by side, and opening at their ends into a cross flue which in turn communicates with the proximate ends of the next succeeding set; a superheater composed of a set of multiple flues having flue-walls of varying heights, surmounted by an arch; and oil and steam supply pipes entering the combustion chamber; substantially as described.

2. A gas generator, provided at its base with a combustion chamber, having a filling of refractory material; a series of superposed sets of multiple horizontal flues the flooring between each set being made up of single courses of fire-brick, and the side walls of the flues being made up of single courses of fire-brick arranged between the floorings and spaced apart to form the flues; cross-flues at alternately opposite ends of the multiple horizontal flues thereby connecting the sets in zig-zag order; a super-heater composed of a set of multiple flues separated from each other by fire-brick walls of varying heights, surmounted by an arch; and oil and steam supply pipes entering the combustion chamber; substantially as described.

3. A gas generator, provided at its base with a combustion chamber surmounted by an arch and having a filling of refractory material; a steam pipe, having a portion of its length embedded in the generator above said arch, so as to be subjected to heat therefrom but protected from the products of combustion, and having a branch extending along in front of the generator and depending pipes from said branch; oil injector burners entering the combustion chamber and supplied with steam by the depending pipes; an oil pipe for supplying oil to said injector burners; superposed sets of multiple flues communicating with the combustion chamber and connected in zig-zag order; and a superheater composed of a set of multiple flues having flue-walls of varying height, surmounted by an arch; substantially as described.

4. A gas generator comprising a basal combustion chamber surmounted by an arch and containing refractory material; a superposed series of sets of multiple flues said sets being connected in zig-zag order above said arch; a superheater composed of multiple flues of varying heights surmounted by an arch, and a metallic casing surrounding and inclosing the generator body, substantially as described.

5. In a gas generator, a fixing chamber consisting of sets of multiple horizontal flues arranged above each other in zig-zag order, and a superposed set of flues of varying heights supported by the lower flues, and surmounted by an arch; substantially as described.

6. In a gas generator, a fixing chamber consisting of sets of multiple horizontal flues arranged above each other in zig-zag order and communicating by means of single cross-flues, and a superposed set of flues of varying heights supported by the lower flues, and surmounted by an arch; substantially as described.

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

STEPHEN W. VAN SYCKEL.

Witnesses:

F. C. LOWTHORP,

SAMUEL D. OLIPHANT, Jr.