

No. 879,320.

PATENTED FEB. 18, 1908.

C. H. RIDER.

APPARATUS FOR MANUFACTURING FUEL GAS.

APPLICATION FILED MAY 25, 1907.

2 SHEETS—SHEET 1.

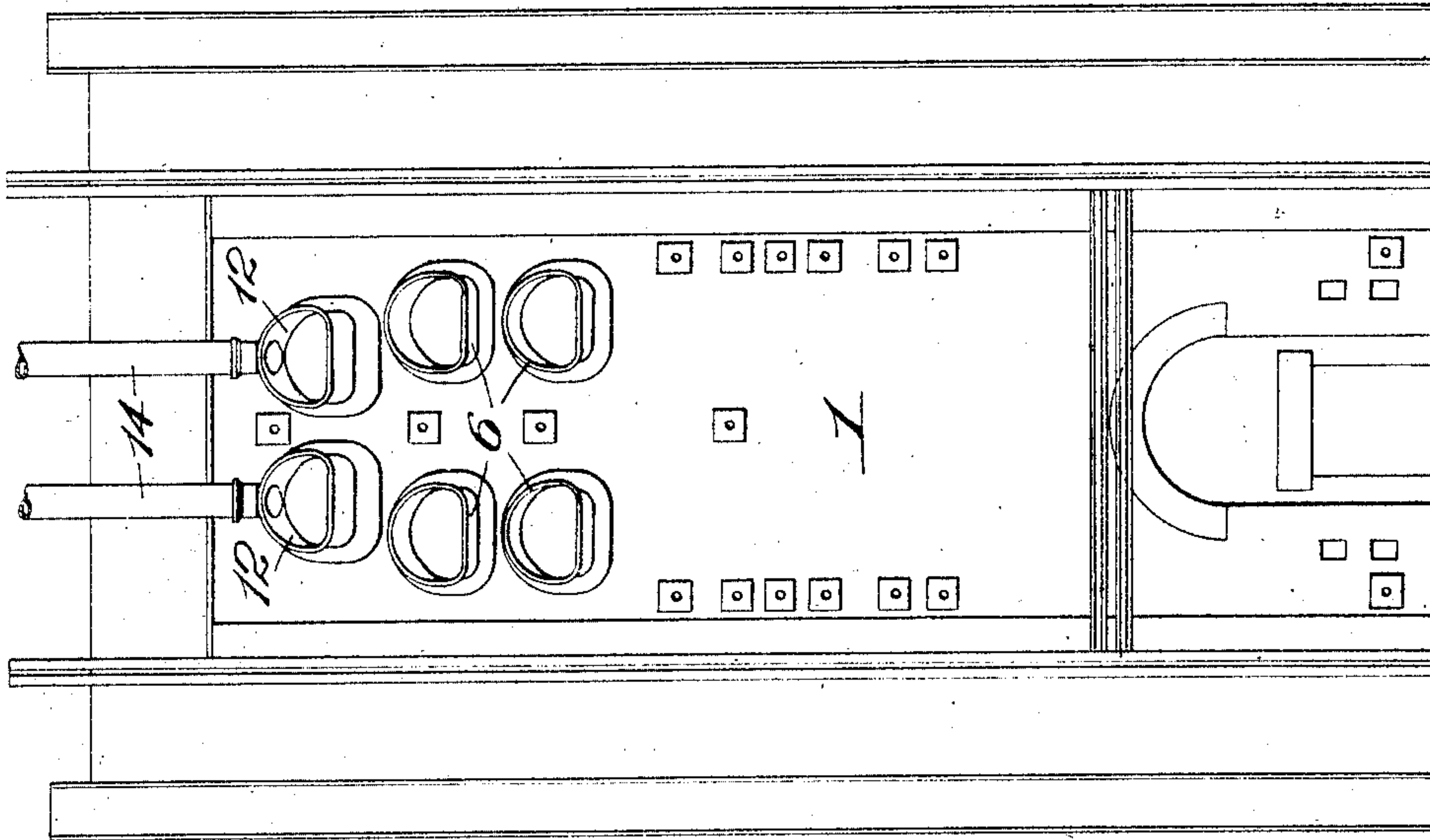
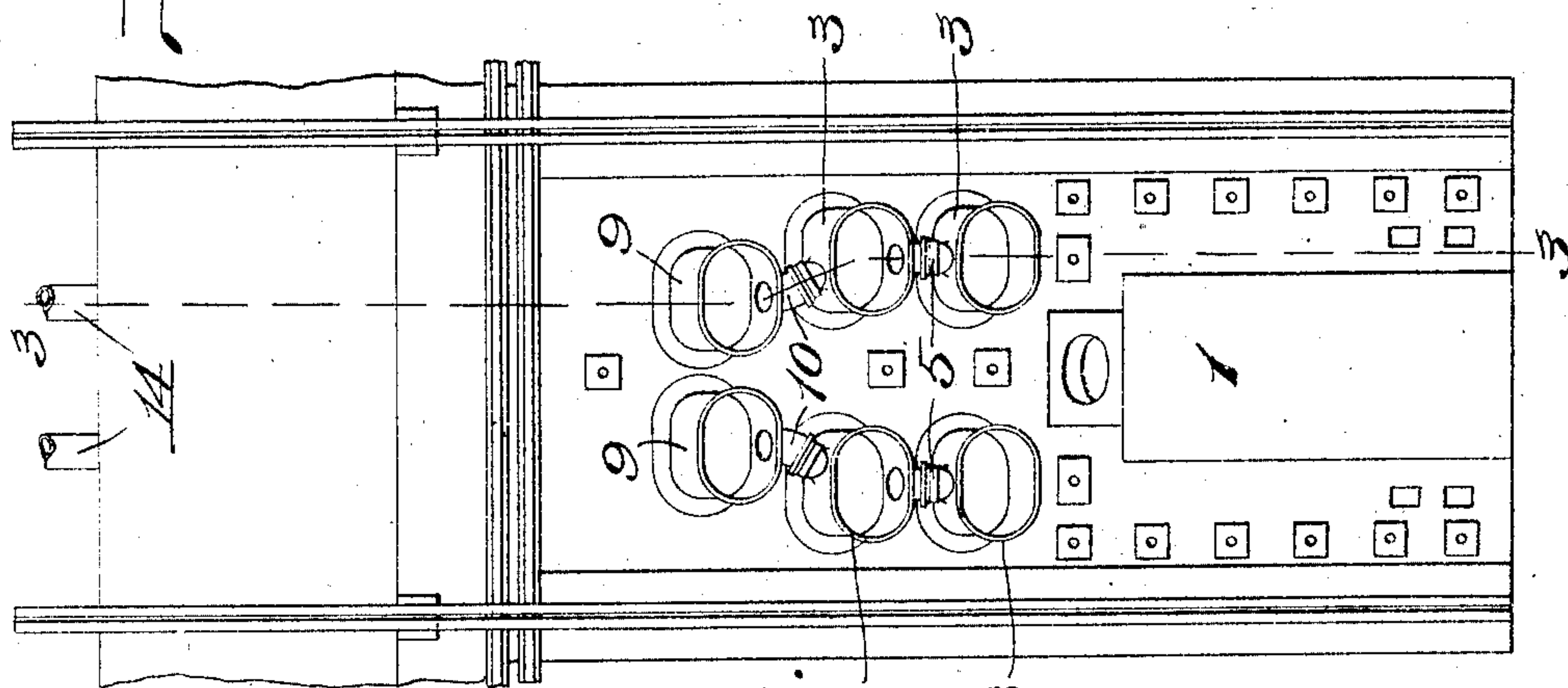


Fig. 2.



Attest,
Edgar J. Farmer:
M. P. Smith

Fig. 1.
INVENTOR.
Charles H. Rider.
By Higdon & Fougan.
Attys.

No. 879,320.

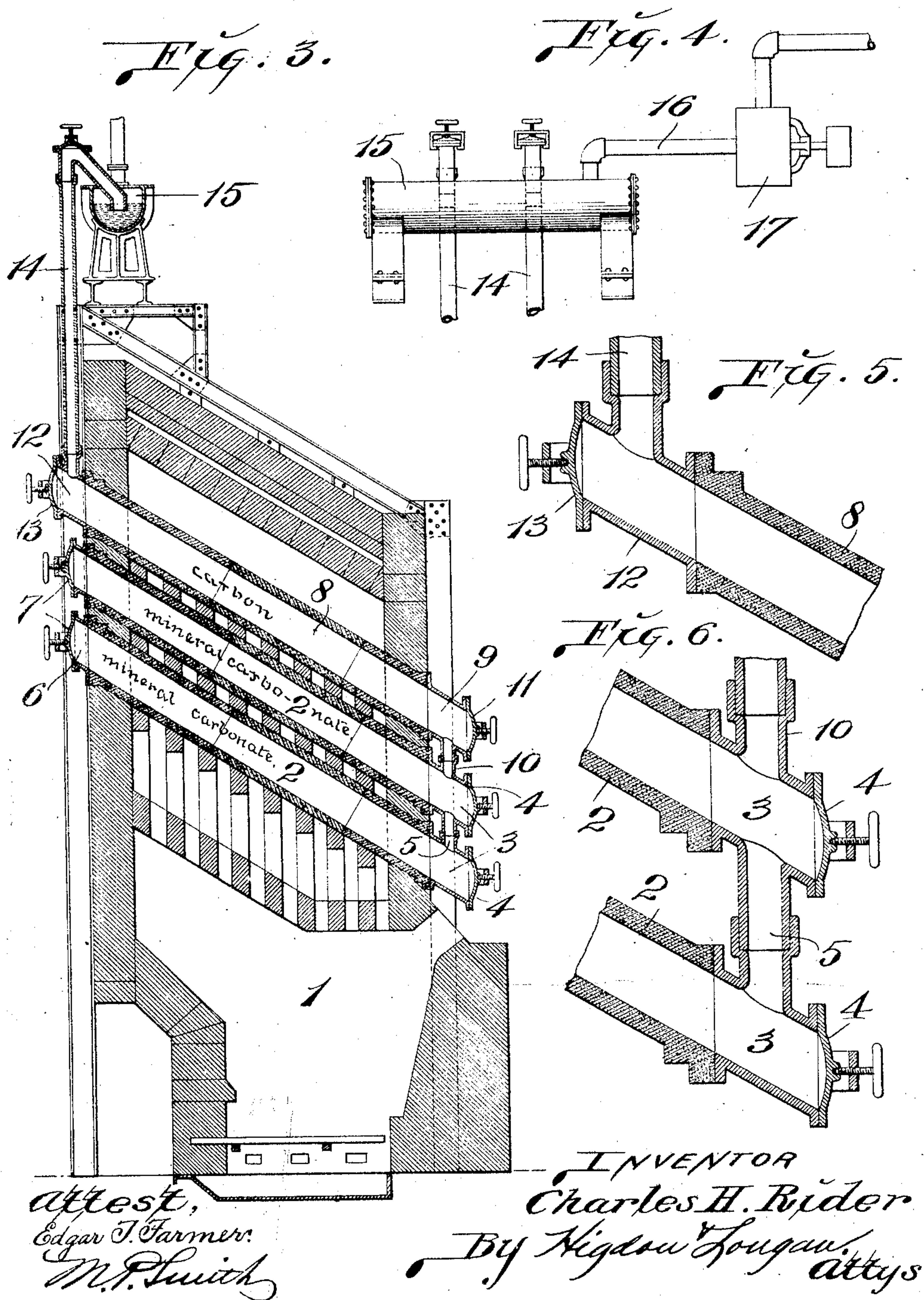
PATENTED FEB. 18, 1908.

C. H. RIDER.

APPARATUS FOR MANUFACTURING FUEL GAS.

APPLICATION FILED MAY 25, 1907.

2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

CHARLES H. RIDER, OF ST. LOUIS, MISSOURI.

APPARATUS FOR MANUFACTURING FUEL-GAS.

No. 879,320.

Specification of Letters Patent.

Patented Feb. 18, 1908.

Application filed May 25, 1907. Serial No. 375,730.

To all whom it may concern:

Be it known that I, CHARLES H. RIDER, a citizen of the United States, and resident of St. Louis, Missouri, have invented certain new and useful Improvements in an Apparatus for Manufacturing Fuel-Gas from Mineral Carbonates and Carbonaceous Materials, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to an apparatus for manufacturing fuel gas from mineral carbonates and carbonaceous materials, and my object being to construct a simple, inexpensive apparatus in the form of a furnace and retorts for thoroughly decomposing the carbonates or carbonaceous material so as to free the carbon dioxide and other non-ignitable gases from the carbonates, and to conduct said gases through a body of heated carbon in order to convert said gases into carbon monoxide, methane, and hydrogen gases, which can be used without further treatment as fuel for gas engines, and the like, or for heating purposes.

A further object of my invention is to arrange a series of air tight retorts and connections in a furnace, which contain the mineral carbonates, and carbonaceous material, from which the gas is extracted and manufactured, which air tight arrangement is necessary in order to completely exclude the air from the mineral carbonates, carbon, and gas, during the operation of manufacturing said gas.

To the above purposes, my invention consists in certain novel features of construction and arrangement of parts, which will be hereinafter more fully set forth, pointed out in the claims, and illustrated in the accompanying drawings, in which:—

Figure 1 is a front elevation of a furnace of my improved construction, with a series or bench of retorts therein; Fig. 2 is a rear elevation of a furnace and retorts; Fig. 3 is a vertical section taken approximately on the line 3—3 of Fig. 1, and showing the connections between the retorts; Fig. 4 is a front elevation of a water trap or seal, through which the gas passes after being manufactured; Fig. 5 is an enlarged vertical section of the rear end of the upper one of the retorts of my improved apparatus; Fig. 6 is an enlarged vertical section taken through the

front ends of the lower pair of retorts of the apparatus.

Referring by numerals to the accompanying drawings:—1 designates the furnace of my improved apparatus, which is of the construction usually employed in gas producers, and arranged in said furnace, in the usual manner, are the pairs of retorts 2, which receive the mineral carbonates from which the gas is extracted; and the forward ends of said retorts are provided with tubular metal fittings 3, the forward ends of which are closed and made air tight by means of plates 4; and said tubular fittings 3 being united by the tubular connections 5.

The rear ends of the retorts 2 are provided with tubular fittings 6, which are closed and made air tight by the removable plates 7.

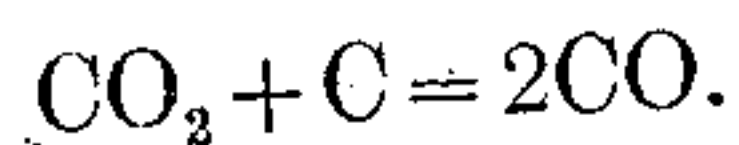
Arranged above the upper one of each retort 2 is a retort 8, which receives carbon, and the forward end of said retort 8 is provided with a tubular fitting 9, which is connected to the upper one of each of the tubular fittings 3 by means of a tubular connection 10.

The forward ends of the tubular fittings 9 are closed and made air tight by the removable plates 11, and arranged on the rear ends of the retorts 8 are tubular fittings 12, the outer ends of which are closed and made air tight by removable plates 13; and leading upwardly from each tubular fitting 12 is a discharge pipe 14. The end of this discharge pipe 14 discharges into a water seal or trap 15, and leading from said trap is a pipe 16, which discharges into a gasometer, or like container, and in which pipe is located an exhaust fan 17, or like device.

When my improved apparatus is in use, limestone, or other mineral carbonate, or carbonaceous material, after being broken, to the desired size, is placed in the retorts 2 until the same are about three-fourths full. Charcoal, or other carbon, coarsely broken, is placed in the retorts 8 in sufficient amount to approximately fill said retorts. The plates 4, 7, 11, and 13 are now tightly seated on the ends of the tubular fittings so as to make the retorts perfectly air tight, and fire is built in the furnace, using any desirable fuel, and the temperature in the retorts is brought to about 1100° F., which temperature is maintained as near as possible until all of the volatile matter has been expelled from the carbonates within the retorts 2,

which operation requires from three to four hours.

During the decarbonization of the mineral carbonates, the exhaust fan 17 is operated continuously so as to remove the gases from the retorts 2 and 8 as fast as generated, thereby hastening the operation, and at the same time preventing an excess pressure against the walls of said retorts. The gases thus generated in the retorts 2 are drawn through the tubular connections 5 and 10, to and through the retorts 8 containing the charcoal, or other carbon; and from thence said gases pass through the discharge pipe 14 into the trap or water seal 15, and from thence through the pipe 16 to the gasometer, from whence said gas may be drawn off and used as desired. During this operation, the generation of non-ignitable carbon dioxide is almost completely prevented by excluding the air from the retorts during the decarbonization of the carbonates, and whatever carbon dioxide is formed is completely converted into carbon monoxide during its passage through the red hot charcoal, or other carbon contained in the retorts 8, owing to the total absence of air, as shown by the reaction:—



Owing to the moisture and water of crystallization and organic impurities contained in nearly all limestone or other mineral carbonates, there is formed during this treatment of the carbonates a compound gas, composed of carbon monoxide, methane, hydrogen, and a small amount of nitrogen; of an average composition approximately as follows: carbon monoxide, (CO) 88% to 90%; methane, (CH₄) 1% to 3%; hydrogen, (H₂) 3% to 5%; nitrogen, (N₂) 4% to 6%. In generating this gas during the manufacture of Portland or other cement, wherein the process calls for a mixture of calcium carbonate, aluminates, silicates, and coal, as is used in some of the processes for manufacturing Portland cement, the

material is placed in the retorts as above described and the heat is raised to the desired degree to form "clinker," the gas being conducted through the apparatus as previously described.

I have found by actual working of the process and by analytical tests that a ton of ordinary limestone produces from 13000 to 15000 cubic feet of gas, showing heating power by analysis to be 320 British thermal units, and a by-product of anhydrous calcium oxide, weighing from 1125 to 1140 pounds.

The retorts 2 being connected at their forward ends only to the retorts 8, necessarily cause all of the gas generated from the carbonates to pass through the retorts 8 containing the carbon, thereby completely converting the carbon dioxide into carbon monoxide.

I claim:

An apparatus of the class described, comprising a furnace, a pair of inclined retorts arranged therein and which retorts are filled with mineral carbonates, air tight fittings arranged on the ends of the retorts, there being a tubular connection between the air tight fittings at the lower ends of the retorts, a third inclined retort arranged in the furnace adjacent the first mentioned retorts, and which third retort receives carbonaceous material, air tight fittings arranged on the ends of the third retort, there being a tubular connection between the air tight fitting on the lower end of the third retort and the air tight fitting on the upper one of the first mentioned pair of retorts, a pipe leading from the air tight fitting on the upper end of the third retort, a water seal arranged in said pipe, and a suction device arranged in said pipe.

In testimony whereof, I have signed my name to this specification, in presence of two subscribing witnesses.

CHARLES H. RIDER.

Witnesses:

M. P. SMITH,
E. L. WALLACE.