

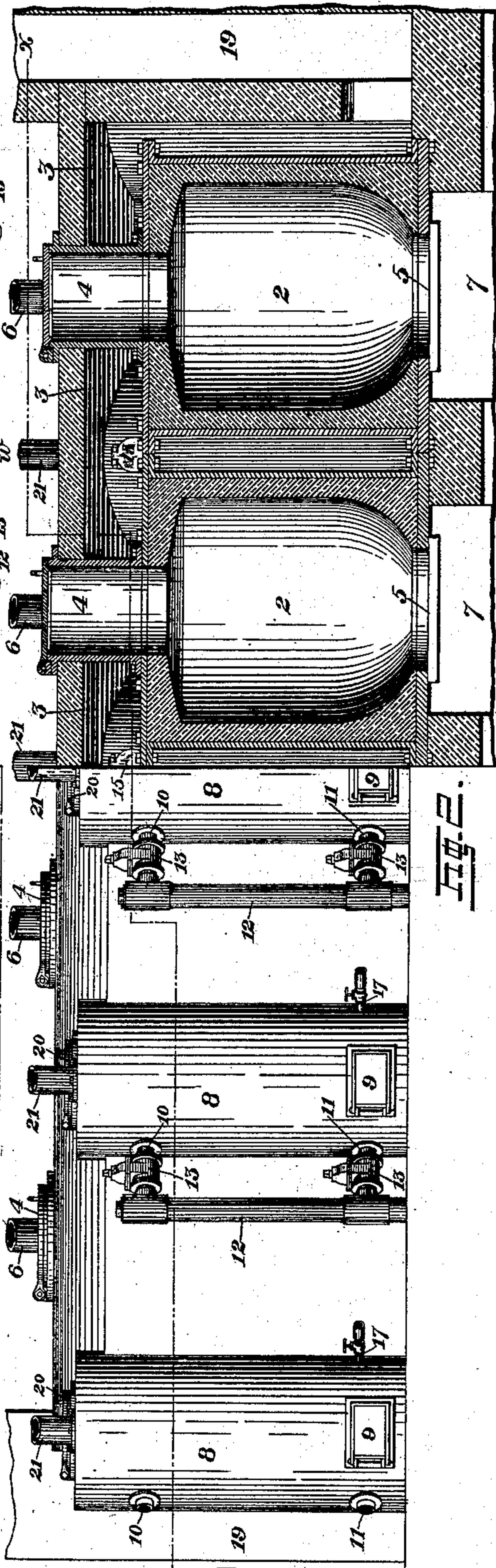
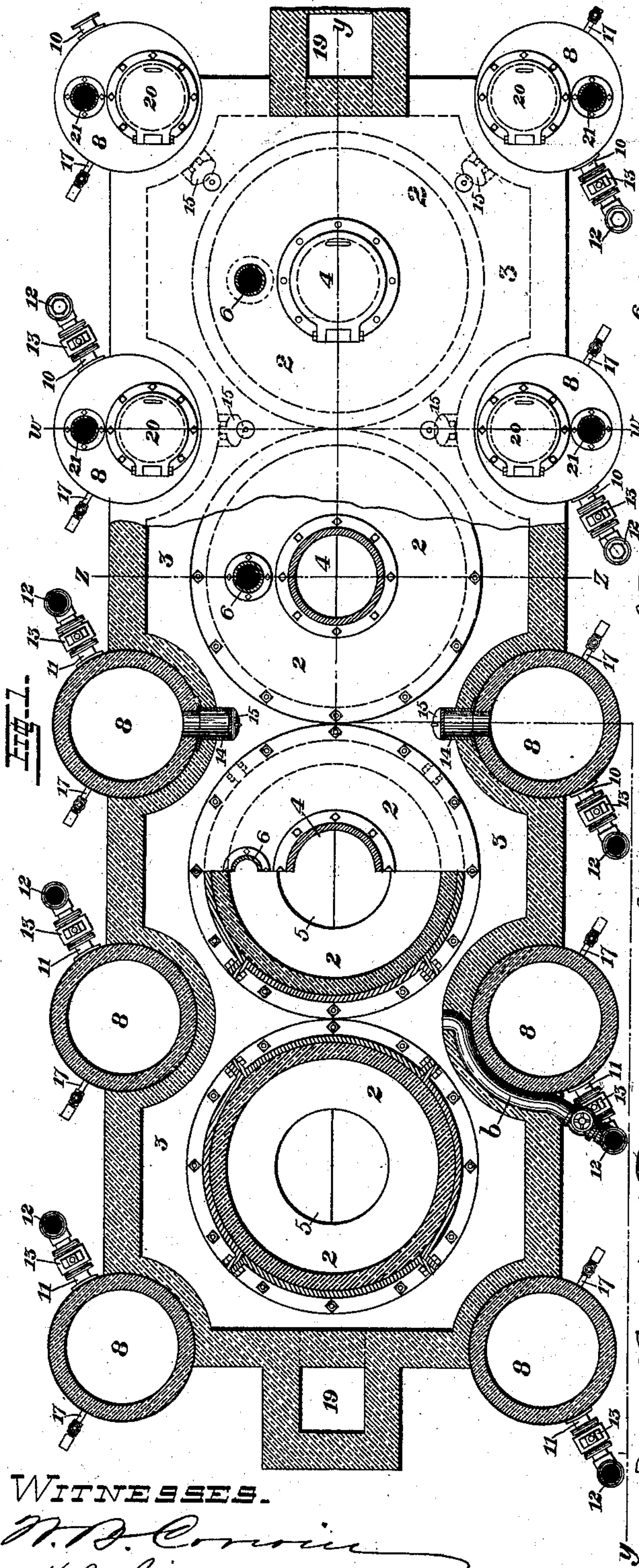
(No Model.)

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APPARATUS FOR THE MANUFACTURE OF GAS.

No. 406,819.

Patented July 9, 1889.



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INVENTOR.

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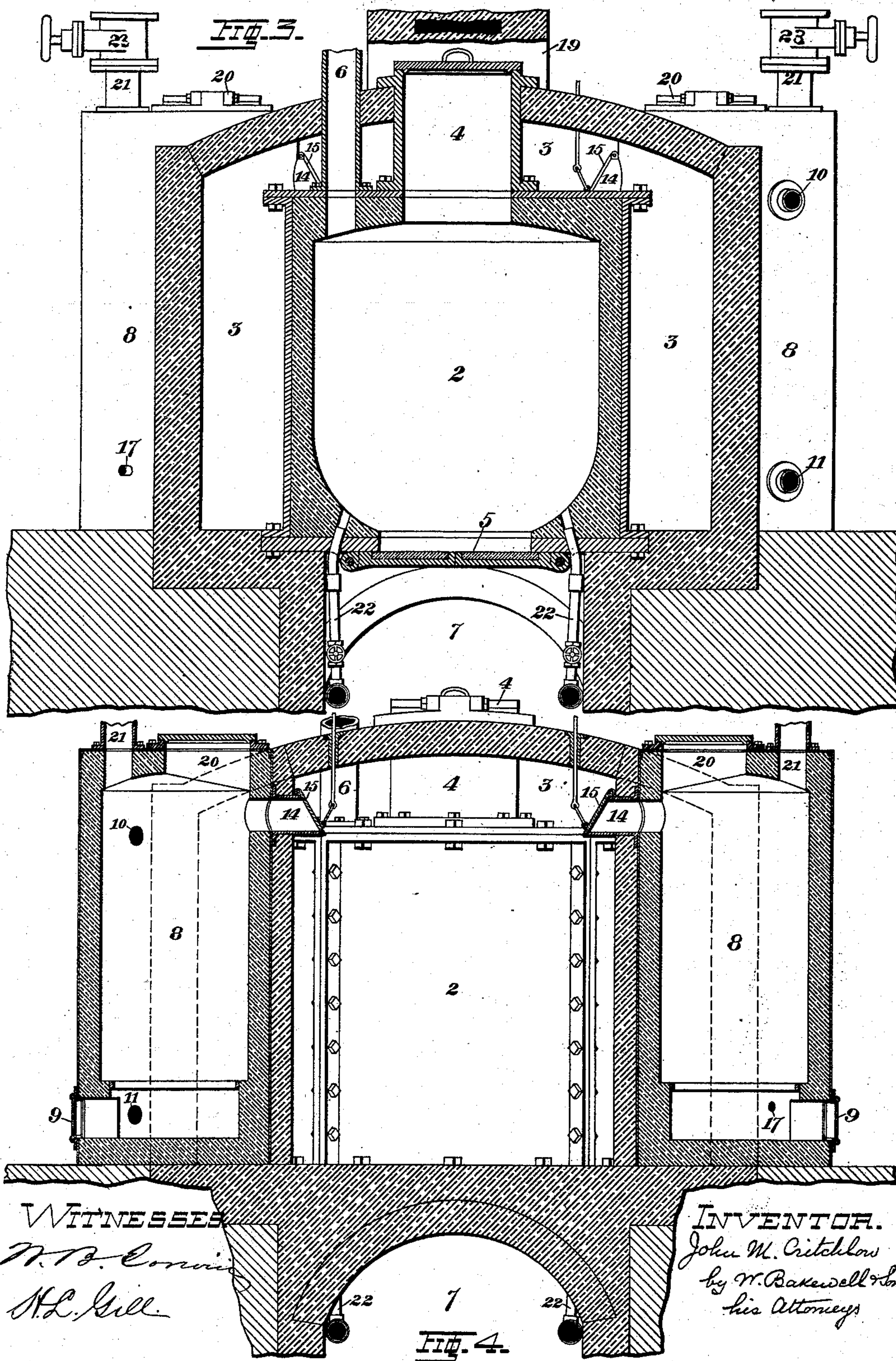
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UNITED STATES PATENT OFFICE.

JOHN M. CRITCHLOW, OF BEAVER FALLS, PENNSYLVANIA, ASSIGNOR OF
ONE-HALF TO ERASTUS T. ROBERTS, OF TITUSVILLE, PENNSYLVANIA,
AND HUGH MCKAY, OF LONDON, CANADA.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 406,819, dated July 9, 1889.

Application filed June 9, 1887. Serial No. 240,743. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. CRITCHLOW, of Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for the Manufacture of Gas; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to an improvement in apparatus for the manufacture of gas.

It consists in combining with a water-gas producer or cupola a retort for the production of hydrocarbon gas by distillation in such way that the waste product from the water-gas producer shall supply the necessary heat to drive the retort, and that the distilled coal from the retort may be used either in whole or in part to supply the carbonaceous charge for the water-gas producer, together with means for the production of water-gas from the charge in the retort, and for cooling said charge after its volatile gases have been expelled and while it is still incandescent by passing steam through it, and in several other particulars hereinafter noted. In this way I am enabled to make both water-gas and hydrocarbon gas very economically, utilizing as much as possible the carbon elements of the coal in the production of the gas and wasting as little as possible in the shape of fuel.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a plan view of a gas-producing plant embodying the principles of my invention, drawn in section on the line $x x$ of Fig. 2. Fig. 2 is a side elevation, partly in section, on the line $y y$ of Fig. 1. Fig. 3 is a vertical cross-section on the line $z z$ of Fig. 1, and Fig. 4 is a vertical cross-section on the line $w w$ of Fig. 1.

Like symbols of reference indicate like parts in each.

In the drawings, Figs. 1 and 2, 2 2 are a number of coal-distilling retorts, made of iron or other refractory material and inclosed within a brick chamber or flue 3. Each retort has a charging-hole 4 at the top, a hole 5 at the bottom provided with drop-doors 5* for drawing the charge, and a gas pipe or outlet 6 for con-

veying away the gases produced in the retort. Beneath each retort is a tunnel or vault 7, by which access is had to the drawing-hole 5. Around the outside of the chamber 3 are a number of cupolas or gas-producers 8, which are preferably built partly inside the chamber 3 and are separated therefrom by the re-entrant walls of the chamber, which shield the cupolas from the direct internal heat of the chamber. At the base of each cupola is an ordinary ash-door 9. At the top is a charging-hole 20 and an exit-pipe 21, (having a valve 23,) and at the sides are holes through which branch air-pipes 10 and 11, connected with a main air-blast pipe 12, enter the cupola. The pipes 10 and 11 have valves 13. One pipe enters at the base and the other at the top of the cupola. As shown in Fig. 4 each cupola has a discharge pipe or flue 14, which opens into the chamber 3, and is provided with a damper or valve 15, whereby it may be closed from the outside of the chamber 3. Steam-pipes 17 enter the several cupolas 8, and are provided with valves.

The operation of the plant is as follows: The cupolas 8 are charged with coal or coke, and after it is fired the air-blast is turned on through the pipes 10 and 11, and the cupolas are thus driven until the coal therein reaches a state of incandescence. During this operation the waste heat and partially-consumed gases from the producer, mixing with the air from the pipe 10, pass through the flues 14 in a flame into the chamber 3, and circulate around the retorts 2, finally escaping through stack-flues 19 at the ends of the chamber. The retorts 2 are charged with coal, and the heat communicated to them drives off the vaporizable matter in the coal by distillation, and converts it into hydrocarbon gas, which passes out through the pipes 6 to the hydraulic main. When the cupolas have been used long enough to raise their contents to an incandescent state, the air-blasts are cut off, the discharge-flues 14 are closed, and steam is admitted into the cupolas through the pipes 17. This steam passing through the body of incandescent fuel is decomposed and converted into water-gas, (the valves 23 closed,)

(hydrogen and carbonic oxide,) which is led off through the pipes 21 to a reservoir, or otherwise utilized. When the cupolas have been used long enough to chill the contained fuel, so that it does not produce water-gas, the valves 23 are closed, the dampers 15 opened, and the air-blasts are turned on until the coal is again brought to an incandescent state, (the waste heat and burning gases meanwhile passing into the chamber 3,) and the dampers 15 are then closed, the steam turned on and water-gas produced as before. By alternating the firing of the several cupolas 8 some of them may be kept always producing water-gas, (the valves 23 closed,) and others discharging their waste heat into the chamber or flue 3, so that the heat in the chamber may be kept constant.

When the coal in any of the retorts 2 has been completely gasified and the coal therein made thoroughly incandescent, steam-pipes 22 at the bottom of these retorts may be caused to emit steam into them, and the steam being converted into water-gas (the valves 23 closed) during its passage through the retorts is led off through the pipes 6 to reservoirs or otherwise utilized. When the charge in the retorts has become inert, the coke is drawn out through the hole 5 at the bottom of the retort, and may be charged when hot as fuel into the cupolas 8. The retort is then filled again and the process proceeds as before. Each retort is thus caused to alternately produce hydrocarbon gas and water-gas, the water-gas producers or cupolas furnishing heat for gasifying the coal in the retorts, and the retorts furnishing in whole or in part the fuel necessary for the producers. In this way I utilize most completely the heat elements of the coal and produce gas economically and with very simple apparatus. The introduction of the hot coke into the producer also aids materially in the production of the gas.

I do not desire to limit myself to the precise arrangement of the plant which I show and describe, since it may be modified by the skilled builder. For example, the producers and retorts may be separated from each other by some distance, in which case the air-adits 10, which are for the purpose of supplying air to complete the combustion of the already partly-burned gases from the producer, may be made directly in the chamber 3 instead of

being in the cupola. I show this at *b* in Fig. 1, where the air-pipe is led through the wall of the chamber. The chamber 3 may also be changed in form, its purpose being simply to serve as a flue to conduct the heat around the retorts.

The prominent features of my invention are: The production of water-gas by passing steam through the retorts after the gases have been distilled, whereby the necessary cooling of the charge in the producer is utilized to produce a valuable gas; also in placing an air-supply either in the producer or in the flue, whereby air is mixed with the waste gases to produce a more perfect combustion around the retorts; also in the arrangement of the retorts in a flue common to all the retorts.

I therefore claim—

1. The combination, with two or more water-gas generators having a common waste-product flue, of a coal-distilling retort arranged in said waste-product flue, so as to be heated by the waste products from the water-gas generators, said coal-retort having a steam-adit for the admission of steam at or near the close of distillation of the coal, substantially as and for the purposes described.

2. The combination, with two or more water-gas generators having a common waste-product flue, of two or more coal-distilling retorts arranged in said waste-product flue, so as to be heated by the waste products from the water-gas generators, said coal-retorts having each a steam-adit for the admission of steam at or near the close of distillation of the coal, substantially as and for the purposes described.

3. In an apparatus for the manufacture of water-gas, the combination, with a gas-producer, a waste-product chamber, a gas-retort located in said chamber, steam-adits in the producer and retort, an air-adit at the top part of said producer, the waste-pipe of said producer being connected with the waste-product chamber, and a damper in said waste-pipe for regulating the supply of waste products to the waste-product chamber, substantially as and for the purposes specified.

In testimony whereof I have hereunto set my hand this 23d day of May, A. D. 1887.

JOHN M. CRITCHLOW.

Witnesses:

W. B. CORWIN,
THOMAS W. BAKEWELL.