

(No Model.)

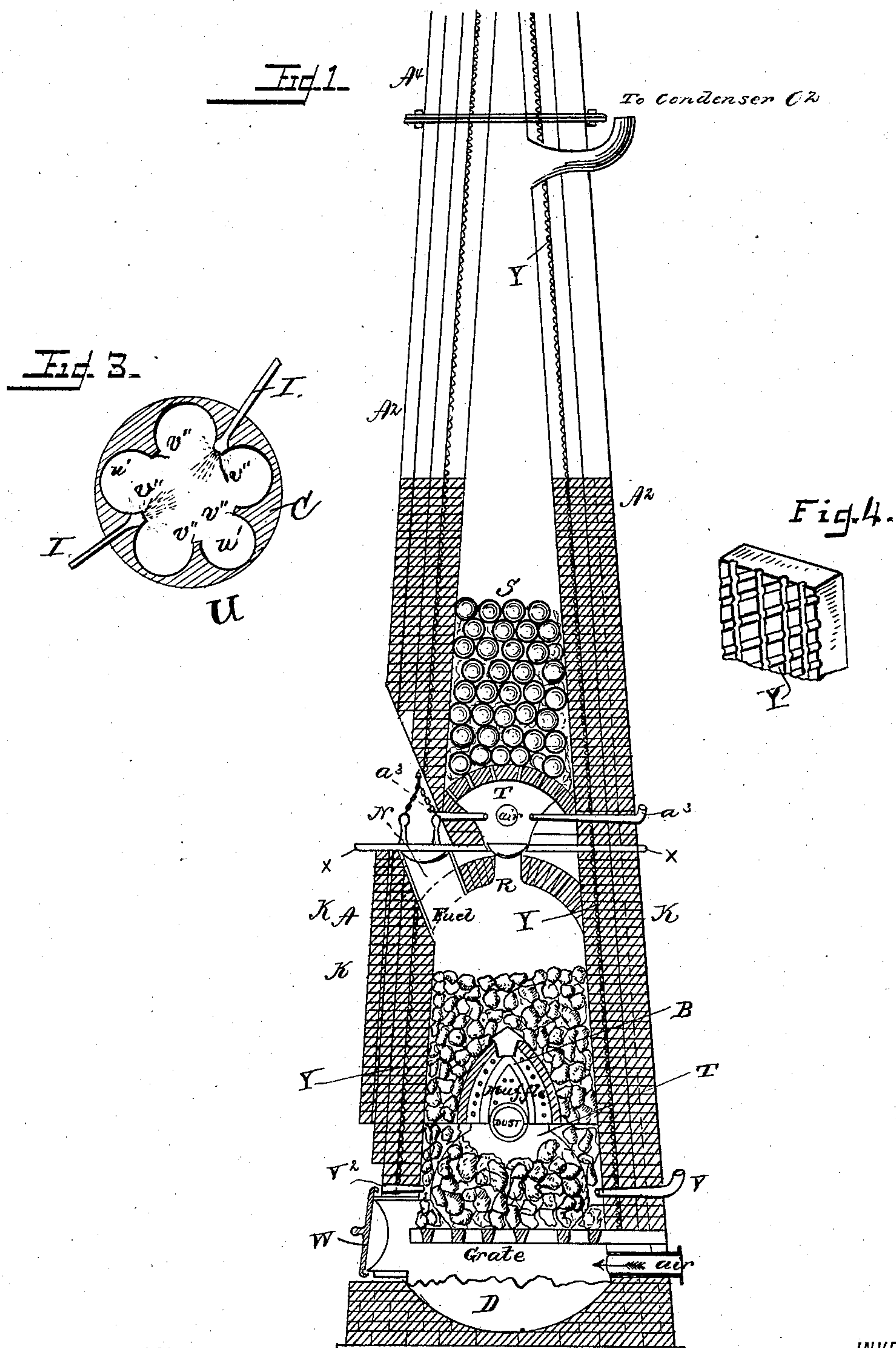
2 Sheets—Sheet 1.

J. CRUTCHETT.

APPARATUS FOR MANUFACTURING GAS.

No. 304,995.

Patented Sept. 9, 1884.



WITNESSES
A. L. Curran
Chas. R. Abell

INVENTOR
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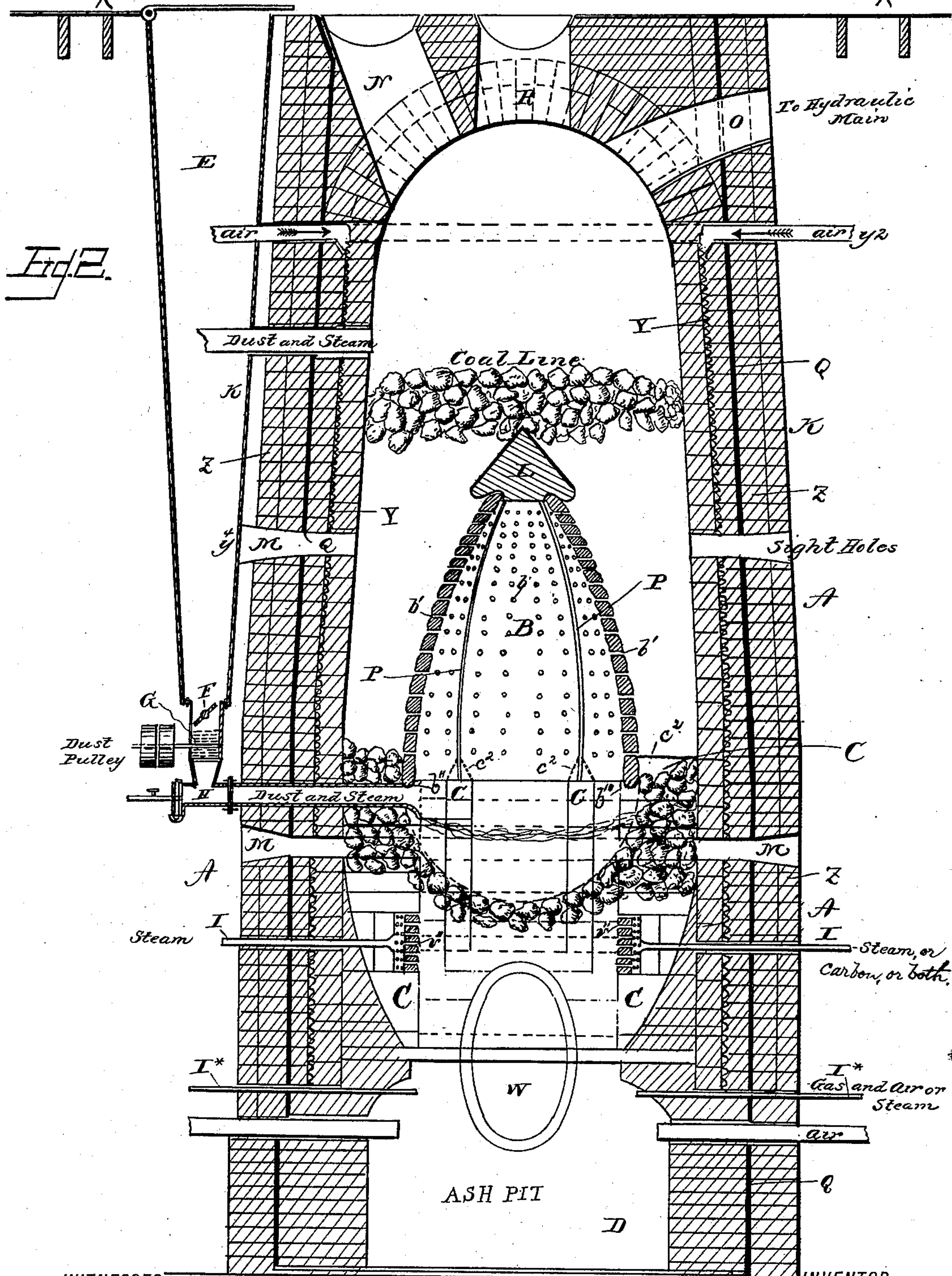
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UNITED STATES PATENT OFFICE.

JAMES CRUTCHETT, OF NEW YORK, N. Y.

APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 304,995, dated September 9, 1884.

Application filed November 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES CRUTCHETT, a citizen of Stroud, in the county of Gloucester, England, residing in New York city, State of New York, United States of America, have invented new and useful Improvements in Apparatus for Manufacturing or Generating Gas for Illuminating, Heating, Motor Power, and other Purposes; and I hereby declare that the following is a full, clear, and exact description of said invention, which will enable others skilled in the art to which it appertains to make and use the same.

In the drawings, Figure 1 illustrates in vertical section an apparatus constructed in accordance with my invention; Fig. 2, an enlarged view of the lower part of the same, taken at right angles to Fig. 1; Fig. 3, a detail (reduced) showing a ground plan of the piers which support the muffle, and Fig. 4 a perspective view of one of the lining-brick.

A shows the body of the cupola; B, the muffle; C, the piers to the muffle; D, the ash-pit, which may be more or less shallow; E, the dust and carbon hopper; F, a regulator of the same; G, a revolving wire brush or screw; H, a tube for supplying solid or liquid carbons; I, tubes for supplying steam, and which for common gaseous fuel may be made to enter underneath the grate-bars, as shown at I*; K, the top or level of the coal-line in the cupola; L, a cap on the muffle; M, sight-holes; N, coal-feeder; O, a gas-education main; P, joints of the muffle, (not luted;) Q, a casing made of boiler-iron; R, outlet from the cupola into the stack above it; S, fire-clay or other refractory materials; T, an open arch forming the bottom of the cupola-heater; U, a ground plan of the piers which support the muffle; V, steam, oil, or carbon vapor distributor in the piers; W, the fire and ash door; X, floor-level at the top of the generator; Y, serrated fire-brick openings; Z, the outer brick-casing around the casing Q.

This invention relates to the manufacture of gas for uses for light, heat, and power generated from coal, coal-dust, oils, or other carbonaceous materials combined with water or steam highly heated in a retort, cupola, or other strongly-heated chamber. I construct an iron boiler-plate shell of cylindrical form,

having at top and bottom of the same cast-iron or other suitable material made generally air or gas tight, the same to be lined with fire-clay brick, or slabs, or other fire-resisting materials suitably made for the various purposes hereinafter referred to, to prevent the action of fire on the metal cylinder. In the said brick-lined cylinder I construct a fire-bed furnace having suitable fire-bars for the support of fuel or other heated materials. From the base of the fire-bed I construct a series of piers, C, to sustain a cylindrical muffle, B, as shown in the accompanying drawings. Between said piers the spaces not necessary to sustain the muffle form recesses shaped like sections of a circle or hollows, *u'*, by means of which the fire-bed is so enlarged as to give greater heating-surface to the extent of the diameter of the cupola, thus allowing a space for fuel, hard or soft coal, coke, or other highly-refracting material of about a foot (more or less) space all around said muffle and inside said cupola, as shown. The muffle I make of fire-proof material and of a cylindrical or conical form, but made in vertical sections, by which means said sections sustain themselves in position in the midst of the coal, carbonaceous, or other highly-heated material, all as shown within the cupola. When made cylindrical, the muffle may be integral or not with its hemispherical cap or cover. In some cases the muffle may be a simple hollow hemisphere. Thus, where coal, coke, or other material is highly heated, the muffle occupies the central position in the heated chamber, and allows the coal or coke to fall down and beneath the muffle to the grate-bars. The principal and desirable object of the muffle is to have the space within the center of the heated chamber, into which space steam and carbonaceous material are introduced and therein operated on at a high temperature to convert the steam into permanent elements of oxygen and hydrogen at a temperature of over 2,200° of heat, and also to operate on the carbonaceous materials admitted within and around said muffle by reason of its then strong affinity for them, and these at a high temperature form permanent carbureted-hydrogen gases adapted for the uses of heat, power, and light.

Another portion of the invention or improve-

ment consists of the muffle having small apertures or holes b' , made through the same over its entire surface, by means of which the steam, gases, or other carbonaceous materials being driven or drawn through said holes become more or less thoroughly mixed, distributed, and combined in and among said heated carbonaceous or other materials as said gases are generated and pass upward through the mass to a further highly-heated chamber, or out to a revolving apparatus, scrubber, or hydraulic main. The sectional joints of the muffle are rounded on the lower edge, as shown at b'' , and this edge rests on a corresponding groove in the piers supporting them. The upper edges of the muffle are correspondingly rounded or formed to enter the annular groove l' in the cap L, which further holds the sections in position and prevents the inlet of coal or other material from the top. It will be evident that the grooves may be in the muffle-sections, and the rounded edges in the cap L or in the piers. The supply of coals, coke, or refractory materials can be made through a suitable opening at the top or side, as preferred, of the cupola. The holes b' in the muffle for the passing of the gases are so made at the outside as to terminate at their outer lower side in a downward groove, tapering scoop like, as shown, to prevent the accumulation of dust or other substances, and the consequent filling or choking of these holes.

As a novel and additional means for the admission of air and heating the same, I make the inner ends of those of the fire-bricks which are located between the iron casing Q and the interior of the cupola of irregular or serrated form, and by means of which air from the outside can be admitted to these serrated surfaces between the fire-brick through any suitable openings in the walls—as, for instance, at y^2 —and thereby become heated by passing down to the lower inlet under the grate-bars, being heated and more fit for supporting combustion of the fuel in the furnace, at the same time, while utilizing said heat, serving also to keep the outer surface of the cupola at a more even temperature. I find a convenient and practicable form for the inner faces of these bricks to be a series of diagonal crossing of grooves.

Coal-dust or other carbonaceous materials can be admitted underneath the muffle by means of the dust-hopper E, which reaches down to near the level of the bottom of the muffle, where a valve or regulator, F, serves to regulate the fall of dust downward, and where a revolving wire brush, G, or a regulating-screw allows the dry carbonaceous material to fall into a suitable tube, H, leading to the inside and beneath the muffle. This delivery of carbon may be facilitated by means of steam, revolving screw, or other mechanical arrangement. Various carbonaceous oils or liquid hydrocarbon can also be admitted, either by small currents or streams, or vaporized,

into or underneath the muffle by the same or other modes hereinafter referred to.

The piers C, supporting the muffle at a suitable height above the grate-bars, are made receptive for steam or oils, or both, highly heated, and which are conveyed through appropriate pipes, I, and distributed through numerous holes, slots, or openings, v'' , in the piers, and thus steam, carbon, or both, are distributed as spray or vapor among or over the incandescent materials underneath the muffle, where the same become acted on by the intense heat therein and converted into carbureted hydrogen. These piers have a slanting top outside the muffle, as shown at c^2 in Fig. 2, to facilitate the fall of the coals.

Where combustion is necessary to increase the heat of the carbonaceous materials in said furnace and cupola, it can be produced by means of air supplied by a blower or suction arrangement and heated underneath the grate-bars. The fire-door W (or doors) is partly above and partly below the fire-bars. Metal sight holes or tubes are arranged in different portions of the surface of the cupola.

Where additional heating of the gases is necessary after they shall have passed up from the cupola through its outlet R, I make an upward extension of the cupola, as shown at A^2 , reaching, say, twelve or fifteen feet high, and filling the same with fire-clay round balls, brick, or other suitable materials, to be heated by the escaping gases from the furnace below, and which is also provided with inlets (say as at a^3) for gas or air supply, or both combined, and which may be admitted at the lower part of A^2 , as at a^3 , and forced or drawn in by blower or exhaust to pass the gas between the heated mass of balls, brick, &c., to the hydraulic main, and thence to the cleaning apparatus O^2 . By this additional means the gases become further heated and combined. The part A^2 may be continued upward to a chimney, A^4 , above it; or, instead of being an upward continuation of cupola A, the part A^2 may be separately erected at the side and be connected by means of proper flues, pipes, and valves, as may be found convenient or desirable.

The diameter of the muffle, the number of sections composing it, and the number of the piers to support the same can be greater or less or more or less, as desired, according to the quantity of gas needed to be generated per day. Where large quantities of gas are desired to be generated, a proportionate number of muffles, suitable piers, inlets and supplies, fire-beds, and working parts can be erected in a large heated chamber, according to the amount of gas desired to be made; but the muffle, holes, and circular arrangement for heat and gas generating I deem the best forms for producing the most intense heat for converting steam into gases and carbonizing the same.

Various sight-holes and other openings in

the cupola for operating, repairing, and otherwise working the same should be provided for in the construction, according to the size of the generator.

5 At the commencement of operations in manufacture of this steam-carbon gas, the coals, coke, or refractory materials within the cupola should be gradually heated until the high temperature of more than 2,200° of heat has been
10 made through the general mass, when steam and also dry and liquid hydrocarbons can be injected by the various ways mentioned into the interior and under the muffle. These may be by successive injections or by continuous
15 prolonged currents, and these continued until the heated mass is brought to the temperature of about 2,200° of heat, when steam and carbon should cease to be supplied until the body of material within the cupola has been raised to
20 from 2,200° to 3,200° of heat, when the steam and carbon can be again supplied and gas made until the residuum of materials becomes such as is desirable to be removed from the fire-bed, ash-pit, &c. This will vary considerably as varieties of coal, coke, and other
25 materials are used, also according to the carbonaceous quality of gases to be manufactured.

Liquid hydrocarbons can be supplied to the interior of the cupola by means of suitable
30 pipes, either in connection with steam or without it, and the liquid hydrocarbon can be vaporized and separately supplied, if desired, into the alternate piers, or in and through suitable openings above the steam-supply into
35 and through the piers, as at *v''*, in any desirable way, to be acted on by steam and the highest degrees of heat. The generating furnace or cupola may be perpendicular or tapering and continued in height to the chimney,
40 or may be made in tiers or in more sections on the ground-floor.

I claim—

1. In combination with a furnace for making steam-carbon gas, a muffle supported on
45 piers and having numerous perforations made as described, and the supporting piers having perforations, whereby the highly-heated steam, liquid hydrocarbon, or pulverized carbon may pass from the interior of the muffle through
50 such perforations or orifices to and through the highly-heated fuel which surrounds or covers the muffle, and whereby the gases and

carbon may be more thoroughly combined to become carbureted hydrogen.

2. In combination with a furnace and muffle, 55 the perforated piers C, serving to support the muffle, and arranged with the arched or recess spaces *u'* between them to more effectually heat the piers, all substantially as shown and described. 60

3. In combination with a furnace, the muffle constructed as described—that is, of a series of perforated sections, and which, when these sections are placed together, shall be of round, conical, or equivalent form—combined with 65 means, as described, for holding the sections together.

4. In combination with a furnace and muffle, the piers as made with perforations *v''*, for the purpose of delivering, diffusing, and heating 70 steam, carbon, vapor, or oils, &c., injected through the piers into the heated and incandescent materials, and under and within the muffle.

5. In combination with the furnace, the 75 muffle and piers, both made with their perforations grooved or rounded off at the lower side of their exit or outlet ends to keep them clear from clogging with dust or residuum from the movable coals or other incandescent 80 or carbonaceous material.

6. In combination with the furnace and a muffle, the perforated piers C, projecting toward the center of the furnace, and made tapering or slanting, tops at the outside of the 85 muffle, as shown at *c''*, and serving not only to facilitate the fall of the coal or other fuel, but also to cause its descent at the sides of such piers and away from such perforations.

7. In combination with the muffle of a furnace, a pointed or conical cap for keeping in 90 position the otherwise loose sections of the muffle, the cap having its lower edge rounded or grooved to fit upon suitable receiving-edges on top of the sections of the muffle, and the 95 muffle having similar rounded edges or grooves at its lower end, in combination with the supporting piers having grooves or ribs.

JAMES CRUTCHETT.

Witnesses:

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