No. 615,385. Patented Dec. 6, 1898.

C. M. GEARING.

GAS APPARATUS.

(Application filed Jan. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

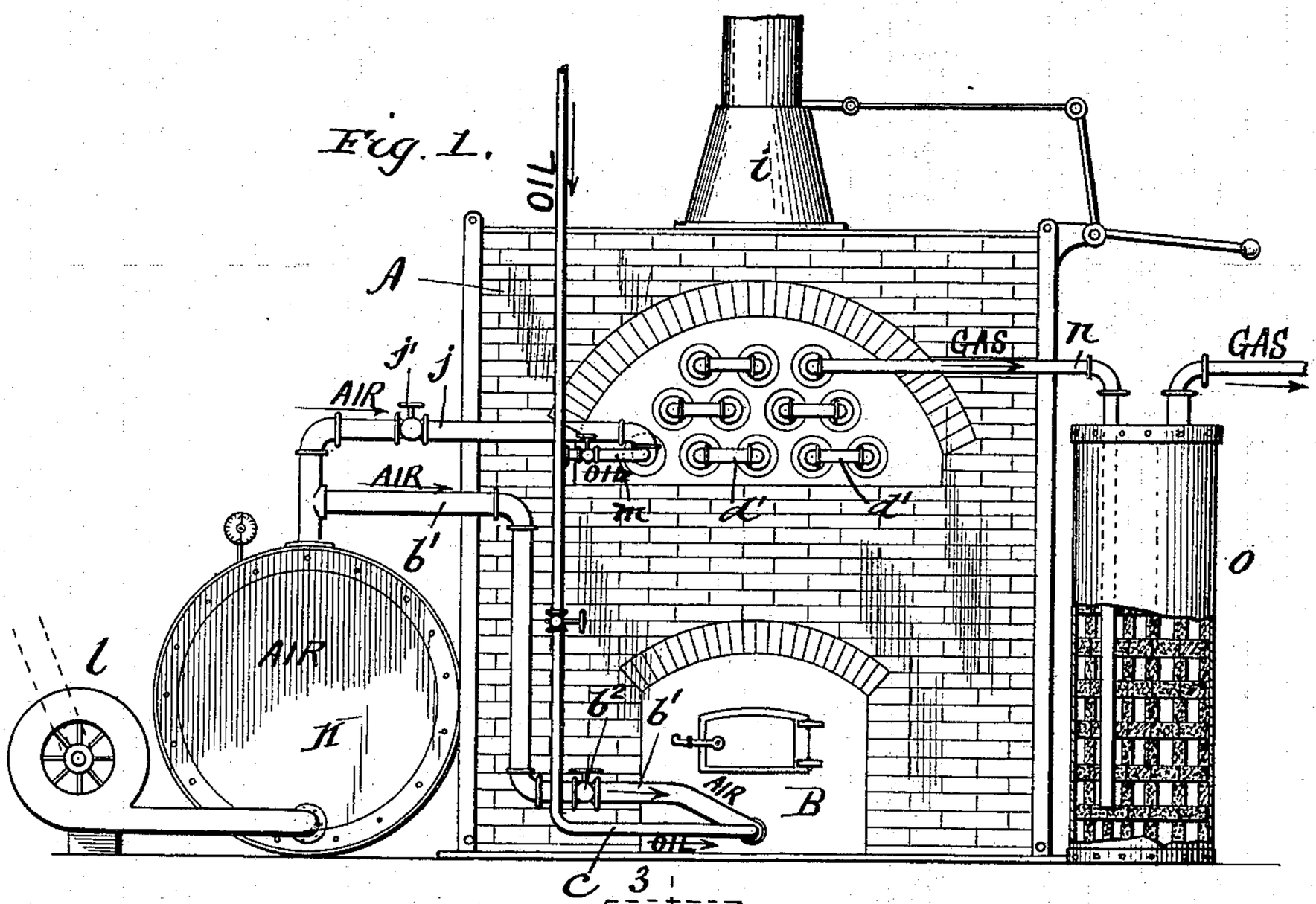

Fig. 2.

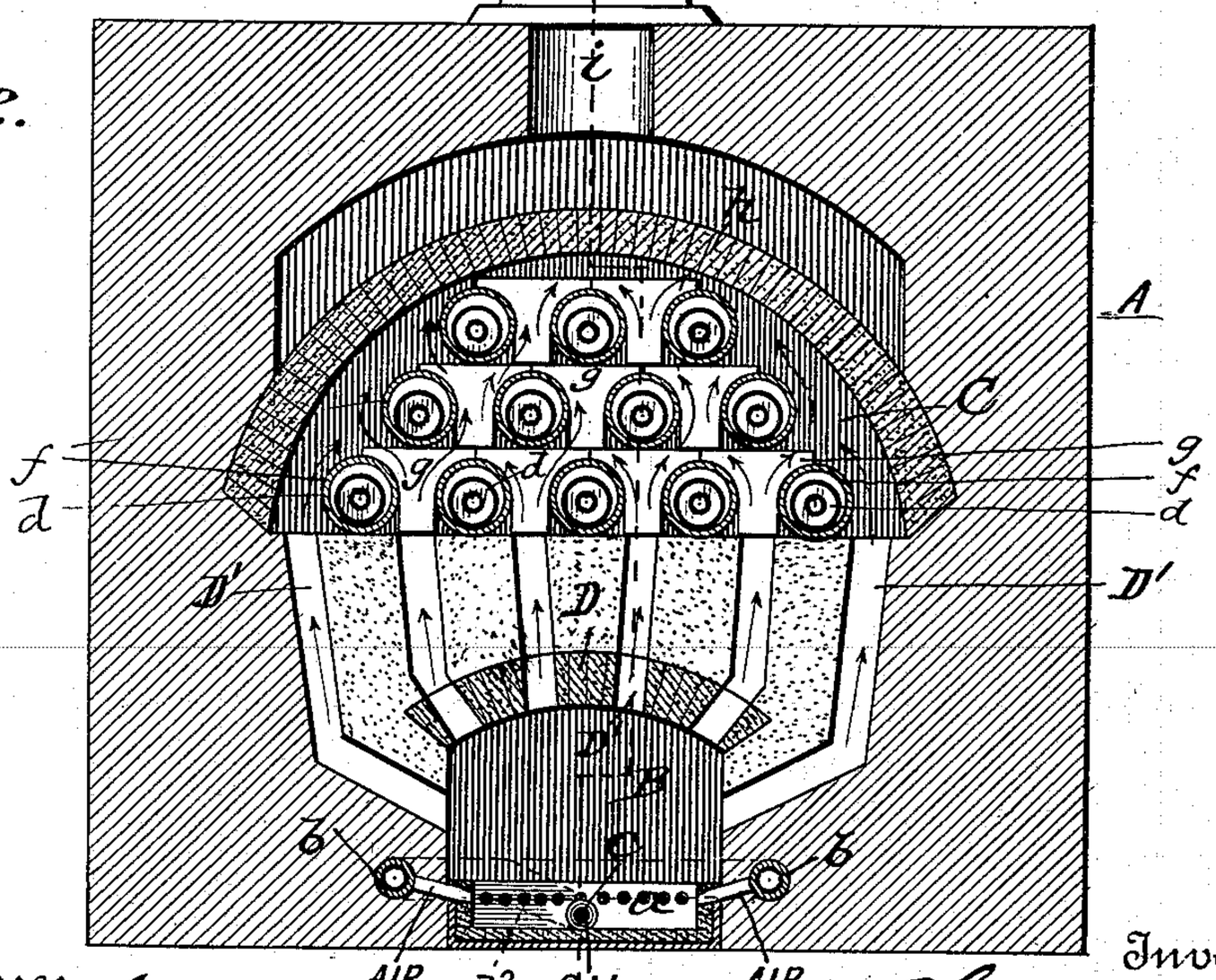

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Fig. 3.

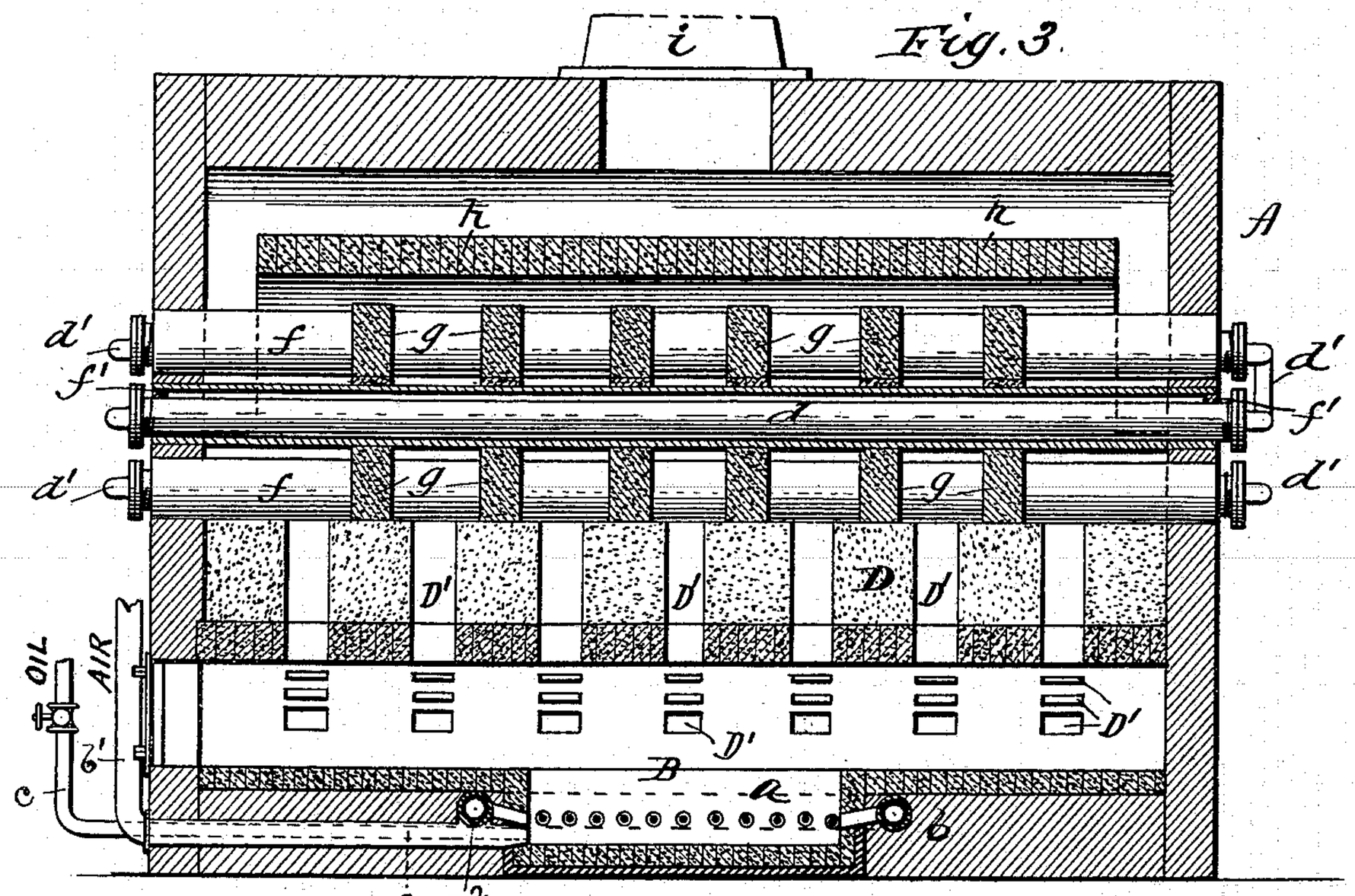


Fig. 4.

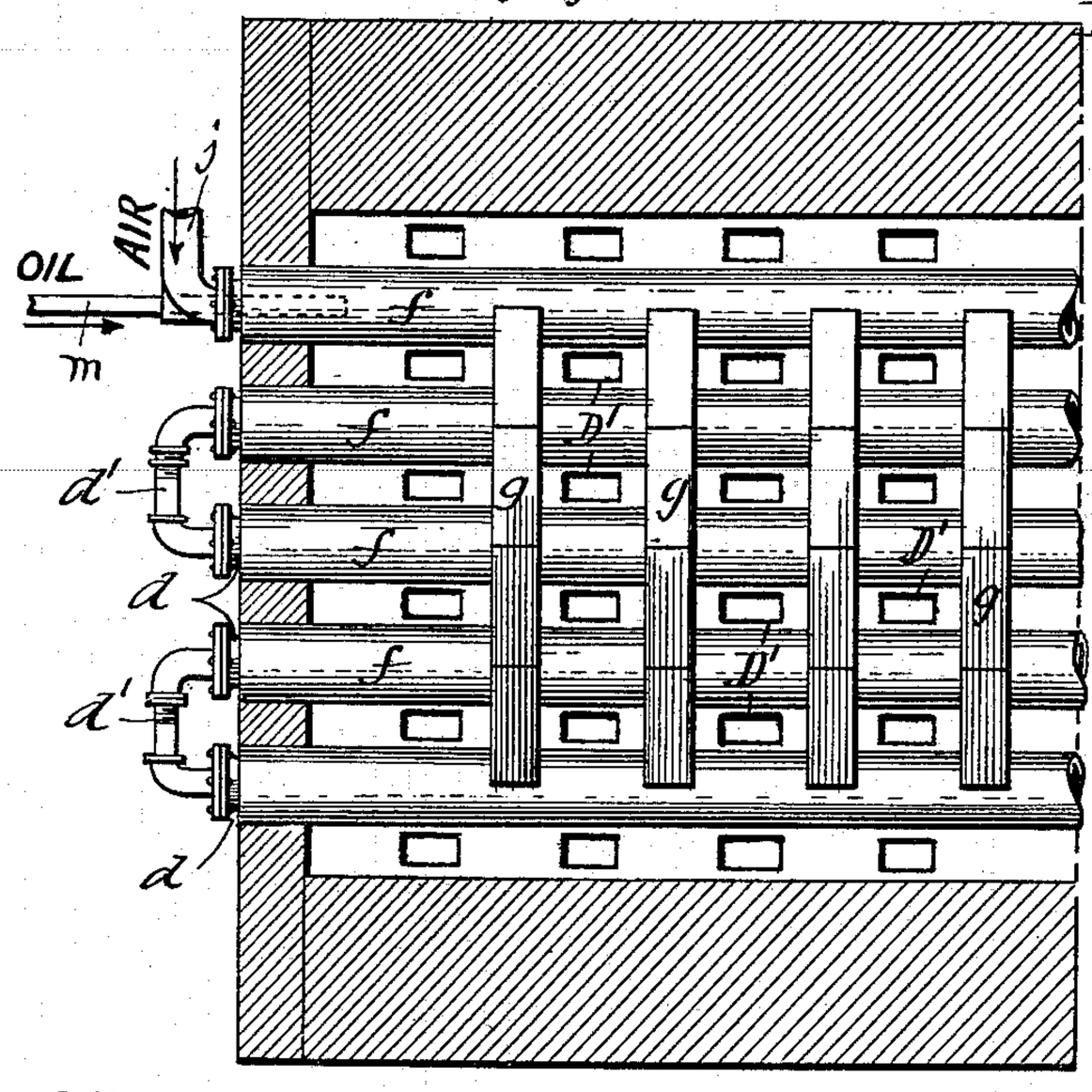
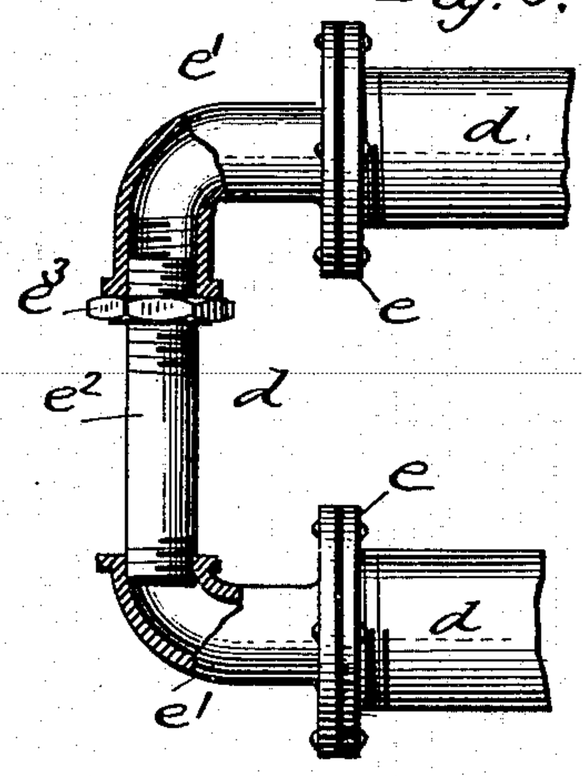


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES M. GEARING, OF BROWNWOOD, TEXAS, ASSIGNOR OF TWO-THIRDS TO CHARLES F. HADLY AND CHARLES O. HADLY, OF PITTSBURG, PENNSYLVANIA.

GAS APPARATUS.

SPECIFICATION forming part of Letters Patent No. 615,385, dated December 6, 1898.

Application filed January 29, 1898. Serial No. 668,434. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. GEARING, a citizen of the United States, residing at Brownwood, in the county of Brown and State of Texas, have invented certain new and useful Improvements in Apparatus for Manufacturing Gas from Air and Hydrocarbon, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a front view of my improved apparatus; Fig. 2, a transverse vertical section thereof; Fig. 3, a vertical longitudinal section; Fig. 4, a longitudinal section taken through a portion of the apparatus just above the lower row of retorts; and Fig. 5, a detail plan, partly in section, of one of the bends connecting two of the retorts.

This invention relates to apparatus for the manufacture of fixed gas from air and hydrocarbon (preferably crude oil) decomposed in conjunction with each other; and the object of the invention is to improve and simplify the apparatus, whereby an even high temperature in the generating and fixing retorts is maintained with but a minimum consumption of fuel in the furnace, as more fully hereinafter set forth.

The invention has also other minor objects in view, which will appear in the course of this specification.

Referring to the drawings by letters, A designates the main structure of the apparatus, in the lower portion of which is built the furnace B and in the upper part the retort-chamber C, the latter being separated from the former by a suitable arch D, of fire-brick and masonry, this arch being provided with passages or flues D′, leading from the furnace into the retort-chamber and arranged in a suitable number of longitudinal series.

In the bottom of the furnace is a suitable pan *a*, lined with fire-brick to prevent it burning out, and around this pan extends a continuous air-pipe *b*, provided all around the fire-box with nozzles extending inward and downward and entering said pan, this pipe *b* being at its front part connected by a short branch b^2 to an air-pipe *b*′, extending out through the front wall of the furnace and provided with a regulating-cock b^2. The oil-pipe *c* enters the pan through the air-supply pipe, as shown in dotted lines in Fig. 3, and is sprayed into the pan by the current of air forced through the air-pipe by the apparatus hereinafter described.

The retorts *d* are supported in horizontal rows, as usual, their ends being alternately connected by suitable bends *d*′ to form a continuous passage for the gas, these connections being exposed at the ends of the apparatus and being so constructed as to be readily detached to permit the retorts to be quickly removed and replaced. I show in Fig. 5 the preferred manner of constructing these connections. As will be seen from said view, a flange *e* is removably secured, preferably by screwing, upon the end of each retort, and bolted to this flange is the flanged end of an elbow *e*′, having a smaller diameter than the retort, a suitable packing being inserted between the flanges. The adjacent elbows to be connected are turned toward each other, and connecting them is a short section of tubing e^2, threaded at each end with right and left threads, respectively, and screwed into the respective elbows, a jam-nut e^3 being on one end of the tube e^2 and adapted to bear against the end of the adjacent elbow and make the joints tight and lock the parts together. To disconnect the elbows, it is simply necessary to loosen the jam-nut and then screw section e^2 far enough into one of the elbows to free it from the other elbow, and to connect up the elbows the operation is reversed. If it is desired to remove one of the retorts, the elbows at each end must first be disconnected in the manner just described, and then one of the flanges *e* must be removed from the retort to permit it to slide endwise out of the retort-chamber. In this way the setting may not only be quickly connected up, but the retorts may also be separately removed for renewal when any of them are burned out, the apparatus being required to be stopped but a short time, as is evident.

Inclosing each retort throughout its length is a closed sectional casing *f* of refractory material, such as burnt clay, its ends passing through and resting, respectively, in the

front and rear walls of the retort-chamber. This casing is sufficiently larger in diameter than the retort to permit the latter to be freely inserted and removed without disturbing the casing, the space between the retort and the casing forming a dead-air chamber and being closed at the ends thereof with a suitable plastic refractory material *f'*, such as clay, after the retort is slid into place. This refractory casing protects the metal retort from the intense heat of the retort-chamber and prolongs its life. It also permits the removal of burned-out retorts without dismantling the apparatus and with but a slight loss of time. It is therefore a very important feature of this invention.

As shown, the retorts of the lower row lie upon the flat upper surface of the arch between and parallel to the longitudinal series of flues D', whereby the heated products of combustion will be brought up around both sides of the retorts. In the second row the retorts are arranged to alternate with those of the lower row, being directly over the openings of the flues, and those of the third row (top row in the construction shown) to alternate with those of the row next below, and so on. The retort-casings are supported at suitable points intermediate the end walls by rows of fire-brick *g*, these rows running transversely of the retort-chamber and between the transverse rows of the flues D'. The lower row of brick rests upon the bottom of the retort-chamber, and the upper rows are superposed upon said row, thereby forming vertical partitions extending to near the arch *h* in the upper part of the structure. The bricks are all shaped alike, each being approximately T-shaped, the vertical portion or stem fitting down between adjacent retort-casings and resting upon the bottom of the retort-chamber or the row of bricks next below and the arms extending outward over the top of the adjacent casings, the ends of the adjacent arms meeting over the center of the casings and the edges of the bricks being rounded out to fit against the cylindrical surfaces of the same. The bricks of each of the upper rows have their stem portions resting upon and across the joints of those of the row next below, thereby in a manner tying all the bricks of each partition together and at the same time supporting the casings firmly. These bricks, as well as the casings, are readily removable, so that the apparatus may be dismantled for cleaning and repair without serious trouble.

The arch *h* is open at its ends to permit the products of combustion to pass around the same on their way to the central stack *i*, whereby the products are compelled to circulate more thoroughly throughout the interior of the retort-chamber.

An air-pipe *j* leads into one of the end retorts of the lower row and is provided with a regulating-valve *j'*. This pipe leads from an air-reservoir *k* and also connects to air-pipe *b'* of the burner. A blower *l* is connected to tank *k* to keep up a constant pressure therein, although any other suitable devices may be employed for this purpose, if desirable. A valved oil-pipe *m* conducts oil into the same retort, this pipe passing through the air-pipe, so that the current of air will spray the oil into the retort, as shown in dotted lines in Fig. 4. The fixed gas is taken off at the top of the bench of retorts by pipe *n*, which carries it to a suitable vessel *o*, filled with a honeycomb of fire-brick, which the gas is compelled to pass through on its way to the main.

Operation: The air under pressure and the oil are turned first into the fire-box, where they are burned in conjunction, producing an intense heat, which soon raises the temperature of the retorts to the degree necessary to make gas. Then the air and oil are turned into the retorts, where they are decomposed and combined into a gas. As the gas passes through the highly-heated retorts in the usual manner it is fixed into a permanent gas, and its passage through the vessel *o* serves to purify and partially cool it, the brickwork in this vessel soon becoming very hot from the passage through it of the highly-heated gas, and thereby serving further to assist in fixing whatever free gas may have escaped from the retorts.

The advantage of the air-reservoir *k* is that it tends to prevent detrimental fluctuations in the air-blast both in the retorts and in the fire-box, and the advantage in connecting both the fire-box pipe and the retort-pipe to the same source of pressure is that when there are variations in the pressure the variations will be proportionate at the burner and in the retorts, thereby tending to make the apparatus automatic so far as supplying the fuel and gas-making material is concerned.

An important advantage lies in the manner of arranging the flues and the retort-settings. It will be seen that the arrangement of flues through the fire-arch and the arrangement of the retort-casings and the vertical partitions in the retort-chamber insures a thorough distribution of heat throughout the retort-chamber irrespective of the openings in the arch above the retort-chamber, whereby the temperature will be evenly maintained. This arrangement of flues, casings, &c., also insures the full utilization of the heat of the furnace, since the fire-arch, retorts, partition-blocks, &c., after they are raised to a high temperature serve as a sort of storage-reservoir for the heat, requiring but a minimum of consumption of fuel to keep up the temperature. In practice I have found that after the temperature of the interior of the apparatus is raised to a high degree the storage capacity of the fire-arch, partitions, &c., is so great that but an extremely small jet of oil will suffice to maintain the retorts at a gas-making temperature.

By my improved apparatus I am enabled to use oil of the crudest sort in the retorts as

well as in the furnace, the heat generated being so great and the temperature being kept so constant that all the component parts of the oil are decomposed, leaving practically no residuum to be cleared out, thereby making it possible to use the retorts a comparatively long period without removal for cleaning purposes.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a gas apparatus, the combination of a retort and means for heating the same, said means consisting of devices for burning air and oil, valved air-pipes connected to said retort and to said heating means, an air-reservoir connected to said pipes and means for maintaining pressure in said reservoir, and valved oil-pipes connected to said retort and to said heating means, the oil being injected into the retort and into the heating means by the air-pressure and commingled with the air, as and for the purposes set forth.

2. In a gas apparatus, the combination of a furnace, a retort-chamber, a fire-arch separating the furnace from the retort-chamber, a series of flues formed in said fire-arch, retorts running longitudinally of the retort-chamber, and arranged in superposed rows, vertical transverse partitions in said retort-chamber, said partitions consisting of horizontal rows of fire-brick superposed and arranged to support the retorts, each of said fire-bricks being substantially T-shaped, the vertical or stem portion fitting down between the adjacent retorts and their lateral arms extending outward over the adjacent retorts, the ends of the arms meeting over the retort and the edges of the fire-brick being curved to fit the adjacent surfaces of the retorts, substantially as described.

3. In a gas apparatus, the combination of a retort-chamber and means for heating the same, a refractory retort-casing *f*, permanently fixed in the retort-chamber, extending through said retort-chamber and open at its ends, a removable retort resting in said chamber and being smaller in diameter than the same, the ends of said retort-chamber extending beyond the casing and being closed, and means for temporarily closing the ends of the space between the casing and the retort, thereby forming a dead-air chamber between the retort and the casing.

4. The combination of a pair of adjacent retorts, a removable flange on each, an elbow connected to each of these flanges and turned toward each other, a pipe connecting these elbows and threaded into the same by right and left threads respectively, and a binding-nut on said pipe and bearing against the end of one of the elbows.

In testimony whereof I hereunto affix my signature this 24th day of January, 1898.

C. M. GEARING.

Witnesses:

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