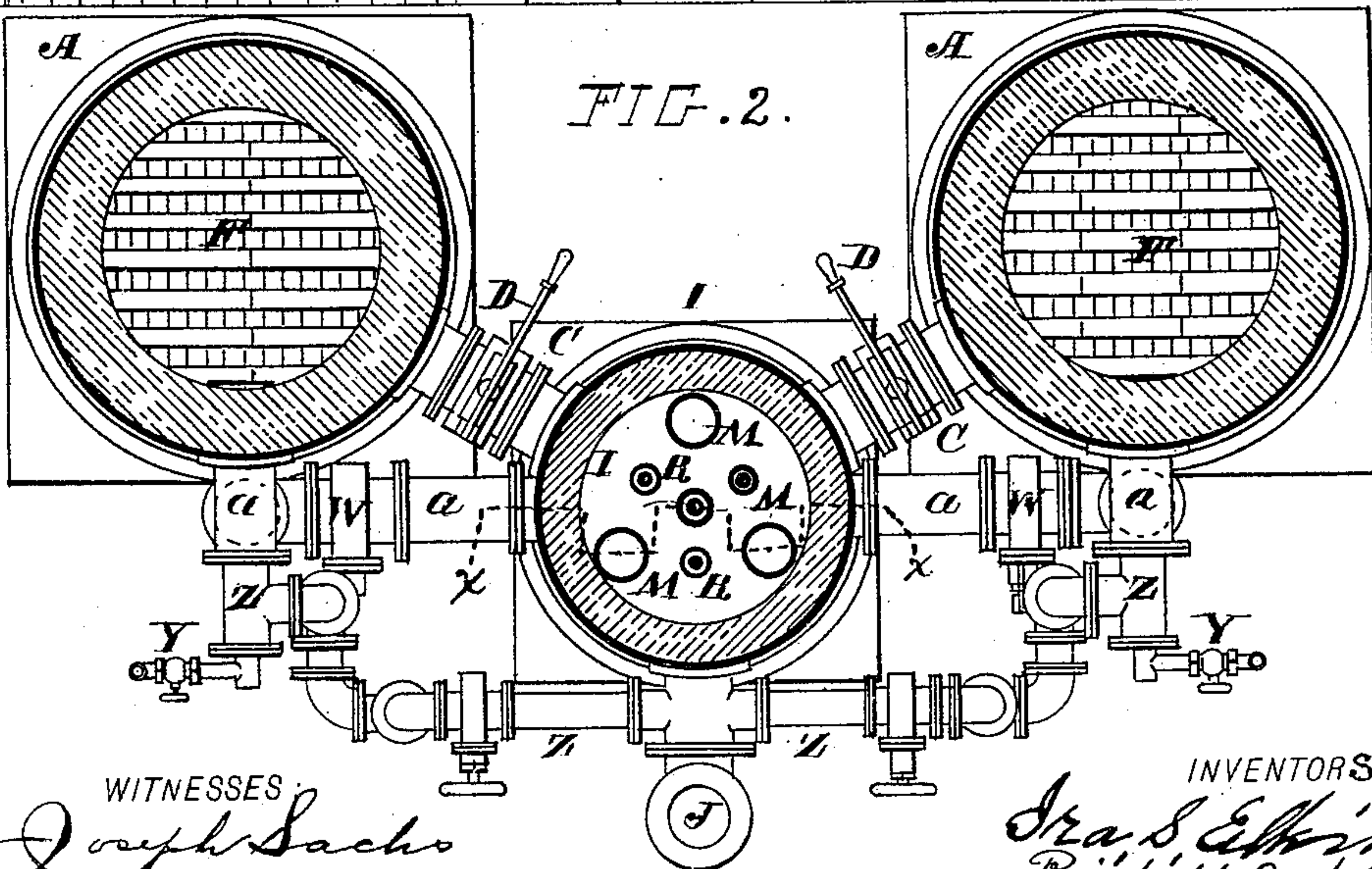


2 Sheets—Sheet 1.

## APPARATUS FOR MAKING GAS.

Patented Sept. 20, 1892.



WITNESSES

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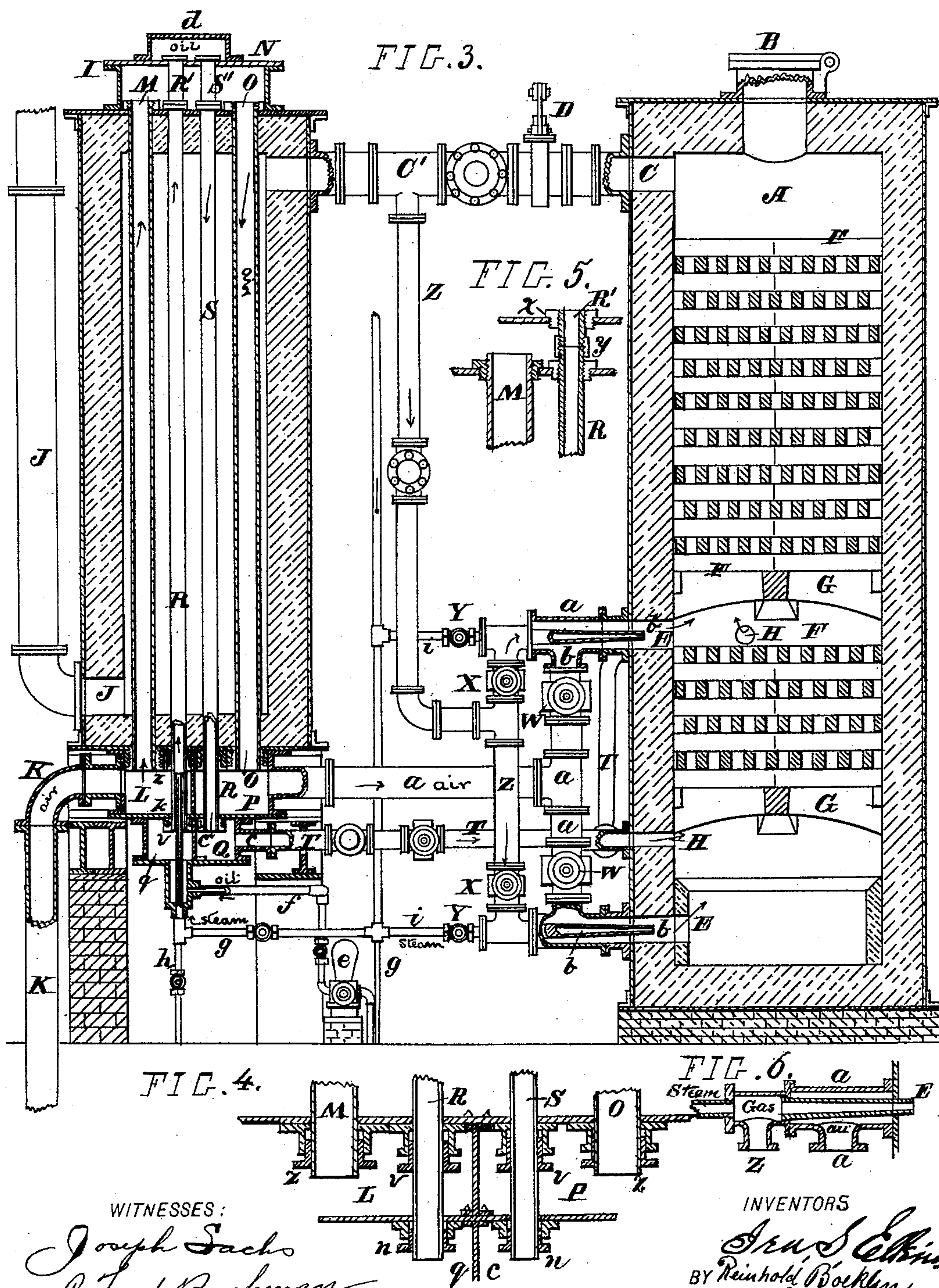


I. S. ELKINS & R. BOECKLEN.

APPARATUS FOR MAKING GAS.

No. 483,107.

Patented Sept. 20, 1892.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

IRA S. ELKINS, OF NEW YORK, AND REINHOLD BOEKLEN, OF BROOKLYN,  
NEW YORK.

## APPARATUS FOR MAKING GAS.

SPECIFICATION forming part of Letters Patent No. 483,107, dated September 20, 1892.

Application filed March 31, 1892. Serial No. 427,263. (No model.)

*To all whom it may concern:*

Be it known that we, IRA S. ELKINS, residing at New York city, in the county of New York, and REINHOLD BOEKLEN, residing at Brooklyn, in the county of Kings, State of New York, citizens of the United States, have invented certain new and useful Apparatus for Making Gas, of which the following is a specification.

The object of our invention is to provide an apparatus for making gas; and it relates particularly to the manner of manufacturing a fixed gas from crude oil, using in combination therewith steam highly heated, and to utilize the intense heat of the finished product in order to vaporize the oil and also to heat the air which is to be used in the manufacture of the product.

In this invention we use, preferably, a divided chamber, into which is introduced air, steam, and liquid fuel, either vaporized or heated therein, and these elements when thus suitably mingled are then introduced into another chamber by means of an ordinary burner or injector, where it is converted into a fixed gas by its own generated heat.

An important feature of our invention relates to a gas apparatus with two or more alternately-operated fixing-chambers with blast connections and brick checker-work and a lined heating-chamber with air, oil, and steam pipes connected and through it and with gas connection and pipes from said fixing-chambers delivering the finished product to said heating-chamber and the blast connections of the fixing-chambers, substantially as and for the purpose hereinafter described.

Figure 1 represents a vertical central section through the heating-chamber of a gas generating and fixing apparatus through dotted line *x* of Fig. 2. Fig. 2 is a horizontal section of the same near the top of its chambers, through line *y* of Fig. 1. Fig. 3 is a vertical section, slightly enlarged, through one of the fixing-chambers and through heating-chamber of the apparatus, the construction of the heating-chamber being somewhat modified from that shown in the former figures. Fig. 4 is a detached vertical section, on a larger scale, of the lower ends of the air and oil pipes passing through stuffing-boxes. Fig.

5 is a similar view showing the top ends of said air and oil pipes. Fig. 6 is a detached vertical section of one of the ends of the blast-pipes with the gas-burner and steam-supply pipe on a larger scale.

A A represent two fixing-chambers made with metal shells, tops, and bottoms and lined interiorly with fire-brick, each chamber being furnished with a top seal-door B and with a gas-outlet C near its top, provided with a valve D. At two or more places above one another on the side at the lower half of each chamber are provided the blast-inlets E, and above and between the blast-inlets is built the brick checker-work F, resting upon arches or arched tiles G. This checker-work forms the tortuous passages for the gas to pass through for successfully rubbing and fixing the same while highly heated. At suitable places in the side of the chamber are arranged the hot steam and oil-vapor inlets H to generate the gases, which become finally fixed in the top part of the chamber and thereafter pass to the gas-outlet C.

I represents a vertical heating-chamber, which is also made with a metal shell and top and bottom and lined with fire-brick, as shown, to retain the heat effectually, and the top portion of this heating-chamber is connected with the gas-outlets C of the fixing-chamber to pass the fixed gases down through it and finally pass out through the outlet-pipe J near the lower end of the chamber I. In this heating-chamber the air for the blast and the oil and steam for generating the gas are highly heated by the hot fixed gases passing from the fixing-chambers through it, for which purpose the said heating-chamber is constructed with air and oil pipes passing vertically through it, as hereinafter described.

Both gas outlets C from the fixing chambers may directly connect into the heating-chamber I, as shown in Figs. 1 and 2, or they may both deliver into a common pipe C', which connects into the chamber I, as shown in Fig. 3; and in said Fig. 3 the letter K represents the blast-pipe, connected with a power-blower or air-pump and delivering the air into the inlet-compartment L of the divided air-chamber *k*, arranged under the bottom of the heating-chamber I. In Fig. 1,



however, owing to modified construction, this inlet-compartment L is at the upper end instead of the lower end, as in Fig. 3. By means of the vertical air-pipes M, passing through the inner space of the chamber I, as in Fig. 3, and connected from the first with the secondary air-chamber N, arranged on the top of the heating-chamber I, the air is heated and delivered into said secondary chamber N, and by means of air-pipes O, passing down from the chamber N through the hot space of the chamber I and connected with the outlet-compartment P of the former lower air-chamber, the air is delivered in said compartment P highly heated and passes from said compartment into the blast-pipes *a a* and finally to the gas-burners *b b* of the blast connections at the blast-inlets E of the fixing-chamber. For heating the oil a similar arrangement of pipes and chambers is provided on the chamber L, of which Q represents a divided oil-chamber having an inlet-compartment *q* and an oil-delivery compartment *c*. R represents the oil-pipes which pass the oil upward through the chamber I and into a secondary and common-oil chamber *d*, arranged over the top of the chamber N. From said chamber *d* are arranged downward pipes S, passing the oil again through the chamber I, which connect with and deliver into the delivery-compartment *c*.

The air-heating pipes M and O are secured in the metal top of the chamber I with a threaded pipe-bush, as shown in Fig. 5, and their bottom ends pass each through a stuffing-box *z*, as shown in Fig. 4. By this means said pipes M and O can expand or contract from the ends of the chamber I, and the said pipes can be readily removed by unscrewing them and raising them out of the chamber I. The top ends of the oil-pipes R and S are also secured in the top of the chamber I with pipe-bushes, as the pipes M and O, and are each extended with a short pipe R' and S' through the air-chamber N, attached by a coupling *y*, and the top ends of the short pipes R' and S' pass through a screw-bush *x*, secured in the cover of the chamber N, as shown in Fig. 5. The bottom ends of the pipes R and S pass through a stuffing-box *v*, secured on the bottom of the chamber I, and also extend through the bottom cover of the bottom air-chamber *k* and pass through a stuffing-box *n*, as shown in Fig. 4.

The oil is supplied by means of the pump *e* from a suitable tank in which crude oil is stored and is forced through the pipes *f* into the compartment *q*, and to prevent the oil from solidifying under the high heat and furnishing hydrogen to the gas-generating process steam is furnished and forced into the oil-pipes R by means of the pipes *g*. The water of condensation is carried off from the pipes *g* by means of a suitable steam-trap connected by the pipe *h*. Both the steam and oil are furnished in proper proportionate quantities automatically regulated. Most of

the oil passing from the pipe S is highly rarefied and vaporized, and by means of the pipes T the oil-vapors and steam are conducted to the inlets H and into the fixing-chamber ready heated and then united for generating and fixing gas.

The blast-pipes *a a* and burners *b* are supplied with fixed gas for fuel, which is conducted from the common pipe C' by the gas-pipe Z and branches to the burners, and each branch has also a steam-supply pipe *i* opposite to the rear end of each burner *b*, as shown in Figs. 3 and 6. All blast-pipes and branches are furnished with suitable valves W for regulating the supply by means of suitable valves X on the gas-pipes Z and suitable valves Y on the steam-pipes, whereby the gas and steam supply is regulated.

The above construction (shown in Fig. 3) of the oil and air heating pipes and chambers and the supply of gas for the blast-burners may be varied and modified to a construction as shown in Fig. 1. Instead of taking the supply of gas from the common pipe C' before entering the chamber I, the gas may be supplied from the outlet-pipe J of the chamber I, as shown in Fig. 1; but, on account of supplying the burners with a much higher heated gas from the pipe C', such supply is much preferred. Instead of passing the air from the blower in the bottom air-chamber *k* and passing it twice through the chamber I, as shown in Fig. 3, said construction may be modified as shown in Fig. 1. The pipe K may deliver the air into the top air-chamber N. The bottom air-chamber may be made one common air-chamber for delivery and all air-pipes made to delivery there in passing only once through the chamber I, as shown in Fig. 1, and instead of constructing the oil-heating apparatus, as shown in Fig. 3, with oil-pipes from an inlet-compartment up to a common chamber *d* and from there down to a delivery-compartment *c*, said construction may be modified as shown in Fig. 1. The oil may be forced into a common bottom oil-chamber Q', from which oil-pipes M' extend upward into larger pipes over them, passing the oil raised in each pipe down over it into a chamber P' above said bottom oil-chamber, as shown in Fig. 1. In either case the steam is supplied into the upward-passing oil-pipe, as shown in both figures.

In operating the manufacture of the gas by the above apparatus the fixing-chambers A are operated alternately. While one is unsealed at the top valve B and the gas-outlet C is closed and the chamber A is blown up and heated, the other is sealed with its top valve B and its valve D of the outlet C is opened. The oil and vapor and steam are admitted through the pipes T and inlets H by opening the respective valves of the pipes T. The oil as well as the vapors and steam enter through the inlets H into the fixing-chamber in a well-heated state, and in passing up through the hot brick checker-work the said oil, vapors, and



steam are converted and rarefied and finally become fixed gases and pass over by the outlet C into the heating-chamber I, in passing down through it causing the heating of the air and oil pipes therein, and the supply of steam and oil forcing the oil-vapors through the inlets H, supplying the fixing-chambers therewith connected. During the same time the gas and air valves of the secondary unsealed fixing-chamber have been opened, the blast delivering hot air, and from the gas passing through the outlets C' a portion is furnished to the burners b. Both the gas and air, being very hot, are delivered into the said referred-to fixing-chamber, causing a very rapid high-temperature combustion at said burners and in the fixing-chamber and heating the same in a short time ready for fixing gases, by which time the former fixing-chamber has lost its heat, and the change of fixing the gases and blowing up is made from the one to the other fixing-chamber.

By introducing the rarefied fixed and hot gases and hot-air blast while heating and blowing up the fixing-chambers, instead of introducing simply the heated oil and oil-vapors and cold air, a large saving of heat, time, and fuel is effected in blowing up.

By means of lining the chambers I with brick nearly all heat from the hot fixed gases entering into said chamber is imparted to the oil and air pipes.

What we claim as new is—

1. In the manufacture of gas, in combination with a generating and fixing chamber, an oil heater or vaporizer having at one end a pipe connected with the fixing-chamber for receiving the hot gases from said fixing-chamber and provided with pipes for steam, air, and oil and pipes to deliver therefrom the steam, heated air, and oil-vapors and connected with the aforesaid generating and fixing chamber.

2. An oil and air heating chamber having a double-chambered base and a double-chambered head, both provided with stuffing-boxes, in combination with tubes secured at one end through said stuffing-boxes and passing through said stuffing-boxes in the other end, whereby unequal expansion and contraction in the tubes and shell are provided for, substantially as set forth.

3. In the manufacture of gas, a tubular heating-chamber provided with pipes for introducing oil, steam, and air, in combination with two or more generating and fixing chambers and valved pipes connecting the lower portion of the heating-chamber and the gen-

erating-chambers and valved pipes connecting the fixing-chambers and upper portions of the heating-chamber, so that while one of said generating and fixing chambers is receiving oil-vapors and steam from the heating-chamber and fixing the same the other generating and fixing chamber is receiving gas and air and blowing up preparatory to fixing gas, as set forth.

4. In the manufacture of gas, the combination of a heating-chamber and a generating or fixing chamber connected by suitable pipes, the heating-chamber having passing through it air supply and return or delivery pipes, the air-pipes connecting at their upper ends with a common chamber and at their lower ends with separate compartments of a chamber, a pipe connecting one of said compartments with said fixing-chamber, and oil-pipes connecting at their upper ends with a common chamber and at their lower ends with separate compartments of a chamber, a pipe connecting one of said compartments with said fixing-chamber at the lower end, and a steam-supply pipe connecting with the oil-supply pipe.

5. In the manufacture of gas, the combination of a heating-chamber and a fixing or generating chamber, the heating-chamber having passing through it air supply and delivery pipes and oil supply and delivery pipes, the air-supply pipes connecting at their upper ends with a common chamber and at their lower ends with separate compartments of a chamber, a pipe connecting one of said compartments with the fixing-chamber, and the oil-pipes connecting at their upper ends with a common chamber and at their lower ends with separate compartments of a chamber, an additional pipe also connecting one of said compartments with said fixing-chamber, and a steam-supply pipe connecting with the oil-supply pipe, the pipes connecting the air-pipe compartment-chamber with the fixing-chamber, and a gas-pipe connecting said fixing-chamber with the pipes connecting said heating and fixing chambers together and provided with burners located in the combustion-chambers of the brick checker-work in the fixing-chamber, substantially as specified.

Signed at New York, in the county of New York and State of New York, this 29th day of March, A. D. 1892.

IRA S. ELKINS.

REINHOLD BOECKLEN.

Witnesses:

W. GEO. OPPENHEIM,

J. S. ZERBE.