(No Model.)

2 Sheets—Sheet 1.

# O. GASSETT.

## OIL GAS GENERATING BURNER.

No. 601,094. Patented Mar. 22, 1898.

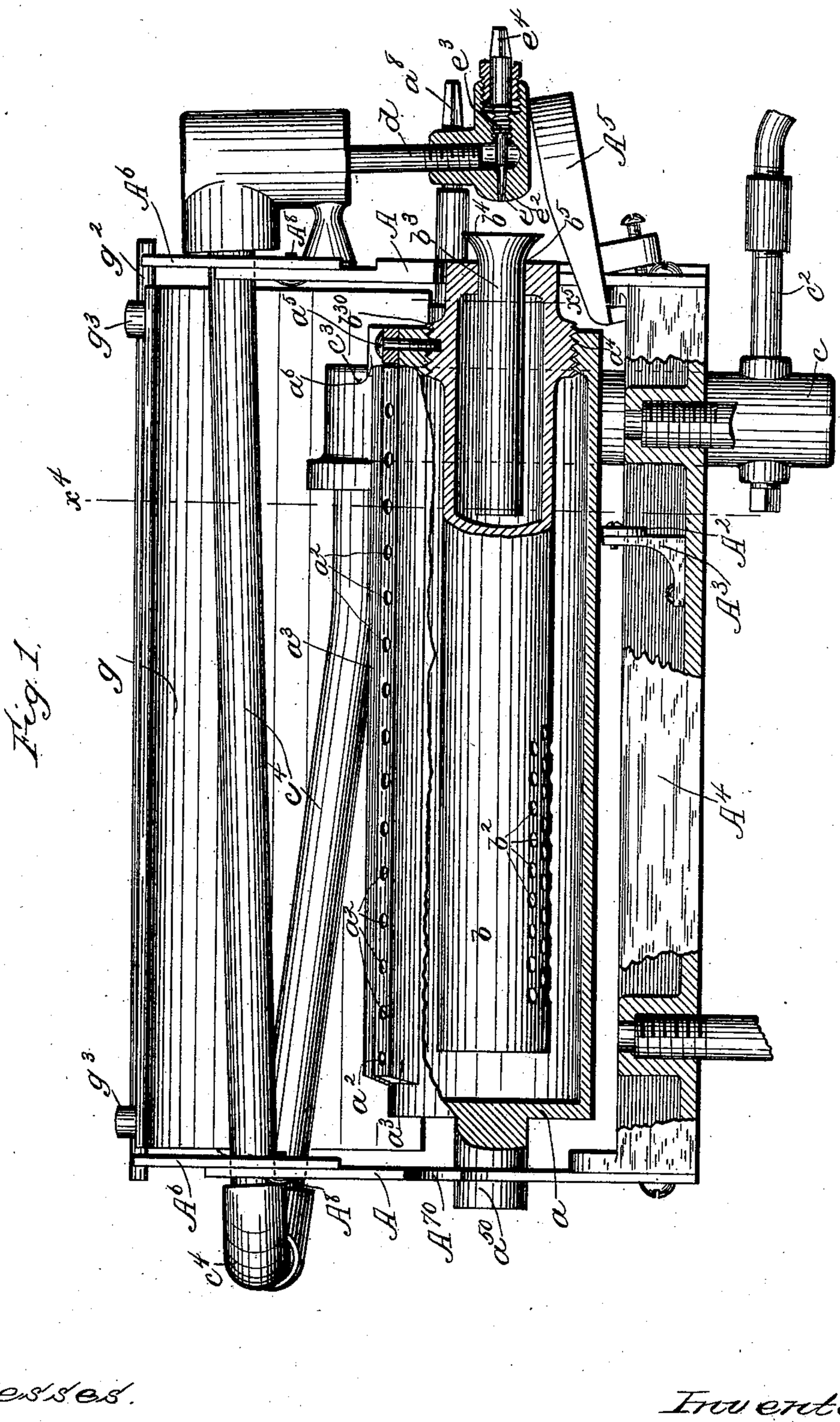

Fig. 1.

Witnesses.
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Inventor.
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 1.

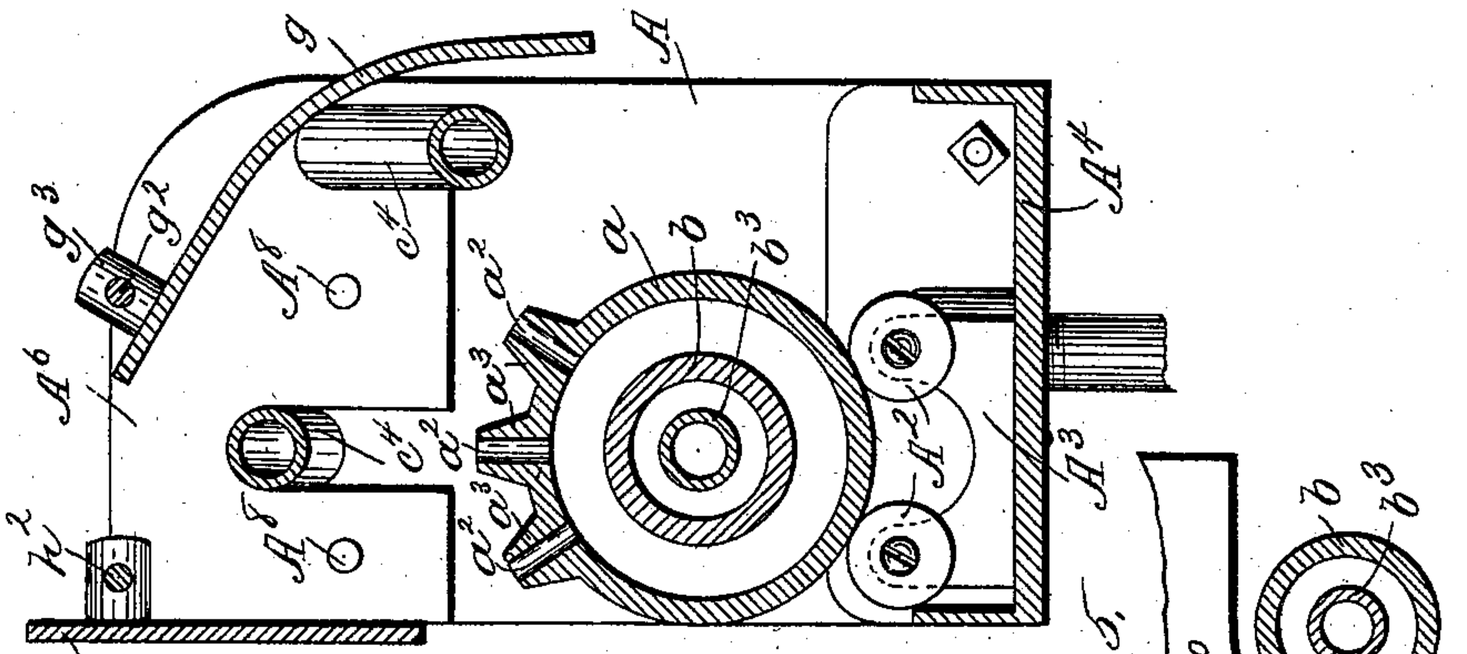


Fig. 3.

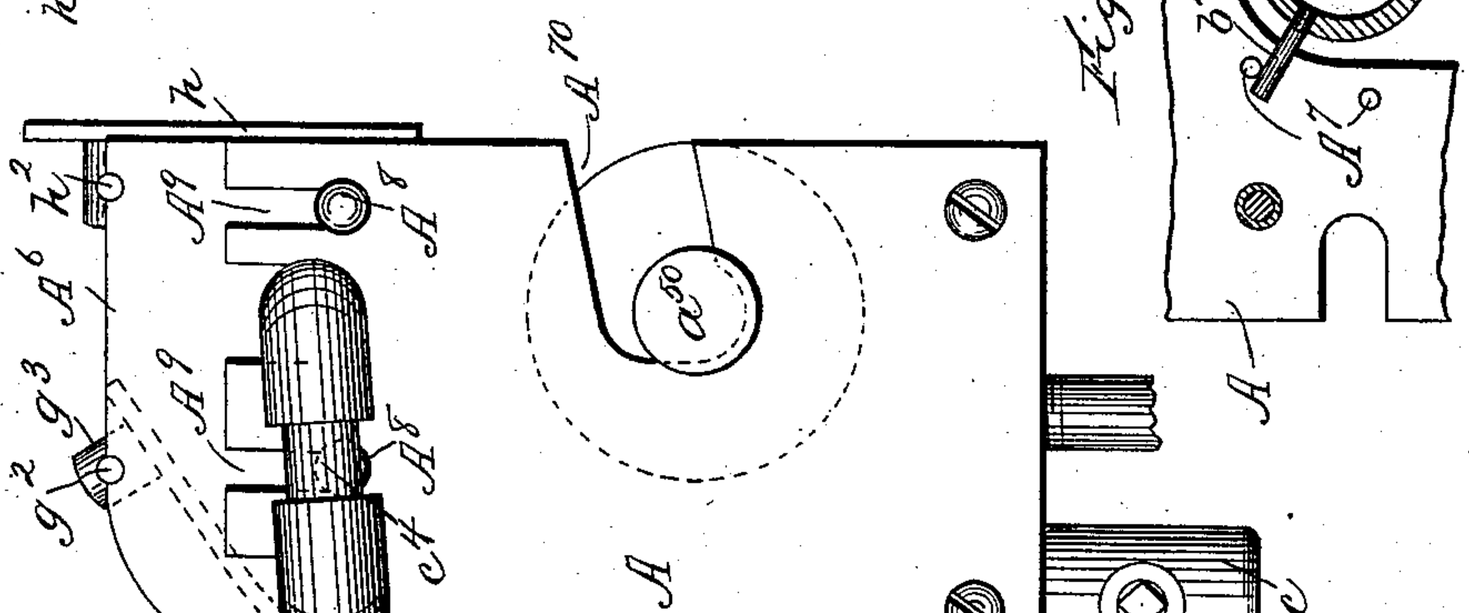
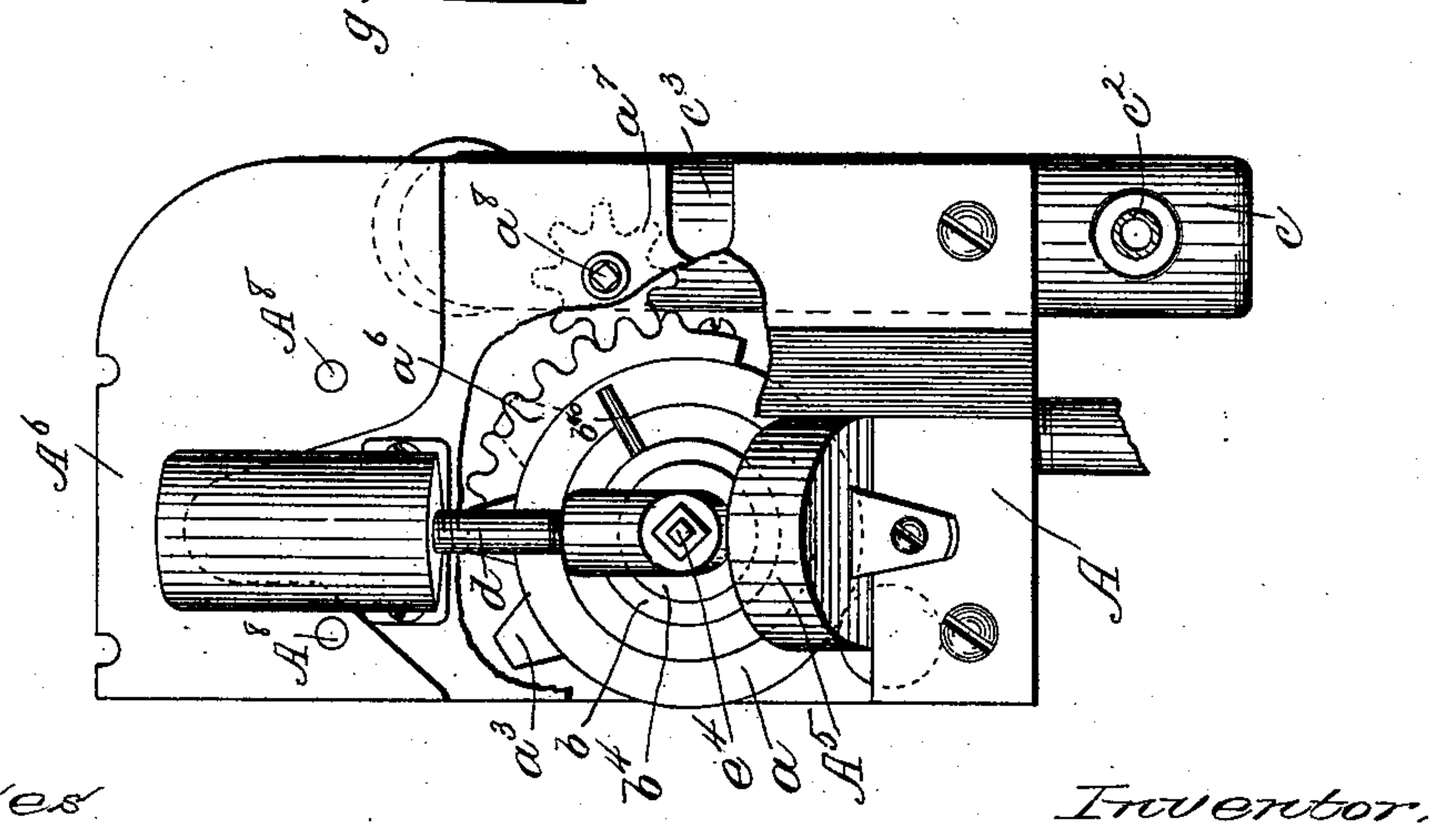


Fig. 5.



Fig. 2.



Witnesses
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H. J. Livermore.

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# UNITED STATES PATENT OFFICE.

OSCAR GASSETT, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO AMBROSE EASTMAN, OF SAME PLACE.

## OIL-GAS-GENERATING BURNER.

SPECIFICATION forming part of Letters Patent No. 601,094, dated March 22, 1898.

Application filed October 2, 1895. Serial No. 564,434. (No model.)

*To all whom it may concern:*

Be it known that I, OSCAR GASSETT, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Oil-Gas-Generating Burners, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to an oil-gas-generating burner, or a burner of that class in which a mineral oil, preferably kerosene, is fed to the apparatus in liquid form and subjected to heat, by which it becomes vaporized and superheated, the gas thus formed being mixed with air and fed to a suitable burner and then ignited.

The invention is embodied in an apparatus in which the liquid fuel is supplied from a suitable reservoir or other source to a superheating tube or tubes, in which it becomes vaporized and superheated to form a gas, the said superheating-tube terminating in an outlet or injector nozzle, from which the gas is injected into the burner, which consists of a chamber having openings, at the outside of which the gaseous contents of the burner are ignited. The gas escaping from the injector-nozzle in crossing the air-space between the said nozzle and the entrance to the burner mixes with air, so that the burner receives a mixture of superheated oil-vapor and air, which forms a highly-combustible gas. In apparatus operating on this principle as heretofore constructed difficulty has been encountered owing to the liability of the gas to ignite within the burner instead of at the outside thereof, the gas then burning at the injector-nozzle, this being especially liable to occur when the outlet from the nozzle is made regulable and reduced in order to reduce the heat of the burner.

The present invention consists, mainly, in an improved construction of burner adapted to be used in conjunction with superheating-tubes communicating therewith through an air-space, as above described, in which the gas escaping from the injector-nozzle at the end of the superheating-tubes, together with the air entrained thereby, is directed, preferably through a concentrating-passage, to an induction-chamber and thence to the burner. It has been found that by such an arrangement the liability of lighting back is practically obviated, while complete combustion is obtained, there being, moreover, no clogging or carbonizing within the burner. The burner embodying the invention consists, therefore, mainly of three parts, which may for convenience be called the "concentrating-tube," the "induction-chamber," having openings which communicate with the burner, and the "burner" proper, preferably surrounding the said induction-chamber and provided with burner-openings communicating with the air, ignition and combustion taking place at the outside of said burner-openings. The induction-chamber and burner-chamber are preferably cylindrical and concentric, the former being contained within the latter and provided with the concentrating-passage, which consists of an elongated tube of a smaller capacity than the said induction-chamber, the said concentrating-passage being adapted to receive gas from the injector-nozzle and the air entrained thereby. The induction-chamber and burner-chamber are both closed at their ends and provided with openings on their side walls, the openings from the induction-chamber being preferably on the side opposite to the side of the burner-chamber which contains the burner-openings.

In order to direct the flame of the burner toward different portions of the stove in which the burner is to be used, the said burner is mounted to rotate upon its longitudinal axis, and two or more lines of openings are provided in the surface thereof, stops being provided to limit the movement of the burner and adjusted so that in either position thereof the flame from at least one row of openings will be directed toward the superheating-tube, which is supported above over the burner, so as to be subjected to heat and insure proper superheating and conversion of the oil into gas before it reaches the jet.

Figure 1 is a side elevation of the apparatus, partly in section; Fig. 2, an end elevation looking toward the left of Fig. 1, a portion of the outer casing being broken to show the other parts; Fig. 3, an end elevation looking toward the right of Fig. 1; Fig. 4, a vertical

cross-section on line $x^4$, Fig. 1; and Fig. 5, a sectional detail on line $x^5$, Fig. 1, looking toward the right.

The burner $a$ consists of a closed chamber, preferably cylindrical, as shown, mounted in upright frame-pieces A at the ends of the apparatus and preferably supported mainly upon the peripheries of wheels or rollers $A^2$, mounted on brackets $A^3$, so as to admit of the said burner being easily rotated on its axis. The said burner is provided with suitable openings, through which a combustible gas admitted thereto, as will be hereinafter described, escapes, there being preferably three rows of such openings, arranged parallel to each other and to the axis of the burner. As shown herein, said openings $a^2$ are somewhat elongated, which may be accomplished by forming them in ribs $a^3$, standing out from the surface of the burner. This elongation is formed to decrease the liability of the gas to ignite within the burner and burn at the jet, this being a common source of trouble in burners of this class. The gas, which consists of oil vaporized and superheated and afterward mixed with air, is admitted to the interior of the burner through an induction-chamber $b$, which consists of a chamber inclosed in the burner $a$ and preferably similar in shape thereto and concentric therewith.

Communication between the induction-chamber and the burner is provided for by means of a series of openings $b^2$ in the wall of said induction-chamber, through which the commingled gas and air contained therein enter the burner. The said induction-chamber is fixed with relation to the burner and preferably so arranged that the openings $b^2$ open toward the closed side of the burner-chamber or, in other words, at the maximum distance from the burner-openings $a^2$, so that the gas escaping therefrom into the burner has to pass around into the induction-chamber before it can escape from the burner-openings, as clearly shown in Fig. 1.

The gas is produced by admitting oil to the apparatus through an oil-inlet $c$, connected by pipe $c^2$ to a reservoir or other supply, the said inlet being connected by an upright chamber or pipe $c^3$ with the vaporizing and superheating tube $c^4$, which is supported in the end frame-pieces A, the said superheating-tube being above the burner-openings, so as to be subjected to the heat of the flame after the apparatus is started. Thus the oil, entering the inlet $c$ in liquid form, becomes vaporized in the chamber $c^3$ and then passes into and through the superheating-tube $c^4$, in which it becomes superheated and converted into gas, which then passes through a pipe $d$ to an injector-nozzle $e$, the said nozzle, as shown, being adjacent to the open end of the induction-chamber $b$, so that the gas escaping under pressure from said nozzle is injected into said induction-chamber, carrying with it a supply of air, with which it becomes thoroughly mixed, thus forming a combustible gaseous fuel which ignites and burns after passing through the burner-openings $a^2$.

Coöperating with the injector is the inlet-tube or concentrating-passage $b^3$, which preferably comprises a tube having an enlarged or bell-shaped mouth $b^4$, directly opposite the injector-nozzle $e$, the said tube being inserted in an opening $b^5$ through the end of the induction-chamber $b$ and extending, as shown, some distance into the chamber, so that the gas and air entrained thereby are confined and concentrated within the said tube before entering the induction-chamber itself.

In order to start the apparatus, a small amount of oil is placed in the bottom of the apparatus, which consists of a pan $A^4$, preferably being provided with a porous substance, such as asbestos, (not herein shown,) to diffuse the oil and cause a proper ignition thereof, thus heating the vaporizing and superheating system to convert the oil admitted through the inlet $c$. A trough or funnel $A^5$ may be provided, as herein shown, to facilitate the pouring of the oil into the said pan $A^4$, the said trough also being lined with asbestos, so that the oil burns in it as well as in the pan, thus heating the jet and preventing any condensation of the fuel which might occur owing to imperfect superheating at the beginning of the operation. After the apparatus is once started it is obvious that the flame from the burner itself is directed against the superheating-tube, so that the apparatus becomes practically self-operating.

The induction-chamber and burner may obviously be connected together in any suitable or usual way, the former being preferably provided with an external screw-thread $b^{30}$, coöperating with an internal screw-thread $a^4$ at the mouth of the burner, the two parts being held in fixed relation by means of a set-screw $a^5$.

The burner-openings $a^2$ may be arranged in any suitable position, there being preferably, as shown herein, three rows of such openings, arranged parallel to each other and extending along the upper surface of the burner $a$. It can be seen that by rotating the said burner upon its axis the direction of the flame issuing from the burner may be changed, it being possible, for example, to direct the greater part of the heat toward one side or the other of the stove when the burner is used in connection with a stove—as, for example, when it is desired to concentrate the heat upon the oven or the water-front.

To provide for means for rotating the said burner, a toothed segment $a^6$ (see Fig. 2) is provided on the outer surface thereof and adapted to mesh with a pinion $a^7$, having a square or flattened spindle $a^8$, adapted to be engaged by a suitable key or wrench, and stops $a^7$, (shown in Fig. 5,) projecting inward from the end plate A, are provided to limit the movement of the said burner, the said stops coöperating with a projection $b^{40}$ from the outer surface of the induction-tube $b$.

The adjustment of the parts is such that in either position of the burner determined by said stops a flame from one line at least of the burner-openings is directly under the final branch of the superheating-tube, which tube, as shown, is preferably in the form of a loop, having an initial and a final branch extending across the upper part of the apparatus and arranged, as will be described, to be subjected to the greatest amount of heat along the final branch.

The fire can be regulated by regulating the flow of gas from the injector-nozzle, the said injector-nozzle being herein shown as provided with a needle-valve $e^2$, having a screw-thread $e^3$ and a flattened or square end $e^4$, adapted to be engaged and rotated by a key or wrench, thus regulating the size of the nozzle-opening and the amount of gas escaping therefrom.

The arrangement of the vaporizing and superheating system is such that the inlet portion, as shown in Fig. 1, is below the burner, and consequently is subjected to a comparatively slight amount of heat. The tube $c^3$, however, rises into the vicinity of the burner, so that the temperature thereof gradually increases from the bottom to the top. Thus the oil from the oil-inlet will rise in the tube $c^3$, remaining in liquid form at the bottom of said tube and becoming vaporized toward the top, the vapor then passing through one branch of the vaporizing and superheating pipe $c^4$, the said branch being, as shown, somewhat away from the direct line of the flame issuing from the burner, so that it is not subjected to the greatest amount of heat. The other branch of the superheating-tube, however, is directly over one line of burner-openings in either position of the burner, and is therefore subjected to the greatest possible heat, so that the process of vaporizing and superheating is gradual, the heat increasing as the material passes from the inlet to the final branch of the superheating-tube, where it is at a maximum, so that the vapor on reaching the tube $d$, leading to the injector-nozzle $e$, is thoroughly superheated and converted.

By reference to Fig. 4 the relation of the burner-openings to the superheating-tubes can be clearly seen, the initial branch of said tubes being somewhat out of the line of the right-hand row of burner-openings, while the final branch is directly over the central line, as shown, or the left-hand line when the position of the burner is shifted.

In order to fully insure the concentration of the heat upon the superheating-tube, deflectors $g$ and $h$ are provided which serve to direct the flames toward the said tube and at the same time prevent the said flames from being disturbed by drafts caused by the removal of the covers from the stove or other causes tending to divert the heat from the superheating-tube.

The construction of the apparatus as a whole is preferably substantially as shown in the drawings and is simple and inexpensive, the arrangement being such that the main portions of the apparatus are retained in place without fastenings of any kind and are therefore readily removable, if need be, from the main frame, which consists, simply, as above described, of a pan $A^4$, having two end plates A secured thereto. The burner, as has been stated, is mainly supported upon the rollers $A^2$, but is further held in position by the slot $A^{70}$ in the end plates, having a recess at the lower part thereof, within which fits the extension $a^{50}$ at the end of the burner. The said burner may therefore be easily lifted and removed, if need be, although when in position it is securely held by its own weight.

The vaporizing and superheating system, together with the oil-inlet and the injector-nozzle, is formed in one piece and supported in the proper position by the end plates A, which are provided, as shown, with recesses at their upper edges to receive the superheating-tube.

To close in the ends of the apparatus above the superheating-tube, the supplemental plates $A^6$ are employed and provided with slots at their lower edges, which fit over the said tube and which may be, moreover, provided with studs $A^8$, coöperating with slots $A^9$ in the end plate A. Thus after the superheating-tube is in place the supplemental plates are slipped over it, and the deflectors $g$ and $h$ are supported upon the said supplemental plates.

As herein shown, the deflector $g$ is provided at its upper portion with a longitudinal rod $g^2$, secured in lugs $g^3$, the end of said rod resting in suitable recesses at the top edges of the supplemental plates $A^6$, and the lower portion of the said deflector $g$ is supported upon the superheating-tube, as indicated in Fig. 4. The deflector $h$ is similarly supplied with a rod $h^2$, secured thereto in substantially the same way and also supported upon the supplemental plates.

I claim—

1. In an oil-gas-generating burner, the combination of a superheating-tube and an injector-nozzle at its educt end, a perforated induction-chamber, an inlet-tube arranged in the outer end thereof, the said chamber and its tube being alined with said nozzle and separated from it by an air-space and adapted to receive commingled air and gas, and a burner-chamber inclosing said induction-chamber and mounted below the superheating-tube, and provided with burners adjacent to said tube, the said induction-chamber being interposed between, separating and also affording indirect communication between the injector-nozzle and the burner, substantially as described.

2. In an oil-gas-generating burner, the combination of a superheating-tube and an injector-nozzle at its educt end, a perforated induction-chamber closed at its inner end, an

inlet-tube arranged in said chamber and alined with the nozzle, the said induction-chamber and its inlet-tube being separated from the nozzle by an air-space and adapted to receive commingled air and gas, and a burner-chamber inclosing said induction-chamber, mounted below the superheating-tube and provided with burners adjacent to said tube, the said induction-chamber being interposed between, separating and also affording indirect communication between the injector-nozzle and the burner, substantially as described.

3. The combination with the superheating-tube and injector-nozzle of a cylindrical burner provided with an induction-chamber adapted to receive air and gas from said injector-nozzle, said burner being mounted below said tube and substantially parallel with the final branch thereof; two or more rows of burner-openings along the surface of said cylinder adjacent to said superheating-tube; and means for rotating said cylinder upon its longitudinal axis within certain predetermined limits, the adjustment of the parts being such that in either position of the cylinder one row of openings will be directly under said final branch of the tubes, substantially as described.

4. In an oil-gas-generating burner, the combination of an oil-gas vaporizing and superheating tube, and an injector-nozzle at its educt end for delivering the gas therefrom, a perforated induction-chamber, and an inlet-tube extending into said chamber and having its mouth in alinement with the gas-injector nozzle and separated therefrom by an air-space, an outer chamber inclosing said induction-chamber and receiving the air and gas from the perforations of the latter, said outer chamber being provided with burner-outlets arranged in proper relation to the oil-superheating tube to cause the flame at said burner-outlets to act on said superheating-tube, substantially as described.

5. The combination of a gas-injector nozzle, a perforated induction-chamber, and an inlet-tube extending into said chamber and having its mouth in alinement with the gas-injector nozzle and with an open air-space between, and an outer chamber inclosing said perforated induction-chamber and receiving the air and gas from the perforations thereof and being provided with burner-outlets, substantially as described.

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

OSCAR GASSETT.

Witnesses:
H. J. LIVERMORE,
N. P. FORD.