No. 698,455. Patented Apr. 29, 1902.

E. S. CLARK.

HEATING GAS BURNER.

(Application filed Mar. 21, 1901.)

(No Model.) 2 Sheets—Sheet 1.

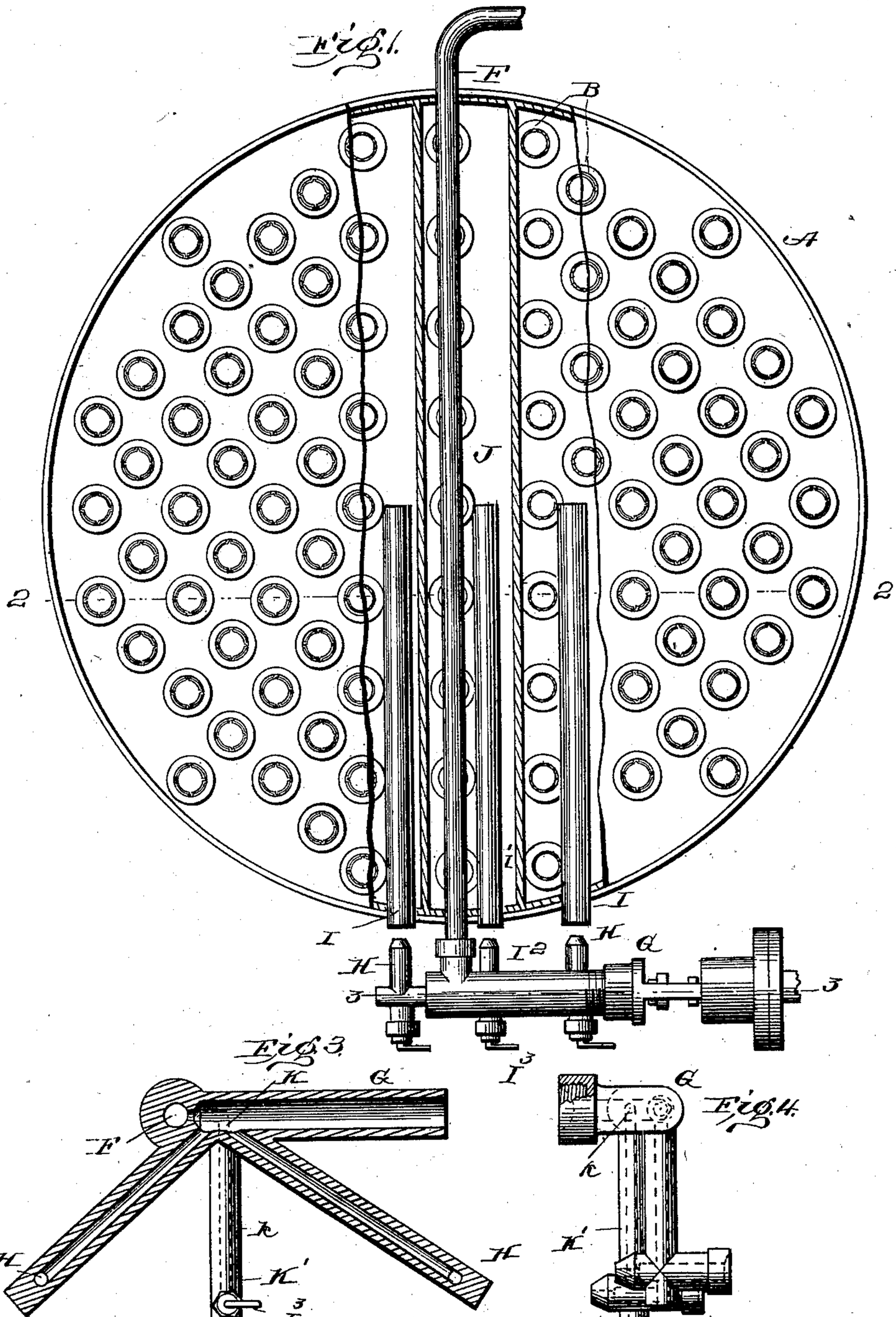

Fig. 3.

Fig. 4.

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Fig. 2

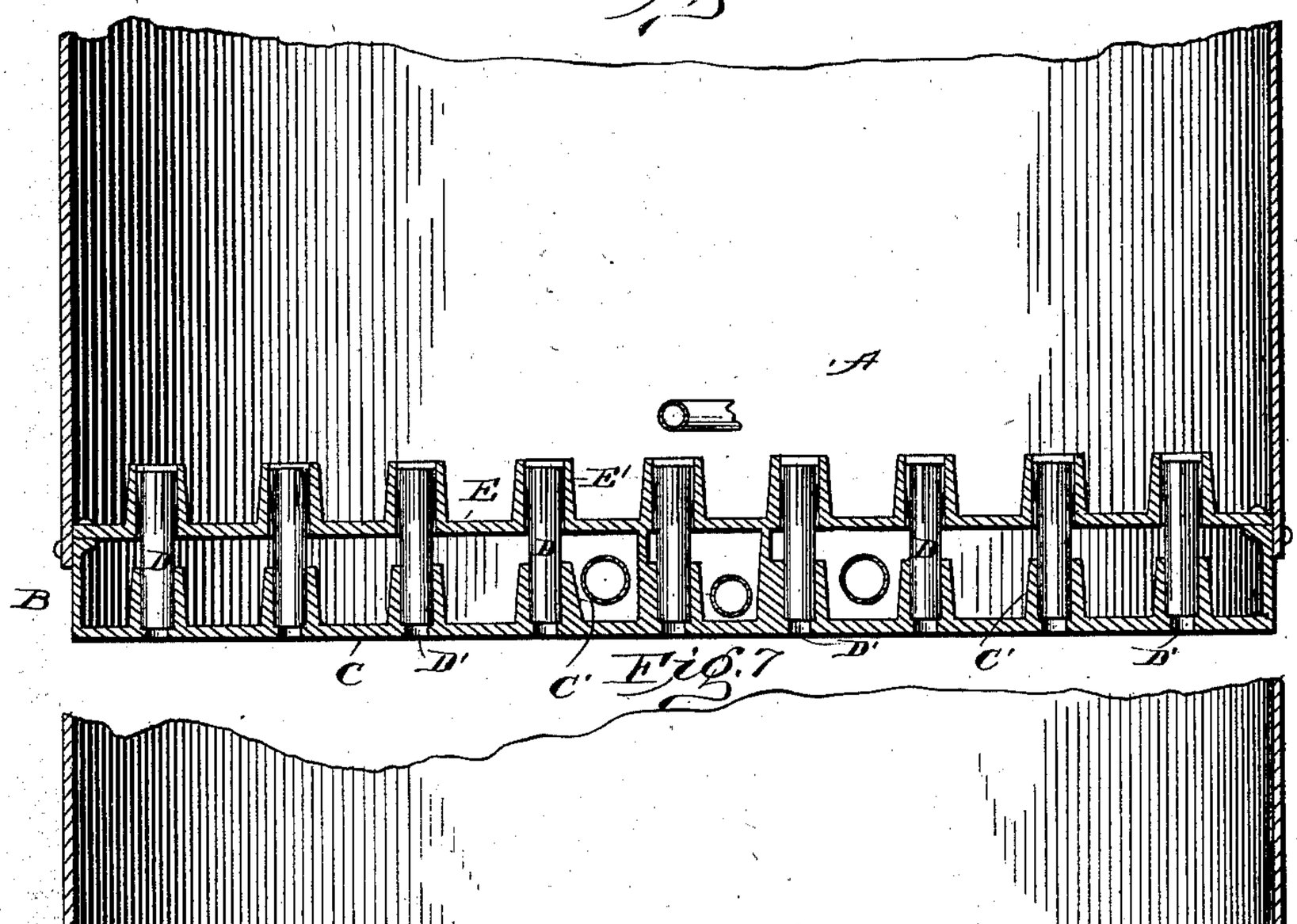

Fig. 7

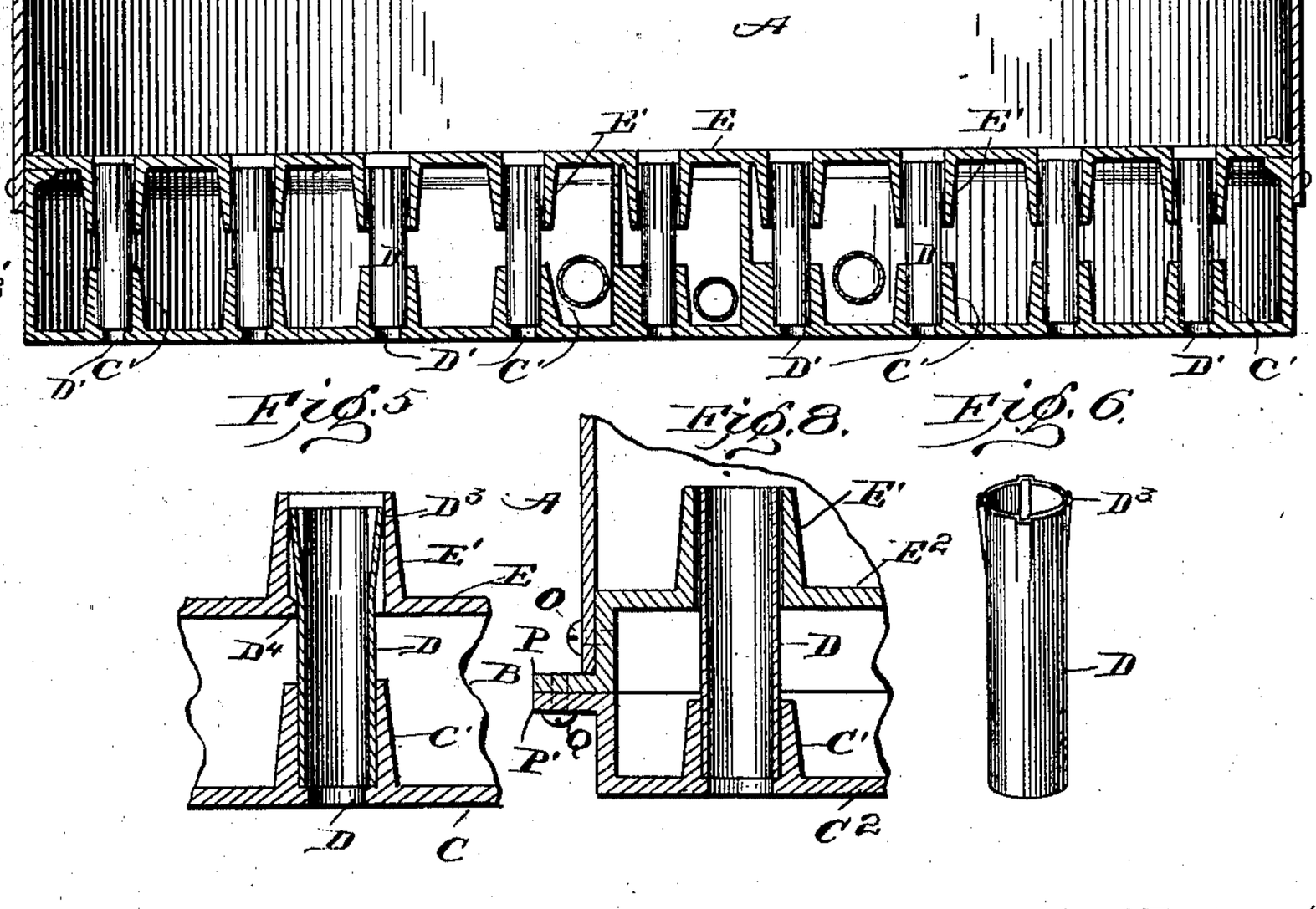

Fig. 5

Fig. 8.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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HEATING GAS-BURNER.

SPECIFICATION forming part of Letters Patent No. 698,455, dated April 29, 1902.

Application filed March 21, 1901. Serial No. 52,169. (No model.)

To all whom it may concern:

Be it known that I, EDWARD S. CLARK, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Heating Gas-Burners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates particularly to burners such as are used for generating steam and the like purposes, and it is illustrated by apparatus adapted for generating steam in a boiler suitable for a motor-vehicle, although the invention is not limited to such apparatus, but may be embodied in devices for use in any case where gaseous fuel is employed for producing heat.

It has been common to make a burner of thin sheet metal formed into a closed box having two opposite sides connected by tubes, boiler-like, which serve as air-flues. Gas being admitted into such box and allowed to escape through numerous small perforations arranged in a circle around each of said air-flues may be ignited and burned at or just above the point of escape. Such burners have proved very unsatisfactory for many reasons. For example, it is necessary to drill thousands of very small holes for the escape of the gas from the box, and this is expensive. A downward blast is likely to drive the flame into the box. The upper plate is highly heated and quickly destroyed. The joints soon open by expansion and contraction, and when spray of the liquid used is mixed with the vapor or when the vapor condenses in the burner the latter leaks and the liquid spreading over the outer wall of the box ignites, becomes hot enough to ignite the gas within, and thus the burner is quickly ruined. When the burner is turned low to prevent useless generation of steam, as when the vehicle is standing still, it is readily blown out by a chance blast, and it is a very difficult matter to repair such a burner or to clean it or to clear such of its apertures as may become clogged. To remedy all these evils is one object of this invention.

Another object is to provide for keeping up pressure without generating too much steam and without danger of extinguishing the flame and filling the burner with liquid by condensation when the flame is accidentally out and the gas still turned on.

Besides these there are other objects which will appear when the apparatus is described.

In the accompanying drawings, Figure 1 is a plan view of a burner mounted in the dependent portion of a boiler-shell. Fig. 2 is a section on the line 2 2, Fig. 1. Fig. 3 is a partial section at 3 3, Fig. 1. Fig. 4 is an elevation of the parts seen in Figs. 1 and 3 looking from the left in Fig. 1. Fig. 5 is an enlarged sectional view showing, with adjacent parts, one of certain tubes seen in Fig. 1. Fig. 6 is a perspective view of one of said tubes. Fig. 7 is a view similar to Fig. 1, showing a slight modification. Fig. 8 shows a further modification.

In all the views where the letters appear, A represents a dependent portion of the shell of a vertical boiler of any suitable type, and B a burner fitting and detachably secured in that shell at any desired distance below the body of the boiler.

As shown in Figs. 1 and 2, the body of the burner consists of a one-piece cup having scattered over its bottom C rather closely-adjacent upwardly-projecting hollow conical frustums C′; in which fit short tubes D, whose interior diameter is preferably just equal to that of passages D′, extending from their lower ends entirely through the bottom C of the cup. The cup is closed by an upper part or cover E, removably fixed to the cup's walls and having, like the bottom of the cup, integrally-formed hollow upwardly-extending frustums E′, registering with those below and terminating at or near the upper ends of the tubes D, which they inclose, respectively. The interior diameter of each of these frustums is somewhat greater than the external diameter of the tube lying within it, and hence there is around each tube a long and narrow annular passage through which gas passes from the interior of the box to be further mixed with air delivered through the tube and then burned at or a little above the upper end of the tube and at some distance from the upper plate of the burner. As the burner fits the shell A, there is no draft

through the space between the frustums, and hence there is a non-conducting layer of nearly dead air between the flame and the plate, so that the burner is not unduly heated. As is seen clearly in Figs. 5, 6, the upper end of each tube D or the interior wall of the frustum may be provided with ribs D^3 or D^4, which keep the tube at all times central in the upper frustum.

The gas usually employed is a hydrcarbon, and to supply it gasolene is brought from any suitable source of supply through a tube F, which passes over the burner to an automatic feeder or regulator G, without novelty, and thence to two nozzles H, which discharge it into mixing-tubes I, delivering it in the burner among the pipes D.

Preferably the burner is provided with a small closed chamber J, (shown as extending entirely across the burner, though this is not essential,) having within it certain of the tubes D, which lie directly under the supply-tube F. Into this chamber gas is introduced through a mixing-tube I′, which gets its supply from the pipe F, but through a by-pass around the regulator-valve apparatus G. This by-pass is a passage K, leading a part of the gas brought by the pipe F through a pipe K′ to a nozzle I^2, the amount passing being controlled entirely by a hand-valve I^3. From this constrnction it follows that around a few tubes a full supply of gas may at all times burn, thereby keeping the gasolene in the pipe F above fully vaporized, keeping the boiler-pressure practically constant, and lighting all the other parts of the burner as soon as gas is supplied.

Should liquid gasolene collect in the burner, it cannot leak out, for the cup is of one piece; but it will be gradually vaporized and pass out around the tubes with the vapor never condensed in the burner. Should the burner need repair or cleaning, it may be quickly removed from the shell. When removed, any one of the many tubes may be lifted out and restored to position or replaced by a new one, and, if desired, the top of the box may be taken off. This top, also, may be replaced by a new one at slight expense.

Preferably the upper and lower parts of the burner-box or the cover and cup are cast, and the cones in addition to their main functions prevent warping of the plates of which they are a part. It has been said that the long frustums also cause the gas to be burned at some distance from the body of the burner; but a more important result of their use is obtaining a long narrow passage for the inflammable vapor, for in the old form of burner ignited gas can be and often is driven through the short passages into the interior of the burner. I have found that the longer the passage the wider it may be without danger. If the passage be of proper length, the flame is smothered, even if the passage be quite wide. I have obtained many advantages in using the frustums; but it is obvious that other constructions would give this long passage and secure safety and also save much of the cost of manufacture.

In Fig. 7 I have shown the modification of inverting the covering-plate, so that the cones may be within the burner. This form is less desirable than the other; but it secures many of the advantages above set forth.

Fig. 8 shows the modification of securing the upper portion of the burner to the boiler shell or skirting extending downward therefrom when the depending portion is not integral with the shell and detachably securing the lower part to the upper part. In the drawings the upper part E^2 is shown as attached to the shell or skirting by screws O and the lower part C^2 as secured by screws Q, connecting flanges P P′ of the two parts and inserted from below, so that they may be perfectly accessible. This construction permits removing the whole burner when necessary and also allows ready detachment of only the lower part and the tubes when, as is usually the case, this is all that is needed for cleaning or repairs. Fig. 8 also shows the tubes as without ribs and as terminating in the plane of the upper limits of the apertures of the upper plate, such construction being illustrated, since it is possible to make a fairly-good burner with other means or no means at all for holding the tubes central in the larger apertures.

What I claim is—

1. The combination with a closed burner-chamber having in its top a series of perforations and in its bottom correspondingly-located smaller perforations, of upwardly-removable open tube-sections each having its lower end seated in the bottom in registry internally with one of the perforations therein and with its upper end portion centrally located in the corresponding larger perforation in the top; whereby the upper perforations become annular passages in the axes of which air from below the chamber is delivered by tubes readily removed and inserted through said upper perforations.

2. The combination with a closed burner-chamber having in its top a series of perforations and in its bottom correspondingly-located smaller perforations each surrounded by an annular projection or boss forming a tube-socket, of upwardly-removable open tube-sections each seated in one of said sockets and having its upper end portion held central in the corresponding larger perforation above and terminating below the upper end of said perforation.

3. In a burner of the class described, the combination with a one-piece cup-like lower member divided into non-communicating compartments each having in its bottom perforations surrounded, respectively, by annular projections forming tube sockets or seats, of an upper member closing all the compartments and provided with perforations larger than those below but registering with them and

surrounded by analogous bosses, tube-sections externally of less diameter than the perforations in the top, removably seated in said sockets, respectively, with their upper end portions lying centrally in the perforations of the top, through which they may be readily removed and replaced, mixing-tubes projecting into said compartments, respectively, a vaporizing-tube passing over the perforations in the top of one compartment, injecting-nozzles supplied from said vaporizing-tube and discharging into the outer ends of the mixing-tubes, respectively, means for controlling the nozzle supplying the compartment below the vaporizing-tube, and independent means for controlling the supply to the remainder of the burner.

4. The combination with the boiler shell or skirting, of an upper burner member downwardly closing the shell and provided with a series of perforations each surrounded by an integrally-formed tubular projection or boss, a cup-like lower member separably connected with the upper member, to form therewith a closed chamber, and provided with perforations registering with those above and each surrounded by a tubular projection or boss counterbored to receive a tube from above, and a series of tubes externally of smaller diameter than the perforations in the upper member, removably seated in the counterbored projections, respectively, and each extending centrally into the corresponding perforation in the upper member and upwardly removable therethrough.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD S. CLARK.

Witnesses:
EDWARD T. MCCLENNEN,
LOUIS AUERBACH.