Nov. 1, 1927. 1,647,315

W. G. SCHERER

HEATER

Filed March 9, 1925 4 Sheets-Sheet 1

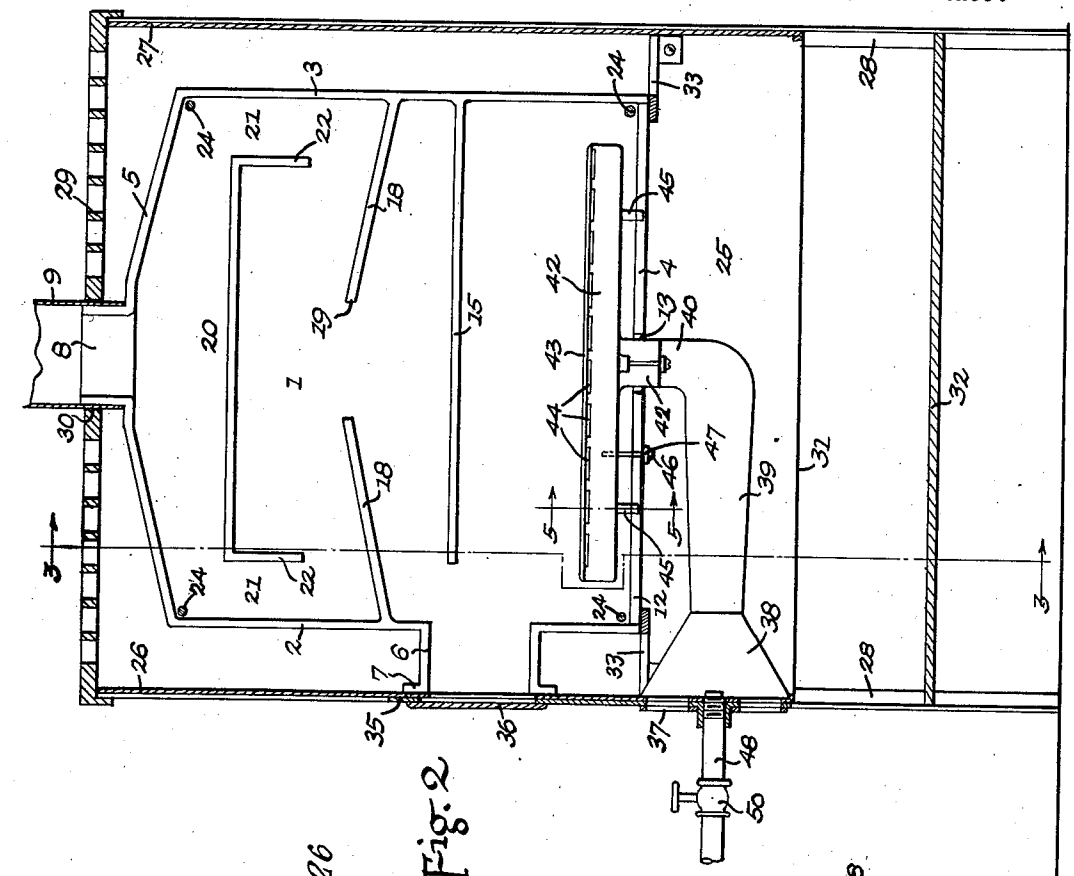


Fig. 2

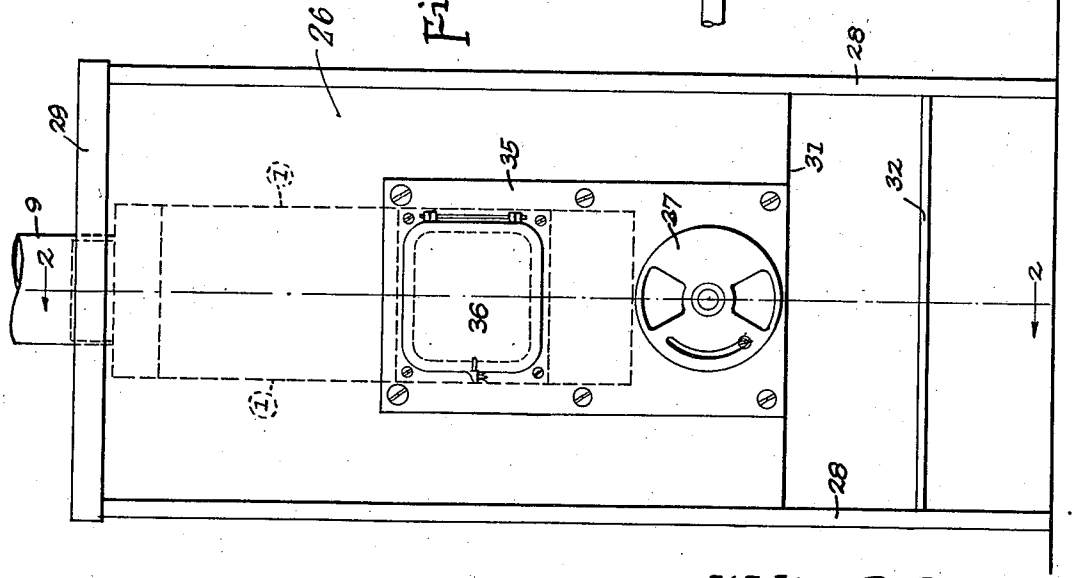


Fig. 1

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Filed March 9, 1925 4 Sheets-Sheet 2

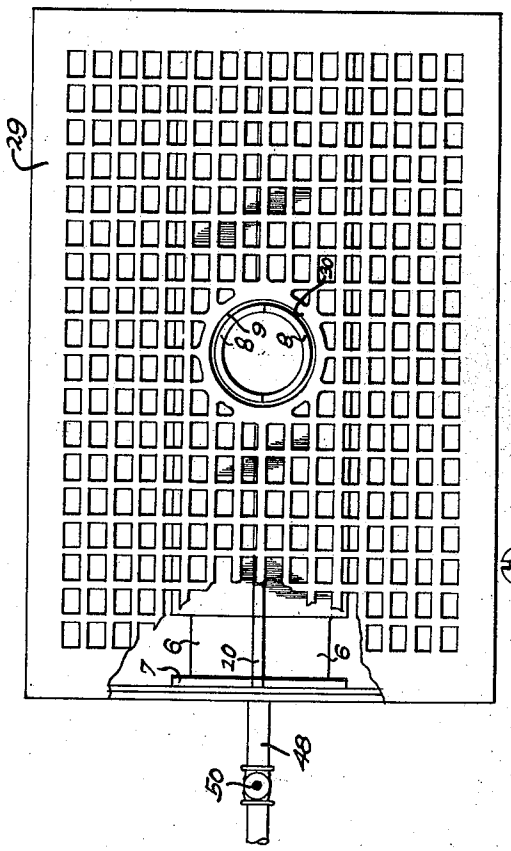


Fig. 4

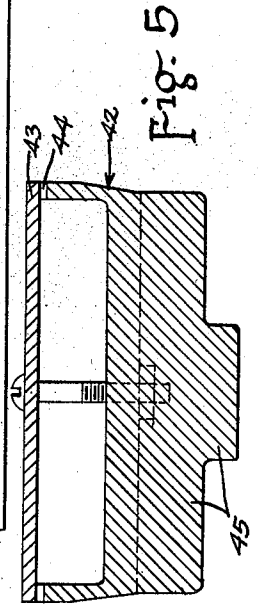


Fig. 5

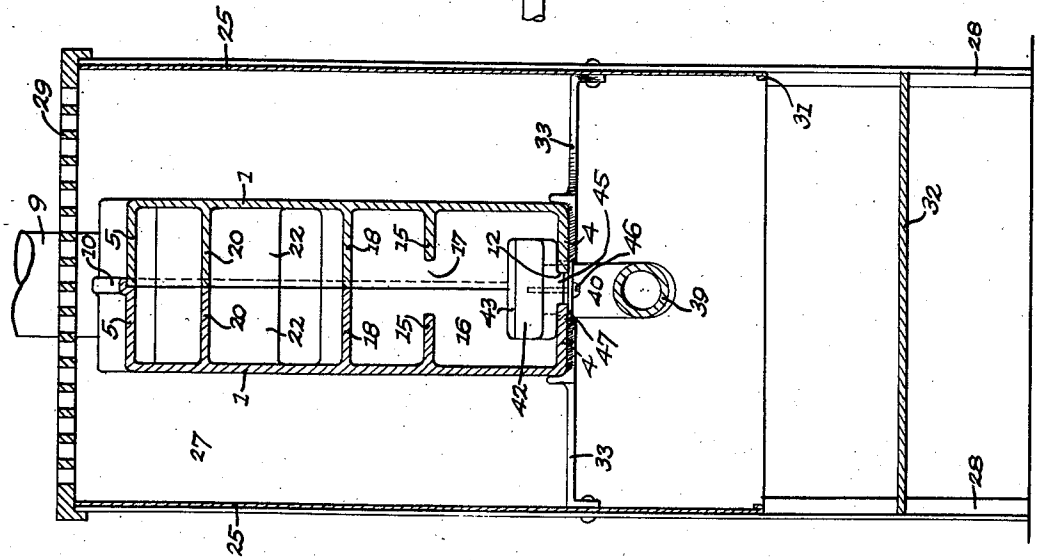


Fig. 3

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Nov. 1, 1927. 1,647,315

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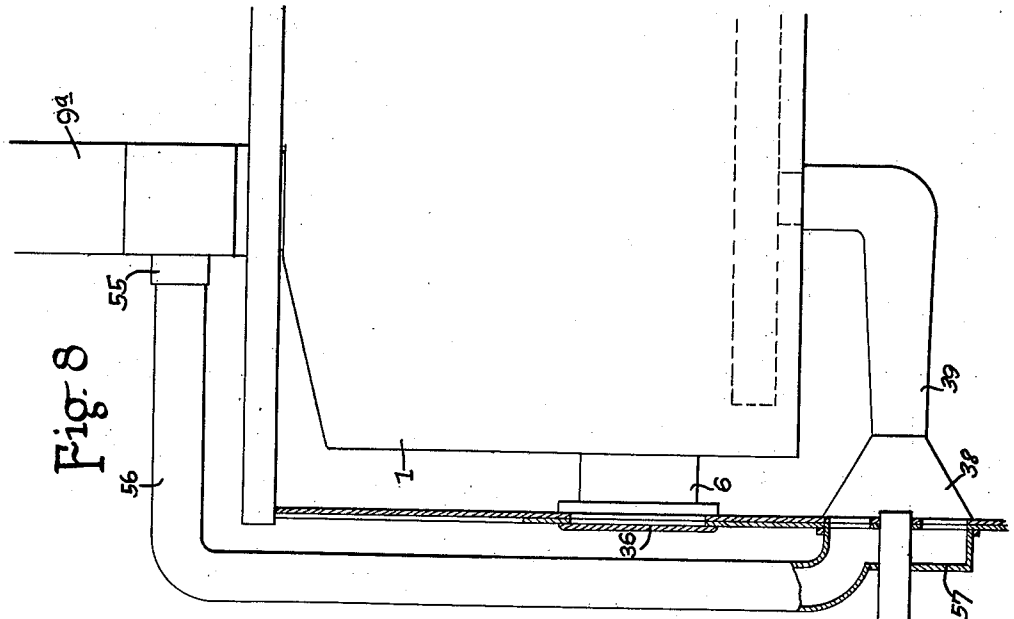


Fig. 8

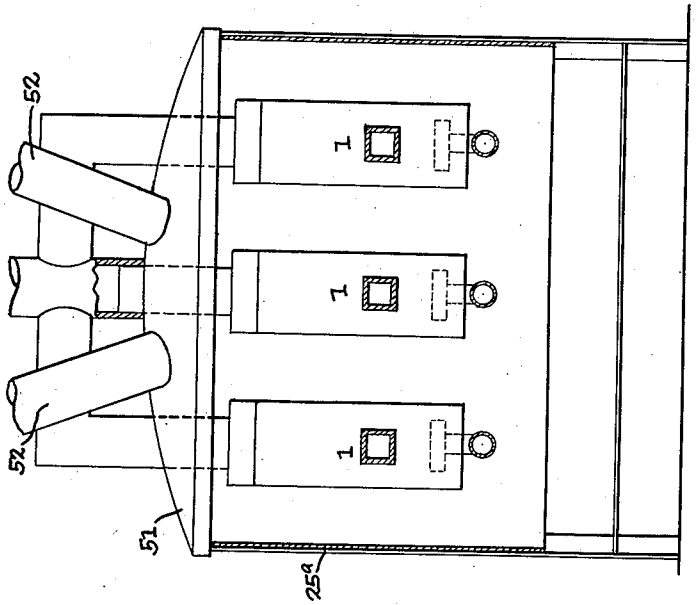


Fig. 7

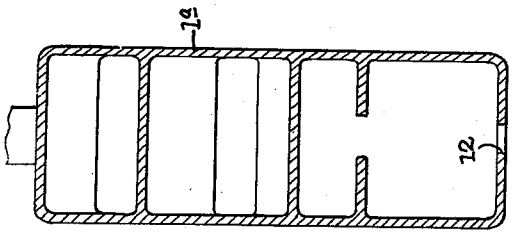


Fig. 6

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Nov. 1, 1927. 1,647,315

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HEATER

Filed March 9, 1925 4 Sheets-Sheet 4

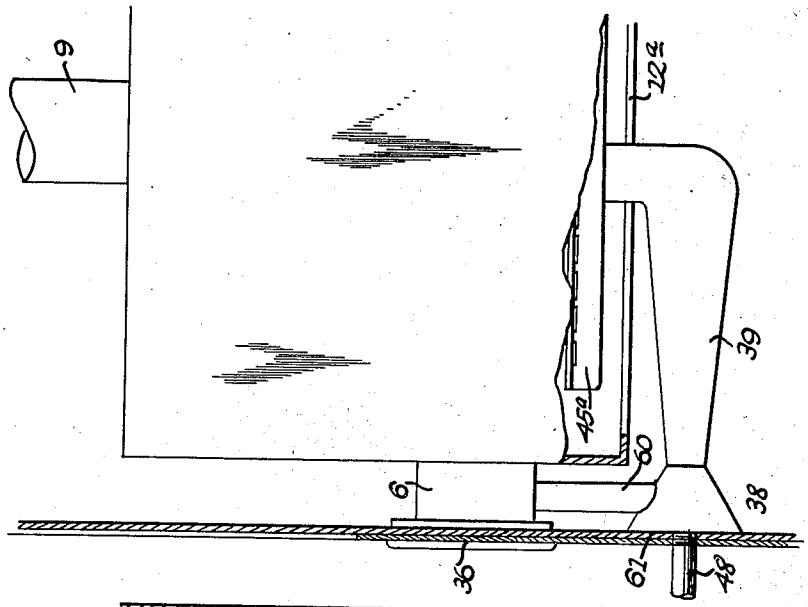


Fig. 9

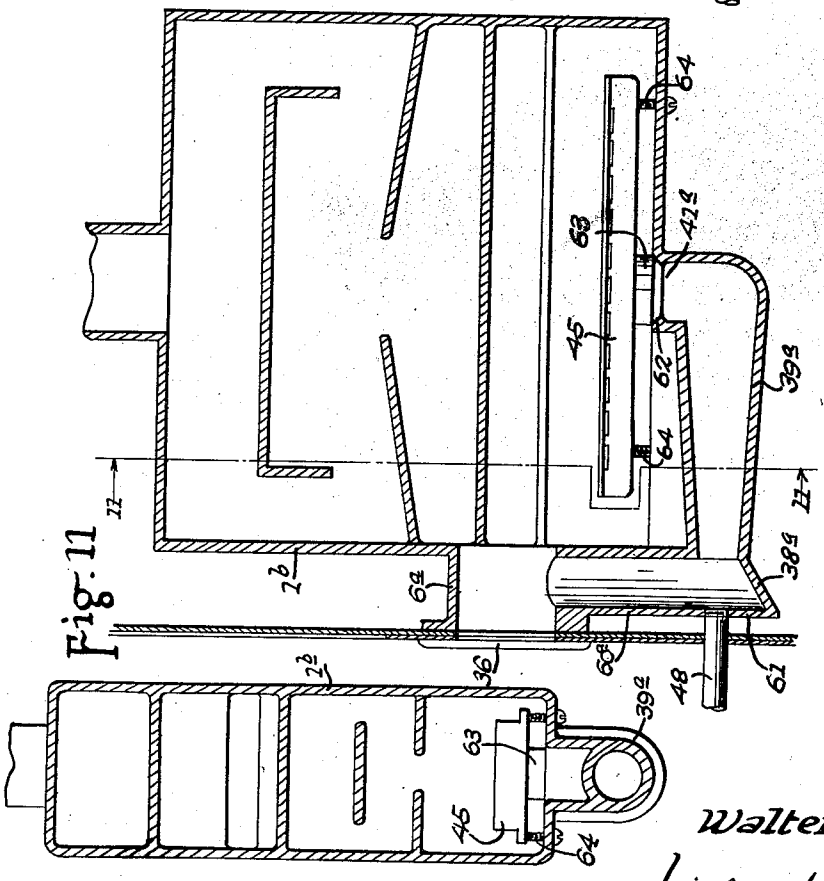


Fig. 10

Fig. 11

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Patented Nov. 1, 1927. 1,647,315

UNITED STATES PATENT OFFICE.

WALTER G. SCHERER, OF CLEVELAND, OHIO.

HEATER.

Application filed March 9, 1925. Serial No. 14,071.

This invention relates to heaters, especially of the gas burning type, and has for its object the provision of a stove of great simplicity, inexpensiveness, and ease of manufacture, devised for use with gas and arranged to be made of such shape as shall exhibit a maximum of heating economy and of such material as shall withstand the corrosive effect of gases customarily furnished at the present day; another object of the invention is the provision of a gas heater so designed that the gas may be turned extremely low without the use of a pilot light or extremely high without injury to the parts, loss of heat economy or the production of disagreeable odors; the provision of a new and improved construction and arrangement of parts affording maximum economy in operation combined with facility in manufacture, especially when the parts are made of cast metal; while further objects and advantages of the invention will become apparent as the description proceeds.

In the drawings accompanying and forming a part of this application I have shown one physical form in which my invention can be embodied although it will be understood that these drawings are intended merely to illustrate the general principles of my inventive idea and not to restrict the embodiment thereof. Fig. 1 is a front elevation of a heater embodying my improvements; Fig. 2 is a central vertical section corresponding to the line 2—2 of Fig. 1; Fig. 3 is a central vertical section corresponding to the line 3—3 of Fig. 2; Fig. 4 is a top plan view; Fig. 5 is a sectional view of the gas burner; Fig. 6 is a cross sectional view of a modified form of internal radiator; Fig. 7 is a sectional view of an air heating furnace illustrating three of my improved radiators located inside a single casing; Fig. 8 illustrates another modification wherein the mixing tube is connected to the outlet flue; Fig. 9 is a partially internal view of one of my improved stoves with part of the radiator broken away illustrating a modified form of connection between the mixing tube and radiator interior; Fig. 10 illustrates another modification wherein the essential parts of Fig. 9 are cast together; and Fig. 11 is a sectional view corresponding to the line 11—11 of Fig. 10.

For purposes of this description I have chosen a type of heater sometimes known as a garage heater and employed primarily for heating garages, factories, assembly rooms, offices, and such places, and comprising an internal radiating member in which the combustion takes place and an external casing surrounding the same and spaced therefrom so as to define an air flue. In its preferred form this combustion chamber comprises a pair of mating cast-iron members having flat side walls 1—1 formed at opposite sides with parallel flanges 2, 3 and on the remaining sides with other flanges 4, 5 respectively. The part having the flanges 4 will hereafter be termed the bottom, that having the flanges 5 the top, and that having the flanges 2 the front of the member.

Projecting forwardly from each of the flanges 2 is a hollow extension 6 adapted to join the similar extension of the mating part to produce a kind of vestibule, the end of which is formed with an out-turned lip 7. The flanges 5—5 are formed each with a semi-cylindrical, upwardly-extending hollow projection 8 which cooperates with a similar mating projection to form a boss for the attachment of a stove pipe 9. The flanges 2, 3, 5, and the meeting walls of the extension 6 are provided, one with an offset peripheral lip 10 defining a rabbet which receives the other, thereby holding the parts tightly together and preventing leakage or shifting. The flanges 4—4 are narrower than the remaining flanges so as to define between them a slot 12 which, in the present instance, extends the entire length of the casing from front to rear for the purpose of permitting entrance of part of the air necessary for combustion purposes; and in addition the flanges 4, 4 are formed at one point with registering notches 13 adapted for the reception of the burner hereafter described.

Interiorly this radiating member is also formed with webs or baffle walls so arranged as to produce a circuitous flow of the combustion products, and while many different arrangements are possible, a very satisfactory one has been that shown in Figs. 2 and 3. Projecting inwardly from opposite walls 1, 1 are thin ribs 15, 15 spaced sufficiently from the flanges 4, 4 to define a combustion chamber 16 and preferably terminating sufficiently short of each other to define an outlet passage 17 running from end to end of the chamber. Projecting inwardly from the side walls 1, 1 above the ribs 15 are webs

18, 18 which preferably join the flanges 2, 3 at their ends and meet each other in the middle, but are spaced apart longitudinally near the center of the chamber to define an outlet passage 19. Above these webs I have shown other webs 20, 20 extending inwardly from the side walls until they meet the companion webs but spaced from each of the flanges 2, 3 so as to define outlet passageways 21, 21 adjacent thereto; and for the purpose of trapping a certain amount of the rising gases I have shown the ends of this web as formed with depending branches 22—22. Additional webs and baffles can be employed in case the height of the member permits, although for a small stove the arrangement herein shown has proven very satisfactory. The halves of the member 1 are secured together by suitable bolts 24—24.

Surrounding the member 1 is a rectangular casing having sides 25—25 and ends 26—27 all formed preferably of sheet metal and spaced sufficiently from the radiating member to afford a passageway for the requisite quantity of air. I have shown this casing as supported by angleiron legs 28—28 at the corners and covered by a grating 29 in which is formed a circular opening 30 receiving the stove pipe. The lower edge of this casing preferably terminates a substantial distance above the floor as shown at 31 although it also preferably depends a considerable distance below the flanges 4—4 as shown in Fig. 3. A sheet metal shelf 32 preferably connects the legs beneath the bottom of this casing so as to reflect the heat which might otherwise fall upon the floor with dangerous effect. Brackets 33 support the radiator in the casing.

The lips 7—7 are bolted through the casing wall 26 to a rectangular front plate 35 which is formed with a working door 36 registering with the vestibule and also with a register plate 37 located beneath the level of the flanges 4—4. This register plate is preferably circular and communicates with the bell mouth 38 of a mixing tube 39 whose rear end is turned upwardly as at 40 for attachment to the depending neck 41 of the burner 42, said neck extending through the notches 13—13. This burner preferably comprises a rectangular, elongated, cast-iron box having its top closed by a removable cast-iron lid 43, the side walls being formed immediately adjacent this lid with shallow cast recesses 44 facing the side walls 1—1 and spaced therefrom such a short distance as shown in Fig. 3 that the thin sheets of gas flame issuing therefrom play over the surface of the walls 1—1, only sufficient space being left for the admission of the requisite quantity of air. The bottom of the burner is formed with cast projections 45 on and between the flanges 4 and the burner is secured in place by bolts 46 and cross pieces 47. The gas pipe 48 enters the front of the stove and is provided with a controlling valve 50 at the most convenient location.

It is not necessary to make the radiating member in two parts as shown in Figs. 1 to 4, since the same can equally well be made by casting in a single piece as illustrated in Fig. 6, the cavities being formed by coring as well known in the casting art. Likewise it is not necessary to employ a single combustion chamber or radiator for each casing as it is equally practicable to employ plural units in a single casing as shown in Fig. 7, the rectangular shape of the parts facilitating this arrangement. The flat rectangular shape of the radiating units also exhibits further advantages of increased ratio of superficial area to cubical contents which facilitates the extraction of the heat from the combustion products; although experience proves that such rectangular shape can be successfully made only in cast ferrous metal since the irregular expansion and contraction produced by this shape rapidly disintegrates any sheet metal member. It is also important that the gas burner have jets which impinge directly on the larger walls of the radiating members.

In Fig. 7 I have illustrated the further modification of providing the top of the casing 25^a with a domed cover 51 instead of the grid 29 and securing thereto a plurality of hot-air pipes 52 by which the heat can be conveyed to distant points. I do not restrict this modification to use with a casing having plural radiators, although in most cases such an arrangement is best suited thereto.

In Fig. 8 I have illustrated a further arrangement of parts whereby heat is conserved and the operation of the heater improved. The flue 9^a from the radiator 1 is formed with a side branch 55 to which is connected a pipe 56 leading to a circular box 57 which tightly covers the inlet mouth of the mixing tube 39. The vestibule 6 is closed by a tightly fitting door 36 and the bottom of the radiator 1 may either be formed with the slot 12 shown in Figs. 3 and 6, or this slot may be entirely closed.

Another mode of securing the same advantageous results is shown in Fig. 9 wherein the vestibule 6 is connected to the bell 38 of the mixing tube 39 by means of a short pipe 60. In this case no side branch is required from the flue 9, neither is any air inlet provided into the bell through the face of the casing at 61, but the gas pipe 48 discharges therein without air supply other than is received through the pipe 60. The mouth of the vestibule is still tightly closed by an imperforate door 36. In this case I have shown the burner 45^a as cast integral with the mixing tube 39 and inserted through a slot 12^a in the bottom of the casing.

In Figs. 10 and 11 I have shown yet another modification which is in many respects the best of all because of its maximum economy of fuel and its complete freedom from gas fumes or fire danger. In this embodiment a radiator member 1^b is made of a single casting suitably cored out and having therein suitable baffle plates substantially as shown in Figs. 2 and 3 or 10 and 11. The mixing tube 39^a is cast integral with the radiator and its bell 38^a is connected with the lower side of the vestibule 6^a by an integral conduit 60^a. The front face of the bell is closed by an integral web 61 having therein a threaded aperture for the reception of the gas pipe 48. The vestibule 6^a is necessarily provided with a displaceable door 36 in order to permit the insertion of the gas burner and the ignition of the fuel, but this door is made tight and in use is kept closed. The burner may be introduced in any suitable or desired manner. I have shown the mixing tube as terminating in an upwardly facing mouth 40^a surrounded by a flared seat 62 receiving the similarly tapered spud 63 with which the bottom of the burner 45 is formed, suitable screws 64 being employed to secure said burner in place.

In all these last named arrangements, the mixing tube is connected with a portion of the interior of the system above the burner so that preheated gaseous products are returned thereto instead of fresh air. I offer no explanation as to why or how combustion occurs under such conditions but merely state it to be the uniform result of many trials that an arrangement of the type shown for example in Fig. 8 will afford a perfect combustion with a clear, smokeless, quiet, uniform flame when the pipe 48 is connected to the natural gas mains in the city of Cleveland, Ohio, all other openings in the radiator, mixing-tube, and piping being tightly sealed and cemented, provided only that a good draught be exhibited by the flue 9^a. The flame produced under these conditions is better, quieter, and more even than is produced with an open slot at the bottom of the radiator or with an air inlet into the bell 38, added to which the gas consumption is reduced approximately twenty-five percent for a given production of heat, and all possible danger of fire or fumes is eliminated. Furthermore the gas can be turned extremely low without danger of snapping back or becoming blown out by changes of wind pressure. It is, within my invention, however, to supply by way of the pipe 48, instead of pure gas, a combustible mixture of gas and air.

Owing to the narrowness of the slots 44 and the massive character of the lid and burner walls the danger of snapping back is a minimum and in addition, owing to the very thin flame which issues therefrom, it is possible to add less air in the mixer than customary, without entailing a deposition of lamp black on the radiator walls, since the large flat surface exposed permits surface combustion. This is also facilitated by the fact that the gas flame issues horizontally and is deflected upwardly by the draught. These conditions unite in decreasing the danger of burner explosions or snapping back even when the gas is turned extremely low and also in the projection of large flame of comparatively low intensity which is widely distributed over the radiating surface. Accordingly it becomes possible for the cast-iron walls to convey the heat away without becoming buckled or injured despite their comparatively small degree of conductivity, and this same low conductivity also prevents the occurrence of hot spots on the exterior of the radiator member which shall tend to burn the dust particles floating in the air and thus create an unpleasant odor in the apartment. The use of a considerable number of baffle plates serves to restrain the outflow of the gases until their heat units have largely been extracted despite the low conductivity of cast-iron while the employment of cast-iron as a construction material prevents corrosion by the combustion products of the gas which is found to be extremely injurious to sheet metal. I do not limit myself to the use of plane sides or square corners as the radiating member can be bulged or pot-bellied or other than rectangular.

As a result of all these considerations the radiating member presents a very large surface which is heated at all points although nowhere to a particularly high temperature, with the result that the air is warmed uniformly and rapidly without odor and with maximum economy of fuel. It is also a feature of my invention that the particular radiating member herein described can be molded and cast with especial ease, and does not warp or crack on cooling or in use. It will be understood, however, that many changes in detail can be made without departing from my inventive idea and that I do not limit myself except as specifically defined in my several claims.

Having thus described my invention what I claim is:

1. In a gas heater the combination with a rectangular sheet metal casing having upright walls, of a gas-tight rectangular cast iron radiating member supported therein and spaced from said walls to form air circulation passageways, said radiating member comprising mating members having peripheral flanges and also having internal webs forming baffle plates, said webs being arranged so as to define a combustion chamber and sinuous passageways, and a burner in said combustion chamber having

narrow horizontal slots facing the side walls of said radiating member whereby the gas flames may issue as flat sheets in close proximity to the radiating surfaces.

2. In a gas heater the combination with a rectangular sheet metal casing having upright walls, of a gas-tight rectangular cast iron radiating member supported therein and spaced from said walls to form air circulation passageways, said radiating member comprising mating members having peripheral flanges which meet at their margins, and also having internal webs forming baffle plates, the distance between the side walls of said member being small as compared with the distance between opposed flanges, the webs nearest the bottom of said member defining a combustion chamber and terminating short of each other to define a long narrow slot which extends longitudinally of said chamber and other webs projecting substantially into contact with mating webs but extending less than the width of said member, and a gas burner in said combustion chamber having burners which face the lateral walls thereof.

3. In a gas heater, the combination with a casing defining an air flue of a radiating member of cast iron in said casing consisting of mating imperforate hollow halves, and a gas burner inside said member comprising a hollow cast-iron box having its walls spaced from the walls of said radiating member and formed adjacent their upper edges with shallow horizontal notches, said box having a cover which converts said notches into slots which face the walls of said radiating member.

4. A radiating member for gas heaters, made of hollow cast metal having a pair of oppositely facing imperforate radiating faces of comparatively great area connected by narrower faces, one of said narrower faces having a closable opening therein and another of said narrower faces having a stove-pipe connection.

5. A radiating member for gas heaters, made of cast metal having a pair of oppositely facing radiating faces of comparatively great area connected by narrower faces, one of said faces having a closable opening therein and another of said faces having a stove-pipe connection, and a burner inside said member having jets which impinge on said first faces.

6. A radiating member for gas heaters made of cast metal approximately lenticular in shape, having a pair of opposed faces of approximately equal dimensions in different directions, connected by narrower faces, one of said narrower faces having a closable opening therein and another of said narrower faces having a stove-pipe connection, said member having a combustion chamber at a point removed from said stove-pipe connection, and baffle plates between said chamber and connection.

7. In a gas heater, the combination with a rectangular casing of a plurality of cast metal rectangular radiating members located therein and spaced from said casing and from each other, each of said members having a combustion chamber therein and a flue connection leading therefrom, and an independent gas burner in each chamber.

8. In a gas heater, the combination with a flat sided casing of a plurality of hollow cast metal radiating members located therein and spaced from said casing and from each other, each of said members having a pair of opposed larger faces connected by narrower faces, one of said narrower faces having a flue connection and an adjacent face having a lighting door, and an independent gas burner in each of said members.

9. A radiating member for gas heaters made of cast metal having a pair of opposed larger faces connected by narrower faces, one of said last named faces having an inlet slot, the opposite face having an outlet-flue connection, and an intermediate face having a lighting opening, and means for securing a gas burner inside said member adjacent to said slot.

10. A radiating member for gas heaters made of cast metal having a pair of plane parallel faces connected by narrower faces, one of said last named faces having an inlet slot, the opposite face having an outlet-flue connection, and an intermediate face having an integral hollow vestibule projecting therefrom, and a gas burner located inside said member adjacent to said slot, said burner having narrow slots which face said plane faces.

11. In a gas heater, the combination with an upright casing of a hollow radiating member of cast metal supported inside said casing and having an oblong cross section in all directions, a burner in said member having jets arranged to play upon the inner surfaces of the larger faces thereof, and a flue connected to said member.

In testimony whereof, I hereunto affix my signature.

WALTER G. SCHERER.