J. E. MILNER & J. M. CALLAHAN.

HEATER.

APPLICATION FILED JAN. 16, 1913.

1,116,832. Patented Nov. 10, 1914.

Fig 2.

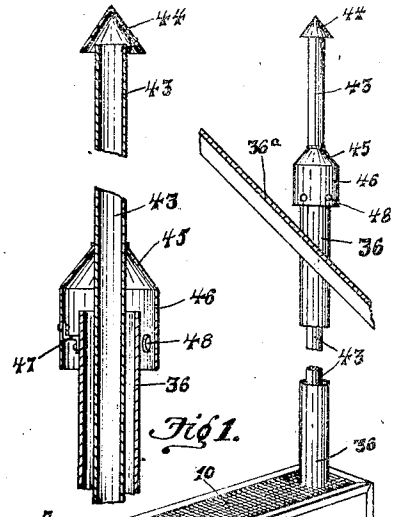


Fig 1.

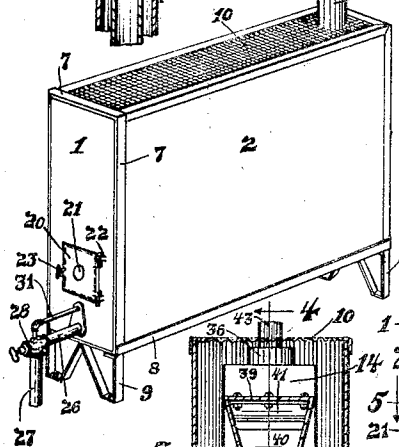


Fig 3.

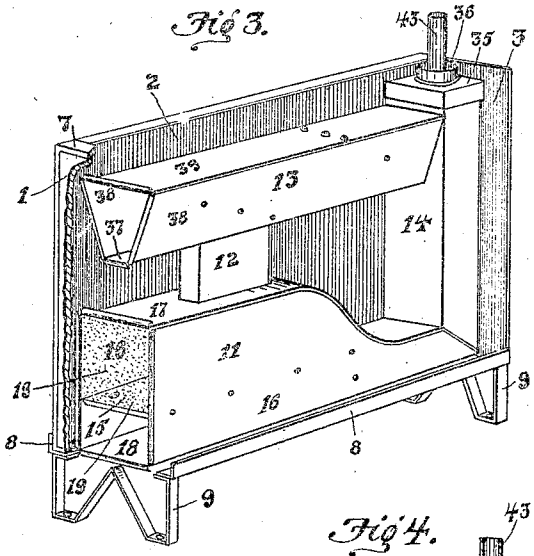


Fig 4.

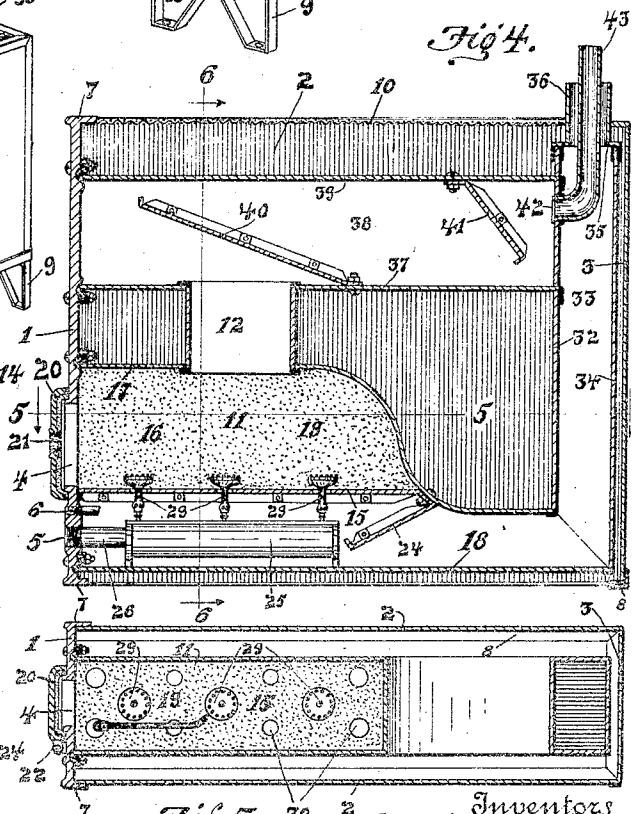


Fig 6.

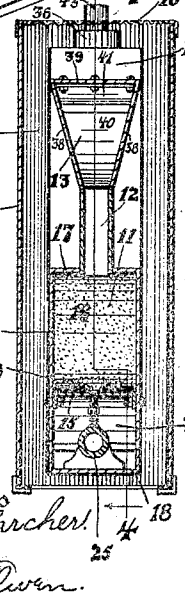


Fig 5.

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UNITED STATES PATENT OFFICE.

JAMES E. MILNER AND JOHN M. CALLAHAN, OF CANTON, OHIO.

HEATER.

1,116,892. Specification of Letters Patent. **Patented Nov. 10, 1914.**

Application filed January 16, 1914. Serial No. 812,513.

To all whom it may concern:

Be it known that we, JAMES E. MILNER and JOHN M. CALLAHAN, both citizens of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented a new and useful Heater, of which the following is a specification.

Our invention relates to improvements in heaters and while applicable to heaters of various kinds and for various purposes, is especially adapted for heaters used in heating inclosures, such as automobile garages where may be present an atmosphere containing combustible or explosive gases, dust and the like.

The objects of the invention are, to generally improve heaters of the character mentioned, to obtain a combination of economy and efficiency in operation, together with simplicity of construction and convenience in control, one of the prime objects being safety and insurance against fire and explosions. These objects, together with other objects readily apparent to those skilled in the art, may be attained by the construction disclosed in the accompanying drawings, although the invention may be embodied in other forms, the construction illustrated being chosen by way of example.

In the drawings Figure 1 is a perspective view of a heater embodying our invention and using gas for fuel, said view also including the vent and air intake pipes, with parts broken away. Fig. 2 is a vertical sectional view through the upper end of said vent and intake pipes. Fig. 3 is a perspective view of the heater with the near side and front of the outer casing removed. Fig. 4 is a vertical longitudinal section through the heater taken on the line 4—4 of Fig. 6. Fig. 5 is a horizontal section through the heater taken on the line 5—5 of Fig. 4. Fig. 6 is a vertical transverse section through the heater taken on the line 6—6 of Fig. 4.

Throughout the several views similar reference numerals indicate similar parts.

More specifically describing the construction disclosed in said drawings, the numeral 1 indicates the front, the numeral 2 the sides and 3 the back of the outer casing. The said front is preferably formed of a cast plate, although sheet metal may be used if desired. The sides and back are preferably formed of sheet metal and the front is provided with the door opening 4 and gas pipe openings 5 and 6. The front 1 is formed with the integral flanges 7 at the sides and top and an angle iron frame 8 is provided for supporting the sides 2 and the back 3 as well as the front. Suitable supports, such as the iron legs 9 are provided for raising said frame 8 above the floor. A wire screen or fabric 10 extends across the top of the outer casing, but the bottom of said casing is open. Within said outer casing is an inner casing comprising a fire box 11, flue 12, circulating box 13 and air supply duct 14. These parts are preferably formed of sheet metal and are laterally spaced from the sides 2, as clearly illustrated in Figs. 5 and 6.

The fire box is provided with a transverse horizontal floor 15, above which is the flame chamber and below which is the air mixing chamber. The sides 16, top 17 and bottom 18 of the fire box are connected to each other and to the front 1, the said bottom 18 extending rearwardly in horizontal position to a point adjacent the back 3. The top 17 extends from the front 1 backward more than half the distance to the back 3, then curves downwardly and rearwardly and is connected to the rear end of the floor 15, whence said top continues rearwardly, parallel to the bottom 18. The sides 16 are connected to the front 1 and to the top 17 and bottom 18, completing the inclosure of the fire box, including the flame chamber and air mixing chamber. The joints between the sides, top and bottom and between said parts and the front 1, are carefully made and hermetically sealed and the interior of the flame chamber, including the floor, sides and top are preferably lined with asbestos 19. The door opening 4 gives access to the interior of the flame chamber and a suitable door 20, preferably lined with asbestos and provided with a mica window 21 is provided and preferably connected to the front 1 as by means of the hinges 22 and latch 23 in such way as to be drawn tight upon the edges of the opening 4 to hermetically close the same. Where the floor 15 is connected to the top 17, said floor is extended downwardly and frontwardly beyond said connection, forming an inclined deflector 24 adapted to direct the incoming air downwardly toward the bottom 18 as it passes

from the air duct portion to the air mixing portion of the fire box.

Within the air mixing portion of the fire box is arranged the manifold 25 which preferably rests upon the bottom 18 and is connected, as by means of the pipe 26 extending through the opening 5, with a gas supply pipe 27 provided with a valve 28. Tapped into the manifold 25 are three gas burners 29 which extend upwardly through the floor 15, the air mixing portion thereof, however, being located below said floor. The floor 15 is also provided with auxiliary openings 30 for supplying air to said burners at their tops or gas orifices.

Forming suitable connection with the pipe 27 is an auxiliary pipe 31, which extends through the opening 6 into the air mixing chamber, thence upwardly through one of the openings 30, and has its open end arranged above and closely adjacent to one of the burners 29, the purpose of said pipe being to provide a pilot light. It will be understood that the pipes 26 and 31 are hermetically sealed in the openings 5 and 6 so as to complete the hermetical inclosure of the fire box except for the flue 12 and air supply duct 14.

The air supply duct mentioned extends vertically within the outer casing closely adjacent the back 3 and comprises the front 32, sides 33 and back 34 which are connected to each other with hermetically sealed joints. At the lower end said supply duct communicates with the rear end of the air mixing chamber of the fire box, the connecting joints being hermetically sealed. At the upper end of the supply duct is provided a cap 35 which closes the upper end of said duct and provides connection for the air supply pipe 36 which extends upwardly and through the wall or roof 36ª of the building to the outside air.

Above the top of the fire box the circulating box 13 comprising the bottom 37, sides 38 and top 39 extends horizontally from the front 1, which hermetically closes the forward end of said box to the front 32 of the air supply duct, which hermetically closes the rear end of said box except for the vent pipe hereinafter described. The top 39 is wider than the bottom 37, so that the sides 38 are inclined upwardly and outwardly, the side edges of the top 39, however, being spaced from the sides 2 of the outer casing, as clearly illustrated in Fig. 6. It should also be noted that the top 39 is spaced downwardly from the screen 10.

The flue 12, extending from the fire box 11, midway between the ends of the flame chamber, communicates with the circulating box 13 through the bottom 37 of which it extends, all of the joints in the said flue 12 and between said flue and the circulating box being hermetically sealed.

Within the circulating box 13 is a front baffle plate 40 and a rear baffle plate 41. The front plate is connected to the bottom 37 and sides 38 and extends, from a point to the rear of the flue 12 forwardly and upwardly in inclined position over the top of said flue to a point adjacent the top 39 to the front of said flue. The rear baffle plate 41 is connected to the top 39 and sides 38 and extends downwardly and backwardly in inclined position to a point adjacent the bottom 37 of the circulating box and front 32 of the air supply duct. Adjacent the top 39, the rear end of the circulating box 13, composed of the front 32 of the air supply duct, is provided with an opening 42 with which is connected the vent pipe 43 which is of smaller diameter than the air supply pipe 36 and extends outwardly into the air supply duct, and thence upwardly through said air supply duct and air supply pipe 36, the walls of the pipes 43 and 36 being spaced from each other, as clearly illustrated in Figs. 2 and 4. It will be understood that the pipe 43 is hermetically sealed at the opening 42 to the front 32.

When the heater is in operation the asbestos lining 19 will prevent over-heating of the sides or top of the flame chamber so as to prevent ignition of combustible or explosive gases coming in contact with the outside of the fire box. The products of combustion pass upwardly through the flue 12 into the circulating box 13, where they strike the baffle plate 40 and are deflected frontwardly and upwardly, impinging upon the top 39 and sides 38 and thence, over the top edge of the plate 40 rearwardly through the main body of the circulating box to the baffle plate 41, which deflects the burned gases and heated products of combustion downwardly, causing the same to impinge upon the sides 38 and bottom 37, whence they move upwardly and discharge through the opening 42 into the vent pipe 43.

The supply of air for supporting combustion at the burners 29 descends from the air supply pipe 36 downwardly through the air supply duct 14 at the rear, thence forwardly through the lower part of the fire box, striking the deflector 21, which causes the air to move downwardly to pass under the forward, free edge of said deflector into the mixing chamber. Thence the air enters the burners 29 in the well known manner and a portion of said air passes upwardly through the auxiliary openings 30 into the flame chamber to supply air therein for the completion of combustion.

The air supply pipe 36, with the vent pipe 43 arranged interiorly, extends to the outside of the inclosure, within which the heater is arranged, in order to secure a supply of outside air for combustion and to discharge the burned gases and products

of combustion into the outer air. Various devices may be employed at the outer ends of said vent and air intake pipes to prevent the entrance of snow and rain and preserve a free opening at all times. We prefer, however, the construction illustrated in Figs. 1 and 2 in which it will be noted that the vent pipe 43 is extended outwardly beyond the end of the air supply pipe 36, the said pipe 43 being provided with a conical cowl 44 such as commonly employed in ventilators and the like. Closely surrounding the pipe 43, above the upper end of the pipe 36, is an inclined flange 45 of sheet metal which extends outwardly to a diameter greater than the external diameter of the pipe 36 and at its edges is connected to the depending circular apron 46 extending down over the upper end of the pipe 36 and spaced therefrom, as clearly shown in Fig. 2. Suitable spacing brackets 47 connected to said apron 46 and the pipe 36 serve to maintain said apron and pipe in proper relative position and said apron may be provided with auxiliary apertures 48, if desired, to permit entrance of air and prevent back drafts when the wind is blowing. It will thus be seen that the air for supporting combustion, entering between the pipe 36 and apron 46 and descending through the pipe 36 will be heated by contact with and radiation from the vent pipe 43 carrying the hot burned gases and products of combustion. As said air passes downwardly through the pipe 36 it becomes more and more heated as it will be understood that the pipe 43 is more highly heated at the lower end. When the air is in the duct 14 it is further heated by contact with the portion of the front 32 of said duct which forms the rear end of the circulating box 13. It will also be understood that the air supply duct is within the outer casing of the heater and by the time the air reaches the mixing chamber it is heated sufficiently to produce perfect combustion and maximum efficiency.

It is a well known fact that in the burning of gas a large amount of water is formed which, in the presence of cold atmosphere or surfaces will condense and gather in liquid form. By preheating the air, however, and by the peculiar form and construction of our heater all of the water formed by combustion is carried off as vapor and exhausted through the vent pipe 43 into the outside air, making it unnecessary to provide for drawing off the water formed in liquid state or providing other means of drainage. When the heater is in operation the air of the inclosure in which it is arranged will be heated both by radiation and conduction, cool air entering the outer casing at the bottom and passing between said outer casing and the fire box 11 upwardly, over and around said fire box, coming in contact with the flue 12 and the sides 38 of the circulating box and thence passing upwardly and outwardly through the screen 10. The convection thus produced accomplishes a rapid diffusion of heat throughout the garage or other inclosure. Danger from ignition or combustion of explosive gases, dust and the like within such inclosure is prevented, and the atmosphere is not contaminated in any way. This feature is of special importance, as it has frequently been a source of objection to heaters, especially those employing gas for fuel, that the atmosphere of the inclosure, room and the like is rendered unwholesome, whereas it will be noted that our invented heater is capable of heating the said atmosphere without utilizing any of it to support combustion or discharging any of the products of combustion in such way as to change the character of such atmosphere.

Although the drawings and above specification disclose the best mode in which we have contemplated embodying our invention, we desire to be not limited to the details of such disclosure, for many changes in form and construction may be made, as circumstances require or experience suggests, without departing from the spirit of the invention, within the scope of the appended claim.

We claim:—

A heater comprising an elongated outer casing formed of side and end walls and open at the top and bottom for the circulation of air therethrough and an inner casing comprising a fire box, a flue, a circulating box and an air supply duct all arranged within and spaced from the side walls of said outer casing, said fire box horizontally disposed at the lower portion of said outer casing and comprising a lower, air mixing chamber extending from front to rear of said outer casing, and the forward portion of said fire box being of greater height than the rear portion and being divided by a horizontal, perforated floor defining an upper flame chamber, said circulating box horizontally disposed and upwardly spaced from said fire box, a vertical flue connecting said flame chamber with the forward end of said circulating box, baffle plates within said circulating box adapted to cause tortuous travel of waste gases therethrough, a vent pipe connected to the rear end of said circulating box and adapted to discharge waste gases therefrom, and said air supply duct vertically disposed within said outer casing at the rear end thereof and opening at its lower end into the rear end of said air mixing chamber, gas burners within said flame chamber and having air mixing portions extending through and below said perforated floor into said air mixing cham-

ber, means for conducting combustible gas through said burners and means for supplying said air duct at its upper end with air for combustion, said inner casing being hermetically sealed, except for the entrance of gas and air and the exhaust of waste gases, as described.

In testimony that we claim the above, we have hereunto subscribed our names in the presence of two witnesses.

JAMES E. MILNER.
JOHN M. CALLAHAN.

Witnesses:
ABRAM W. AGLER,
WILLIAM H. MILLER.