March 12, 1940. W. J. LINCH 2,192,920

SAFETY HEATER

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Fig. 1.

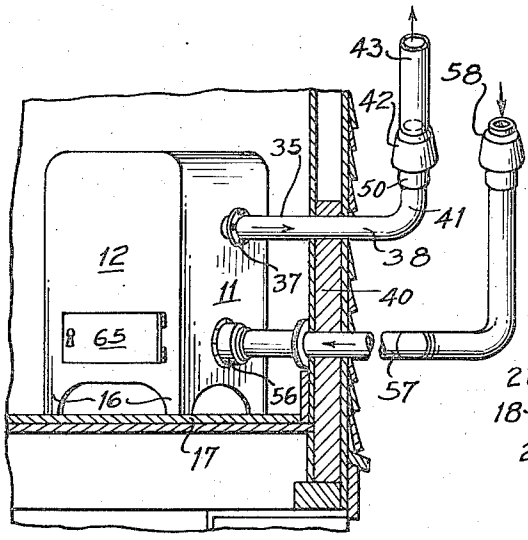


Fig. 4.

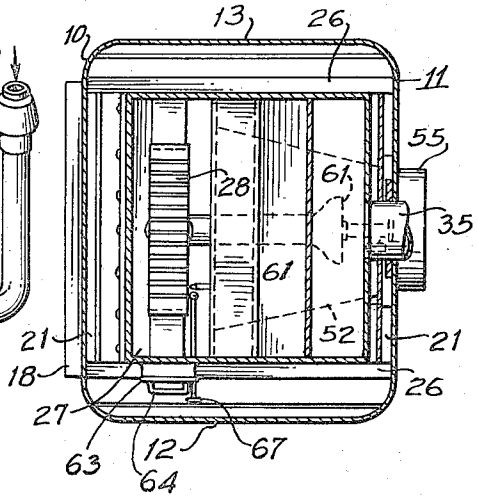


Fig. 2.

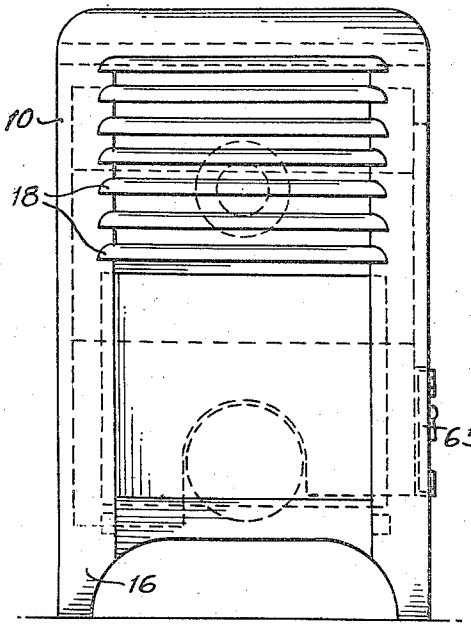
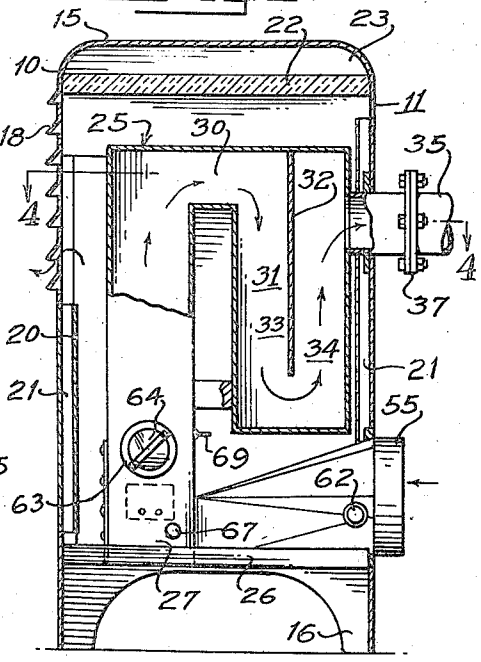


Fig. 3.



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Fig. 6.

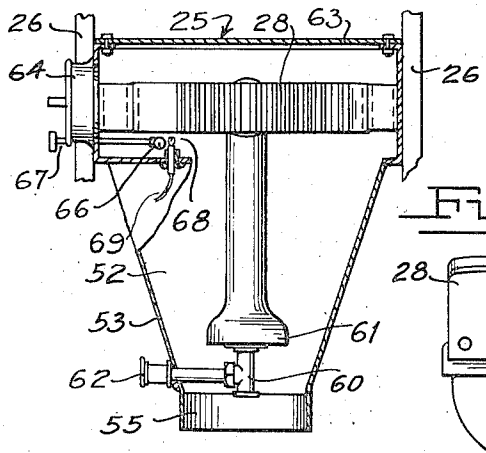


Fig. 7.

Fig. 8.

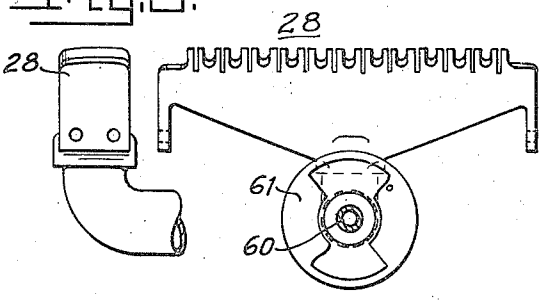


Fig. 5.

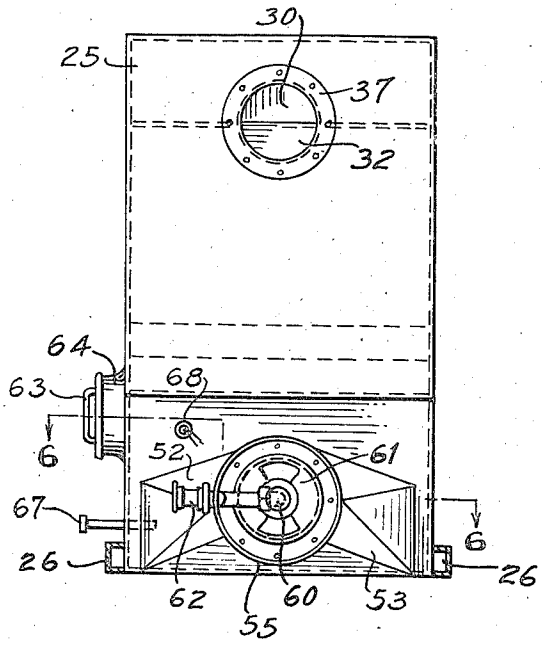
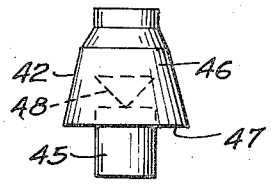


Fig. 9.



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UNITED STATES PATENT OFFICE

2,192,920

SAFETY HEATER

Warren J. Linch, Los Angeles, Calif.

Application November 21, 1938, Serial No. 241,595

3 Claims. (Cl. 126—90)

This invention relates to improvements in safety heaters particularly adapted for use in locations where inflammable gases are present and explosions or fire hazards may be anticipated from an open flame heater.

The principal object of my invention is the provision of heating apparatus utilizing gaseous fuel wherein the flame is entirely enclosed and isolated with respect to the room in which it is located and employed for heating thus especially adapting the heater to rooms where inflammable gases are prevalent, such as paint rooms, gasoline filling stations, and the like.

A further object of the invention is to provide a safety heater of the class described wherein the combustion takes place in a completely closed chamber excepting for the intake and exhaust draft-flues which terminate in the open air exteriorly of the room occupied by the heater so that the normal condition of the air within the room will not be vitiated by the products of combustion or the warmth radiated by the heater.

A still further object of my invention is to provide a heater burning gaseous fuel which is entirely safe from causing external ignitions or explosions and also from accidental extinguishment of the flame therein and consequent accumulation of dangerous gases within the firebox, such safeguards against extinguishment consisting in the provision of a closed combustion chamber and a tortuously arranged heating chamber leading to the outlet draft-flue whereby it is rendered practically impossible for a reverse or down-draft to occur to blow out the flame, together with an inlet draft flue to provide air support combustion opening into the atmosphere externally of the room being heated, both the effective openings of said outlet and inlet draft-flues being disposed at substantially the same elevation and in near proximity whereby equal barometric pressures are present at said openings and therefore the combustion chamber will be unaffected by unequal external conditions and the flame therein will remain constant.

A still further object of my invention is the combination in an enclosed safety heater of draft inlet devices leading into an enlarged air-current retarding chamber within the heater-housing wherein the fresh air to support combustion is slightly heated and caused to flow to the gas-burner with its speed of flow reduced.

A still further object of the invention is the provision of gas-supply apparatus positioned symmetrically within said air-retarding chamber and extending to within close proximity of the fresh, cooled air therein so that the mixing chamber of said gas-supply will remain relatively cool through the influx of fresh air.

Other objects and advantages residing in my invention, and objects relating to details of construction and arrangements of parts thereof, will be fully set forth in the detailed description to follow.

The accompanying drawings illustrate by way of example a representative form of my invention, in which:

Figure 1 is a perspective view of a safety heater embodying my invention mounted in operative condition within a room and showing the respective inlet and outlet flue elements thereof extending exteriorly of said room.

Fig. 2 is a view in front elevation of the same.

Fig. 3 is a view in vertical section through the heater housing, the walls of the enclosed combustion and heating chamber being broken away.

Fig. 4 is a view in cross section taken on line 4—4 of Fig. 3.

Fig. 5 is a view in rear elevation of said combustion and heating chamber element with the outer housing removed.

Fig. 6 is a view in horizontal section taken on line 6—6 of Fig. 5.

Fig. 7 is a view in side elevation of the gas-burner utilized in my safety heater apparatus.

Fig. 8 is a similar view in end elevation.

Fig. 9 is a detached view in side elevation of a down-draft diverter terminal as employed in both the inlet and outlet flues of my improved heater.

Referring to said views, the reference numeral 10 indicates the front wall, 11 the back wall, and 12 and 13 the side walls, respectively, forming a substantially square outer housing of my safety heater, enclosed at the top by the wall 15. Said housing stands upon legs 16 and is open therebetween to admit of the circulation of air from the floor 17 of the room in which the heater is situated to flow upwardly within the housing chamber and outwardly into the room through open spaces in the upper portion of the front wall 10, or, as shown, through louvres 18 formed therein.

The described vertical exterior walls of the housing are safeguarded from direct radiation of heat from the heating apparatus within said housing chamber through the provision of liner-walls 20 spaced from said exterior walls respectively, and providing air-spaces 21 open at top and bottom for the circulation of air. The top wall 15 is protected from overheating through

the provision of an inner wall 22 secured to said vertical walls and affording a dead-air space 23.

The heating apparatus of my invention comprises a firebox 25 rigidly mounted upon bars 26 supported upon the front and rear walls of the housing. Said fire-box is formed of sheet metal and is of rectangular configuration in front elevation and of relatively shallow depth enclosing the combustion chamber 27 in which the gaseous fuel burner 28 is positioned adjacent the lower end. Said combustion-chamber extends upwardly above said burner for a considerable distance with the same dimensions throughout. At the upper portion of said combustion-chamber a rear outlet 30 is provided for the products of combustion extending the full width of the chamber 27 and communicates with a baffle-box 31 including a rectangular chamber extending vertically in spaced relation and in parallel with the combustion chamber. A baffle-plate 32 dependent from the upper wall of the box 31 divides the chamber therewithin into down-draft passage 33 and updraft passage 34 from whence the products of combustion may pass into a tubular flue-connection 35. It will be noted that the transverse or longer horizontal dimensions of the combustion-chamber 27, the rear outlet 30, and the passages 33 and 34 are all equal and that the widths of the combustion-chamber outlet 30 and of the passages 33 and 34 are the same throughout including the connecting portion 36 between the lower end of the baffle-plate and the lower wall of the baffle-box 31. Thus by but slightly restricting the dimensions of the outlet and passages from that of the combustion-chamber itself the latter spaces form in effect a continuation of the combustion-chamber and admit of a full extension and undamped development of the flame.

The flue proper begins at the tubular connection 35 which extends horizontally through the rear wall 11 and is preferably provided with a flanged connection 37 with a draft-flue 38 extending through the wall 40 of the room or building in which the heater is located into the outer air. Said draft-flue may be directed upwardly, as at 41, and provided with a hooded diverter 42, hereinafter described, at or near the level of the upper end of the heater. From thence a smoke-pipe 43 may extend to any height desired.

The diverter 42, see Fig. 9, is mounted by means of a sleeve 45, upon the draft-flue 38 and through connections, not shown, supports a hood 46 having a relatively wide skirt 47 extending below the upper end of said sleeve. An inverted cone 48 is mounted axially of the sleeve and diverts any descending currents of air from entering the sleeve and draft-flue while the ascending flue gases will be drawn up into the smoke-pipe 43 which is attached to the collar 50.

The gas-burner 28, see Figs. 6 to 8, inclusive, is mounted at the lower portion of the combustion-chamber and in line with the transverse axis thereof. The lower portion of the rear wall of the fire-box 25 is open to an air-chute 52 having flaring side and top walls 53 terminating in a tubular collar 55 extending through the rear wall 13 of the housing. A reducing pipe 56 is connected to said collar having flanged connections with a draft-flue 57 extending through the wall 40 and which is directed upwardly to substantially the same level as the outlet flue 38 where it terminates in a diverter device 58, similar to the diverter 42.

Gas and air in an inflammable mixture are supplied to the burner 28 through a pipe 60 extending therefrom axially of the air-chute and into proximity of the collar 55 where relatively cool air enters the mixing chamber 61 to combine in the usual manner with gas entering through gas-supply pipe 62. An opening is provided in an end wall of the fire-box at or about the level of the burner which may be closed by a screw-plate 63 having a transparent window 64 therein for the purpose of observing the flame therethrough when a hinged door 65 in the side wall 12 of the housing is opened.

It will be observed that the combustion of gas in said combustion-chamber occurs in as nearly an isolated condition with respect to the room in which it is located as is practicably possible. All joints of the fire-box and passages of the heater are welded to avoid leaks and the opening closed by the screw-plate is securely sealed in gas-tight condition as well as the opening through which the gas-supply pipe 62 enters. Thus with the apparatus in good order the room and its contents regardless of the explosive character thereof is safe-guarded from ignition from the flame within this heater and the same may be safely employed in any situations where the conditions approximate those described.

To maintain the flame reliably without extinction in a closed fire-box of the class described and to render the combustion of the gas efficient within the same under such closed and isolated conditions and tests to which the safety heater apparatus has been rigorously treated, certain prime factors of safety and efficiency must be present and sustained:

First, the flame development and combustion should take place under positively uniform and equable conditions unaffected by barometric or weather conditions. This is largely effected by the provision of the outlet and inlet draft flues 38 and 57, respectively, both terminating in the outer atmosphere and both at substantially the same elevation whereby no appreciable difference in barometric pressures will subsist therebetween and therefore the flow of air within and the efflux of combustion gases from the fire-box will remain constant and unaffected from causes of unequal pressures. In this connection it may be noted that the complete and unitary safety heater of my invention to obtain the full protection afforded thereby should and does include the draft flues 38 and 57 up to and including the diverters 42 and 58.

Secondly, the flame issuing from the burner is fully produced and developed within the combustion-chamber 27 whence the resultant hot gases flow through the outlet 30 practically unchecked and into the baffle-box 31 through whose tortuous passages they flow evenly and freely while radiating their heat through the walls thereof. One of the principal causes for the even and uninterrupted flame produced in the practically closed fire-box is due to the provision of the outlet connection 30 between the combustion chamber and the baffle-box passages being of sufficient extent and of the full width of said chamber whereby the flame therein is unquenched and the baffle-passages become in effect a part of the said combustion-chamber.

Thirdly, aside from the avoidance of unbalanced pressures in the several draft flues, the provision of the baffle-box disposed between the combustion-chamber and the draft-flue 37 and particularly the interposition of the baffle-plate 32 therein further safeguards the flame from extinction through the reverse passage of air-currents blowing down the draft-flue 37 from any cause.

Fourthly, the flame is further safeguarded from unduly strong currents of air flowing thereto through the inlet draft-flue **57** through the successive enlargements of the inflowing air duct. Thus the draft-flue **57** communicates with a reducer-pipe **56** which progressively enlarges the space occupied by the incoming air and which is further enlarged by the flaring air-chute **52** so that upon reaching the burner such air currents are induced by the updraft in the combustion-chamber and not materially affected through currents of air blowing downwardly in said draft-flue, and in flowing towards and about the burner are provided increasing space in which to expand upon the absorption of heat from the burner.

As the main object of this invention is at all times to safeguard the enclosed flame of the burner from the air within the room in which the heater is located provision is made to ignite the burner by internally positioned means consisting in a pilot-light **66** fed from the gas-main through pipe **67**. To ignite the pilot-light in case of failure an electric lighting device **68** is employed supplied with current through circuit-wires **69** and controlled by a push-button, not shown.

Having described my invention, what I claim, is

1. A safety heater, consisting of a housing for a medium to be heated, means forming a sealed combustion chamber therein having draft-flue connections at its top and bottom, said bottom flue connections comprising an inwardly flared air-inlet duct positioned within said housing, a burner adjacent the inner end of said flared duct, and pipes extending from said connections to the exterior atmosphere.

2. A safety heater as set forth in claim 1, wherein the pipes extending from the draft-flue connections terminate in the exterior atmosphere at or about the same level.

3. A safety heater as set forth in claim 1, wherein the pipes extending from the draft-flue connections terminate in the exterior atmosphere at or about the same level and are each provided with a draft-diverter.

WARREN J. LINCH.