April 8, 1958 E. V. WYATT 2,829,634

FIREPLACE

Filed Nov. 23, 1953 2 Sheets-Sheet 1

Fig. 1.

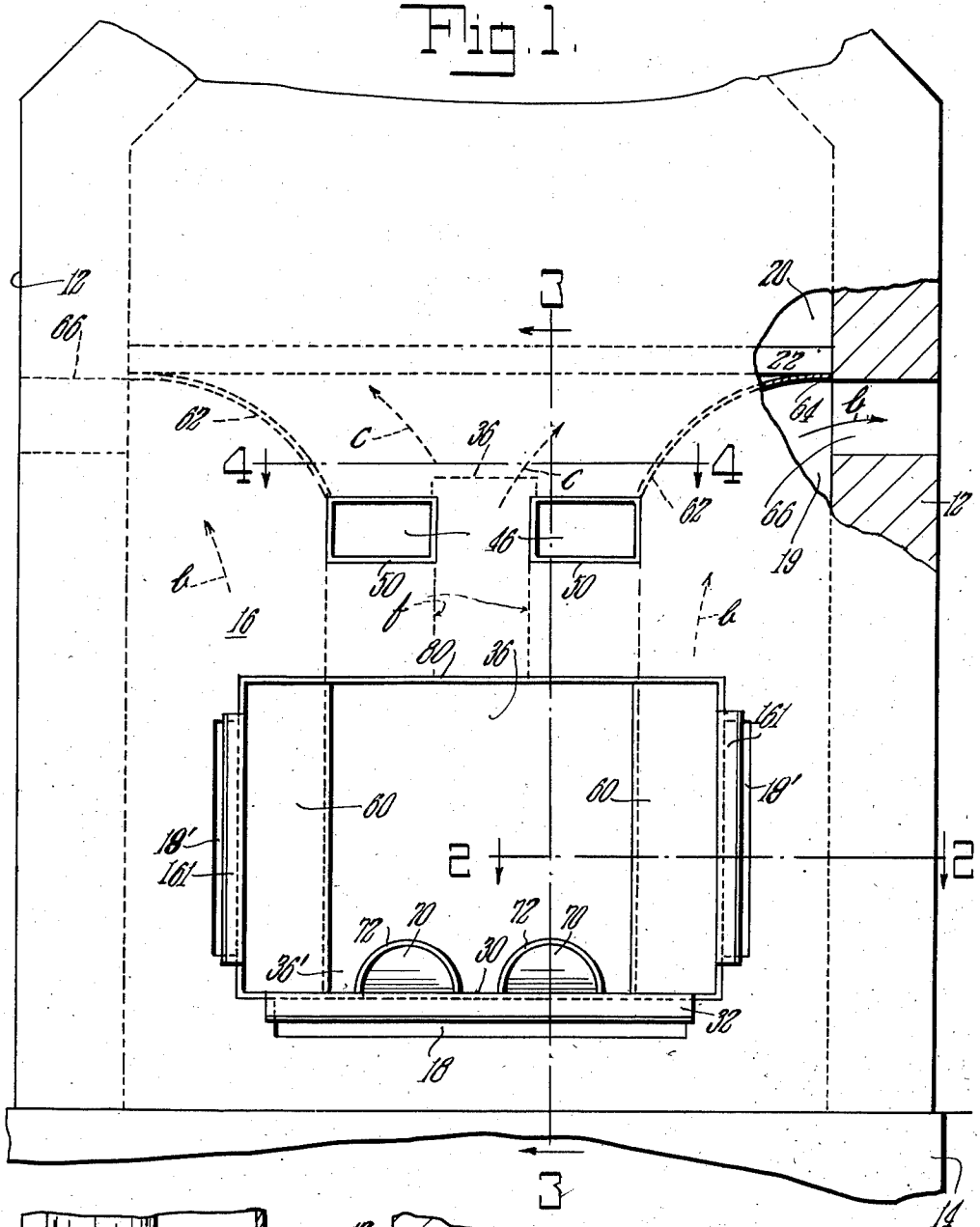
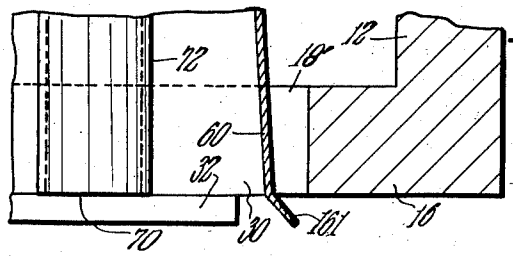


Fig. 2.



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Fig. 4.

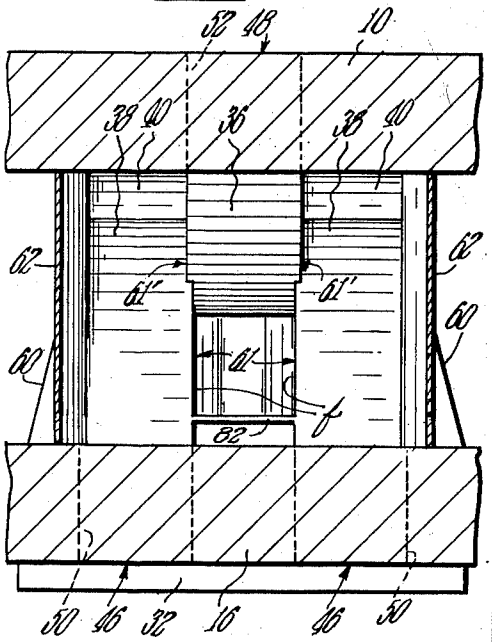


Fig. 3.

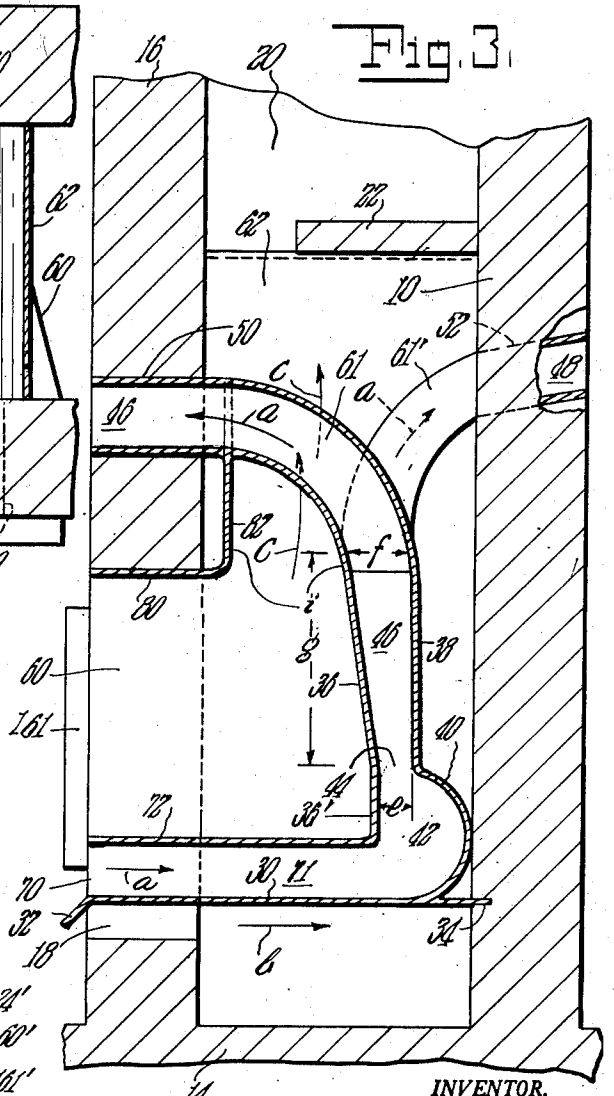
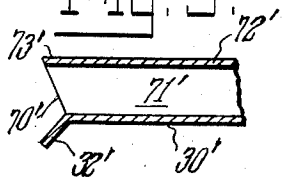


Fig. 5.



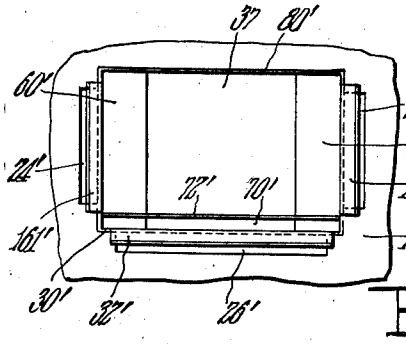


Fig. 6.

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FIREPLACE

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Application November 23, 1953, Serial No. 393,540

1 Claim. (Cl. 126—121)

My invention relates to new and useful improvements in a fireplace construction and is directed more particularly to a device which may be readily disposed within the combustion chamber of a domestic fireplace of the conventional design and by means of which a rapid circulation of warmed air is created for purposes of warming the room in which employed.

It is the principal object of my invention to provide a unitary fireplace heating structure which is available for ready installation by disposition in a fireplace during the construction of same, whereby a durable completed fireplace results.

It is another object of the invention to provide an improvide heating means for use in connection with a fireplace construction of the conventional design and through which the air of an adjacent room or rooms may be circulated for the efficient heating of same by means of not only a primary heating system but also a secondary heating system, all adapted and arranged to provide a novel and improved construction of the type in which the primary and secondary systems function simultaneously.

One of the primary purposes of my invention is to provide structural and operational improvements in devices of the class to which reference has been made, which improvements not only simplify the structure as such, but also provide important distinct advantages in strength, efficiency, ease of operation, and the like.

It is another object of my invention to provide a unitary structure whereby the rapid circulation of warm air is attained by novel and unique means, which overcome the disadvantages or otherwise objectionable features of other metal fireplaces known to the art and whereby the necessity for baffles, electric fans, and other contrivances, which have effected the high costs of prior art devices, is eliminated.

The conventional fireplace has been a relatively inefficient heat generator. Most of the heat from combustion passes directly upwardly into the flue and is thereby dissipated and lost. Fireplaces have retained their popularity not for their efficiency as room heaters but more for their function as attractive ornamentations in the home.

The structure of my invention involves the utilization of two principal features: firstly, means are provided for scooping or deflecting air currents from the normal or natural path of movement as same enters the opening of the combustion chamber thereby forcing air through inlets or channels into primary and secondary heating chambers therearound; and secondarily, means are provided for further increasing the velocity of the moving air through the utilization of the jet expansion principle.

It is a well accepted principle in the science of jet propulsion that by raising the temperature of an enclosed body of air, the pressure and volume thereof increases, the air flows through a nozzle or throat into a gradually expanded exhaust trunk where the rapidly expanding air gathers additional increases in velocity. The application

of this principle forms one of the basic features of this invention.

That is to say, I introduce cool air from the outside or room atmosphere through and immediately adjacent a unitary structure which is disposed in a conventional fireplace. By means of this forced introduction of air, I produce forced drafts of air peripherally and perimetrically of the construction which establishes lines of flow thereabout and/or therepast where, under accelerated velocities, same is evacuated back to the outside or room atmosphere as warmed or heated air.

For purposes of reducing the explanation of my application to simple terms, I would compare the unitary construction of my invention to a square sheet metal stove wherein one side thereof has been removed. Obviously, with the said one side removed, the control of the air admitted into the stove becomes impossible and the efficiency of the stove is lost. So it is with the device of my invention. Same functions to offset the efficiency losses common to the conventional open fireplaces which are similar to the above referred to stove with one side thereof removed. That is to say, the fireplace of my invention is something more than the conventional fireplace with only the usual opening in the forward face thereof. Other features are combined therewith which provide the new and novel results claimed thereby.

In the case of a room in a house where a fireplace is located, the cool air flow is generally along the floor for a depth of three feet more or less.

As the moving air moves toward the fireplace opening, a considerable velocity is generated around the perimeter of the fireplace opening. It is this movement which is made use of herein as the basis for further stimulating the circulation of air as it makes contact with the wall surfaces of the unitary structure of my invention and moves therethrough and/or therearound as the case may be.

Other prime objects of my invention include: first, the securement of a higher degree of efficiency and greater degree of variety in the manner of work performed therewith than has heretofore been possible with prior art constructions; second, the attainment of a higher speed of construction and assembly of the device due to its simplification of design and its unique composition of parts; third, the provision of an improved fireplace which may be made more economically and with fewer operations in the manufacture of its parts, as well as in the assembly of the same, than prior devices known in the art; fourth, the provision of a construction which may be readily installed with respect to the various purposes for which it is intended, and fifth, the provision of such other improvements in and relating to fireplace constructions of the type above referred to as are hereinafter described and claimed.

All of the objects cited above, I accomplish by means of such structure and relative arrangements of parts thereof, as will fully appear by a perusal of the description below and by various specific features which will be hereinafter set forth. To these and other ends and with the foregoing and various other novel features and advantages and objects of my invention, my invention consists in certain novel features of construction and in a combination and arrangement of parts, all as will be hereinafter pointed out in the claims annexed and more fully described in connection with the drawings wherein:

Fig. 1 is a front elevational view of a fireplace construction provided with the unitary air heater structure of the invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view of a modified form of one of the cold air inlets shown in Fig. 3; and

Fig. 6 is a small scale front elevational view of the lower portion of the fireplace construction and unitary air heater structure shown in Fig. 1 incorporating certain other modifications.

In the accompanying drawings, I have illustrated one complete example of a physical embodiment of the invention in which the parts are combined and arranged in accordance with a form thereof which I have devised for the practical application of the principles of the invention. Additionally, I have shown certain modifications which I contemplate as falling within the scope of this invention. It will be understood that other changes and alterations are contemplated within the scope of the claim, and without departing from the broad principles of the invention.

In the following description and claim, various details are identified by specific names for convenience. These names, however, are intended to be as generic in their application as the art will permit.

Referring now to the drawings more in detail, I have shown an improved unitary air heater structure in connection with a fireplace of brick or similar material.

The fireplace construction is of the conventional design and includes a rear wall **10**, spaced opposite side walls **12** and **12**, a bottom wall **14**, and a front wall **16** having the usual fireplace recess or opening **18** in the lower portion of the front wall **16** and normally located within a room of a house or the like.

The lower portion of the fireplace construction is provided with a hollow interior **19**, the fireplace being more or less shell-like in character, as is well known.

It is in this interior **19** and the recess or opening **18** that the unitary air heater structure about to be described is disposed.

A chamber **20** within the walls of the fireplace offers communication between the fire space thereunder and the chimney (not shown) thereabove.

A down-draft or shelf **22** of the conventional design is horizontally disposed at the bottom of the chamber **20**.

The unitary air heater structure includes a lower horizontally disposed wall or floor member **30** having an angularly disposed baffle or deflecting lip **32** depending downwardly along the forward edge thereof.

The member **30** has a rearward edge portion **34** which may be secured to the rear wall **10** in any convenient manner for support purposes.

The unitary structure further includes a pair of substantially vertically disposed rear wall members **36** and **38** which are held in spaced relation relative to the member **30** at the rearward portion thereof so as to form a double walled or hollow rearmost wall section (see Fig. 3.)

The lower extremity **36'** of the wall member **36** is disposed substantially vertically relative to the horizontal axis of the member **30** and the portion of the wall member **36** upwardly thereof diverges slightly so as to provide the rearward wall of a combustion chamber of the known configuration and design.

In Fig. 3, the divergence of the wall member **36** is greatly exaggerated so as to illustrate the diverging relationship of the wall members **36** and **38**, the importance of which will soon be observed.

The lower extremity **40** of the wall member **38** is of arcuate shape throughout the width thereof and is fixed at its lowermost edge to the lower wall member **30** thereby providing an enlarged turbulence chamber **42** horizontally across the rearmost side of the structure.

Upwardly of the turbulence chamber, the wall member **38** is positioned so as to slightly diverge upwardly and rearwardly toward the rear wall member **10** of the fireplace construction.

Thus, it will be observed that a choke or restricted throat **44** is provided having a certain width (indicated by the letter *e*) between the members **36** and **38**.

Upwardly of the choke, the slightly diverging walls **36** and **38** are formed so as to provide an expansion chamber or trunk **46** therebetween. At a certain distance (indicated by the letter *g*) upwardly of the choke, the width (indicated by the letter *f*) between the members **36** and **38** is greater than the dimension *e*.

I have determined that when wall members **36** and **38** are disposed at angles of approximately 3½° away from a center line drawn through the choke **44**, the best results are obtained. I have determined that the width *e* should be approximately 1" and the width *f* should be approximately 4" where the distance *g* is approximately 2' 4".

The upper extremities of the wall members **36** and **38** are curved upwardly and outwardly (as shown) in substantial parallelism so as to provide a pair of spaced forward conduits having outlets **46** and **46** and a rear conduit therebetween having an outlet **48**.

The forward outlets **46** extend through appropriately spaced openings **50** in the front wall **16** of the fireplace construction and offer communication with the room being heated.

The rear outlet **48** extends through an appropriate opening **52** in the rear wall **10** of the fireplace construction and offers communication with an adjacent room, if same is desired. Conceivably, such an outlet could be blocked off by damper or similar means where there was no need or desire for heating an adjacent room area.

A pair of spaced vertically disposed side wall members **60** extend upwardly from the lower wall member **30** at opposite sides of the unitary structure. Said wall members converge slightly from the front of the structure toward the rear wall **10** of the fireplace construction to which they may be attached in any convenient manner.

The outermost opposite side edges of the members **36** and **38** are fixed to the adjacent members **60** along their points of jointure in any convenient manner.

Additionally, inner wall members **61** serve to enclose the inner sides of each of the forward conduits and inner wall members **61'** serve to enclose the opposite sides of the rearward conduit.

Baffles **62** extend upwardly from the side wall members **60** and flare outwardly in curving relation away from each other toward the respective side wall **12** of the fireplace construction terminating thereat at **64** and being secured thereto in any desired manner immediately above an opening **66** through the wall **12**.

A flue (designated by the numeral *i*) is provided between the pair of spaced forward conduits and adjacent the rearward conduit through which the products of combustion formed in the firebox of the structure when in operation may pass upwardly via the route indicated by the flow arrows *c* to the chamber **20** and thence upwardly and outwardly through the chimney.

A pair of spaced cold air intakes are provided by a pair of half-round conduits **72** which are fixed to the lower wall or floor member **30** and extend from the front of the structure to the rear thereof so as to form a pair of air passageways **71**.

The inlets **70** of the intakes are open to the room in which the fireplace is constructed and the rearward ends thereof are open and extend through appropriate openings in the wall member **36** so as to provide direct communication with the turbulence chamber **42**.

The unitary structure further includes an upper front wall member having a forward horizontally disposed section **80** which is receivable within the recess **18** of the fireplace construction, so as to enclose same on the upper side thereof, and a rearward vertically disposed section **82** which is joined to the opposite side walls **60** and to the wall members **61** as shown.

On each side of the unitary structure, a vertically disposed elongated baffle member **161** extends angularly

and outwardly away from the forward edge of each side wall member **60** and is adapted to deflect certain of the air normally passing into the combustion chamber through elongated portions **18'** of the recess **18** extending through the forward wall **16** of the fireplace construction as shown.

Similarly, the baffle **32** deflects certain of the air normally passing into the combustion chamber through the portion of the recess **18** beneath the unitary structure as shown.

The cool room air thus deflected by the baffles **32** and **161** and **161** passes into the interior of the fireplace construction and moves past the outer sides of the outer walls **30**, **60** and **60** of the unitary structure.

In actual operation, the cool room air flows naturally into the combustion chamber in the well known manner. As before stated, however, as the moving air moves toward the firebox, a considerable velocity is generated creating pressure around the perimeter of the fireplace opening.

It is this movement and resulting pressure which is utilized as another feature of my invention as a basis for further stimulating the air circulation.

Primarily, portions of this cool room air are deflected, and forced by pressure of the air mass forwardly of the fireplace without artificial or mechanical means, find their way into the intakes through the inlets **70**.

The air moves through the passageways **71** into the tubulence chamber **42** and in such transit, it will be appreciated that the air is warmed by radiation from the walls of the structure, same being heated by the heat within the combustion chamber or firebox.

The flow of this air through what will be referred to as the primary system is indicated by the flow arrows *a*. In the turbulence chamber **42**, the air is deflected upwardly by the arcuate shaped portion **40** of the rearward wall member **38** into and through the choke or throat **44**.

It is at this throat that the jet principle is being applied, the velocity of the air increasing by expansion as it is warmed and as it passes through the restricted throat, into the expansion chamber **46**.

As the air continues to be heated, it further expands and the velocity thereby is further increased whereby the upward movement thereof through the conduits and out the outlets **46** and **48** is greatly accelerated.

As aforesaid, the primary air system comprises the admission of the cool air from the adjacent room through the passageways **71** of the intakes into the turbulence chamber **42**, from which it passes through the throat **42** into the expansion chamber **46** and thence outwardly via the conduits through the outlets **46** and **48** into the adjacent room areas.

Simultaneously therewith, other portions of the air moving toward the combustion chamber are deflected by means of the baffle **32**, **161** and **161** through the elongated openings provided at the perimeter of the structure at the sides and bottom thereof.

The direction of the air of this system, distinguished from the above referred to primary air system, and identified herein as the secondary air system, is indicated by the flow arrows *b*.

In the secondary air system, the cool air from the room is deflected en route to the firebox by means of baffles **32**, **161** and/or **161** through the respective adjacent openings **18** and **18'** into the chamber **19** defined by the inner sides of the wall members **10**, **12**, **14** and **16** of the fireplace construction and the outer surfaces of the wall members **30**, **60** and **62** of the unitary structure.

In Fig. 5, I have shown a modified form of the cool air intake shown in Fig. 3 wherein the half-round conduit **72'** provides an air inlet **70'** and an air passageway **71'** therethrough, the member **72'** being fixed to the floor member **30'** and said member **30'** having the downwardly depending baffle member **32'**, all as before described.

The uppermost forward end **73'** of the member **72'** extends outwardly beyond the forward end of the member **30'** whereby an improved means for facilitating the intake of air through the inlet **70'** is provided. That is to say, the overhanging end portion **73'** serves to increase the so-called "scooping" action of the intake whereby an increased quantity of air is induced into the passageways **71'**.

In the modification shown in Fig. 6, I have shown the front wall **16'** of a fireplace construction of the usual design.

The unitary air heater structure receivable in the conventional opening in the wall **16'** of the fireplace construction includes a lower horizontally disposed wall member **30'** having an angularly disposed baffle or deflection member **32'** depending downwardly along the forward edge thereof. The rearward end of the wall member **30'** is supported by the rear wall of the fireplace as before described.

The unitary structure further includes the pair of substantially vertically disposed rear wall members such as aforedescribed and only one of which (wall member **37**) is shown. By means of the spaced rear wall members the turbulence chamber, throat and expansion chamber, all previously described, are provided.

Vertically disposed side wall members **60'** extend upwardly from the lower wall member **30'** at opposite sides of the unitary air heater structure and are secured to the rear wall members in any usual manner.

In lieu of the pair of spaced cold air inlets above described, in this modification a horizontally disposed wall member **72'** is disposed above and in spaced relation from member **30'** so as to provide an inlet **70'** at the forward face of the unitary structure adjacent the room area and an outlet at the rearward extremity thereof, which outlet is in communication with the turbulence chamber above described.

The modified form also includes the upper front wall member **80'** as previously described whereby the conventional fireplace construction chamber is provided.

The vertically disposed lips **161'** extend angularly and outwardly from the forward side edges of the members **60'** and **60'** and deflect certain of the air from passing into the interior of the unitary structure through the elongated openings **24'** through the forward wall **16'** of the fireplace construction on the opposite sides thereof.

The air is also deflected from the unitary structure to the underside thereof through the opening **26'**, as above described, by means of the baffle **32'**.

By means of this modification, the irregular shape of the intakes shown in Figs. 1, 3 and 4 is replaced by a double-walled form of floor member shown wherein a pair of air inlets are provided beneath the firebox.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claim rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claim are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

A unitary fireplace heater characterized by a unitary structure adapted to be disposed within a fireplace combustion chamber of a fireplace and comprising, a lower horizontal wall member disposed substantially throughout the width of the fireplace combustion chamber, an upper horizontal wall member disposed substantially throughout the width of the fireplace combustion chamber and spaced above said lower wall member, vertically disposed side wall members on opposite sides of said upper and lower wall members, a double-walled vertically disposed rear wall member at the rear of and connecting said upper and lower and side wall members to form

therewith an open-faced fire box forwardly of said rear wall member, cool air intake means disposed above and adjacent said lower wall member and communicating with a turbulence chamber disposed rearwardly of and throughout the width of said rear wall member, said turbulence chamber being formed by a vertically depending lowermost end portion of the forward wall of said rear wall member and by an arcuate shaped lowermost end portion of the rearward wall of said rear wall member, said rear wall member including a restricted throat formed by the convergence of the spaced forward and rearward walls thereof above and communicating with said turbulence chamber therebelow, said rear wall member also including a tapered expansion chamber formed by the divergence of the spaced forward and rearward walls thereof above and away from the restricted throat, the restricted throat and expansion chamber of said rear wall member providing a Venturi passage for the expansion of the heated gases during passage therethrough from said turbulence chamber, the upper portions of the spaced forward and rearward walls of said rear wall

member flaring upwardly and outwardly above the plane of said upper horizontal wall member to provide distribution means for facilitating the discharge of heated air from the restricted throat and tapered expansion chamber through communication with a plurality of outlets into rooms adjacent the fireplace.

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