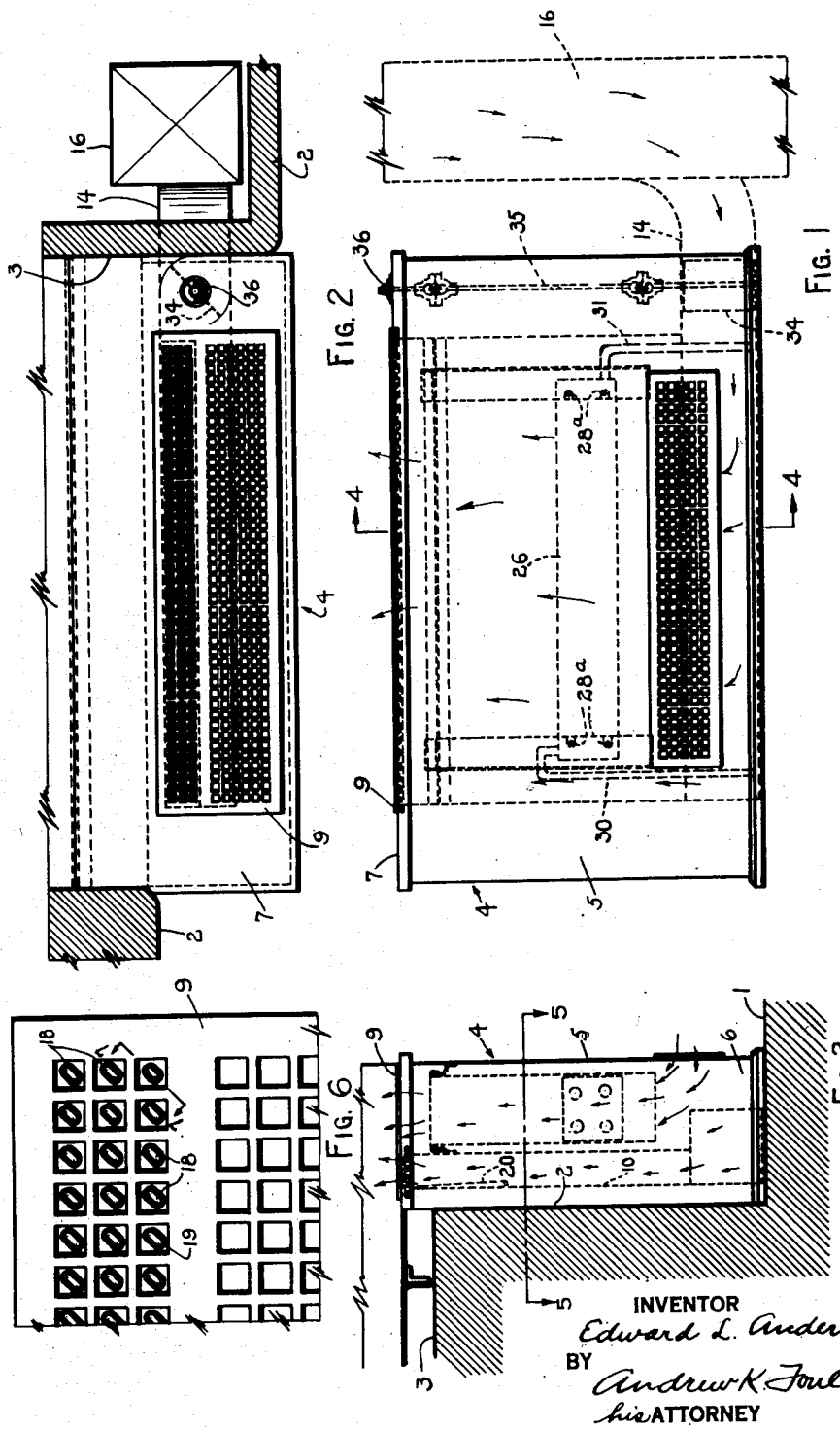
May 23, 1939. E. L. ANDERSON 2,159,495

GAS MIXING APPARATUS

Filed Nov. 5, 1934 2 Sheets-Sheet 1



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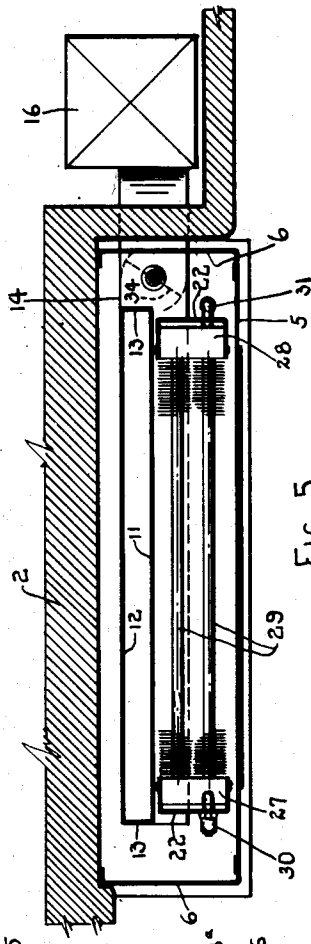


FIG. 5

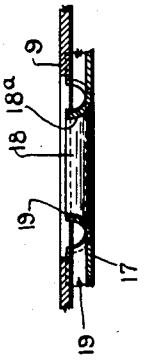


FIG. 7

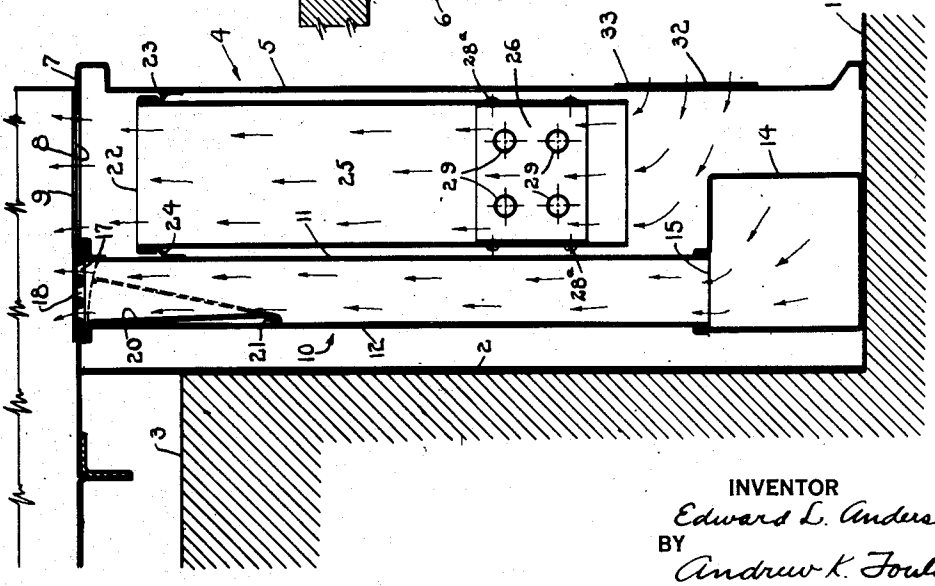


FIG. 4.

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2,159,495

GAS MIXING APPARATUS

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Application November 5, 1934, Serial No. 751,455

10 Claims. (Cl. 98—38)

My invention relates to an apparatus for mixing air or other gases and is particularly directed to supplying air to a room or other enclosure. When the conditioning of the air in a room or enclosure is accomplished by projecting thereinto a stream of cool, fresh or conditioned air, it is highly desirable to prevent the contact of the cool air stream with occupants who may be in the room. My invention therefore has for one of its objects the shielding of the interior of the room from the cool air stream until the stream has been suitably tempered. My invention also contemplates the efficient blending of the cool air stream within the room with a relatively warmer stream which may comprise air withdrawn from the room.

A further object is the provision of an apparatus by which my invention may be performed.

The invention consists in the improved apparatus, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as a part of this specification, I have fully and clearly illustrated a preferred embodiment of the apparatus for performing my invention, in which drawings—

Figure 1 is a view in front elevation of the apparatus;

Fig. 2 is a top plan view thereof, showing the same positioned in a room or enclosure;

Fig. 3 is an end view of the apparatus, looking from the left toward the right of Fig. 2;

Fig. 4 is an enlarged view in section on the line 4—4 of Fig. 2;

Fig. 5 is a view in section on the line 5—5 of Fig. 3;

Fig. 6 is an enlarged detail top plan view of a portion of the apparatus, and

Fig. 7 is a detail view in section on the line 7—7 of Fig. 6.

Referring to the drawings by characters of reference, 1 designates generally the floor of a room or other enclosure having a side wall 2 with a window aperture 3. Supported on the floor 1 there is a casing or cabinet 4 having vertical front and end or side walls 5, 6 respectively. The casing is positioned with its rear against the wall 2 and preferably at the window opening 3. The casing has a substantially horizontal top wall 7 provided with a longitudinally extending substantially rectangular opening 8 having its longer sides substantially parallel to the wall 2, with the opening 8 being closed by a grille plate 9. Within the casing 4 there is a vertical duct member 10 which extends longitudinally of the casing 4 substantially parallel to the wall 2. The member 10 is preferably formed by an upright hollow partition having front and rear walls 11, 12 joined by end walls 13. The duct member 10 is supported by a cold air inlet conduit 14 substantially rectangular in transverse cross-section and extending longitudinally of the casing 4. The duct member 10 is open at its bottom end and communicates with the conduit 14 through a longitudinally extending opening 15 in the top wall of the conduit. The conduit 14 preferably rests on the floor 1 and extends through the end casing wall 6 and the room wall 2 for communication with a supply duct 16. The duct member 10 terminates at its upper end substantially at the top wall 7 and is provided with a top cover plate 17 having a plurality or multiplicity of longitudinally extending rows of relatively small apertures 18 therethrough. The apertures 18 are of an elongated and somewhat oval or elliptical form transverse to the direction of fluid flow therethrough so that the discharged air will be in relatively thin or flat streams. The longitudinal axes of the apertures 18 transverse to the direction of flow and designated by line 7—7 of Fig. 6 are inclined to the front or forward edge of the duct member 10. Each of the apertures also has its inner or air guiding wall surface 18a convexly curved and converging in the direction of flow with the inner surface terminating substantially parallel to the axis of flow so as to reduce the resistance of the apertures to the discharging air and to eliminate audible vibration of the body of air into which the air discharges from the apertures. Each of the apertures is preferably formed in part by a projecting continuous lip or flange 19 which is punched or bent from the material of the plate. The apertures 18 discharge through or from an opening in the top wall 7 which extends longitudinally of the casing at the rear of and substantially parallel to the opening 8, the apertures 18 registering with apertures through the grille plate 9. In the duct member 10 adjacent its upper or outlet end there is an adjustable damper plate 20 which extends longitudinally between the duct end walls 13 and which is pivoted at its lower edge on a substantially horizontal shaft 21. The upper free edge of the damper plate terminates adjacent the cover plate 17 so that the damper plate 20 is operable on movement to direct flow through one or more of the longitudinally extending rows of apertures 18, i. e. through the front row only, or through the two front rows or through all of the rows. Positioned between the front duct member wall 11 which is spaced rearwardly from the front casing wall 5 there are end wall members 22 which are supported at their top edges by brackets 23, 24 secured respectively to the walls 5 and 11. The end walls 22 form with the walls 5 and 11 an upflow duct 25 which discharges through the top wall opening 8 forwardly of the outlet from duct member 10 and which has its lower portion defining a heating chamber. Within the heating chamber of the

duct 25 there is an air heating means 26 comprising opposite headers 27, 28 fixed to the end wall members 22 by screws or the like 28a. The headers 27, 28 are joined by finned heater tubes 29. The header 27 is provided with an inlet pipe 30 and the header 28 is provided with an outlet pipe 31 for the circulation of a heating fluid through the tubes 29. In the front casing wall 5 there is an air inlet opening 32 which extends longitudinally of the casing and is positioned below the level of the heating means 26 and which serves to supply air withdrawn from the room to the heating means 26 and the duct 25 for discharge into the room through top wall opening 8. The opening 32 is preferably provided with a grille plate 33. The cold air inlet conduit 14 is preferably provided within the casing 4 with a valve or damper 34 which is supported on a vertically extending shaft 35 which projects upward through the top casing wall 7 where it is provided with an operating knob or hand grip 36.

The method of operation of my apparatus is as follows: Relatively cold, fresh or conditioned air is supplied through duct 16 under pressure and flows from the duct 16 through the inlet conduit 14 to the upflow duct within the duct member 10. This relatively cold air is discharged upwardly closely adjacent the side wall of the room and substantially parallel thereto in a plurality of closely spaced jets. Simultaneously with the discharge of the cold air, a sheet or stream of warm air will be discharged upwardly through the top casing wall from the duct 25 and being positioned on the room side of the cold air stream will prevent the cold air from reaching the interior of the room until it has blended with the room air and the air from duct 25. The air discharged from the duct 25 will be withdrawn from the room through the inlet opening 32 by gravity flow due to the heating means 26 and also due to the injector action caused by the cold air stream discharging from duct member 10. The plurality of thin air jets discharging from the duct member 10 also serves to draw room air inwardly across the top of the casing 4, the inwardly drawn air and the air from duct 25 being carried upward with the cold air stream and blending rapidly therewith due to friction between the sides of the adjacent air streams. In addition to the efficient mixing and blending of the streams by the use of a multiplicity of jets, the relatively large or long peripheral measurement of the jets as compared to their cross sectional area transverse to the direction of air flow causes rapid dissipation of the cold air velocity, thus preventing the occurrence of objectionable drafts in the room or space. The damper 34 serves to control the total quantity of cold air discharged by the duct member 10. The damper plate 20 functions to maintain the velocity of discharge by its Venturi action as it may be moved to permit discharge through a single row of apertures 18 when the volume of cold air is cut down by the damper 34. It will be apparent that the damper plate 20 can also be employed to decrease the quantity of cold air discharged from the duct member 10.

It is to be noted that my invention also contemplates the positioning of the warm air stream between the room wall surface and the cold air stream, which would be accomplished by a reversal of the position of the ducts within the casing 4. Such a reversal of the position of the air streams is highly desirable when the apparatus is placed in front of a window or other cold wall surface in order to avoid and prevent frosting of the window pane or sweating of the cold wall due to contact therewith of the cold air stream. Although the positioning of the warm air stream on the room side of the discharging cold air stream is desirable, the use of the multiplicity of cold air jets promotes such a rapid diffusion and blending of the cold and warm air streams as to properly temper the discharging cold air prior to contact with objects or occupants of the room.

Although I have shown the duct 25 as supplied directly with air withdrawn from the room, it is to be understood that the duct 25 may be supplied with return air from a supply duct similar to the duct 16.

What I claim and desire to secure by Letters Patent of the United States is:

1. An apparatus for supplying air to a room comprising a casing positioned adjacent a room wall, said casing having an outlet through its top wall for upward discharge of heated air, said casing having a second outlet for upward discharge of cold air through its top wall and positioned between the room wall and said first outlet, said second outlet being subdivided to provide a multiplicity of small cold air streams to induce mixing of the cold and heated air, hollow partition means joining said top wall and providing a cold air duct within said casing communicating with said second outlet, a second duct means formed between said hollow partition means and the front wall of said casing and communicating with said first outlet for passage of air therethrough, and heating means within said second duct means and operable to heat the air passing therethrough.

2. An apparatus of the character described, comprising a casing adapted to be positioned against a room wall, said casing having a top wall provided with an outlet opening, a vertically extending duct member disposed within said casing and spaced from the front wall of said casing, said duct member extending to said top wall and communicating with said outlet opening, end wall members positioned between said duct member and said front casing wall and cooperating therewith to provide a vertical duct having an outlet through said top casing wall and in close proximity to said first-named outlet, said casing having an inlet for said duct member and an inlet for said duct, and means in said duct to heat the air admitted through said duct inlet.

3. An apparatus of the character described, comprising a casing adapted to be positioned against a room wall, a vertically extending duct member disposed within said casing and spaced from the front wall of said casing, said duct member having an outlet through the top wall of said casing, end wall members positioned between said duct member and said front casing wall and cooperating therewith to provide a vertical duct having an outlet through said top casing wall, said casing having an inlet for said duct member and an inlet for said duct, said end wall members being supported by said duct member and said front casing wall, and means in said duct to heat the air admitted through said duct inlet.

4. An apparatus of the character described, comprising a casing having front and side walls, said casing being adapted to be positioned against a room wall, a vertically extending duct member disposed within said casing and spaced from the front, and side walls of said casing,

said duct member having an outlet through the top wall of said casing, end wall members positioned between said duct member and said front casing wall and cooperating therewith to provide a vertical duct having an outlet through said top casing wall, said casing having an inlet for said duct member and an inlet for said duct, and heating means extending between and supported by said end wall members and operable to heat the air admitted through said duct inlet.

5. An apparatus of the character described, comprising a casing having a top wall and adapted to be positioned against the wall of a room, an open ended vertical duct member of elongated horizontal cross section in said casing and extending to said top wall, a conduit leading from outside of the room and extending through said casing beneath the lower end of said vertical duct member and opening into said duct member, said duct member being spaced from the front wall of said casing to provide a heating chamber, said chamber having an inlet through the front wall of said casing and having an outlet through the top wall of said casing, the top wall of said casing having a separate outlet opening for said duct member, and heating means in said chamber.

6. An apparatus of the character described, comprising a casing adapted to be positioned against the wall of a room, a vertical duct member in said casing and extending from top to bottom thereof, an air supply conduit leading from outside of the room and opening into said duct member, said duct member being spaced from the front wall of said casing to provide a heating chamber, said chamber having an inlet through the front wall of said casing and having an outlet through the top wall of said casing, the top wall of said casing having an outlet opening for said duct member, means subdividing said outlet opening into a multiplicity of jets whereby to quickly diffuse and mix the air discharged from said outlet opening with the surrounding atmosphere, and heating means in said chamber.

7. An apparatus of the character described, comprising a casing having a horizontal top wall and adapted to be positioned against the side wall of a room, a substantially rectangular vertical duct member in said casing extending longitudinally of the front casing wall and having its outlet opening through said top wall, an inlet conduit extending through said casing beneath said vertical duct member and opening into the lower end of said duct member, a cover plate for the outlet end of said duct member and having a plurality of longitudinal rows of apertures therethrough, said apertures being elongated transversely to the axis of flow and converging convexly in the direction of flow, said duct member being spaced from the front casing wall to provide an upflow duct, said casing having an inlet to said duct and an outlet for said duct through said top wall in front of said duct member outlet, and heating means in said duct.

8. An apparatus of the character described comprising a rectangular shaped cabinet having a top wall provided with an opening therethrough for the discharge of air into a room and having a front wall provided with an opening therethrough for the entrance of room air, an inlet duct for the entrance of cold air, said inlet duct extending longitudinally within said cabinet adjacent the bottom thereof, said duct having an opening therein, a rectangular shaped open ended duct mounted on said first-named duct and spaced from the front wall of said cabinet, said second-named duct having one end overlying the opening in said first-named duct and having its other end joining the top wall of said cabinet and overlying less than half of the area of the opening in said top wall, spaced end wall members carried by said cabinet and cooperating with one wall of said second-named duct and with the front wall of said cabinet to provide a passage for air for discharge into the room through the remaining portion of the opening in the top wall of said cabinet, grille means overlying the opening in the top wall of said cabinet to diffuse the air discharged therefrom, and heating means carried by and extending between said end wall members in said passage for heating the air passing through said passage.

9. In an apparatus of the character described, a casing adapted to be positioned against a room wall, a vertical duct member in said casing extending to the top thereof and having an open upper end and spaced from the front wall of said casing, a second duct member intermediate said casing front wall and said vertical duct member and forming a heating chamber, heating means in said heating chamber, a damper member in said vertical duct member adjacent said open upper end thereof and operable to permit the fluid flowing through said vertical duct member to flow only through a portion of said open upper end to maintain sufficient velocity of fluid movement from said vertical duct member to provide intimate mixing external of said casing, said second duct member having an inlet through the front wall of said casing and having an outlet opening through the top wall of said casing, the top wall of said casing having an outlet opening for said vertical duct member, means subdividing said outlet openings into a multiplicity of jets whereby to quickly diffuse and mix the fluid discharged from said outlet openings and with the surrounding atmosphere.

10. In an apparatus of the character described, a casing adapted to be positioned against a room wall, a vertical duct member in said casing extending to the top thereof and spaced from the front wall of said casing, a second duct member intermediate said casing front wall and said vertical duct member and forming a heating chamber, heating means in said heating chamber, said second duct member having an inlet through the front wall of said casing and having an outlet through the top wall of said casing, the top wall of said casing having an outlet opening for said vertical duct member adjacent said outlet, duct means supplying external air to said vertical duct member under forced convection, damper means in said duct means to reduce the volume of air flow to said vertical duct member, a damper member in said vertical duct member adjacent said top opening and operable to permit the air flow through said vertical duct member to flow only through a portion of said top opening so that the reduced volume of air to said vertical duct member is delivered from said top opening at a predetermined minimum velocity, means subdividing said outlet opening into a multiplicity of jets whereby to quickly diffuse and mix together the air discharged from said outlet opening said outlet and with the surrounding atmosphere.

EDWARD L. ANDERSON.