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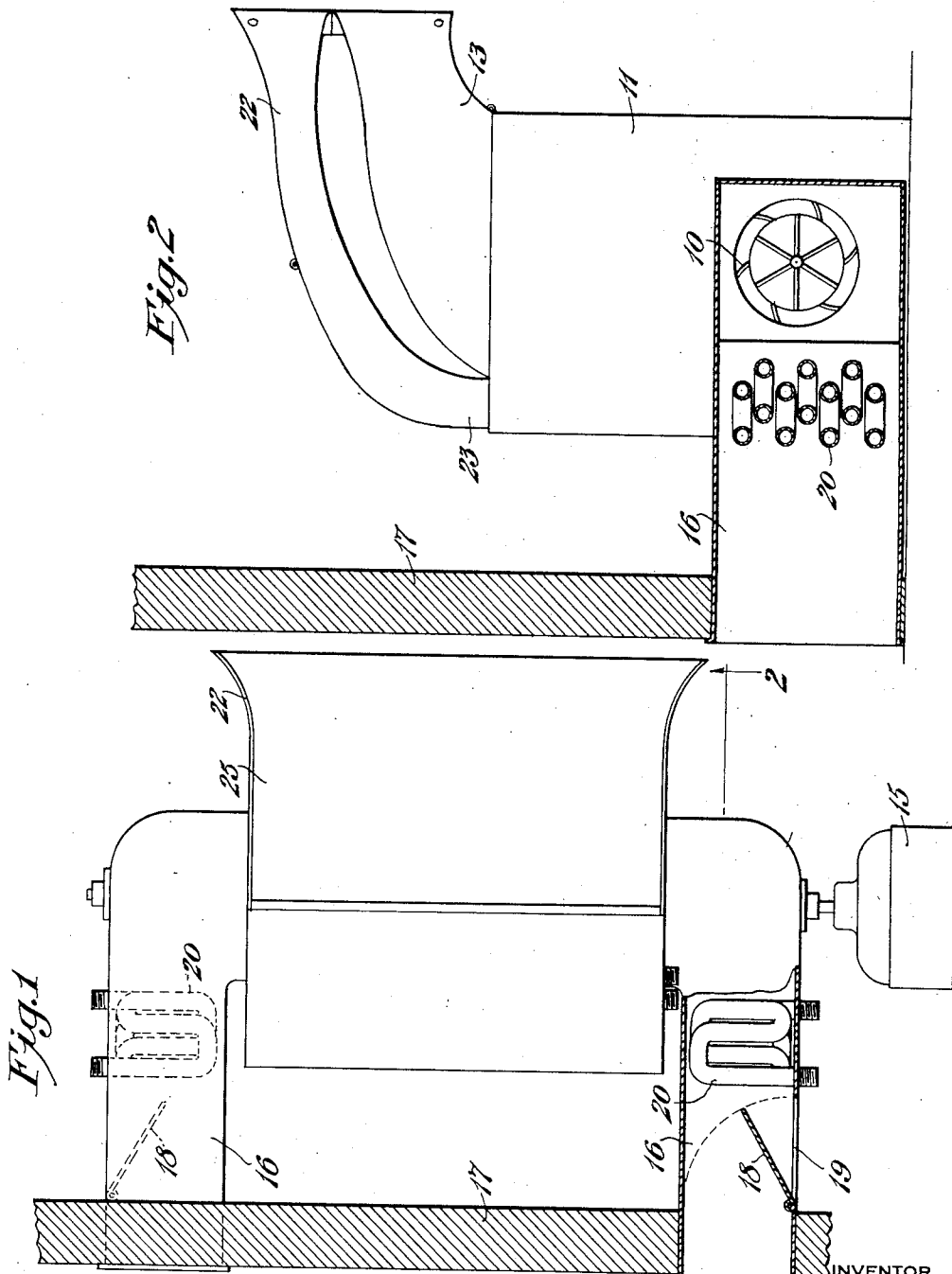
C. C. CARSON

2,093,306

HEATER

Original Filed Sept. 27, 1928

2 Sheets-Sheet 1



INVENTOR
C. C. Carson

BY *Liggett & Adams*
ATTORNEYS

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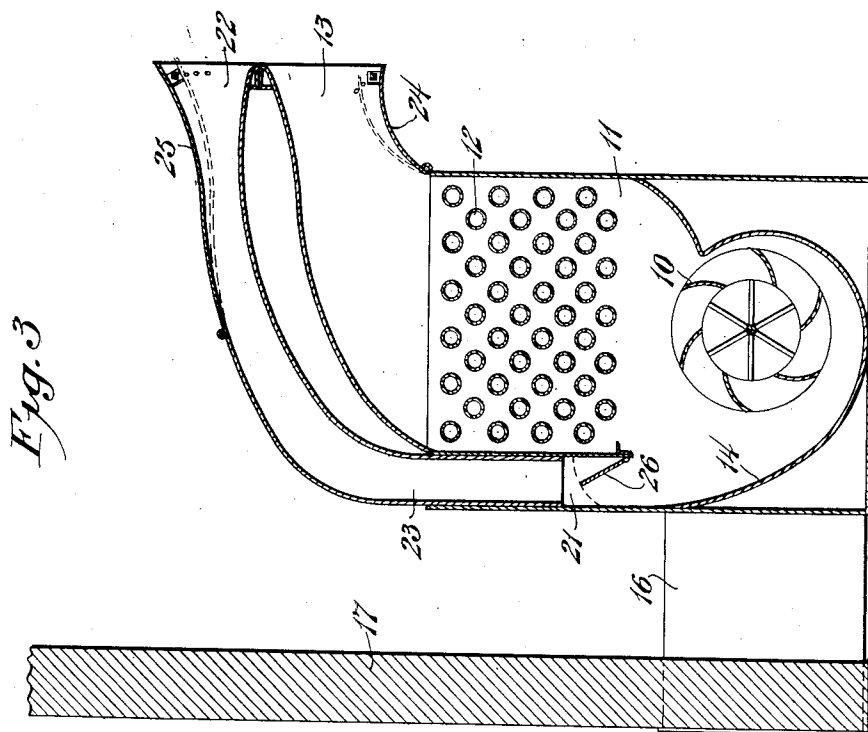
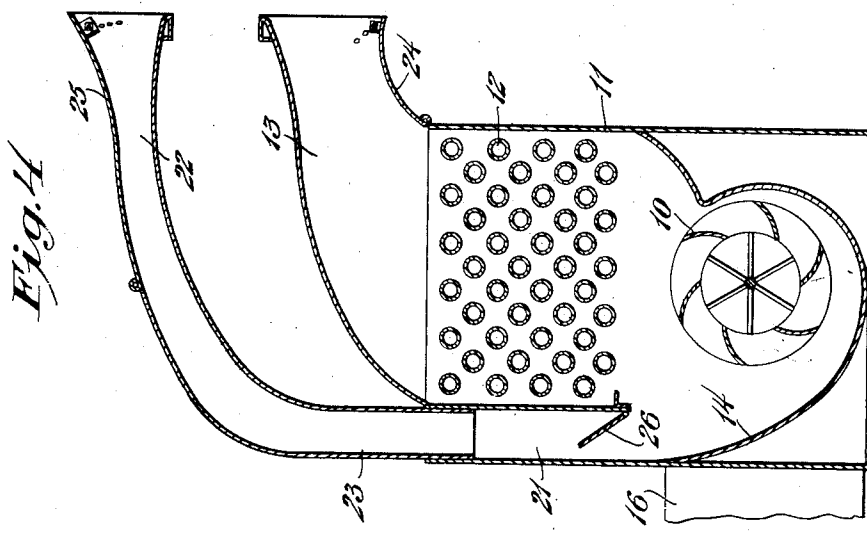
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UNITED STATES PATENT OFFICE

2,093,306

HEATER

Clifford C. Carson, Chicago, Ill.

Original application September 27, 1928, Serial
No. 308,681. Divided and this application
October 9, 1929, Serial No. 398,443

17 Claims. (Cl. 98—39)

This invention relates to unit heaters adapted to be used for heating factory buildings, theaters and the like and, among other objects, aims to provide important improvements on the heater disclosed in my co-pending application, Serial No. 308,681, filed Sept. 27, 1928, which has now matured into Patent No. 1,820,893, issued Aug. 25, 1931, some of the main features being the provision of means to admit ventilating air from the outside or air in the building, or a controlled mixture of both, to the heater and means to regulate or control the relative temperature volume and velocity of two discharging curtains or substantially horizontal strata of air from separate nozzles, so as to confine the heated air to the working or lower zone in a building. Broadly speaking, the idea is to provide an improved, very efficient and commercially practicable unit heater utilizing a curtain or stratum of relatively cool air to confine the heated air as much as possible to the working zone where it is required.

Other objects and aims of the invention will appear in the specification, when considered in connection with the accompanying drawings showing one illustrative embodiment thereof and in which:

Fig. 1 is a top plan view of the selected embodiment, parts being shown in cross section;

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

Fig. 3 is a central, vertical sectional view through the heater; and

Fig. 4 is a fragmentary sectional view similar to Fig. 3, but showing the cold air discharge nozzle in raised position.

Referring particularly to the drawings, the heater is there shown as being of the so-called unit type wherein a current of air discharging from an air pump, such as a fan 10 of conventional design arranged within a casing 11, is heated by a series of pipes 12 within the casing through which steam, hot water or other heating fluid is circulated. The heated air is discharged substantially horizontally through a flared nozzle 13 so that it is circulated, at the desired velocity in the working zone of the building. These features are disclosed in my aforesaid application.

In this instance, the centrifugal fan or blower 10 is partially surrounded by a scroll 14, so arranged as to direct the current of air upwardly into the casing. As will be seen in Fig. 1, the fan shaft is adapted to be driven directly by a motor 15 and intake ducts 16 are there connected to the opposite sides of the casing near

the floor level where the air is somewhat cooler than it is at higher levels. These ducts are shown as extending through a wall 17 so as to receive a supply of fresh air from the exterior of the room or space to be heated; although adjustable dampers or air valves 18 and lateral intake openings 19 in the conduits provide for re-circulating the air in the heated space or room through the heater and/or admitting a mixture of the room air and fresh air, the idea being to afford adequate fresh air ventilation and also to regulate the temperature of the heated air. Of course, the dampers may be manually controlled or operated automatically by temperature responsive means such as thermostats subjected to the temperature of the discharged heated air. The latter expedient requires no illustration nor detailed explanation.

In cold climates, the fresh or outside air is too cold to admit directly to the heater, because its capacity and rate of exchange is limited according to the heating area of the pipes or coils 12. It is, therefore, desirable that the fresh air admitted through the ducts shall be pre-heated, so as to regulate the temperature of the make-up air. To this end, heating coils 20 are conveniently arranged within the ducts so that the temperature of the incoming air may be raised sufficiently to enable the main heater coils to boost the temperature as much as is necessary. Also, the idea is to control the temperature of that portion of the make-up air for the confining or upper stratum.

As has already been intimated, the discharged stream of heated air is confined largely to the working zone by a substantially horizontal curtain or stratum of relatively cold air above the working zone. Obviously, the cold air, being of greater density and specific gravity than the warm air will tend to settle and will thus form a barrier through which the heated air cannot rise. In this example, the cold air stratum is produced by the fan 10 and passes through a by-pass duct 21 formed across the back of the heater casing above the scroll 14, thence, through a substantially horizontal, flared nozzle 22 which is preferably vertically adjustable within the by-pass duct so that the level or height of the cold stratum can be varied at will (see Fig. 4), said nozzle having a conduit 23 telescoped within the by-pass duct.

Referring to Figs. 3 and 4, it will be apparent that air discharging from the fan at a high velocity is delivered to the by-pass duct. It is desirable that the cold air stratum shall have a

higher velocity than the heated air so that it will not settle and mix with the heated air. Furthermore, it should discharge in a relatively thin stream and spread over a wide area. Hence, the cold air nozzle is more restricted than the heated air nozzle. The depths of both strata are preferably adjustable so as to obtain the best results by regulating the thicknesses of the curtains or strata. To this end, the nozzle 13 has a pivoted and adjustable lower wall 24 and the nozzle 22 has an adjustable upper wall 25.

It is highly desirable that the relative temperatures, volumes and velocities of the cold stratum and the heated stratum of air, shall be regulated either automatically or manually. The temperature of the incoming or make-up air is controlled either by moving the dampers 18 to admit relatively warm air with it and/or by utilizing the pre-heating coils 20. Now, the relative volumes and, hence, the velocities of the heated and cold air strata are herein adapted to be regulated by means of a damper or valve 26 in the by-pass duct. When this valve is wide open, the maximum volume of cold air is discharged through the duct at maximum velocity, while the minimum volume of air is delivered through the heater at minimum velocity. Thus, the temperature of the heated air and also the relative temperatures can be varied at will without disturbing the intake dampers. Also, the velocities of both strata may be controlled by either varying the speed of the air, which, incidentally, controls the volume of air delivered, or by adjusting one or both of the nozzles.

From the foregoing description, it will be seen that the improved heater is especially adapted to buildings having large floor areas and will maintain the proper temperatures in the working zone without permitting most of the heated air to rise to the ceiling or roof where the heat is dissipated and wasted. It is very simple in its design and can be manufactured at a relatively low cost, most of the parts being made by cutting and die-stamping operations. Moreover, such apparatus may also be used for cooling rooms or enclosures.

Obviously, the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly, since they may be employed advantageously in various combinations and sub-combinations.

What I claim is:—

1. A unit heater of the class described comprising, in combination, a casing; a fan arranged to discharge air into the casing; air heating means within said casing; a hot air nozzle on the casing arranged to discharge the heated air substantially horizontally; a by-pass conduit for some of the air delivered by said fan; and a separate substantially horizontal nozzle connected to said by-pass conduit and arranged above said hot air nozzle so as to provide a curtain or stratum of relatively cold air and thereby confine the heated air therebelow.

2. A unit heater of character described comprising, in combination, a casing; heating means within the casing; means for delivering a current of air through the heating means; a conduit on the casing to discharge the heated air in a wide substantially horizontal stratum; and a separate conduit independent of the hot air conduit for by-passing a portion of the air before it is heated and discharging it in a relatively thin

stratum above the stratum of heated air so as to confine the hot air therebelow.

3. An air heater of the character described comprising, in combination, a casing; heat exchanging means within a portion of the casing offering resistance to the flow of air therethrough; a substantially horizontal hot air discharge nozzle connected to the heater; a separate nozzle connected to deliver relatively cold air at a greater velocity than the hot air and automatically horizontally above the hot air stream; and a single means to deliver the air through both nozzles.

4. An air heater of the character described comprising, in combination, a casing; heat exchanging means within a portion of the casing offering resistance to the flow of air therethrough; a conduit having a substantially horizontal hot air discharge nozzle connected to the heater; a second conduit having a separate nozzle connected to deliver a horizontal stratum of relatively cold air at a much higher velocity than and above the discharging hot air; and a fan in the casing arranged to discharge air through both nozzles.

5. An air heater of the character described comprising, in combination, a casing; a pair of substantially horizontal discharge nozzles connected to the casing, one above the other; separated conduits carrying said nozzles; a heating compartment within the casing arranged to discharge heated air through the lower nozzle; a fan in the casing connected and arranged to deliver relatively cold air through the upper nozzle and air to be heated into the heating compartment and through the lower nozzle.

6. In a heater of the character described, a casing; a fan associated with the casing; a heating compartment within the casing arranged to heat air delivered by said fan; a wide discharge nozzle connected to said heating compartment and arranged to discharge a stratum of air into a space to be heated; an independent cold air discharge nozzle above said hot air nozzle; a by-pass conduit to direct high velocity air from the fan to said cold air nozzle; and means to control the relative volumes and velocities of air passing through said nozzles.

7. In a heater of the character described, a casing; a fan associated with the casing; a heating compartment within the casing arranged to heat air delivered by said fan; a wide discharge nozzle connected to said heating compartment and arranged to discharge a stratum of air into a space to be heated; an independent cold air discharge nozzle above said hot air nozzle; a by-pass conduit to direct some of the air from the fan to said cold air nozzle; and a damper in said by-pass conduit arranged to control the relative volumes and velocities of air passing through the nozzles.

8. In a heater of the class described, a casing; a heating compartment within the casing; a fan arranged to deliver air to the casing; a hot air nozzle leading from the heating compartment and arranged to discharge a substantially horizontal stratum of hot air into the zone to be heated; a by-pass conduit arranged to receive relatively cold air from the fan; and a vertically adjustable cold air nozzle connected to said by-pass conduit and arranged to discharge a stratum of the relatively cold air above the stratum of hot air and thereby confine the hot air to the zone to be heated.

9. In a heater of the class described, a casing; a heating compartment within the casing; a fan

arranged to deliver air to the casing; a hot air nozzle leading from the heating compartment and arranged to discharge a substantially horizontal stratum of hot air into the zone to be heated; a by-pass conduit arranged to receive relatively cold air from the fan; a vertically adjustable cold air nozzle connected to said by-pass conduit and arranged to discharge a substantially horizontal stratum of air above the discharged hot air; and a damper within the by-pass conduit to regulate the volume and velocity of the air issuing from said cold air nozzle.

10. In a unit heater of the character described, a casing; heating means within the casing; means to create a blast of air to be heated; a relatively wide nozzle to deliver the heated air from said casing; an independent nozzle to deliver a stratum of relatively cold air substantially horizontally above and adjacent to said hot air nozzle; and means on both nozzles to vary the relative thicknesses of the strata delivered thereby.

11. In a unit heater of the class described, a casing; heating means within the casing; independent conduits connected to the casing to deliver separate strata of hot and relatively cold air from said casing so arranged as to confine the heated air to a space to be heated; an air intake conduit connected to the casing; and an air pre-heater to control the temperature of the air delivered and to temper the air which enters the cold air conduit.

12. In a unit heater of the class described, a casing; a heat exchanger in a portion of said casing; separate conduits having independent outlets to deliver separate, substantially horizontal and parallel strata of hot and cold air through the casing so as to confine the hot air to the space to be heated; and means to control the velocity, quantity, thickness and temperature of said strata.

13. An air heater comprising in combination, a casing having conduits of fixed dimensions providing passageways for air moving through the air heater and provided with outlets arranged in superposed relation and discharging horizontally, means for circulating air through said casing in a manner to cause air issuing from said upper outlet to move at a higher velocity than the air issuing from the lower outlet, means for heating the air that issues from said lower outlet, and means for regulating the relative velocities of the air issuing from said upper and lower outlets.

14. An air heater of the class described com-

prising two adjacent and vertical passageways having superposed, substantially horizontal outlets; a chamber at the lower end of said passageways; a fan in said chamber connected and arranged to discharge air through both passageways and receiving its supply of air from the lower portion of a space to be heated; heat exchanging means in the passageway having the lower outlet and retarding the velocity of the air passing therethrough; and a damper in the other passageway to regulate the volume and velocity of the air issuing from the upper outlet.

15. A unit heater of the class described comprising, in combination, a casing; a fan arranged to discharge air into the casing; air heating means within the casing; a hot air outlet at the upper end of the casing arranged to discharge heated air substantially horizontally; a by-pass conduit for some of the air delivered by said fan; and said by-pass conduit having a horizontal outlet arranged above said hot air outlet so as to discharge a curtain or stratum of relatively cold air and confine the heated air therebelow.

16. An air heater of the character described comprising, in combination, a casing; heat exchanging means in a portion of the casing offering resistance to the flow of air therethrough; a substantially horizontal discharge outlet for the heated air in the upper portion of the casing; a by-pass conduit communicating with the lower portion of the casing; a horizontal discharge outlet for the by-pass conduit immediately above the heated air outlet; and a single means to deliver air through said heat exchanging means and said by-pass conduit.

17. Air conditioning and ventilating apparatus comprising, in combination, separate air conduits having discharge outlets arranged to discharge adjacent, substantially parallel streams of air horizontally, one above the other, into a room or enclosure; means to create said streams and discharge them at different velocities through said outlets; said apparatus having an intake conduit for fresh outside air; an intake opening also to admit room air to said apparatus; heat exchanging means connected to change the relative temperatures of the air forming said streams whereby the upper stream is always cooler than the lower stream; means to vary the quantity of outside air delivered to said apparatus; and means to regulate the quantity of cool air forming said upper stream.

CLIFFORD C. CARSON.