

Sept. 6, 1949.

A. W. BUELL

2,481,077

JET HEATER

Filed July 24, 1945

2 Sheets-Sheet 1

Fig. 1.

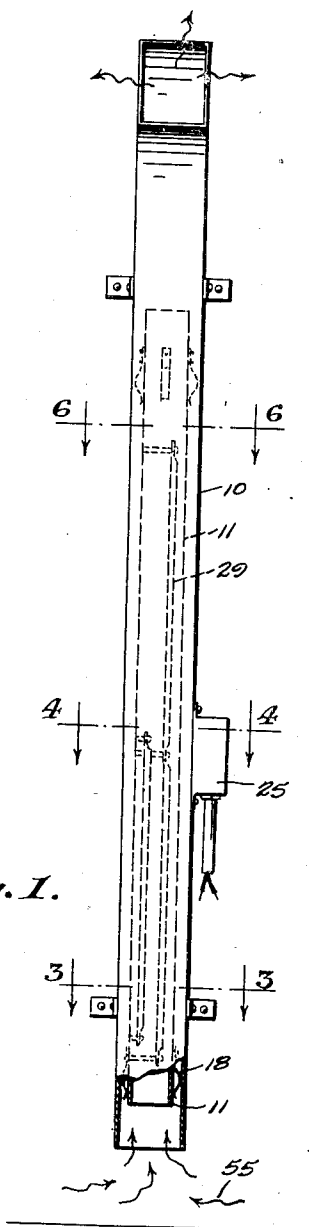
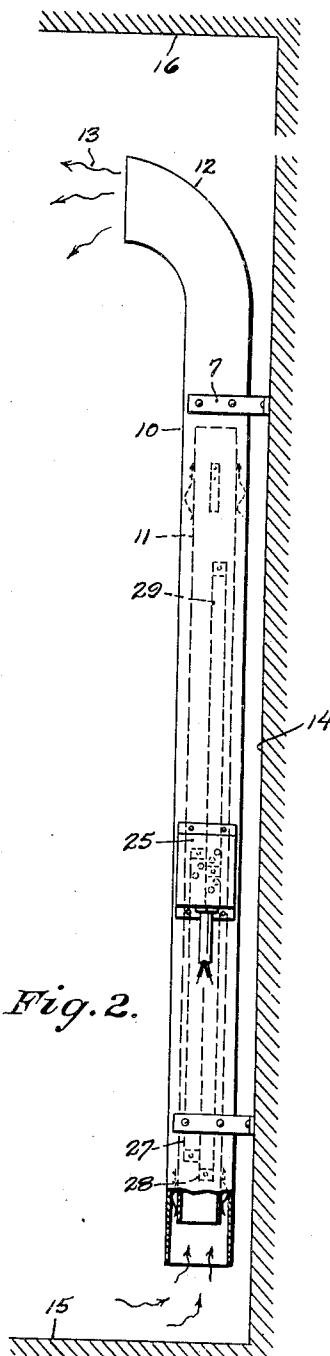


Fig. 2.



INVENTOR.

Albert W. Buell

BY

Edward J. Romet

ATTORNEY.

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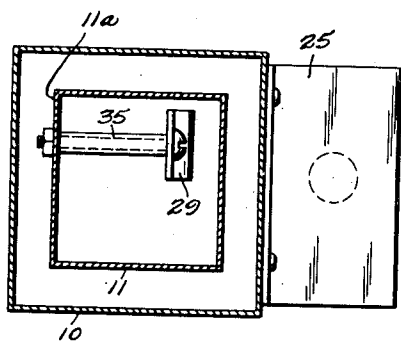


Fig. 6.

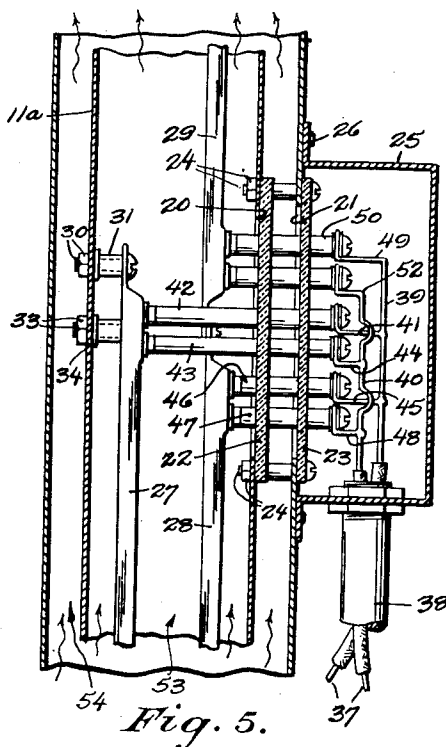


Fig. 5.

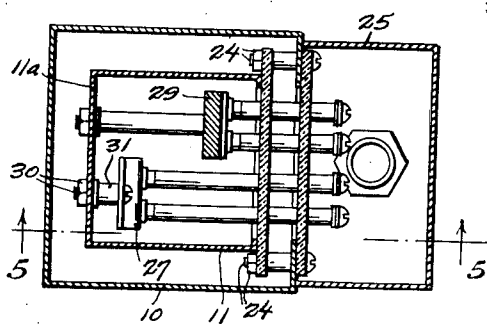


Fig. 4.

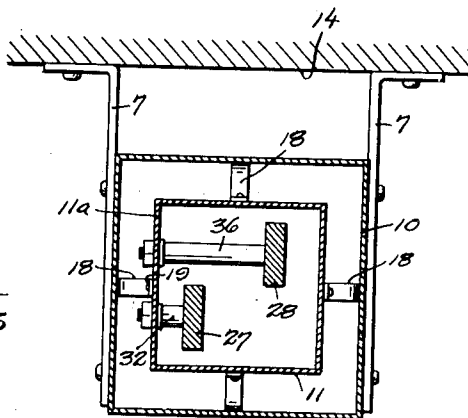


Fig. 3.

INVENTOR.
Albert W. Buell
BY
Edward R. Bauer
ATTORNEY.

UNITED STATES PATENT OFFICE

2,481,077

JET HEATER

Albert W. Buell, Seattle, Wash.

Application July 24, 1945, Serial No. 606,843

6 Claims. (Cl. 219—39)

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This invention relates to certain new and useful improvements in jet heaters.

The primary object of the invention is to provide a heater for enclosed spaces, such as rooms, and wherein the heating element receives its energy preferably from an electrical source, the character of heater being such as to cause increased circulation of heated air without recourse to mechanical or other forced draft devices.

A further and important object of the invention is to provide a heating device for mounting within a room, preferably in proximity of a vertical side wall thereof and of such construction as to permit air in proximity of the floor line to enter the lower end of the heater and exit from the upper end of the heater in the general area of the ceiling of the room and above what may be termed the "comfort zone" of the room.

It is a further important object of the invention to provide an air circulating heater of the foregoing character and of such construction as to include inherent insulating characteristics so that when mounted in an exposed position within a room, the outer surface thereof will have a temperature considerably lower than the elevated temperature of air flowing therethrough and thereby eliminate danger of burning by contact with the outer surface of the heater.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the accompanying drawings:

Figure 1 is a front elevational view of the heater, with the lower end thereof partly broken away and shown in section to illustrate the spaced conduit or tube arrangement of the heater providing separate air passages therethrough,

Figure 2 is a side elevational view of the heater supported on a room wall that is fragmentarily illustrated in section,

Figure 3 is a horizontal sectional view taken on line 3—3 of Figure 1, showing the double tube arrangement of the heater and the devices for holding the tubes in spaced relation,

Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 1 and illustrates insulating plate members respectively carried by the two tubes and in turn connected together to hold the tubes in assembled relation against relative longitudinal movements,

Figure 5 is a vertical sectional view taken on line 5—5 of Figure 4, showing the strip heaters

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within the inner tube and a source of electrical energy in communication therewith, and

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 1.

Briefly described, the air heater of this invention comprises a pair of conduits or tubular members of different cross-sectional areas, one within the other, with their longitudinal axes approximately coincidental, with the tubular members open at both the lower and upper ends so that air entering the lower end will flow through the inner tubular member and in the space between the inner and outer tubular members for exit at the upper ends thereof. Heating elements, preferably of an electric character, are located within the inner tubular member and are so arranged therein as to cause increased heating of the air at the lower end of the heater and within the inner tubular member, while the air flowing upwardly between the two tubular members is heated by conduction from the inner tubular member so that when the heater is mounted in an exposed position within a room the outer surface thereof will not be excessively heated.

Referring more in detail to the accompanying drawings and particularly to Figures 1 and 2, there is disclosed a jet air heater that has been especially designed for commercial use, such as in the heating of an office room, a storage room, a room in a warehouse or the like, and said heater comprises a pair of assembled outer and inner tubes 10 and 11 respectively, the inner tube terminating at its lower end in spaced relation to the lower end of the outer tube 10, while the upper end of the inner tube also terminates at a point below the upper end of the outer tube, the latter being flared laterally as shown at 12 for the discharge of heated air in a substantially horizontal direction as indicated by the arrow lines 13 in Figures 1 and 2. The heater that is in the form of an elongated tubular member as shown is mounted in a vertical position upon the side wall 14 of a room or the like, with the lower terminal end thereof spaced from the floor line 15 while its upper flared end 12 that is substantially horizontally directed away from the side wall 14 terminates below the ceiling 16. Suitable fastening means, such as angle brackets 7 and in the number desired, secure the heater to the side wall 14 as illustrated in Figures 1 to 3.

To maintain the tubular members 10 and 11 in spaced relation with their axes approximately coincidental, and in a manner which will allow slight endwise travel of the inner member relative to the outer member in compensation of expan-

sion and contraction movements, spring clips 18 are employed, these clips being anchored as at 19 to the outer face of the inner tube 11 and providing bowed centers which bear against the inner faces of the outer tubes 10. While the spring clips 18 are illustrated as being positioned adjacent the upper and lower ends of the inner tubular member 11, it is to be understood that they may be dispersed wherever desired along the length of said member to maintain centering thereof relative to the outer tube 10. It is further to be understood that other spacer devices of a type which will allow slippage between the tubes may be substituted for the clips. To maintain the tubular member 11 against displacement, the said member is anchored to the outer member 10 at a point central to the length of the assembly. As can be seen from an inspection of Figs. 4 and 5 of the drawings, registering openings 20 and 21 are cut in the two tubes, and applied as closures for these openings are insulation plates 22 and 23. Nuted-bolt and spacer combinations 24 connect the insulation plates one to another and to the tubular members. For purposes presently to appear a housing or casing 25 covers the outer insulation plate 23 and is attached to the outer side of the tubular member 10 as at 26. While the tubular members 10 and 11 are herein illustrated as being rectangular in cross-section, it is self-evident that they may possess other cross-sectional configurations without departing from the spirit of the invention.

For the heating of the air flowing through the tubular members, heater elements are located within the inner tube 11 and are preferably in the form of elongated strips constituting electrical resistance elements, a pair of such heater strips 27 and 28 being proximate the lower end of the tube 11, while a single heater strip 29 is proximate the upper end of the tube 11. The heater strip 27 is supported at its upper end on a side wall 11^a of the tube 11 by means of a nut and bolt combination 30 and is spaced from said wall 11^a by a spacing collar 31, the lower end of said heater strip 27 being similarly supported as designated in general by the reference character 32 in Figure 3. From an inspection of the drawings, it will be observed that the two heater strips 27 and 28 in the lower section of the tube 10 are diagonally offset with respect to each other and that the heater strip 29 in the upper end of the tube 11 is in vertical alignment with the lower heater strip 28, adjacent ends of the two heater strips 28 and 29 being connected together by a bolt and spacer combination 33 that is anchored as at 34 in the wall 11^a of the inner tube 11. A nut and bolt combination with a spacer element designated 35 connects the upper end of the heater strip 29 to the wall 11^a, while the lower end of the lower heater strip 28 is supported on the wall 11^a by means of the nut and bolt combination and spacer element 36.

From an inspection of Figures 1, 2, and 5, it will be observed that the upper end of the heater strip 27 and the adjacent connected ends of the heater strips 28 and 29 are in horizontal alignment with the insulation plates 22 and 23 and that electrical devices, part of which are encased in the housing 25, extend through said insulation plates for engagement with said heater strips. A pair of conductor wires 37 from a source of electrical energy extend through a conduit 38 that enters the lower end of the housing 25 and within said housing the conductor wires now designated 39 and 40 have branch lead-in and return con-

ductors for the supply of energy to the heater strips 27, 28, and 29. For the supply of energy to the heater strip 27 a branch wire 41 from the conductor 39 communicates with a terminal 42 attached to the heater strip 27, a second terminal 43 also attached to the heater strip 27 having a wire connection 44 with the conductor 40, thereby completing the circuit for the heating of the strip heater 27 by resistance. It will be observed that the terminal members 42 and 43 extend through the insulation plates 22 and 23. The supply of energy for the other lower heater strip 28 is by way of the wire 45 from the conductor 39 to the terminal 46 that communicates with the heater strip 28 while the return terminal 47 has a wire connection 48 with the conductor 40. For the operation of the upper heater strip 29, the wire 49 from the conductor 39 connects with one binding post 50 attached to the heater strip, a second binding post has a wire connection 52 with the other conductor 40.

It will be observed that the heater has two separate air passages 53 and 54 therethrough, the passage 53 being through the inner tube 11, while the passage 54 is between said tubes and surrounds the inner tube. Cold air or air at room temperature enters the lower end of the heater as indicated by the arrow lines 55 in Figures 1 and 2 and flows in separate paths upwardly through the heater in the passages 53 and 54. The air entering the passage 53 within the inner tube contacts the heater strips 27 and 28 and the air in rising through this heat zone has the velocity thereof progressively increased by the heat activity and emerges at the upper end of the inner tube at a relatively high rate of travel. With the placement of the two heater strips 27 and 28 adjacent the lower end of the inner tube and with a single heater strip adjacent the upper end of the inner tube, air entering the lower end of the heater has the temperature thereof quickly raised, with the single heater strip adjacent the upper end being operative for holding the air at the increased temperature until it escapes from the upper end of the heater. A second body of cold air or air at room temperature adjacent the floor 15 flows upwardly through the passage 54 and by heat radiation from the inner tube a moderate temperature rise is imparted thereto and an inherent increase in velocity commensurate with the rise of temperature and with its upward flow. At the upper end of the inner tube 11 the two air streams merge and are mixed so that the two intermixed streams issue at the upper end 12 of the outer tube 10 at the desired velocity and temperature in a direction as indicated by the arrow lines 13 across the room and away from the wall 14.

Further, in the operation of the device, it will be understood that the high velocity of the heated air flowing upwardly through the passage 53 when merging with the air in the passage 54 at the upper end of the inner tube 11, will tend to draw air upwardly through the passage 54, at such speed or velocity to a degree that the air flowing upwardly through the passage 54 will in effect possess heat insulation characteristics for the heated air in the passage 53 so that the temperature of the outer tube 10 will not be unduly raised. Heated air at the desired temperature issues from the upper flared end 12 of the tube 10 in a substantially horizontal direction for a considerable distance which results in a complete circulation of heated air through the enclosed space or room.

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While there is herein shown and described the preferred embodiment of the invention, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

What is claimed as new, is:

1. In a room heater, an elongated heater casing arranged to occupy a vertical position and formed with separate air-flow passages running lengthwise of the casing and placed one within the other, the casing being open bottom and top, and heating instrumentalities one of greater and the other of lesser heating capacity both supported within the inner said passage with the greater instrument lying toward the bottom and the lesser instrument lying toward the top of the passage.

2. In a room heater, an elongated heater casing arranged to occupy a vertical position and formed with separate air-flow passages running lengthwise of the casing and placed one within the other, the casing being open bottom and top, and heating instrumentalities one of greater and the other of lesser heating capacity supported one above the other within the inner said passage with the lesser instrument uppermost.

3. The heater of claim 2 in which the heating instruments are comprised of electrically energized strip heaters disposed longitudinal to the passage.

4. In a room heater, an elongated outer casing arranged to occupy a vertical position relative to the room which is to be heated and extending from adjacent the floor line to very nearly the ceiling limit of the room, said casing having an air admission opening at the bottom and an air outlet at the top with said top opening directed horizontally inwardly toward the center of the room, an inner casing open top and bottom and supported within the outer casing to describe an inner passage within the inner casing and an outer passage between the two casings, and an electrically-energized heating element housed in the inner casing, said top opening of the inner casing being spaced a material distance below the air outlet to assure a commingling of the ascending inner column of hot air with the ascending

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outer column of comparatively cold air before issuance of the combined air columns into the room.

5. In a heater of the character described adapted for placement adjacent the side wall of a room or the like, said heater comprising a pair of elongated tubular members, one within the other and with a space therebetween forming separate air passages, the longitudinal axes of the two tubular members approximately coinciding, the lower end of the outer tubular member serving as an air inlet to both passages and the upper end of said outer member being laterally bent to provide a substantially horizontal outlet, an electrically-energized heating element received in the inner tubular member, the upper end of the inner tubular member terminating at such a distance below the upper end of the outer member as to cause the ascending column of hot air issuing from the upper end of the inner tubular member to exert a substantially inductive influence upon and commingle with the air present in the outer passage before reaching the upper end of the outer member for discharge into the room.

6. A heater according to claim 5 wherein means is provided for holding the tubular members in operating relation while permitting moderate and relative movement in an endwise direction compensating for differences in expansion and contraction between the two members.

ALBERT W. BUELL.

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