Feb. 23, 1943. A. E. STACEY, JR 2,312,272

AIR DISTRIBUTING APPARATUS

Filed Sept. 11, 1939

Fig. 1.

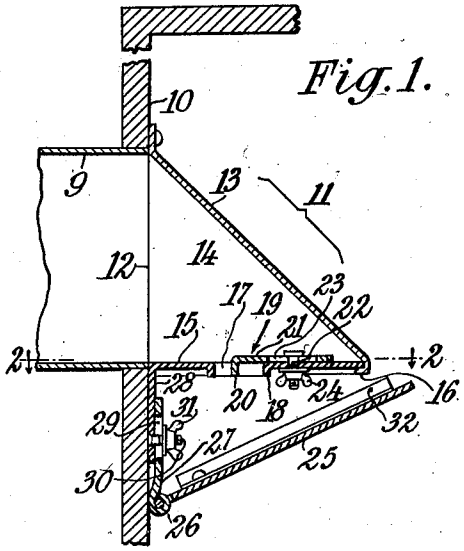


Fig. 3.

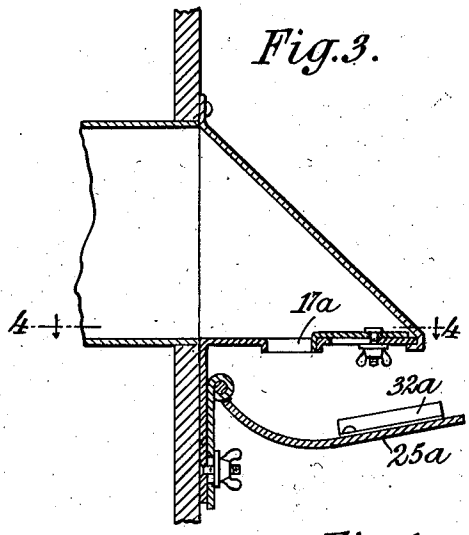


Fig. 2.

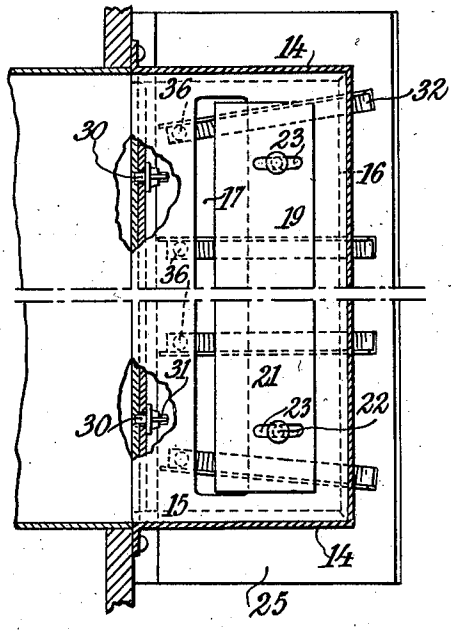
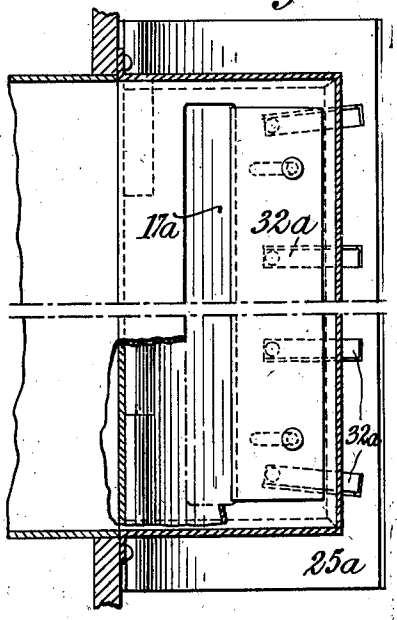


Fig. 4.



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2,312,272

AIR DISTRIBUTING APPARATUS

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Application September 11, 1939, Serial No. 294,275

7 Claims. (Cl. 98—40)

This invention relates to air conditioning systems, and more particularly to improvements in apparatus for distributing and circulating conditioned air within an enclosure.

It is the general object of the invention to provide an outlet for introducing conditioned air into a room or other enclosure at high velocity and at a substantial temperature differential, and for distributing that air uniformly and for mixing it thoroughly with room air to produce a gentle circulation of tempered air throughout the occupied part of the room.

It is another object to provide an outlet having an orifice through which conditioned air may discharge at high velocity, with means adapted to reduce the velocity of the issuing air and for effecting its distribution within the room to be conditioned, which means also serve to conceal the orifice from the normal view of persons in the room.

It is yet a further object of the invention to provide an outlet of the foregoing character with means which are readily accessible from within the room to vary the effective area of the orifice to regulate the quantity of air passing therethrough, and with other means which intercept the air leaving the orifice, disperse it and direct it to those parts of the room where it is needed.

The full nature of the invention, along with other objects and various features thereof, will be more fully understood from a consideration of the following description in the light of the accompanying drawing, in which

Figure 1 is a vertical sectional view of an outlet embodying the principles of the present invention, applied to a supply conduit for distributing conditioned air within an enclosure.

Fig. 2 is a plan view of the structure of Fig. 1, certain parts thereof being broken away better to show underlying ones;

Fig. 3 is a view similar to that of Fig. 1 illustrating an outlet embodying the invention in a modified form, and

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3.

In the drawing, and referring first to Figs. 1 and 2, the numeral 9 indicates a branch conduit through which conditioned air may be supplied from any appropriate conditioning apparatus (not shown) to a room or other enclosure as indicated generally by the walls 10. The usual practice is to supply the conditioned air at a temperature which is markedly different from that existing in the enclosure, whereby a small quantity of it may suffice to temper the much larger volume of air in the enclosure. If this intensely conditioned air were introduced and allowed to follow its normal course into the average room, it would not achieve a general tempering of the room air but on the contrary would create drafts and produce streaks of too great warmth or coolness for the comfort of occupants. An outlet, generally designated 11, is needed to effect uniform distribution of the conditioned air, and a thorough mixing of it with room air.

The outlet of the present invention comprises a box or chamber adapted to be mounted upon a wall of the room at a point as much above the occupied part or zone as is practicable. In low ceilinged rooms it will be mounted near the ceiling; in others, at least several feet above what might be considered the average headline, so that air discharged from the chamber may have an opportunity to spread and to mix with room air before it reaches the occupants.

In the preferred embodiment the box is of triangular cross section having an open rear side 12 communicating with the supply conduit, a sloping front wall 13 and vertical end walls 14 provided with flanges for use in mounting the outlet, and a horizontally disposed bottom plate 15. The front and end walls may conveniently be made from a single piece of sheet metal, and the bottom plate may or may not be formed integrally therewith. In the illustrative structure a separately formed bottom plate is used, and is held in place by the inturned lower edges 16 of the front and end walls, although any other suitable construction may be adopted.

The bottom plate is provided with an orifice 17 which directs a stream of conditioned air downwardly into the room. It is preferred that the edges of the orifice be flanged or rolled as at 18, which may conveniently be done by stamping or punching the plate, to form what is in effect a short nozzle having smooth, well-rounded, surfaces over which air may flow at high velocity in expanding from duct pressure to that of the enclosure without whistling or creating other objectionable noises.

The regulation of the quantity of air discharged is preferably achieved by varying the effective area of the orifice. This may conveniently be done by providing an adjusting plate 19 preferably having a flanged edge 20 extending through the orifice parallel to one of its edges, and a body 21 attached to the bottom plate 15 by bolts 22 which extend through slots 23 (Fig. 2) in the body for cooperation with wing nuts 24 located on the under side of the bottom plate. The ad-

justment involves nothing more than a loosening of the wing nuts and a shifting of the position of the plate 19 to bring its flanged edge 20 closer to, or to move it further from the opposing flanged edge 18 of the orifice.

In operation air issues through the orifice at a fairly high velocity. It is not at all unusual for the outlet velocity to be 1000 feet per minute, and in many cases it is as high as 3000 feet per minute. Further, and as has been mentioned before, the difference between its temperature and that of the atmosphere of the room may be considerable, as much as 15° to 30°. If passed directly into the occupied part of the room it would produce drafts, and create hot or cold streaks; it would not temper the atmosphere in the desired way. In order to prevent that, the outlet includes a splash plate 25 disposed immediately beneath the orifice to intercept the issuing stream of air, absorb a large part of its velocity by impact, and distribute it evenly across the room. The splash plate is preferably hinged at 26 to legs 27 for vertical angular adjustment; and the supporting legs 27 are attached to the downturned flange 28 of the bottom plate, the legs having slots 29 therein through which bolts 30 pass for engagement by the wing nuts 31, so that the vertical distance between the orifice and the splash plate may be changed at will. Further, the splash plate is provided with vertical vanes 32, each riveted or otherwise attached thereto at one point only, for angular adjustment in a horizontal direction. These three adjustments lend flexibility to the outlet; make possible its installation in rooms of different sizes, shapes and ceiling heights. The vertical angular adjustment directs the issuing air either upwardly or downwardly to determine the distance which it will blow before settling into the occupied part of the room, and at the same time it determines the volume of air passing over the front edge of the splash plate as compared with that passing over its ends. The vertical adjustment is a concomitant of the adjustment of the orifice. If the latter is wide open then the distance between it and the splash plate should be relatively great; if constricted to reduce the volume of air discharged, then the splash plate may be moved closer to the orifice. Adjustment of the vanes of course directs the air to those parts of the room where it is wanted, and permits the streams to be directed away from ceiling lights, posts or other obstructions which would deflect it into the occupied part of the room prematurely.

The complete operation of the outlet may now be considered. After installation, the orifice is set—i. e., plate 19 is adjusted—to admit just that quantity of conditioned air which will be needed to temper the atmosphere of the room. That air, of course, issues from the orifice at a high velocity, but upon striking the plate loses substantially half of its energy, and splashes over the edges of the pan in all directions. The splash plate is adjusted in a vertical direction to direct the stream of air issuing over its front edge either upwardly or downwardly, as the case may be, so that some of it may carry to the farthest corner of the room. Further, the vanes 32 are adjusted in a horizontal position to direct the air sidewise, to direct it away from obstacles, for example, and to distribute it uniformly across the room. The conditioned air, dispersed and spread in this manner quickly loses the remaining part of its energy, thoroughly mixes with the room air, and filters through the occupied zone of the room to maintain it at a desired condition. The total result is a gentle flow of tempered air throughout the occupied area without drafts or streaks.

The device is shown in a slightly modified form in Figs. 3 and 4. In that embodiment the splash plate 25*a* is curved to present a concave face to the orifice 17*a*; and a stream of air issuing therefrom strikes the plate more or less tangentially. A great deal of its velocity is lost by impact, but not so much as is the case with the flat splash plate of the device of Figs. 1 and 2. The air thus leaves the plate at 25*a* at a somewhat higher velocity than in the first described case, and as a result has the ability to carry for a greater distance before descending into the occupied part of the room. This device, then, is particularly applicable to rooms of fairly great length, for long and narrow ones, for example, while the other one is particularly suited to shorter rooms.

In the device of Figs. 3 and 4 it will be evident that the vanes 32a cannot practically be made to extend across the full width of the splash plate as is the case in the device of Figs. 1 and 2. They are, accordingly, made somewhat shorter, being disposed only across the flat portion of the plate. In other respects, however, this device is substantially identical with Figs. 1 and 2 and its various constructional details need not be considered.

In both of these illustrated embodiments it will be noted that but a single outlet orifice is employed, and that it extends for substantially the full length of the bottom plate. This arrangement is preferred because it is both satisfactory and simple. It will be evident, however, that an aligned series of shorter slots, or of round holes, might be used instead, or that additional and parallel slots or rows of openings may be provided to increase the capacity of the device.

The outlet in both of its modifications is designed to project from the wall into the view of persons in the room. It is a feature of considerable practical importance, however, that it is not unsightly, and, in fact, that its presence will hardly be noticed. This follows from the fact that its front surface is sloped rearwardly so that it cannot be seen at all from many points in the room, and only faintly so from others; and of the further fact that the splash plate is both longer and wider than the bottom of the chamber, and is normally tilted at least slightly upward so as completely to conceal the unsightly orifice adjusting plate, vanes, and in fact all parts over which air passes and will rapidly become dirty by reason thereof. The splash plate presents a smooth and not unattractive surface which if painted to match the walls will hardly be seen from below. The visible surfaces of the outlet become soiled at no faster rate than the adjacent wall surface of the room. They will not, as is the case with most outlets, collect dirt in such a way as to spoil the decorative scheme of the room in which the outlet is mounted.

Since certain changes may be made in the embodiment of the invention without departing from the principles thereof, it is intended that the foregoing shall be construed in a descriptive rather than in a limiting sense.

What I claim is:

1. An outlet for an air conditioning system comprising a casing adapted to be mounted with-

in a room above the zone of occupancy thereof and to be connected to a source of intensely conditioned air, said casing having a bottom wall with an orifice therein and a nozzle projecting from its lower surface around said orifice through which conditioned air may discharge downwardly at high velocity, and a splash plate disposed beneath and spaced from said bottom wall to intercept issuing air and to disperse it across the room, an element connecting said splash plate and said casing, said splash plate being hinged to said element for movement about a horizontal axis to control the direction of flow of air across the room, and said element being slidably attached to a part of said bottom wall so that the distance between splash plate and said bottom wall may be varied, and a plurality of vertical vanes pivotally attached to the splash plate on its upper side to control the discharge of air in a horizontal direction.

2. An outlet for an air conditioning system comprising a casing adapted to be mounted within a room above the zone of occupancy thereof and to be connected to a source of intensely conditioned air, said casing including a bottom wall having a slot-like orifice extending lengthwise thereof with smoothly rounded flanged edges forming a nozzle through which conditioned air may discharge downwardly at high velocity, an adjusting plate disposed alongside of said orifice with a smoothly rounded flange projecting therethrough for cooperation with the opposing rounded flange of said nozzle, said adjusting plate being movable in a crosswise direction to vary the effective area of said nozzle, and means for holding the last mentioned plate in any one of its adjusted positions.

3. An outlet for an air conditioning system comprising a casing adapted to be mounted within a room above the zone of occupancy thereof and to be connected to a source of intensely conditioned air, said casing having a bottom wall with an orifice therein and a nozzle projecting from its lower surface around said orifice through which conditioned air may be discharged downwardly at high velocity, and a splash plate disposed beneath and spaced from said bottom wall to intercept issuing air and to disperse it across the room, said splash plate having a curved rear portion which is adapted to present a concave face to the lower end of said nozzle and being hingedly connected to said casing for movement about a horizontal axis to control the direction of flow of air across the room, and a plurality of vertical vanes each attached to the flat front portion of said plate at one point so that it may be adjusted to direct air passing over the plate at a desired horizontal angle.

4. An outlet for an air conditioning system comprising a chamber adapted to be mounted upon a wall of a room to be conditioned above the zone of occupancy thereof and to be connected to a source of intensely conditioned air at relatively high pressure, said chamber being of triangular cross section with a sloping front wall and a horizontal bottom plate, said bottom plate having an orifice therein with smoothly rounded, flanged edges defining a short nozzle through which conditioned air may discharge downwardly at high velocity, a splash plate disposed beneath said orifice to intercept and disperse the conditioned air, said splash plate being adapted for vertical angular movement to control the flow of air therefrom in a vertical direction, and being arranged substantially to conceal the chamber and orifice from the view of persons in the room.

5. An orifice according to claim 4 further characterized by the provision of a plurality of vertical vanes pivotally attached to the upper side of the splash plate to control the flow of air therefrom in a horizontal direction.

6. A conditioned air outlet installation comprising a chamber mounted upon a wall of a room to be conditioned above the occupied zone thereof and connected to a source of intensely conditioned air, said chamber being of triangular cross section, including a sloping front wall and a substantially horizontally disposed bottom, said bottom having a slot-like orifice therein extending substantially its full length with smoothly rounded, flanged edges defining a short nozzle through which conditioned air may discharge downwardly at high velocity, an adjusting plate disposed along one edge of said orifice with a smoothly rounded flange projecting therethrough parallel to the opposing flanged edge of the orifice, said adjusting plate being movable in a crosswise direction to vary the effective area of the orifice, a splash plate disposed beneath and spaced from said bottom to intercept the issuing stream of air and to disperse it, said splash plate being adjustable to vary the spacing between it and said orifice, and being hingedly supported from the chamber for vertical angular movement to direct the conditioned air across the room above the occupied zone thereof at a desired vertical angle, and a plurality of vertical vanes pivotally mounted upon the upper surface of the splash plate to control the discharge of conditioned air in a horizontal direction, said splash plate being both longer and wider than the bottom plate whereby it may substantially conceal the chamber and the orifice from the view of persons in the occupied zone of the room.

7. A outlet for an air-conditioning system comprising a chamber adapted to be mounted within a room to be conditioned above the zone of occupancy thereof and to be connected to a source of intensely conditioned air, said chamber including a wall having a slot like orifice extending lengthwise thereof with a smoothly rounded flange defining at least one of the longer edges of said orifice, an adjusting plate disposed alongside of said orifice with a smoothly rounded flange projecting therethrough for cooperation with the opposing flange of said wall to define a nozzle through which conditioned air may be discharged into the room at high velocity, said adjusting plate being movable crosswise of said orifice to vary the effective area of the nozzle and a splash plate disposed in front of said nozzle to intercept and disperse conditioned air discharged therefrom, said splash plate being hingedly connected to said chamber whereby its angular position with respect to said nozzle may be adjusted to control the direction of flow of air into the room.

ALFRED E. STACEY, JR.

CERTIFICATE OF CORRECTION.

Patent No. 2,312,272. February 23, 1943.

ALFRED E. STACEY, JR.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 8, claim 5, for "orifice" read --outlet--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of April, A. D. 1943.

Henry Van Arsdale,

(Seal) Acting Commissioner of Patents.