Jan. 9, 1934. D. D. KIMBALL ET AL 1,942,432

HEATING APPARATUS

Original Filed May 17, 1929

Fig. 1.

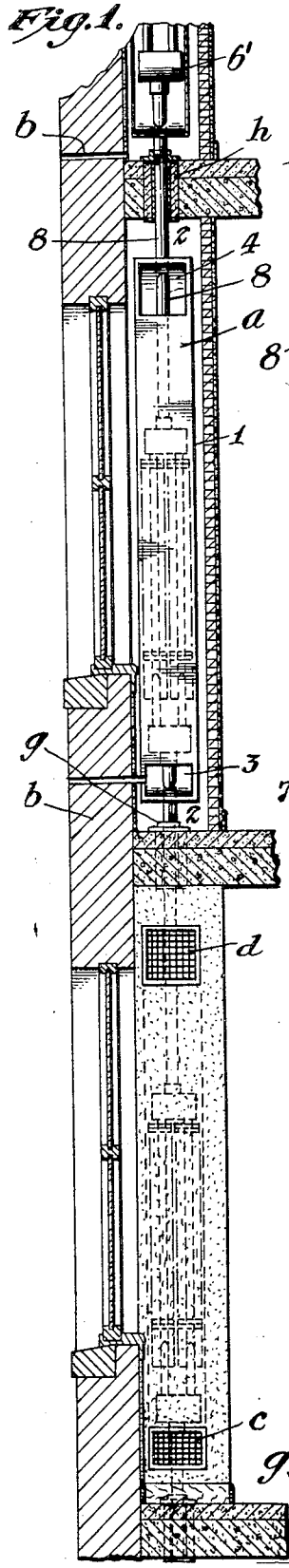


Fig. 2.

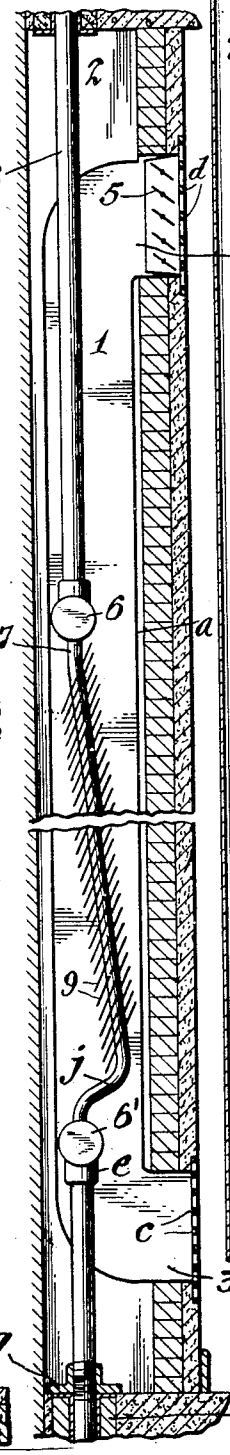


Fig. 3.

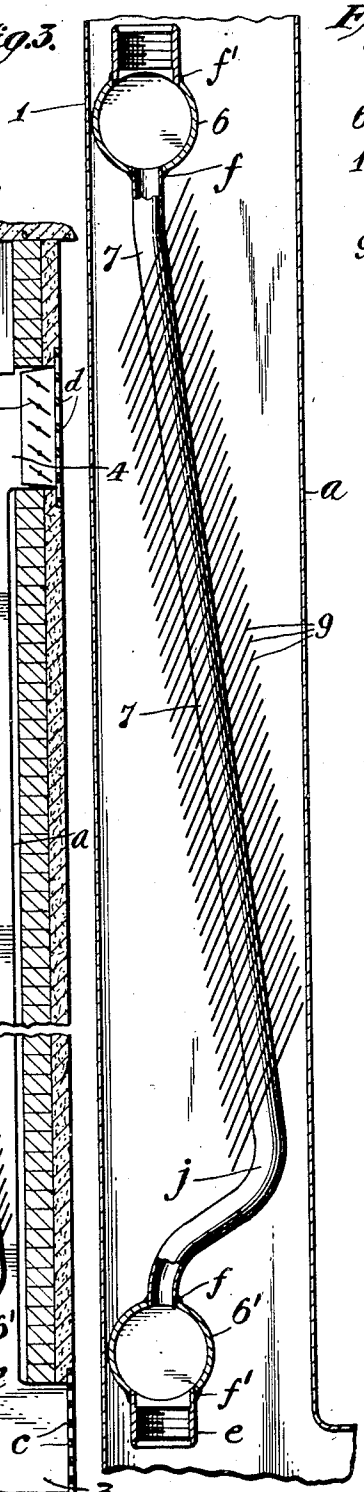
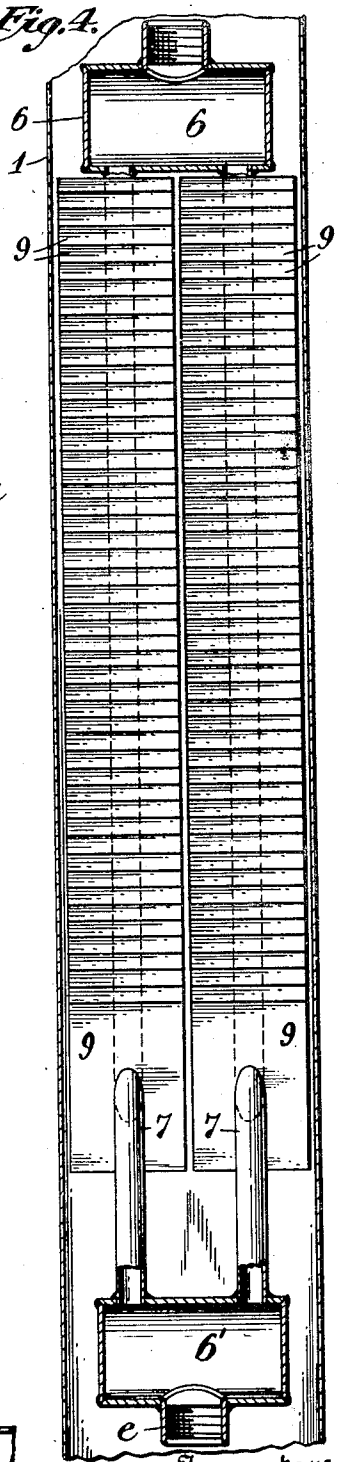


Fig. 4.



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HEATING APPARATUS

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Application May 17, 1929, Serial No. 363,964
Renewed June 2, 1933

9 Claims. (Cl. 257—136)

This invention relates to either heating or cooling apparatus for buildings and has for its particular objects the provision of an efficient concealed apparatus which is of compact and simple construction, is relatively inexpensive in first cost and is easy to install and to maintain.

Our invention constitutes an improvement upon the construction described in our co-pending application No. 324,544 and besides the various advantages possessed by such former construction which included the elimination of exposed radiators, radiator valves and branches, air valves, ordinary expansion joints and riser anchors, the excessive piping required by present systems and other features as explained in such co-pending application, this improvement is particularly adapted to production on a large scale, possesses increased heating capacity, is even cheaper to install and allows for expansion even more effectively than our aforesaid former construction.

The invention is more fully set forth in the following detailed description and drawing forming a part thereof, in which latter

Figure 1 is a fragmentary vertical section, partially broken away, of several stories of a building equipped with our improvement;

Fig. 2 is an enlarged vertical transverse section of a single story of a building showing one of the heating units in side elevation;

Fig. 3 is an enlarged side elevation, partially in section, of a heating unit showing the construction of the headers and

Fig. 4 is a front elevation, partially in section of a heating unit.

Referring to the drawing and the construction shown therein, the reference numeral 1 designates a casing which is adapted to enclose the heating or radiator units and which, as shown, are located in recesses 2 preferably formed between the inner and outer walls of a building in which the same are installed. Preferably the outer plate *a* of said casing constitutes a removable cover which is not secured in place during installation of the system until after the latter has been tested. At the bottom and top of said cover plate respectively there are an air inlet 3 and an air outlet 4, which openings admit of the circulation through the casing of air taken directly from an adjacent room, which may be freshened, if desired, by fresh air admitted to the bottom of the casing, such as the casings 1 through conduits *b*.

The respective air inlets and outlets are preferably provided with grills *c* and *d*. and also, as shown, a register 5 of well known construction, is associated with the upper grill, the same being adapted to control the amount of air which circulates through the duct or casing 1.

The individual radiator or heating units enclosed within each of the casings 1 comprise top and bottom cylindrical headers 6, 6′ which are interconnected by one or more crooked tubular radiation elements 7, the radiators illustrated employing two of the same.

Said headers 6, 6′ are identical with each other but reversed in position during assembly, the same being each provided with apertures to receive one of the ends of the crooked tubular elements 7 and also to receive one end of a coupling *e*, both of said tubular elements 7 and said coupling *e* being rigidly held in the desired position within the apertures in said header by means of fillet welds *f* and *f′*. Said couplings serve to respectively connect the top and bottom headers to the section 8 of the steam riser in which the said heating units are interposed. Flanged unions *g* serve to interconnect two adjacent sections and to anchor the same at each floor level. Preferably the conduits in each floor through which the riser sections extend are lined and preferably suitable heat insulation material, such as designated by the reference letter *h* may be employed to prevent unnecessary dissipation of heat into the floors.

The said tubular elements 7 are each provided with a series of obliquely extending fins or vanes 9 and preferably, as shown, each header carries at least two of these tubular elements 7, the same being disposed in parallelism with each other, but each tubular element, as shown is formed at its bottom portion into an ogee curve *j* to insure that the lowermost and uppermost vanes of each series will respectively come into close proximity to the front wall and rear walls of each casing 1 while the axis of the entire series of vanes will, as a consequence, extend obliquely and upwardly through the casing until the uppermost vane of the series is in proximity to the opposite wall of the case, thus admitting of the respective headers on each unit being in vertical alignment, while substantially preventing the passage of currents of air exterior of the fins without passage therebetween, thus substantially promoting the efficiency of the heat transfer between the fins and a heating or cooling medium passing through the tubular elements 7. As a consequence, a much greater volume of air is delivered at the outlet register while at the same time the temperature rise in the air as it passes through the

casing is substantially increased. Furthermore, the ogee section *j* aforesaid serves an expansion element and thereby eliminates any necessity for separate expansion joints to take care of the expansion and contraction of the system.

While the principal use for our improved apparatus is for heating purposes, it lends itself for employment in summer weather as a cooling apparatus, since it merely requires that the riser pipe be connected also to a source of cooled water or brine supply. In such an event, the metal casing is constructed so as to be water-tight and a drain is provided to draw off the water due to atmospheric condensation, the same being either conducted to a common drain pipe return leading to the basement or leading to receptacles at convenient locations on the different floors of the building.

Our improved heating system while possessing all of the advantages above enumerated, is extremely simple in construction and consequently of light weight and cheap and is both cheap and easy to install in new buildings or to replace the present types of heating systems in old buildings.

As is apparent from the foregoing construction, the heat units from a heating medium circulating in each radiator unit will be transferred by the fins to the air passing upwardly therearound through conduction, convection and radiation and where a cooling unit is employed, the heat units will be transferred from the air passing downwardly around the fins to the latter through convection and radiation and thence by conduction to the cooling medium in the radiator. The oblique disposition of the major part of each tubular element within the casing, whereby the maximum contact between the obliquely disposed fins thereof and the circulating air is obtained, effects the passage of the air currents through said casing with increased velocity and thereby the efficiency is increased about 16% as compared with a rectilineal tube equipped with similarly disposed fins.

Each radiator unit is virtually complete in itself and can be readily installed at a minimum of expense for labor since the headers are readily secured to the riser sections and the latter are easily connected together by means of the flanged or threaded unions. As a consequence, the entire cost of installation of such a heating system is reduced to a minimum and furthermore, in the event it is desired for any reason to remove any of the radiator elements, the same can be easily accomplished.

In small capacity installations we prefer to employ but a single tubular element 7 and omit the header members connecting the tubular elements 7 directly to the riser sections above and below the radiator unit.

If desired, the tubular element may be inverted with respect to the position shown in Figs. 2 and 3.

Obviously any number of tubular elements may be employed and the angle at which the fins are mounted on the tubular element may be varied from that shown, but it should be less than a right angle, and besides various other changes within the scope of the appended claims may be made without departing from the spirit of our invention.

What we claim and desire to obtain by United States Letters Patent is:

1. The combination, comprising a radiator unit which includes a tubular member for the circulation of a fluid, temperature-regulating medium therethrough, which tubular member extends throughout substantially the entire length of the radiator unit and is externally equipped with spaced, heat-conducting fins extending at an oblique angle to that portion of the tubular member to which they are attached and the major part of said tubular member being substantially rectilinear, extending at an oblique angle to and lying outside of a straight line interconnecting the centers of the respective ends thereof.

2. The combination, comprising a radiator unit which includes a tubular member for the circulation of a fluid, temperature-regulating medium therethrough, which tubular member extends throughout substantially the entire length of the radiator unit and is externally equipped with spaced, heat-conducting fins extending at an oblique angle to that portion of the tubular member to which they are attached, the major part of said tubular member being substantially rectilinear, extending at an oblique angle to and lying outside of a straight line interconnecting the centers of the respective ends thereof and header members secured to the top and bottom of said tubular member.

3. The combination, comprising a radiator unit which includes a tubular member for the circulation of a fluid, temperature-regulating medium therethrough, which tubular member extends throughout substantially the entire length of the radiator unit and is externally equipped with spaced, heat-conducting fins extending at an oblique angle to that portion of the tubular member to which they are attached, the major part of said tubular member being substantially rectilinear, extending at an oblique angle to and lying outside of a straight line interconnecting the centers of the respective ends thereof, header members secured to the top and bottom of said tubular member, the major axis of said header members extending at an angle to a straight line interconnecting the said centers of the ends of said tubular member.

4. The combination, comprising a radiator unit which includes a tubular member for the circulation of a fluid temperature regulating medium therethrough, which tubular member extends throughout substantially the entire length of the radiator unit and is externally equipped with spaced, heat-conducting fins extending at an oblique angle to that portion of the tubular member to which they are attached, the major part of said tubular member being substantially rectilinear, extending at an oblique angle to and lying outside of a straight line interconnecting the centers of the respective ends thereof, header members secured to the top and bottom of said tubular member, the major axis of each header member extending at a right angle to a straight line interconnecting the said centers of the ends of said tubular member.

5. The combination, comprising a radiator unit which includes a tubular member for the circulation of a fluid, temperature-regulating medium therethrough, which tubular member extends through substantially the entire length of the radiator unit and is externally equipped with spaced, heat-conducting fins extending at an oblique angle to that portion of the tubular member to which they are attached, the major part of said tubular member lying outside of a straight line interconnecting the centers of the respective ends thereof, header members secured to the top and bottom of said tubular member and means se-

cured to each of said header members on the opposite side thereof from that side thereof which is connected to one of the ends of said tubular member for securing said radiator unit to a riser section of a heating system.

6. The combination, comprising a radiator unit having a tubular member for the circulation of a fluid, temperature-regulating medium extending throughout substantially the entire length thereof, said tubular member, adjacent one end thereof, being formed into an ogee curve whereby, when said radiator unit is interposed between the aligned riser sections in a temperature controlling system of a building, the major portion of said tubular member will lie outside of a straight line interconnecting the centers of the ends of said tubular member and heat-conducting fins secured to said tubular member at intervals along the length thereof and projecting transversely of the axis of the portion of the tubular member to which they are secured.

7. The combination, comprising a radiator unit which includes a tubular member for the circulation of a fluid, temperature-regulating medium therethrough, which tubular member extends through substantially the entire length of the radiator unit and is externally equipped with spaced, heat-conducting fins extending at an angle to the axis of that portion of the tubular member to which they are attached, said tubular member extending at an oblique angle to a straight line interconnecting its respective ends and being of a configuration to provide for expansion and to increase the efficiency thereof as compared to its efficiency if rectilinear throughout the length thereof.

8. A radiator unit for a temperature modifying system, comprising a tubular member adapted to be connected at its ends into a riser pipe and formed with a straight inclined portion and a crooked end portion, and a casing enclosing said tubular member, said casing formed with vertically spaced openings for the flow of air therethrough.

9. A radiator unit for a temperature modifying system, comprising a plurality of parallel tubular members each formed with a straight inclined portion and a crooked end portion, headers into which the ends of said tubular members are connected, said headers adapted to be connected into a riser pipe, heat radiating fins mounted on the straight inclined portions of said tubular members, and a casing enclosing said tubular members and headers, said casing formed at its ends with openings for the flow of air therethrough.

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