Feb. 28, 1933. W. L. MACK 1,899,098

AIR HEATER

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Fig. 1.

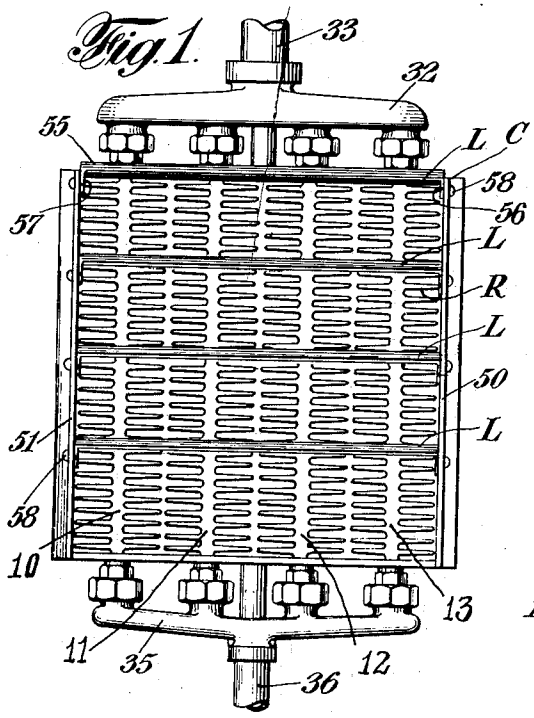


Fig. 2.

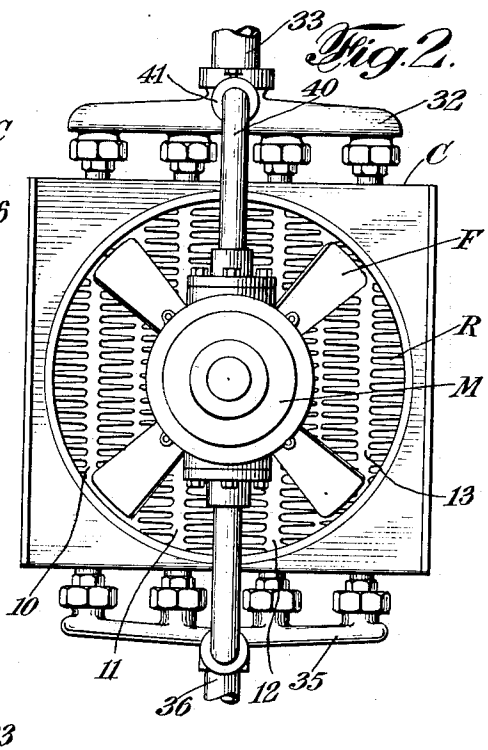
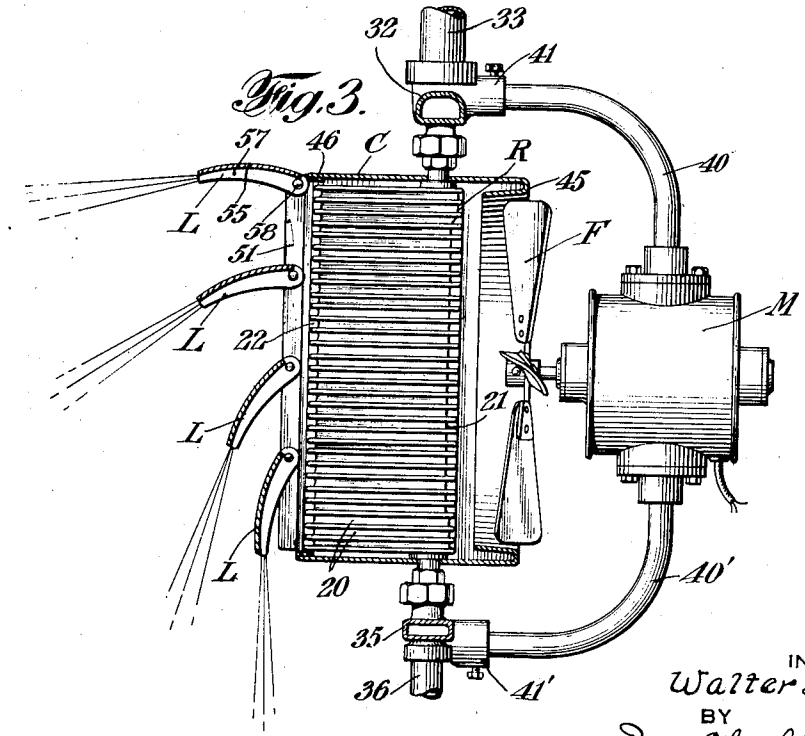


Fig. 3.



INVENTOR
Walter L. Mack
BY
Fay, Oberlin & Fay
ATTORNEYS

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Fig. 4.

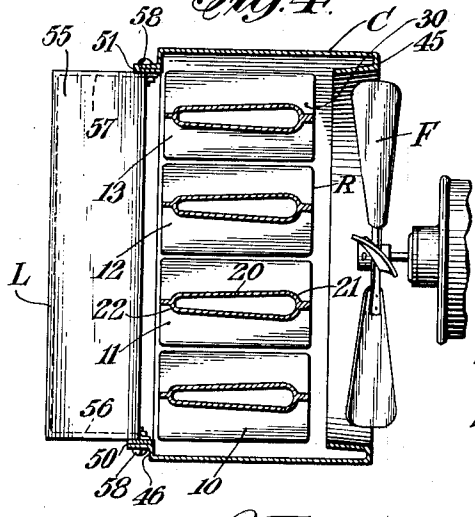


Fig. 9.

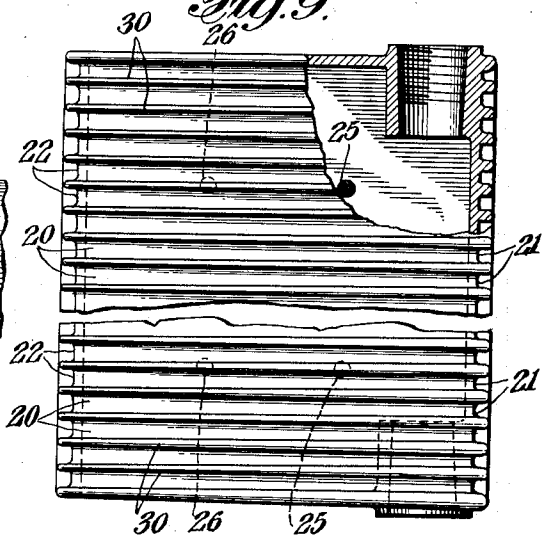


Fig. 5.

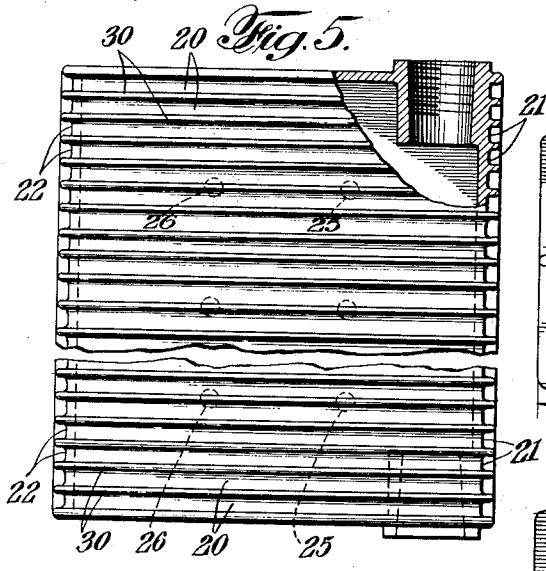


Fig. 6.

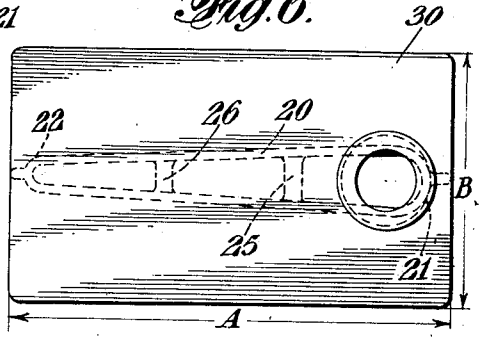


Fig. 8.

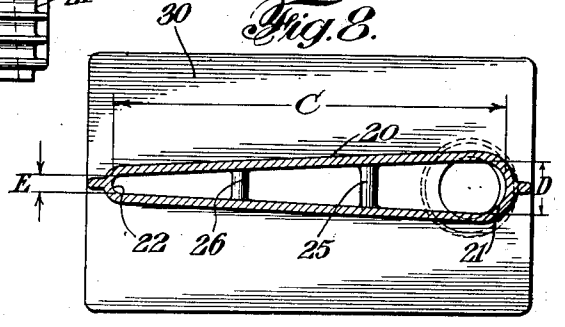
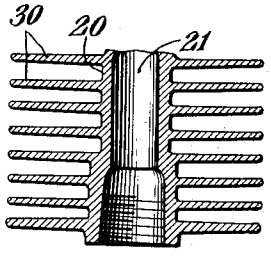


Fig. 7.



INVENTOR

Walter L. Mack

BY

Fay, Oberlin & Fay

ATTORNEYS

Patented Feb. 28, 1933 1,899,098

UNITED STATES PATENT OFFICE

WALTER L. MACK, OF TOLEDO, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AIRWAY ELECTRIC APPLIANCE CORPORATION, OF TOLEDO, OHIO, A CORPORATION OF DELAWARE

AIR HEATER

Application filed October 16, 1929. Serial No. 400,020.

This invention relates to air conditioning apparatus and more particularly to heating or cooling devices or distributing units.

Although the invention is applicable broadly to air conditioning apparatus or devices and may be used for heating, cooling, drying, or otherwise conditioning the air, it will be described particularly with reference to heating. Heating systems now in common use in houses, office buildings, manufacturing plants and other structures, involve the conduction or transportation of the heat by steam or hot water through pipes from a heat generator to radiators located in the rooms to be heated. Radiators of the ordinary type are not economically efficient since they merely provide hot spots in the rooms. The areas near the radiators and near the walls and ceiling are overheated and the heat losses through the walls and roof are great.

This invention has for its salient object to provide a device for distributing and directing heated currents of air to points and areas where the heat is needed.

Another object of the invention is to provide a device for rapidly and efficiently distributing and directing heated air currents.

Another object of the invention is to provide a radiator unit for heaters so constructed and arranged that maximum radiation for the size of the unit will be obtained and a minimum of resistance will be offered to the air passage through the radiator.

Further objects of the invention will appear from the following specification taken in connection with the drawings, which form a part of this application, and in which:—

Fig. 1 is a front elevation of a unit constructed in accordance with the invention; Fig. 2 is a rear elevation of the device shown in Fig. 1; Fig. 3 is an elevational view, partly in section, taken at right angles to Fig. 1; Fig. 4 is a top plan view of the heater unit, the upper end of the casing being removed and sectioned; Fig. 5 is an elevational view of one of the heating units; Fig. 6 is an end elevation of one end of the unit shown in Fig. 5; Fig. 7 is a sectional elevation on an enlarged scale showing a portion of the radiator unit; Fig. 8 is a sectional elevation showing the cross section of the conduit in the radiator unit; and Fig. 9 is an elevational view of a portion of a radiator unit showing a slightly modified form and arrangement of radiating fins.

The invention briefly described consists of a unit adapted for conditioning air and particularly of a heating unit comprising a radiator having conduits therethrough for the passage of the heating medium, radiating fins integrally connected to the conduits for radiating the heat, a fan for forcing air through the radiator, and deflecting means for directing the heated air to the areas to be heated. The fins are so constructed and mounted that unobstructed passages are provided through the radiator and the conduits extend substantially throughout the width of the radiator units, thus effecting the heating of the air throughout its entire path of movement through the radiator. Further details of the invention will appear from the following description.

In the form of the invention illustrated in the drawings there is shown a radiator R comprising a plurality of radiator units 10, 11, 12 and 13. A casing C surrounds the radiator R on four sides. A fan F is mounted at the rear of the radiator and casing and independently adjustable deflectors or louvers L are mounted at the front of the radiator.

Each of the radiator units comprises a central core 20 which is hollow and forms a conduit for the heating medium. The conduit, as shown clearly in Figs. 4 and 6, is tapered from its rear end 21 to its front end 22, the conduit being wider at the rear end 21 and gradually tapered toward the other end 22. In the form of the invention illustrated, transverse reinforcing members 25 and 26 are provided at spaced intervals in the conduits.

Each heating unit also has integrally cast with the cores or conduits, a series of parallel radiating fins 30, the fins being disposed at right angles to the core or conduit and extending throughout the width of the conduit.

The fins, as shown in Fig. 7, are tapered in thickness from their inner ends to their

outer edges, being thicker adjacent the heating conduit. Thus there is provided more metal to take up the heat at the portions of the fins nearest the source of heat or the conduit.

Furthermore, if desired, the fins may be tapered from end to end, as shown in Fig. 9. This form of construction provides more metal for taking up the heat at the ends of the fins nearest the inlet manifold and inlet ports to the conduits for the heating medium. Also, in the construction shown in Fig. 9, heated air which expands is given more space as it passes through the radiator units than the cool air entering the units.

The thickness, taper and dimensions of the fins and the size, taper and dimensions of the conduit, have all been most carefully worked out to give the maximum efficiency in the radiation of the heat. Furthermore, the relative proportions of the dimensions and sizes of the conduits and fins are most important.

In the particular unit shown, the length over all "A" of each fin is 7 inches, the width B is $3\frac{5}{16}$. The conduit has a dimension C of $5\frac{3}{16}$. The greatest inside width D of the conduit is $\frac{11}{16}$ of an inch and the inner walls of the conduit are tapered from the wide end to a narrow inside diameter E of $\frac{3}{16}$ of an inch. These dimensions are approximate but should be closely adhered to for best results.

The fins shown in Fig. 7 are tapered in thickness from approximately 7/64 of an inch at their inner edges adjacent the conduit to 5/64 of an inch at their outer edges.

It will be understood that units can be made larger or smaller but the same proportions should be maintained.

The unit is preferably formed of an aluminum alloy, consisting of aluminum and silicon combined with metallic sodium. Since the unit as a whole is formed of an integral casting, there are no joints, welds, flanges, or brazed or soldered connections to interfere with the conduction of the heat or render the unit liable to leakage. The construction is furthermore non-corrosive and not subject to cracking by freezing or to breakage by dropping. Fig. 7 illustrates the threaded opening cast in each end of each radiator unit casting.

Particular attention is directed to the stream line formation of the core or conduit 30 which facilitates the passage of the air through the unit and imposes the minimum resistance thereto. Attention is also directed to the fact that there is more space between the front ends 22 of the conduits of the adjacent units than at the rear end thereof, thus providing for the expansion of air, due to heat. Moreover, the air as it passes through the unit is heated during its entire passage, due to the construction of the conduit which extends from the front to the rear of the unit.

The conduits 10, 11, 12 and 13 are connected at their upper ends to a manifold 32 which receives steam or hot water from a main 33. At their lower ends the conduits of the units 10, 11, 12 and 13 are connected to a manifold 35 which empties into a main 38.

In the form of the invention illustrated, the motor M for the fan F is carried by an arm 40 mounted in a boss 41 carried by or formed on the manifold 32.

The casing C may be constructed in any desired manner and, as above stated, surrounds the radiator on four sides, namely, the top, bottom and sides. An extension 45 on the rear end of the casing has an opening therein surrounding the fan F and the casing has an extension 46 at the front thereof, having side walls 50 and 51 on which are mounted the louvers L. The louvers are provided with curved deflecting surfaces 55 and each louver has arms 56 and 57 at its ends, which are secured to the side walls 50 and 51 by screws 58. By independently adjusting the louvers to the desired angles, the air forced through the radiator by the fan can be deflected and directed to the area where the heat is desired. Attention is directed to the curved or stream line construction of the louvers by reason of which a minimum resistance to the passage of air is imposed.

It will be understood that the movement of the radiator units, the speed of rotation of the fan, and the adjustment of the louvers can be varied to suit conditions. Furthermore, any required number of units can be utilized, the units being so placed and the deflectors or louvers being so adjusted as to provide for an even distribution of heat throughout a room, thus equalizing the temperature in all parts of the room. The units can be mounted on and supported by the steam or hot water main. After one adjustment of the louvers has been made to suit the conditions, no further adjustment is necessary.

Although one specific embodiment of the invention has been particularly shown and described, it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claim.

What I claim is:

A radiator section for a space heater comprising a flattened tubular conduit, closely spaced, parallel, relatively wide and thin vanes cast integrally with said conduit in planes perpendicular to the major axial plane of said radiator, openings being provided in the respective ends of said conduit

for connection to fluid circulating means, and struts cast integrally with said conduit and extending between adjacent wall portions thereof at intervals along the length of the conduit.

Signed by me this 14th day of October, 1929.

WALTER L. MACK.