

O. S. BEYER.

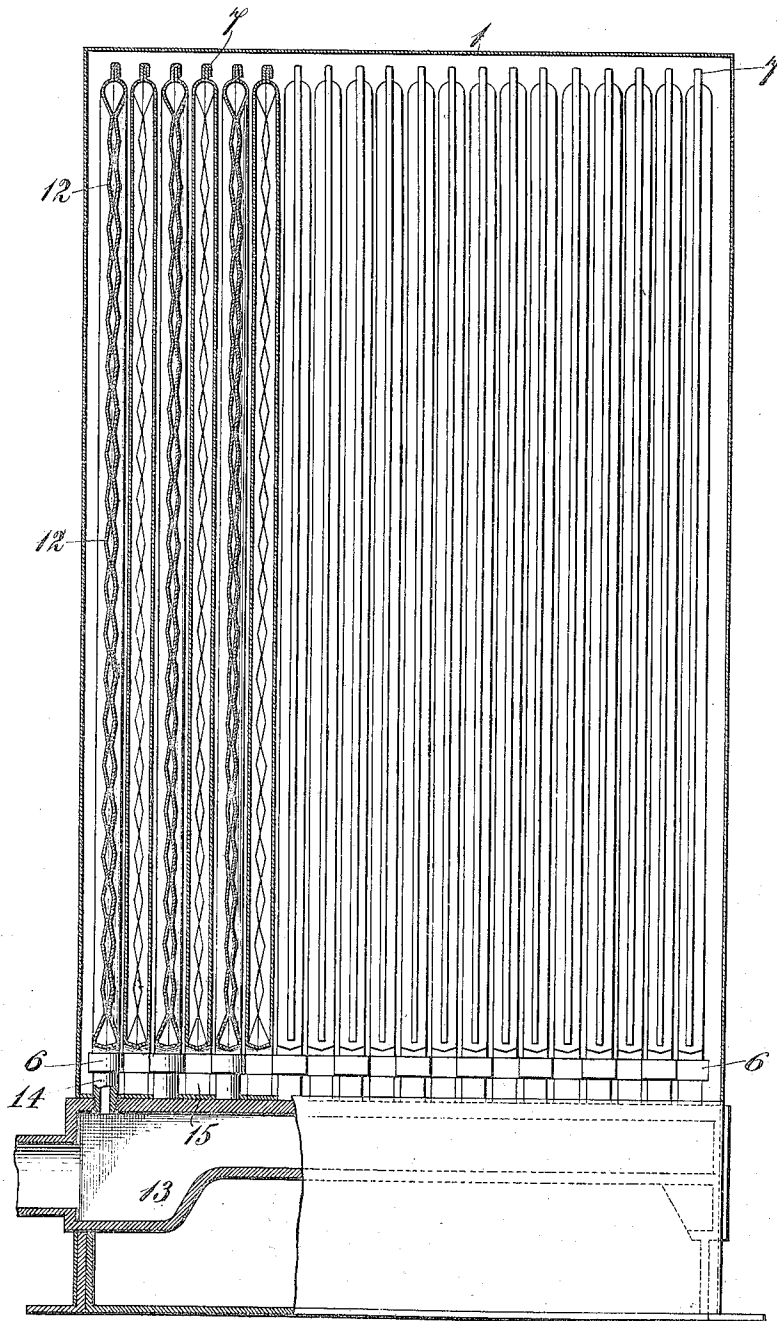
HEATER.

APPLICATION FILED NOV. 26, 1909.

1,057,404.

Patented Apr. 1, 1913.

3 SHEETS-SHEET 1.



WITNESSES=

W. L. Gilman.

N. D. McPhail

FIG. 4-

INVENTOR=

Otto S. Beyer

J. Phillips Van Emmon & Fish
attys

O. S. BEYER.
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3 SHEETS—SHEET 2.

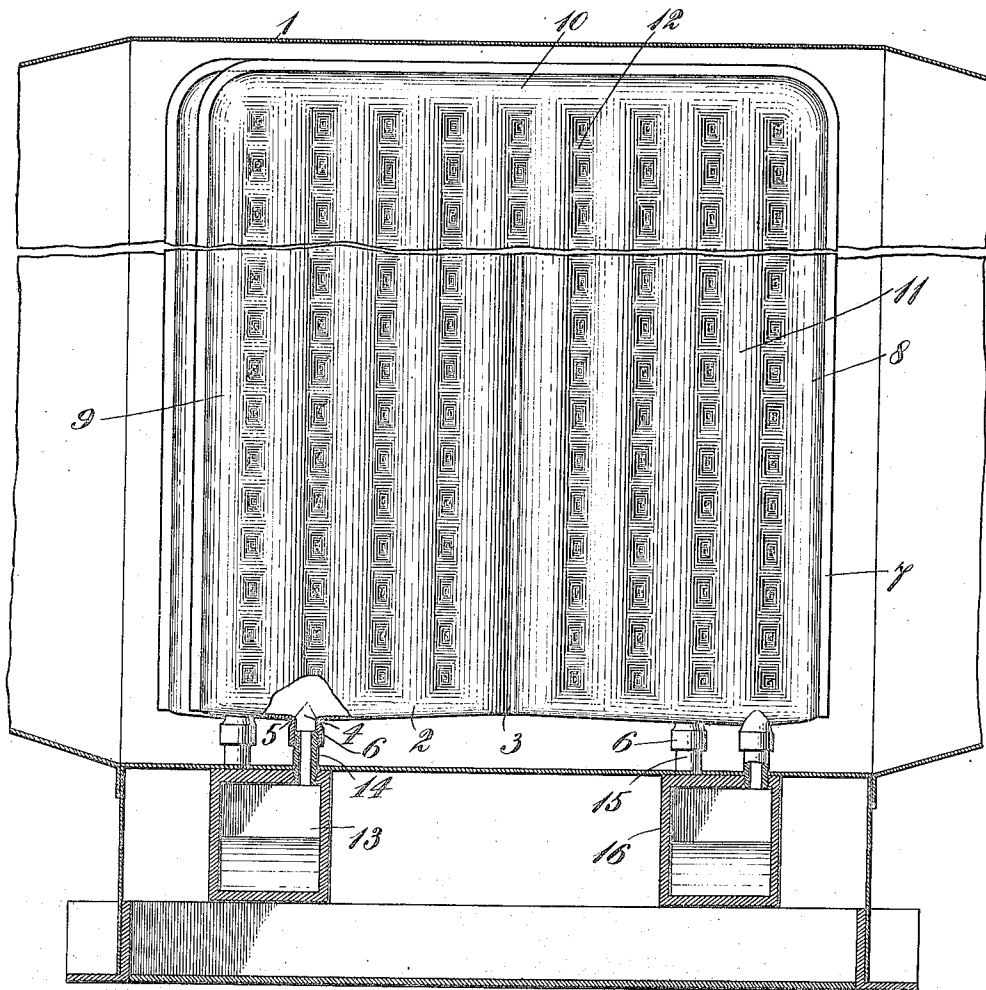


FIG. 2.

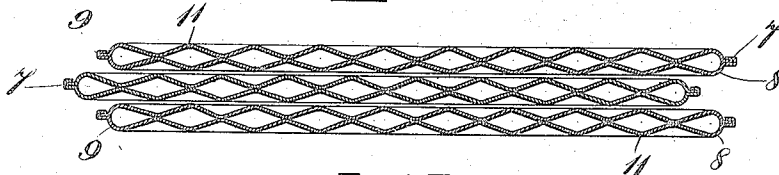


FIG. 3.

WITNESSES:

M. L. Gilman.

K. D. McPhail

INVENTOR:

Otto S. Beyer

by
Phillips Van Emmon & Fish
attys

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3 SHEETS—SHEET 3.

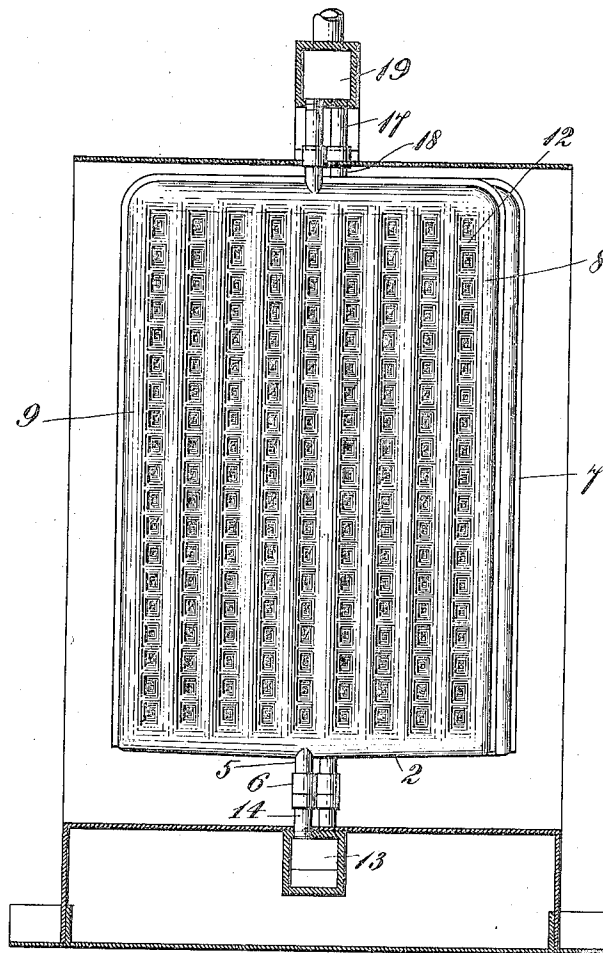


FIG. 4.

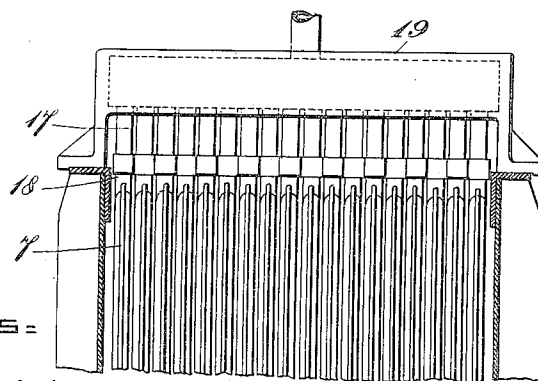


FIG. 5.

WITNESSES:

M. L. Gilman.

H. D. McPhail

INVENTOR=

Otto S. Beyer

*by Phillips Van Emmon & Fisher
attys*

UNITED STATES PATENT OFFICE.

OTTO S. BEYER, OF HYDE PARK, MASSACHUSETTS, ASSIGNOR TO B. F. STURTEVANT COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

HEATER.

1,057,404.

Specification of Letters Patent.

Patented Apr. 1, 1913.

Application filed November 26, 1909. Serial No. 529,879.

To all whom it may concern:

Be it known that I, OTTO S. BEYER, a citizen of the United States, residing at Hyde Park, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to radiators or heaters, and more particularly to radiators or radiator units which are formed from sheet metal.

It is one of the objects of the invention to provide a sheet metal radiator or radiator section which may be conveniently and economically manufactured, and which will be substantially free from the corrosive action due to the collection of water of condensation, and therefore not liable to become defective under continued use even when made from comparatively thin material.

It is a further object of the invention to provide a multiple section heater which will give a large heating area within a compact space, and will act upon the air passing through the sections in a more efficient manner than the usual pipe heater heretofore in use in high pressure installations.

With these objects in view the invention consists in the features of construction and combination of parts hereinafter described and set forth in the claim.

The various features of the invention will be understood from an inspection of the accompanying drawings, and the following detailed description of the heaters shown therein.

In the drawings Figure 1 is an end elevation partly in section of a multiple section heater embodying the invention; Fig. 2 is a vertical sectional view showing the heater sections in elevation; Fig. 3 is a horizontal sectional view through three of the heater sections showing the relative arrangement of the sections; Fig. 4 is a vertical sectional view similar to Fig. 2, showing a modified form of heater; and Fig. 5 is an end elevation of the upper part of the heater shown in Fig. 4.

In the drawings the invention is illustrated as embodied in a multiple section

heater especially adapted for use in heating air in ventilating, drying, or other installations, in which comparatively large volumes of air are to be heated and handled.

As shown, the sections of the heater are arranged within a casing 1, the ends of which are open, and are connected with the conduits or chambers through which the flow of air is produced in the usual manner by means of fans or otherwise.

Each section of the heater is formed from a single metal sheet, preferably steel, which is stamped or pressed to form the desired depressions therein, and is then folded through the center to bring the faces of the sections on opposite sides of the fold together, the contacting marginal portions or edges of the sections, and the other contacting surfaces of the sections being then united, preferably by electric welding. The radiator or heater section is so arranged that the transverse fold at the center of the sheet forms the bottom of the radiator, and the outlet for the steam and water of condensation is formed in this seamless bottom of the radiator by stamping or pressing out the metal previous to the folding of the sheet to form a flange or nipple to which a threaded union may be secured by electric welding or otherwise. The sheet of metal is preferably so stamped or pressed that the seamless bottom of the radiator is inclined toward the outlet, so that there can be no collection of water of condensation at any point where a crevice or joint occurs, and the danger of corrosion is consequently eliminated. In case the inlet as well as the outlet opening for the radiator or radiator section is located at the bottom of the radiator, this opening is also formed in the seamless bottom, and the sheet is so stamped or pressed that the bottom is inclined from the center in opposite directions toward the inlet and outlet openings.

In forming radiator sections for use in multiple section heaters for high pressure installations, it is preferred to employ the construction and form of radiator section shown in the drawings. As shown in Figs. 1, 2 and 3 of the drawings, each radiator section is formed from a single sheet of steel, or other suitable material, which is so shaped by suitable dies that when it is folded to bring the sections on opposite

sides of the fold face to face, a transverse passage or tube 2 is formed at the bottom of the radiator. In the case of comparatively large radiators such as shown, the transverse depression is so formed that vertically extending contacting faces are provided at 3 midway of the radiator which extends upward from the bottom across the transverse depression. The transverse depression is also so formed that the seamless bottom of the radiator formed by the fold in the sheet inclines toward the inlet or outlet openings 4. These inlet and outlet openings are formed by perforating the metal in the bottom of the transverse depression, and pressing or bending the metal around the perforations outward to form a flange 5 to which a union 6 may be secured, as by electric welding. The metal sheet is also so stamped or pressed that the sections of the sheet on opposite sides of the fold are provided with semi-tubular depressions extending from the ends of the transverse depressions around the edges of the sheet at a short distance from the edge, so as to leave marginal surfaces 7 at the edges, which are brought into contact when the plate is folded, and may be united by any suitable means, as by electric welding. When the marginal edges are united, these semi-tubular marginal depressions form vertical passages or tubes 8 and 9, and an upper transverse passage or tube 10, which is connected with the bottom tube or tubes by the tubes 8 and 9. Additional semi-tubular depressions are also formed in the sheet, and form the vertical tubes 11 extending between the top and bottom tubes in the completed radiator. The vertical passages or tubes of the radiator preferably intercommunicate with each other through horizontal passages 12 formed by shallow semi-tubular depressions in the metal sheet. In case both the inlet and outlet for the radiator section are formed in the bottom of the section, it is preferred to omit the transverse passages 12 between the two adjacent vertical tubes at the center of the section, except near the top of the section. With this construction the contacting surfaces between the two center vertical tubes or passages may be united, as by electric welding, so that the steam entering at one side of the center of the section will pass upward through that side of the section and downward through the other side of the section, and thus an efficient distribution of the steam will be effected. The comparatively restricted transverse passages 12 between the vertical tubes or passages causes an efficient breaking up and distribution of the steam, and adds to the efficiency of the heater section.

The location of the outlet for the water of condensation in the seamless bottom of the radiator, and below the joint at the

edges of the folded sheet, is an important feature of the invention. By thus arranging the outlet for the water of condensation, there is no danger that water will collect in any crevice or crack in the joint between the edges of the sheet, and thus the danger of corrosion and weakening of the joint during long continued use is eliminated or reduced to a minimum. This enables the use of a thinner metal than could otherwise be used, with a resulting decrease in the weight and cost of material, and an increase in the facility with which the metal sheets may be stamped or pressed and folded into the desired form.

In embodying these radiator sections in a multiple section heater, the inlet unions 6 are connected to a header 13 by screw threaded nipples 14, and the outlet unions 6 are connected by similar nipples 15 with a header 16. In connecting the radiator sections with the headers, the sections are so placed that the vertical tubes in one section register with the depressions between the tubes in the next adjacent section, as best indicated in Fig. 3. This enables the sections to be arranged compactly, and at the same time a sinuous passage is provided between the adjacent surfaces of the heater sections through which the air may readily pass. A large heating area is thus provided in a comparatively small space, and the heating surfaces are also arranged to secure an effective transmission of the heat to the air passing over the heating surfaces. As the air flows through the sinuous passages between the plates, it is deflected back and forth from one plate to the other, and thus brought into intimate contact with the heating surfaces without the formation of the eddies or counter-currents which are produced in the usual construction of pipe heaters provided with staggered pipes.

Instead of arranging both the inlet and outlet headers and the inlet and outlet openings to the heater sections at the bottom of the heater, they may be arranged as indicated in Fig. 4. As here shown, the outlet opening through which the water of condensation escapes from the radiator or heater section is formed in the center of the seamless bottom, and the bottom of the radiator is inclined from each side toward the outlet. The inlet 18 is formed at the upper end of the radiator or heater section, and is connected with the inlet header 19 through a nipple 17. In this case the flow of steam is from the upper end of the radiator toward the lower end, and communication between the adjacent vertical tubes or passages of the radiator is provided throughout the breadth of the radiator. With this construction the radiator sections may be supported or hung from the upper header, as indicated in Fig. 5.

In constructing radiator sections of comparatively large heating area, and especially if the sections are to be used in high pressure installations, it is preferred to secure the contacting surfaces between the transverse passages 12 by electric welding or other means. By thus uniting the opposing walls of the radiator, it is given sufficient strength to resist high pressures, even when formed of comparatively thin sheets of metal.

While it is preferred to employ the specific construction and arrangement shown and described, it will be understood that this construction and arrangement is not essential, and may be varied in accordance with the size of the radiator or heater sections, or to suit the conditions under which the radiator or heater sections are to be used, without departing from the invention.

Having explained the nature and object of the invention, and specifically described

certain forms of radiators in which it may be embodied, what I claim is:—

A radiator comprising a series of sections, each of said sections being composed of a single plate of sheet metal folded midway its ends to form adjacent plates having a seamless bottom connection, and each of said plates being provided with marginal joining flanges at its top and sides, and with vertical and horizontal semi-tubular depressions on their inner sides forming passages for the heating fluid, and with vertical and horizontal convex surfaces on their outer sides by which the currents of air passing between the radiator sections expand successively into the pockets formed between such convex surfaces.

OTTO S. BEYER.

Witnesses:

N. D. McPHAIL,
WARREN G. ODGEN.