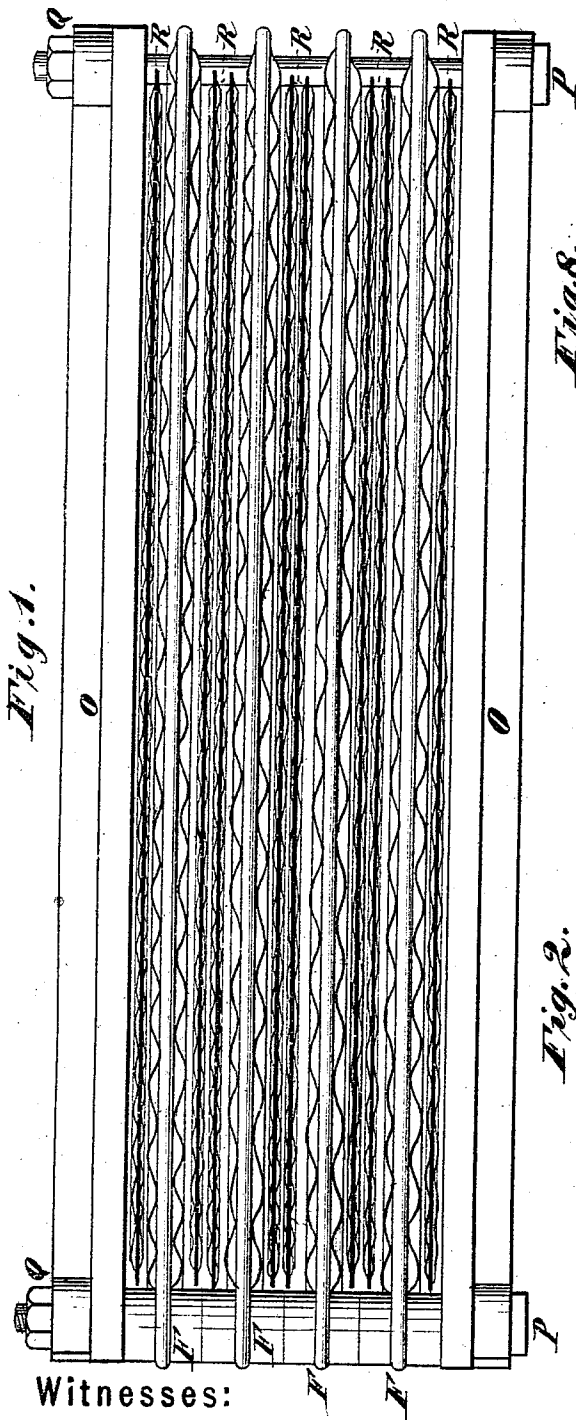


S. LLOYD WIEGAND.
Steam Heater.

No. 123,602.

Patented Feb. 13, 1872.



Witnesses:

Addison Max Hahn.
John S. Holloway.

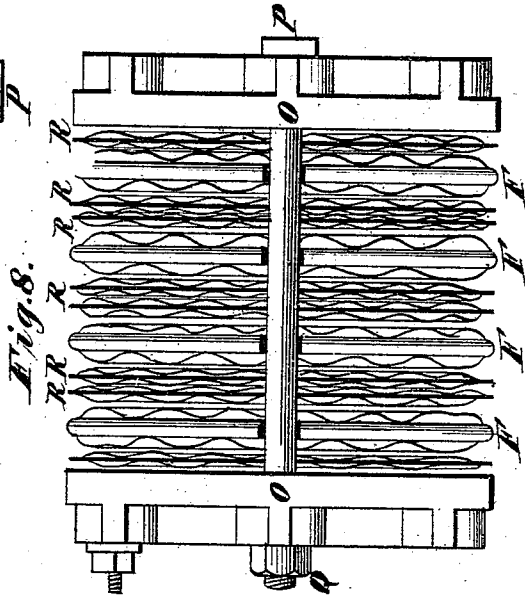
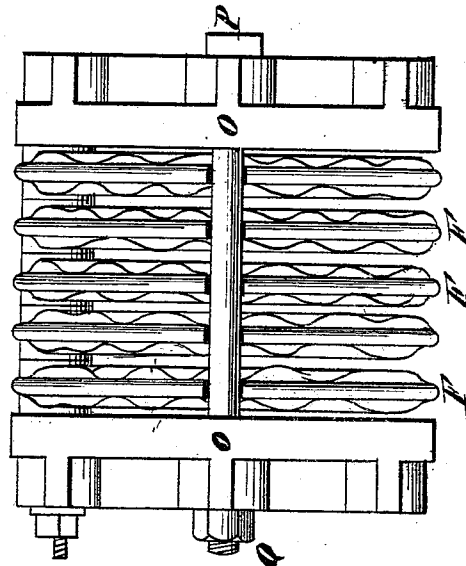


Fig. 2.



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Fig. 6.

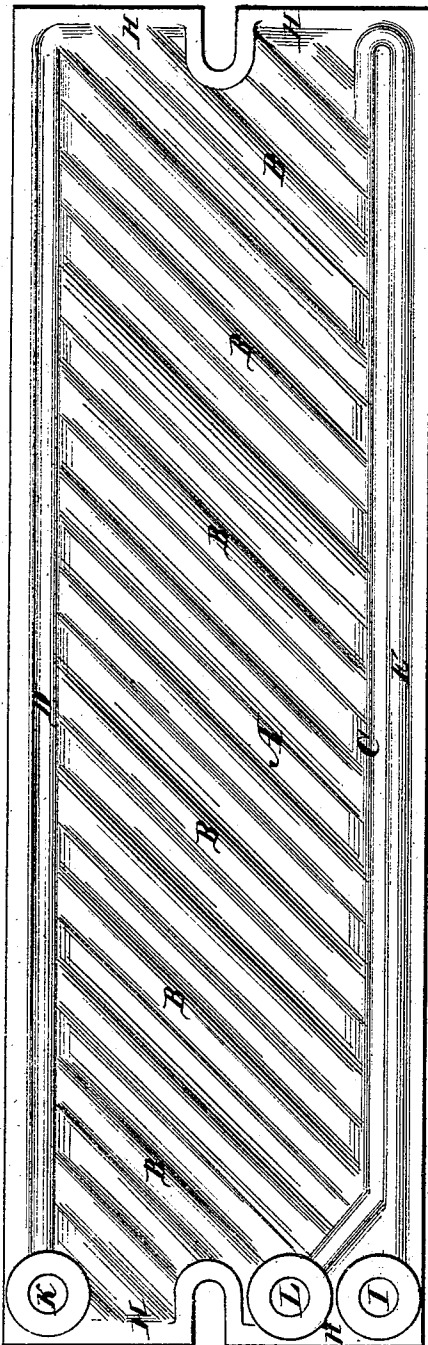
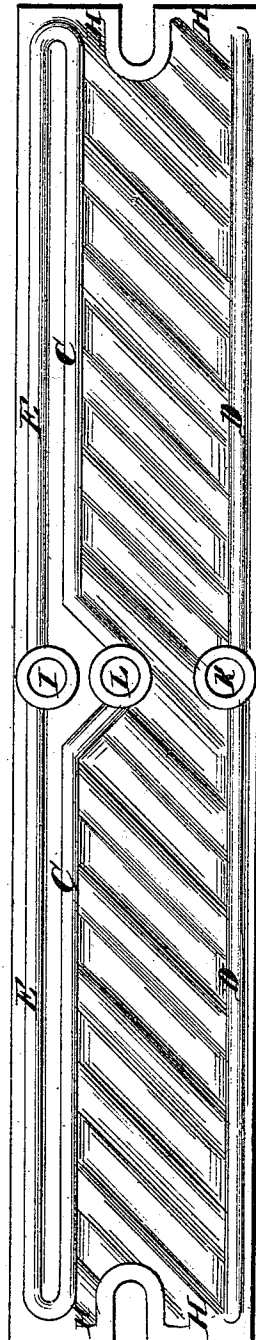


Fig. 7.



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Fig. 5.

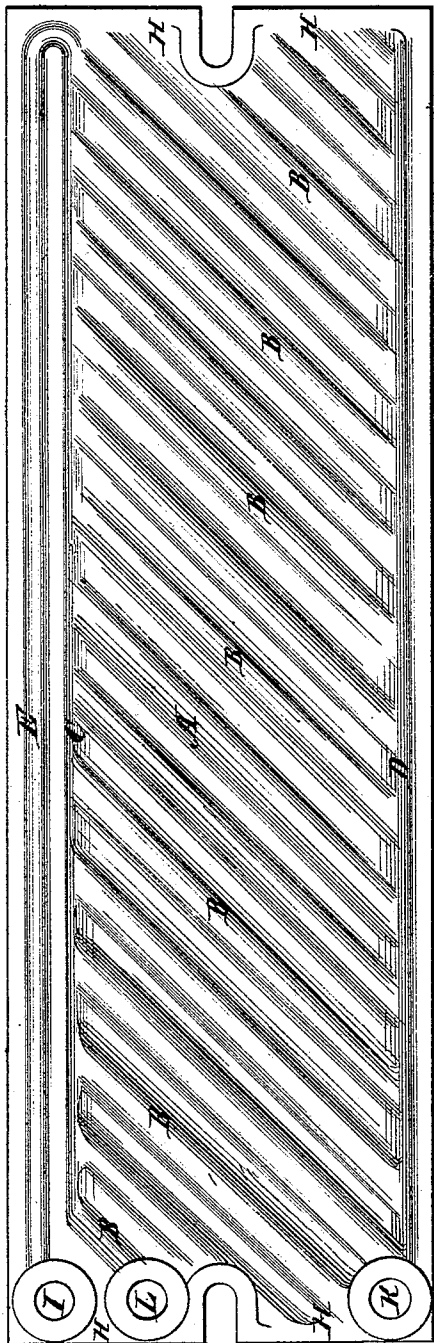


Fig. 10.

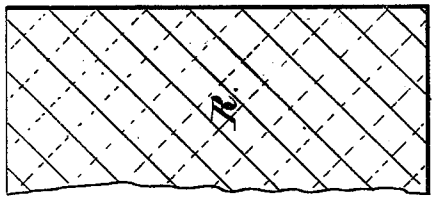


Fig. 9.

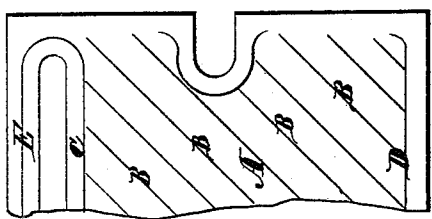


Fig. 4.

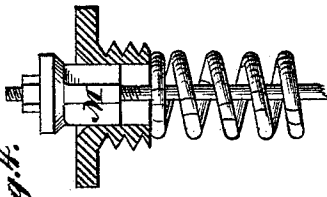
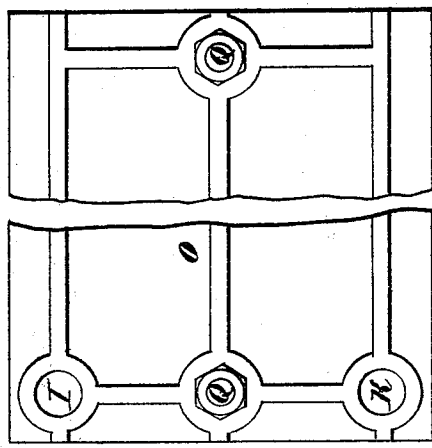


Fig. 11.



Fig. 3.



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UNITED STATES PATENT OFFICE.

S. LLOYD WIEGAND, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN STEAM-HEATERS.

Specification forming part of Letters Patent No. 123,602, dated February 13, 1872; antedated January 24, 1872.

To all whom it may concern:

Be it known that I, S. LLOYD WIEGAND, of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Radiator, for imparting heat from steam and hot water or other heated fluids to air, and thus warming apartments; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing and letters of reference marked thereon.

The nature of my invention consists in so forming a radiating surface that it can be made cheaply and strongly from thin metal, and also of such shape as to subdivide the air and steam currents so minutely as to render a small and compact radiator of this construction more efficient than others of more than thrice the bulk. I am thus enabled to use more durable material than can be afforded in other radiators.

The precise construction and operation of this invention will fully appear in the following specification and drawing annexed. The same letters of reference apply to the same parts in the several figures.

Figure 1 shows a plan. Fig. 2 shows an end elevation. Fig. 3 shows a side elevation. Fig. 4 shows the air-valve, and expansion spring for operating it, in partial section. Figs. 5 and 6 show the obliquely-corrugated plates of which each cell or chamber of the radiator is formed. Fig. 7 shows a modification in form of the chamber. Fig. 8 shows a mode of increasing the heating surface of the radiators. Fig. 9 shows a portion of one of the corrugated chambers, the dotted lines indicating the position and direction of the corrugations of the back or further side. Fig. 10 shows a portion of one of the intervening plates, (of iron,) marked R, (also shown in Figs. 1 and 8,) the dotted lines showing the location and direction of the corrugations of the adjacent similar plate; and Fig. 11 shows an upper or plan view of Fig. 10.

The plates are so placed that the lines of the corrugations in the two plates intersect each other. I corrugate obliquely metallic plates A A, as shown at B, into grooves or corrugations that do not extend to the edges, but are bounded by channels C and D upon the long sides of the plates, and at the end terminating in flat surfaces H H. The part of the plate between the channel D and the edges is flat,

and the part beyond the channel C is flat and has another channel, E, beyond it, which is parallel with the channel C. At the end to the left an aperture is made by which steam may be admitted to flow through the channel E into C, and thence through the corrugations B to the channel D, and out through the aperture K to the drip. At the end of the channel C is an aperture, L, to which an air-valve, M, is applied. The air-valve M is formed with a seat and a valve, with a stem like any ordinary poppet-valve, and is operated by a helical or spiral spring formed of two metals of different rates of expansion, and is operated by the temperature. When cold, the valve M is open, and permits any air contained in the apparatus to escape; but as soon as the spring becomes expanded it closes. The plates are put together in pairs, and are united by seaming or soldering, or both, although they might be riveted, but not so readily. Each pair of plates thus forms a chamber, F, which has a series of channels running obliquely in opposite directions on each side, and has three apertures—one marked K, near the bottom, to draw out the condensed water; one marked I, near the top, to receive the steam; and one marked L, to pass off the air. The portion of the chambers around the apertures I, K, and L is strengthened by additional pieces of metal, best made by castings, which pieces may be placed between the two plates forming each chamber, or may be brazed or soldered to the chambers in the shape of bushings, with lateral apertures opening into the channels of the chambers F; or the increased thickness may be applied in the form of collars, shaped so as to conform to the shape of the chambers around the apertures I, K, and L. The precise manner of applying them is unimportant, and will be determined by the convenience of the workman. A number of these chambers are secured together, as shown in Figs. 1, 2, and 3, by means of clamps O O and bolts P P and nuts Q Q, suitable washers or packings being interposed between the joints around the apertures I K L; although this may be dispensed with, and the joints sweated or soldered together. When placed together in the manner described, there are two series of channels intersecting each other between each chamber; and upon admitting air from below it becomes

finely divided, and, being heated, rises through the channels between the several chambers of the radiator. The chambers are held together by means of the bolts P P and clamps O O, and any tendency of internal pressure to expand them horizontally is thus resisted, while from the direction of the corrugations in the sides of the vessels the tensile strength of the material of the chambers is directly applied to resist the internal pressure from lengthening or widening the chambers.

It will be seen upon inspection that the chambers are connected only at one end. The purpose of this arrangement is to avoid strains from expansion and contraction impairing the joints by which the several chambers are connected.

A modification can be made by making the chambers symmetrical—that is to say, by placing the apertures I, K, and L near the center of the length of the chambers, as shown in Fig. 7; but this is not so convenient for erection and making attachments as when the openings occur at the ends of the chambers.

Copper has been found, from its superior ductility and conducting power, to be the best material of which to make these radiators, and is more durable than any other metal that can be afforded for such uses.

Instead of corrugations, cavities and protuberances can be used; but corrugations crossing each other on the opposite sides of each chamber are believed to be preferable, because the tensile strength of the metal forming one side of the chamber is made fully available to resist the lateral expanding effect of internal pressure upon the corrugations of the other side of the vessel; and so long as the clamps O O confine the several chambers the several grooves or corrugations have all the power to resist internal pressure that tubes of the same material and equal radius and thickness possess. The clamps O O, shown in Figs. 1, 2, 3, and 8, are rectangular plates, flat on one side and upon the other strengthened by ribs or braces, rendering them rigid and inflexible. The several chambers F F F F are not of themselves strong enough to withstand the internal pressure of steam with which they are used, but would, if subjected to it, bulge out laterally and burst. To prevent this the clamps O O are applied. When the intermediate plates are used they must be made stiff enough to withstand the internal pressure of steam in the vessels F, and transmit such pressure to the clamps O O, and thus afford lateral support to the vessels F. The direction of the corrugations in the sides of the vessels F is shown in Fig. 9; the corrugations in the back or further side thereof are shown by the dotted oblique lines intersecting the lines of the corrugation B on the front side. Fig. 10 shows the direction of the corrugations in the intermediate plates R. Those in any two contiguous plates intersect each other as the dotted diagonal lines in Fig. 10 intersect the diagonal full lines. When the plates R

are placed between the vessels or chambers F they are so arranged that the corrugations of the plates R intersect those of the chambers F with which they are in contact. Lateral support is thus supplied to the chambers F at every point of intersection and contact of the crests or ridges of the corrugations of the chambers F with the ridges of the corrugations of the plates R. The same arrangement should be observed in placing the chambers F in contact with each other when the plates R are omitted, as shown in Fig. 2, so that the clamps O O may afford the requisite lateral support to the chambers. When the chambers F are nested together between the clamps there is no view possible in which the channels E, C, and D can be seen. The positions that they occupy when in use is best illustrated in Fig. 5. By thus combining several light metallic vessels between clamps, so as to support each other laterally at numerous points, I am enabled to produce at a very low cost an apparatus of the requisite strength, formed of high-priced material, and of much greater heat-conducting capacity for equal superficies or bulk or weight than has been heretofore made. The radiating or heating capacity of this apparatus may be further increased, in the manner illustrated in Fig. 8, by inserting plates of metal R between the several chambers, which plates receive heat by radiation and conduction from the chambers and impart it to the air passing between. These plates are rendered more effective by being corrugated and roughened, and should be of such strength as to transmit the force of the clamping-bolts P to the chambers F.

I do not consider this invention as restricted to the precise arrangement of channels, which I have described, as there may be modifications of this part of the invention which would be equally efficient. Thus, the steam might be admitted where the air-vent is shown, and the condensed water drawn from a channel at the bottom extending to the end of the chamber furthest from the steam-inlet, and the air may be withdrawn from a channel at the upper part of the chamber and all the functions of the radiator be performed. The purpose of using a channel to convey the steam in my radiator to the opposite end from that in which the air-valve is located is to insure the delivery of steam to all parts of the chamber before the heat of the steam closes the air-valve.

The advantages of this radiator are that they may be erected in positions where others are too large to be applicable; they are not liable to leak at the joints, and do not, as is the case with radiators formed of castings, require much time to become heated when cold; and that, from their lightness, they are very easily handled in shipping and in erection.

Experiment demonstrates that one square foot of surface in these radiators will do as much work in heating with the same steam-pressure in the same time as three and one-half superficial feet of cast-iron radiators.

I am aware that single flat radiators have been prepared of ductile metal, in which an embossed plate has been stayed by riveting to a flat plate for heating apartments by direct radiation therein; also, that various forms of cast-metal nested radiators have been used. Both of these I distinctly disclaim; but

What I claim as my invention, and desire to secure as such by Letters Patent, is—

1. A radiator formed of nested chambers, formed of thin ductile metal, so embossed or corrugated as to support each other laterally at numerous points, substantially as described and shown.

2. The combination of clamps with chambers formed of ductile metal, corrugated, em-

bossed, or roughened, substantially as described and shown.

3. The channels in the chambers for distributing the steam to the several corrugations and for collecting and discharging the air and condensed steam therefrom, substantially as described.

4 The combination of plates or other metallic conducting substance interposed between and laterally supporting or bracing the chambers of thin ductile metal—corrugated, embossed, or roughened—against internal pressure, substantially as shown and described.

Witnesses: S. LLOYD WIEGAND.

R. E. GORDON,
LEWIS GODBOU.