No. 609,800. Patented Aug. 30, 1898.

A. H. FOWLER.

RADIATOR.

(Application filed Mar. 20, 1896.)

(No Model.) 2 Sheets—Sheet 1.

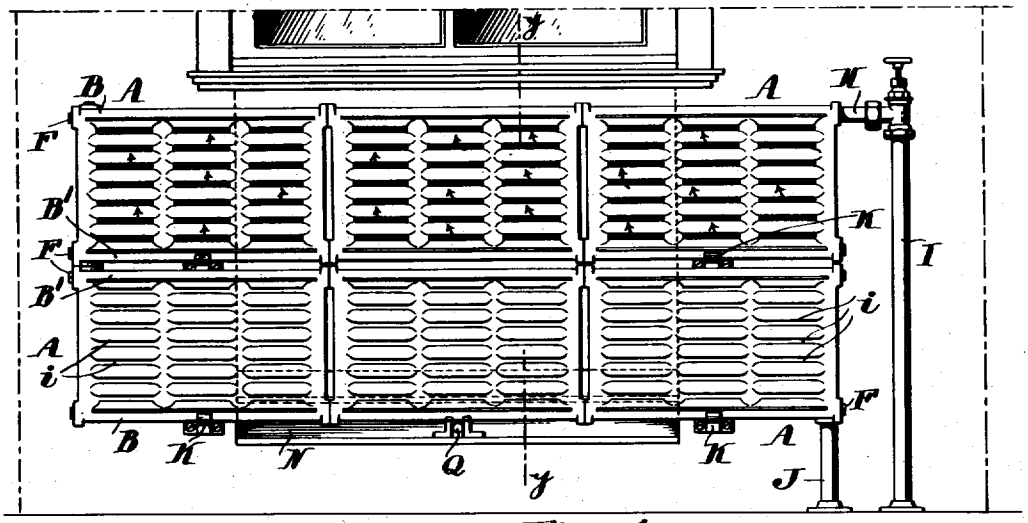


Fig. 1.

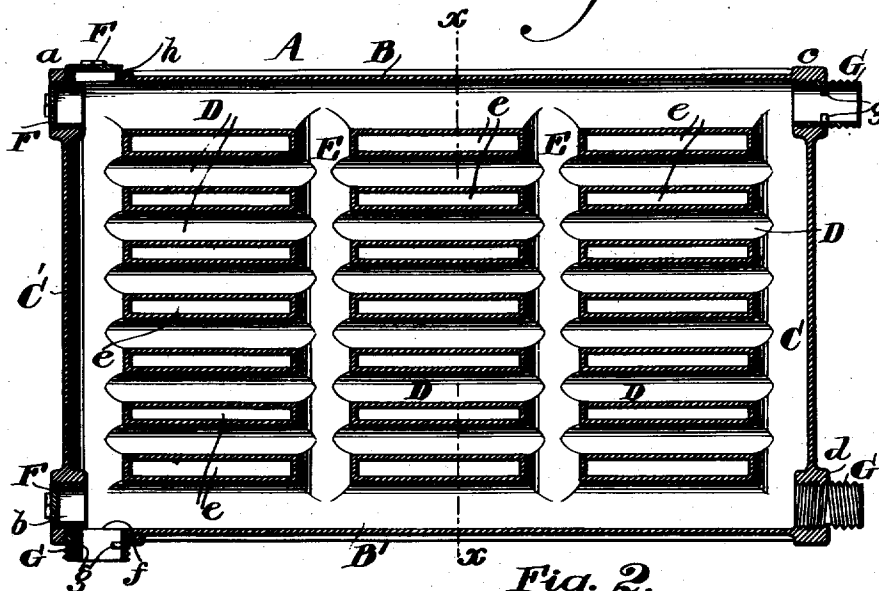


Fig. 2.

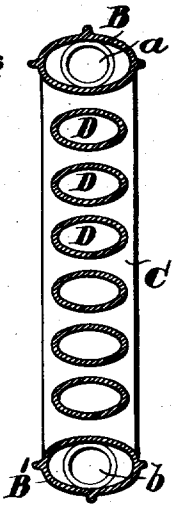


Fig. 3.

Witnesses.

Inventor.

Arthur H Fowler

By

Attorney.

No. 609,800. Patented Aug. 30, 1898.

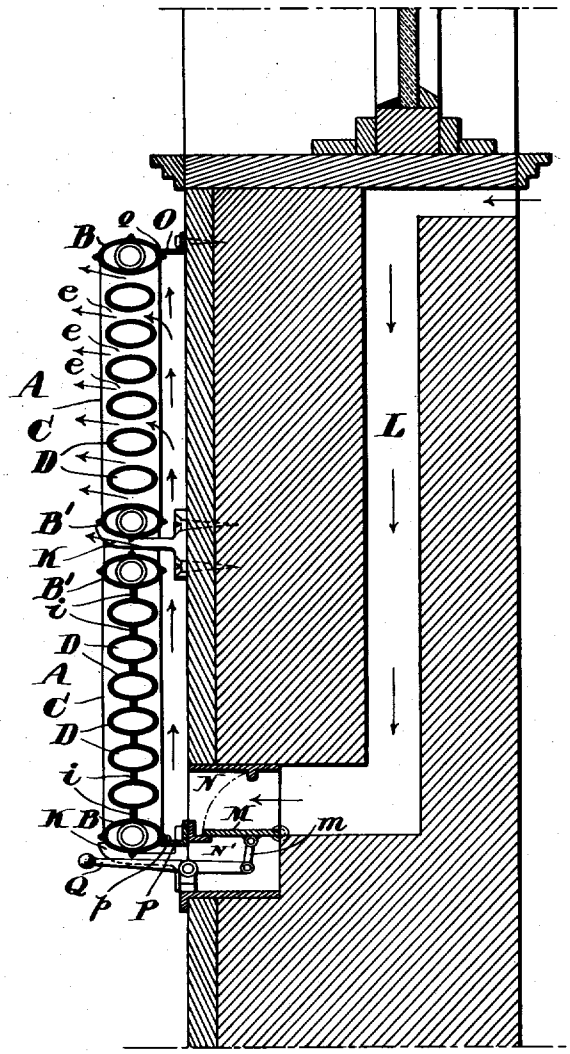
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(No Model.) 2 Sheets—Sheet 2.

Fig. 4.



Witnesses.

Henry Drury

Wm. L. Evans

Inventor.

Arthur H. Fowler

By Thos. G. Orwig & Co.

Attorney.

UNITED STATES PATENT OFFICE.

ARTHUR H. FOWLER, OF NORRISTOWN, PENNSYLVANIA, ASSIGNOR TO THE FOWLER & WOLF MANUFACTURING COMPANY, OF SAME PLACE.

RADIATOR.

SPECIFICATION forming part of Letters Patent No. 609,800, dated August 30, 1898.

Application filed March 20, 1896. Serial No. 584,015. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR H. FOWLER, of the city of Norristown, Montgomery county, State of Pennsylvania, have invented an Improvement in Radiators, of which the following is a specification.

My invention relates to radiators; and it consists of the improvements which are set forth in the following specification and claims and which are shown in the accompanying drawings.

More particularly my invention relates to radiators especially adapted to be supported by the wall or wainscot; and it is one of my objects to make an efficient and ornamental radiator composed of cast-iron sections of uniform size and shape that can be assembled to form a radiator of any length and width occupying the least area for the radiating-surface obtained and requiring practically no floor-space, and thus avoiding the cutting and fitting of carpets about the radiator-base.

It is also an object of my invention to provide a radiator that may be used for semidirect radiation—*i. e.*, to enable external air to be drawn into the room, heated, and circulated, and also to permit the regulation of the supply of external air, so that a greater or less quantity may be drawn in, or the supply of external air may be shut off and only the air of the room heated. This portion of my invention is important, as it permits the air of the room to be kept fresh and pure and the temperature to be regulated. When a radiator acts directly over and over upon the air in the room, the temperature becomes excessive and the air is vitiated. The opening of windows and doors to admit fresh air and lower the temperature produces drafts of cold air and the temperature cannot be regulated properly. By my improvements a greater or less quantity of fresh air may be admitted and there is no possibility of drafts of cold air entering the room. These improvements are especially adapted for large assembly-rooms, schools, and churches.

In carrying out my invention I form the radiator of cast-iron sections, which may be used either singly or grouped together and coupled, as hereinafter set forth, according to the area of the radiating-surface desired. These sections are preferably formed in the particular manner described to afford a maximum radiating-surface for the area occupied and to enable the sections to be so grouped and coupled together that a direct circulation of the steam or hot water through the successive sections may be obtained.

My invention is particularly advantageous in that it permits a large radiating-surface to be employed without occupying any floor-space. With ordinary radiators, such as are composed of a series of sections clustered together, an increase in the number of sections to increase the radiating-surface extends the radiator over the floor to a great extent. In some cases wall-coils are used composed of wrought-iron heating-pipes screwed into headers at the ends; but such heating-coils, besides being very unsightly, are not compact and must be extended over a large area of wall-space to provide any large radiating-surface. Such coils are also expensive as compared with a radiator made up of cast-iron sections.

I shall now refer to the drawings, in which—

Figure 1 is a side elevation of a portion of a room having my improved radiator fastened to the wall and showing the same made up of a series of coupled sections and adapted for use for semidirect radiation. Fig. 2 is a horizontal vertical sectional view of one of the radiator-sections. Fig. 3 is a transverse vertical sectional view of the same on the line $x\ x$ of Fig. 2. Fig. 4 is a transverse vertical sectional view, enlarged, on the line $y\ y$ of Fig. 1.

A is one of the radiator-sections, composed of a hollow cast-iron frame made up of a battery of tubes.

The sections are preferably rectangular in shape and composed of two longitudinal top and bottom tubes B B′, united by two end tubes C C′, which are connected by a series of smaller longitudinal tubes D. I prefer to employ intermediate cross-tubes E, connecting the tubes B B′ and having the longitudinal tubes D connecting with them. In the construction shown there are two of these

large intermediate cross-tubes E located between the end tubes C C and dividing the small longitudinal tubes D into three sets or series. The small longitudinal tubes D are located at sufficient distance apart to form intermediate openings or spaces *e* for the circulation of air between them. Each section thus constructed is composed of a series of communicating tubes, forming a unitary rectangular hollow frame.

I prefer to construct the section A with the tubes arranged in the manner described, because as the circulation of the steam and water is in horizontal planes the most free circulation should be permitted in those directions, and this is attained by the large horizontal tubes B B' and the series of small tubes D. The small tubes are preferably made of an area substantially equal to that of a one-inch pipe; but as tubes of that size are liable to offer considerable friction to the steam or water traversing them I prefer to shorten their length by the interposition of the intermediate transverse tubes E. While I prefer this particular arrangement of the tubes for the reasons stated, it is to be understood, however, that I do not mean to limit myself to this precise construction.

The tubes are preferably of flattened or oval construction, as shown, as that shape is found the most efficient for radiation.

The sections A are provided at their four corners with openings *a b c d*, by which they may be united to other sections to make up a large radiator. Such openings in any section as are not required for this purpose may be closed by plugs F. The metal of the sections may be reinforced or strengthened at the corners where these openings are formed, as shown. Each section is also preferably provided with an opening *f* in the longitudinal face at one of the corners to permit it to be united with a corresponding section located above or below it when the sections are arranged one above another, as in Fig. 1, and when such construction is not made this opening will be closed by a plug similar to the plug F. By thus casting the openings in four corners of each section I provide supports for the cores that are used in casting the sections, and thus avoid the use of chaplets or anchors.

My preferred method of uniting the sections together is by means of nipples G, having right and left hand threads adapted to corresponding threads cut in the openings in the sections. These nipples may be provided with internal lugs *g*, adapted to engage a flat bar inserted through the opening in the section at the other end of the tube from that in which the nipple is to be inserted. In this way the nipples may be turned to unite the sections. For a similar purpose each section may be provided with an opening *h* opposite the opening *f* to admit the bar for screwing the nipple into the opening *f*. This opening *h* is closed by a plug F. Instead of the nipples G other suitable couplings or unions may be employed.

While I have shown in Fig. 1 a radiator made up of six united sections arranged in two groups of three each and all located in the same plane, it is to be understood that a single section may be used or any number, according to the radiating-surface desired, and the sections may be connected side by side instead of in the same plane. I prefer, however to make each of the sections small, as they are then easier to make and to handle and permit more variation in the sizes of the radiators that may be formed by assembling them together.

If desired, two separate sections or series of sections may be employed, each coupled up separately with the supply and return pipes, and by suitable valves one section may be shut off, if desired, so that part or all of the radiating-surface may be employed.

To obtain the most efficient circulation with a series of sections arranged in rows or groups, as shown in Fig. 1, whether the rows be arranged one above another, as in that figure, or side by side, the only communications between the successive rows would be between the last section in each row and the first in the next row, as shown in Fig. 1, so that there will be a free communication between each group or row and the next in the series and a continuous circulation of the steam and water through the successive sections of the group or row. The first section of the series is connected through a suitable coupling H with the supply-pipe I, and the last section is suitably connected with the outlet or bleeder pipe J, as shown in Fig. 1. The team or water thus enters the radiator at the top and traversing the successive sections passes down and out at the bottom, driving the air before it.

The radiator or sections may be suitably secured to the wall or wainscot, as by brackets K, fastened to the wall and engaging the lower portion of the radiator-section.

I shall now refer to that part of my invention which relates to the use of the radiator as a semidirect radiation. For this purpose one section A or a series of sections may be employed, according to the size of the radiator.

For the purpose of admitting fresh air from the external atmosphere I employ a flue L, leading through the wall from the exterior to a point adjacent to the base of the radiator, through which the air is admitted behind the radiator and passes up to a greater or less extent in the space between the wall and the back of the radiator and emerges at the top or through the upper portion of the radiator. A damper M in the flue L is used to control the volume of fresh air admitted or to entirely exclude it, as may be desired. In Fig. 4 of the drawings I have shown the flue L leading from a point below the window-sill and extending downward through the wall, opening through a box or air-chamber N at the back of the base of the radiator. A passage-way N' leads

from the room to the chamber or box N, and the damper M is located between the passage-ways L and N', so that it may be operated to open or close either passage-way. When the passage-way L is closed, the air from the room may pass through the passage N' and chamber N to the back of the radiator.

I prefer to arrange the flue as shown, as it prevents the air being blown excessively directly into the room in the event of high winds.

The radiator is set at sufficient distance from the wall or wainscot to form an air-space, and to prevent the air from passing directly in the room through the base of the radiator the openings *e* between the horizontal tubes D in the lower portion of the radiator are closed by webs *i*. These webs insure the upward passage of the air over the radiating-surface of the lower portion of the radiator before it emerges into the room. The webs *i* are not formed in the upper portion of the radiator in order that the air may pass into the room through the openings *e*, thus coming into direct contact with the radiating-tubes D.

When a radiator is composed of two sections or series of sections located one above the other, as in the construction shown in Figs. 1 and 4, the entire lower section or set of sections may be formed with the webs *i* and the entire upper set with the openings *e*; but if a single section or row of sections be used the webs may be formed for part of the height of the section, the upper portion being left with the openings *e*, and such a partially-webbed section may be used as an intermediate section when the radiator is composed of three or more rows of sections one above another.

To insure the passage of the air into the room through the openings *e* between the tubes D in the upper portion of the radiator, the top of the air-space between the radiator and wall may be closed by a strip or flange O, secured to the wall and falling upon a longitudinal rib *o* along the inner side of the tube B. The air-space may be similarly closed at the bottom to prevent the passage of the air directly into the room below the radiator by a strip or flange P, secured to the lower part of the wall and fitting against a longitudinal rib *p* along the base of the radiator.

The damper M may be operated in any convenient manner. I have shown a hinged damper connected by a link or links *m* with a hinged lever Q.

The inner face of the wall or wainscot behind the radiator is preferably lined with some non-conducting material, such as a sheet of asbestos. With this arrangement the radiator may be used for direct radiation by closing the damper M, in which case the radiator will act over and over upon the air contained in the room, or it may be used for semidirect radiation by opening the damper to any extent desired, in which case the face of the radiator will act directly upon the air contained in the room, while the back will heat the volume of fresh air that may be admitted.

The opening of the flue M may of course extend throughout the entire width of the radiator or through a portion only, as may be desired.

The various details of construction that have been shown may be varied without departing from the invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. A radiator-section composed of a unitary hollow casting, consisting of four outer tubes communicating with one another at the corners, one or more intermediate cross-tubes between opposite outer tubes, and a series of connecting-tubes between each intermediate cross-tube and the opposite outer tube or adjacent intermediate cross-tube.

2. A radiator-section composed of a unitary hollow casting, consisting of a tubular structure embracing outer tubes communicating with one another at the corners, one or more cross-tubes between the outer tubes, and a series of connecting-tubes between said cross-tubes and the adjacent outer tubes.

3. A radiator-section composed of a flat hollow casting, made up of a multiplicity of communicating tubes, and provided at the corners with openings in the plane of the section arranged at right angles one to the other, whereby said section may be coupled with other sections to extend the radiator both longitudinally and transversely.

4. A radiator-section composed of a flat hollow casting, made up of a multiplicity of communicating tubes, and provided at the corners with openings in the plane of the section arranged at right angles one to the other, whereby said section may be coupled with other sections to extend the radiator both longitudinally and transversely, in combination with similar sections coupled with said section at said openings and respectively located in a longitudinal and transverse direction with reference to said section.

5. A radiator consisting of one or more flat hollow sections consisting of a battery of communicating tubes, arranged in an upright position, in combination with a wall located adjacent thereto so as to form an air-space between said wall and the inner face of the radiator, the spaces between the adjacent tubes in the lower portion of the radiator being closed to prevent the passage of the air between them and the top of the flue being closed to deflect the air and guide it between the open spaces between the tubes in the upper portion of the radiator.

6. A radiator consisting of one or more flat hollow sections consisting of a battery of communicating tubes, arranged in an upright position, in combination with a wall located adjacent thereto so as to form an air-space be-

tween said wall and the inner face of the radiator, the spaces between the adjacent tubes in the lower portion of the radiator being closed to prevent the passage of the air between them and the top of the flue being closed to deflect the air and guide it between the open spaces between the tubes in the upper portion of the radiator, an air-inlet at the lower portion of said flue, and means to control said inlet to regulate the volume of air admitted through it to said space between the radiator and wall.

In testimony of which invention I have hereunto set my hand.

ARTHUR H. FOWLER.

Witnesses:
ERNEST HOWARD HUNTER,
WM. L. EVANS.

Correction in Letters Patent No. 609,800.

It is hereby certified that the residence of the assignee in Letters Patent No. 609,800, granted August 30, 1898, upon the application of Arthur H. Fowler, of Norristown, Pennsylvania, for an improvement in "Radiators," was erroneously written and printed "of same place," (*i. e.*, Norristown, Pennsylvania), whereas said residence should have been written and printed *Philadelphia, Pennsylvania;* 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, countersigned, and sealed this 20th day of September, A. D., 1898.

[SEAL.]

WEBSTER DAVIS,
Assistant Secretary of the Interior.

Countersigned:
C. H. DUELL,
Commissioner of Patents.

Disclaimer in Letters Patent No. 609,800.

DISCLAIMER.

609,800.—*Arthur H. Fowler*, Norristown, Pa. RADIATOR. Patent dated August 30, 1898. Disclaimer filed May 21, 1914, by the assignee, *Fowler & Wolfe Manufacturing Company.*

Enters this disclaimer—

"To that part of the claims in the said Letters Patent which is in the following words, to wit:

"3. A radiator-section composed of a flat hollow casting, made up of a multiplicity of communicating tubes, and provided at the corners with openings in the plane of the section arranged at right angles one to the other, whereby said section may be coupled with other sections to extend the radiator both longitudinally and transversely.

"4. A radiator-section composed of a flat hollow casting, made up of a multiplicity of communicating tubes, and provided at the corners with openings in the plane of the section arranged at right angles one to the other, whereby said section may be coupled with other sections to extend the radiator both longitudinally and transversely, in combination with similar sections coupled with said section at said openings and respectively located in a longitudinal and transverse direction with reference to said section.

[*Official Gazette, May 26, 1914.*]

Disclaimer in Letters Patent No. 609,800.

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[*Official Gazette, May 26, 1914.*]