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PATENTED MAR. 20, 1906.

W. G. JONES & J. W. JOHNSON.
HEATING APPARATUS.

APPLICATION FILED JUNE 14, 1905.

3 SHEETS—SHEET 1.

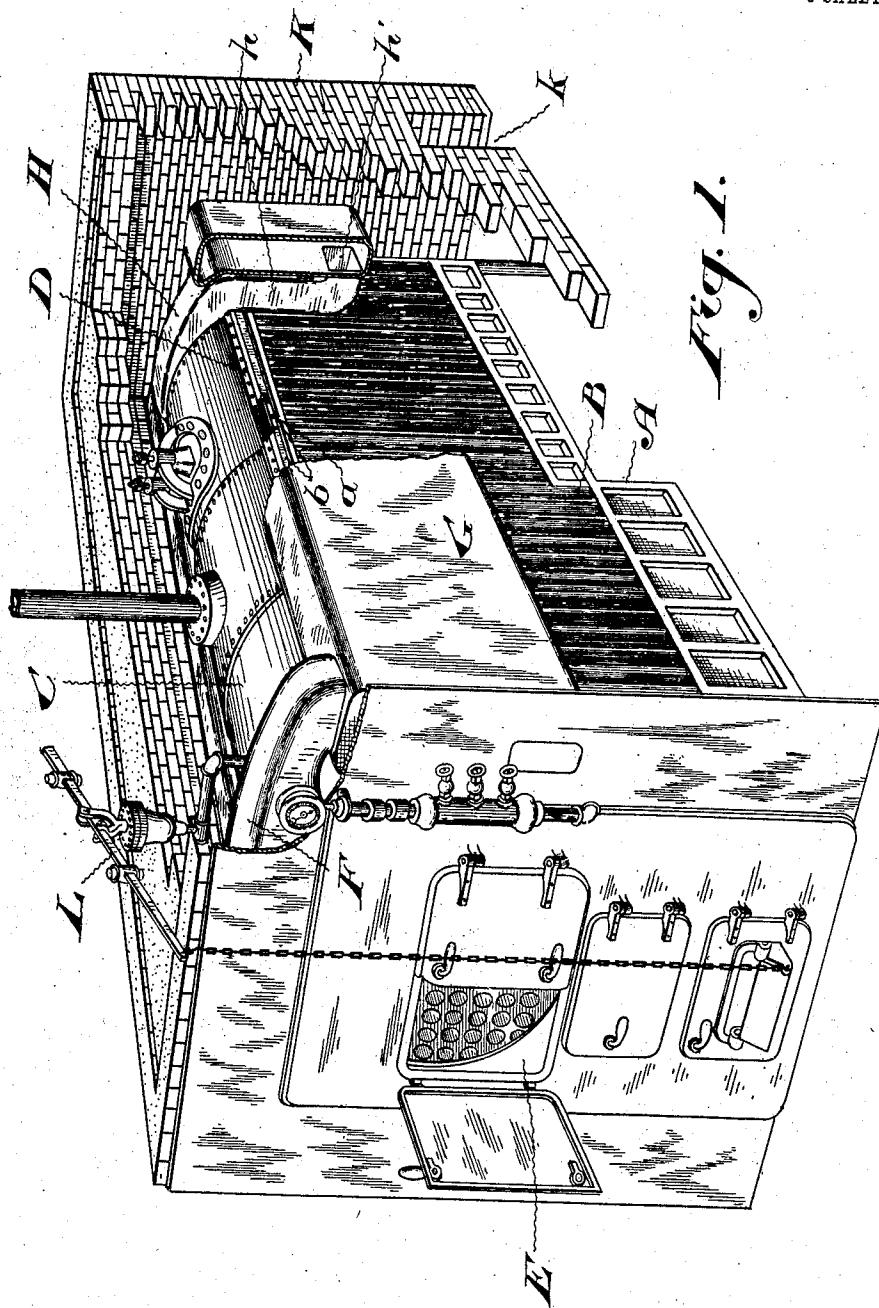


Fig. 1.

WITNESSES:

P. Jones
C. W. C.

INVENTORS

W. G. Jones
J. W. Johnson
BY *Robert M. Mayhew*
ATTORNEYS

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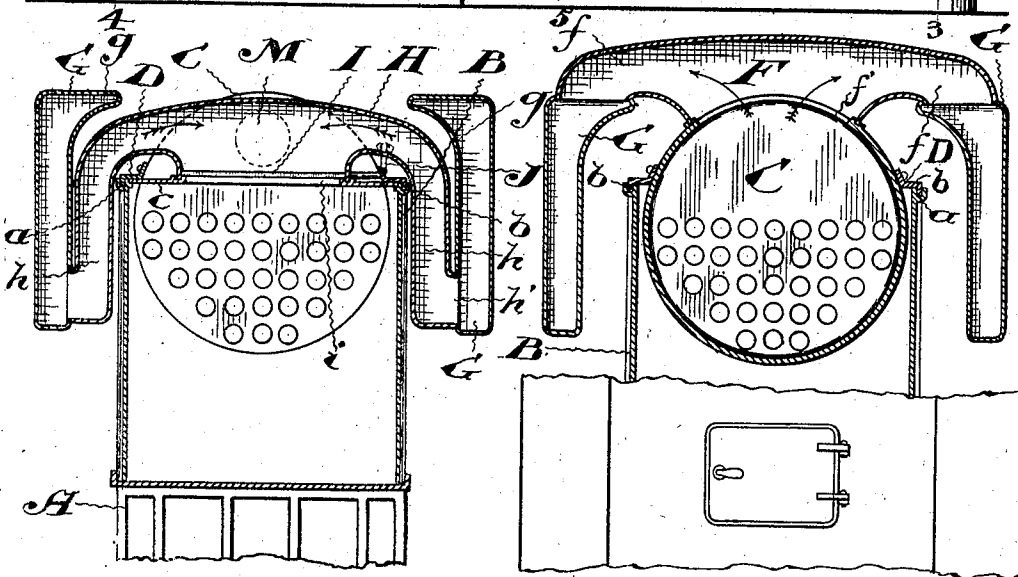
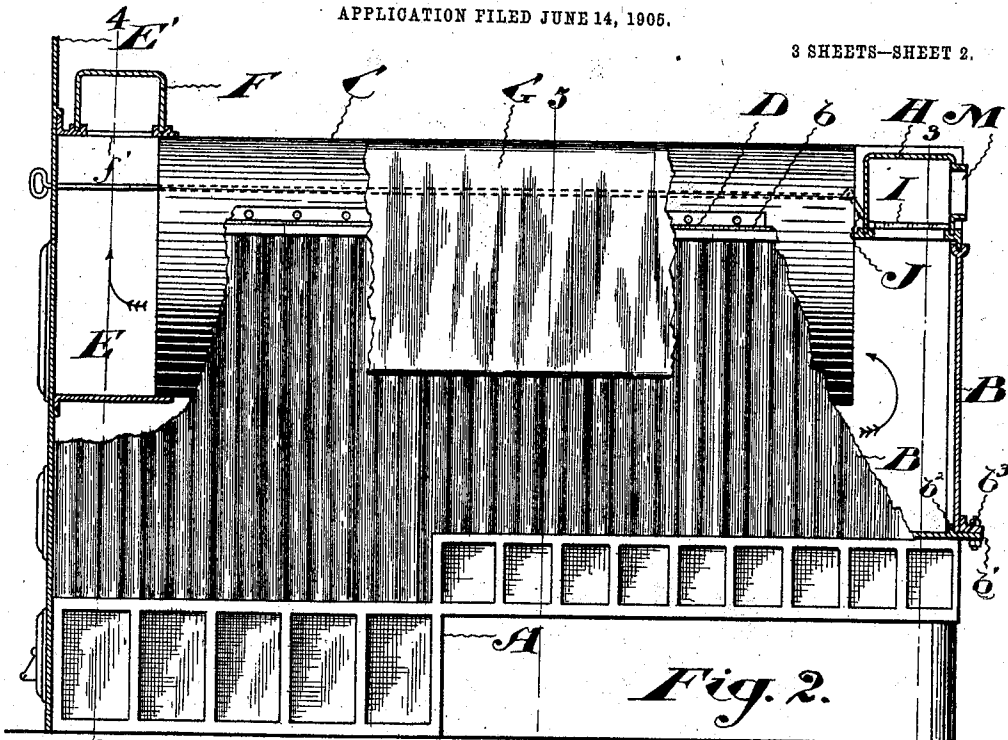


Fig. 3.

Fig. 4.

WITNESSES:

W. G. Jones
Chas. Burt

INVENTORS

Wilbur G. Jones
BY *Joseph Warren Johnson*
By *Robert M. Hughes* ATTORNEYS

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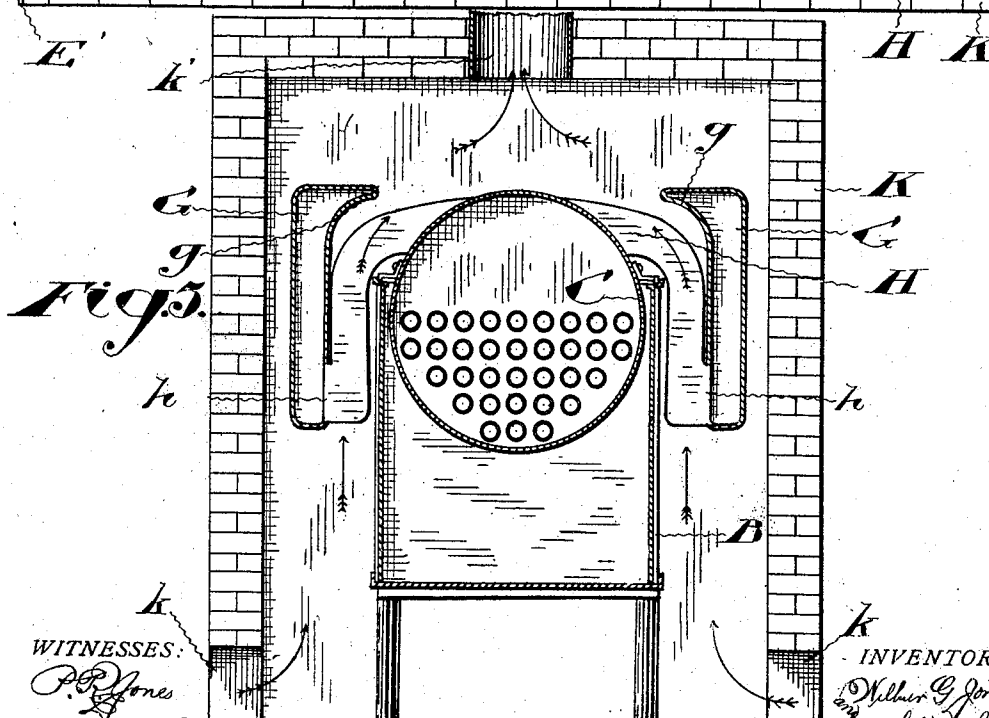
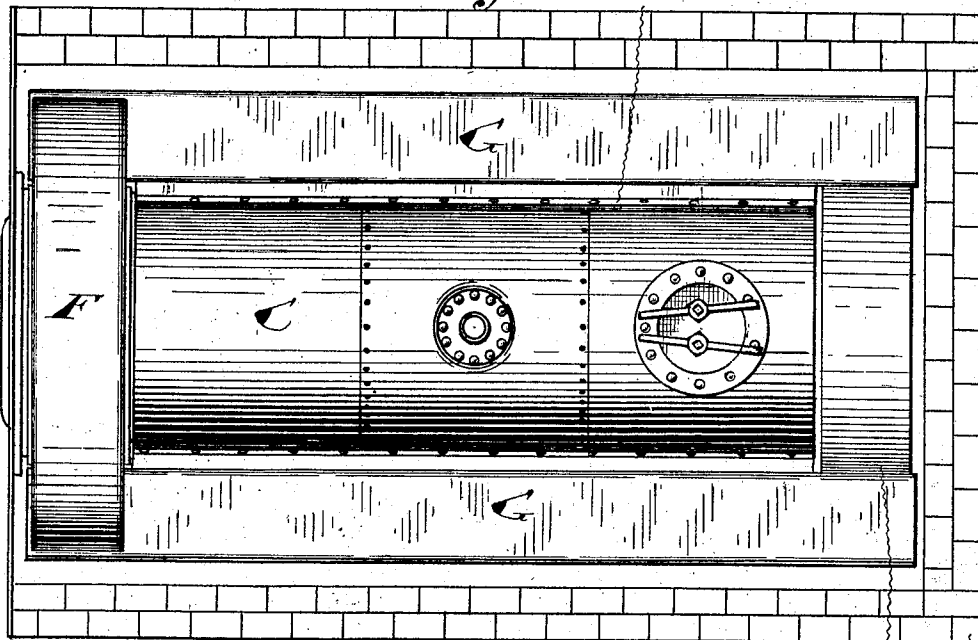
W. G. JONES & J. W. JOHNSON.

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3 SHEETS—SHEET 3.

Fig. 6. D



WITNESSES:

P. B. Jones
W. R. C.

INVENTORS

Walter G. Jones
Joseph W. Johnson
By *Richard M. Hughes*
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILBUR G. JONES AND JOSEPH W. JOHNSON, OF TORONTO, CANADA.

HEATING APPARATUS.

No. 815,839.

Specification of Letters Patent.

Patented March 20, 1906.

Application filed June 14, 1905. Serial No. 265,218.

To all whom it may concern:

Be it known that we, WILBUR G. JONES and JOSEPH WARREN JOHNSON, citizens of the United States, residing in the city of Toronto, in the county of York, Province of Ontario, Canada, have invented certain new and useful Improvements in Heating Apparatus, of which the following is a specification.

This invention relates mainly to that class of combined boilers and air-heaters which are employed for heating and ventilating buildings and which comprise a boiler for producing steam or hot water arranged within a casing or jacket through which the air flows which is being heated and provided with a radiator through which the hot gases pass after leaving the boiler, which radiator is also arranged within said casing or jacket, so that the air flowing through the latter is heated by the combined effect of the boiler and radiator.

The objects of this invention are to improve this class of combined boilers and air-heaters with a view of increasing the efficiency thereof by producing comparatively large radiating-surfaces while preserving compactness of structure, simplifying the construction, preventing injurious strains under unequal expansion and contraction of the parts, and improving the apparatus in various other respects.

In the accompanying drawings, consisting of three sheets, Figure 1 is a perspective view of a combined boiler and air-heater provided with our improvements. Fig. 2 is a side elevation of the same, partly in section. Fig. 3 is a vertical transverse section through the rear portion of the apparatus in line 3 3, Fig. 2. Fig. 4 is a similar section through the front portion of the apparatus in line 4 4, Fig. 2. Fig. 5 is a similar section approximately through the middle of the apparatus in line 5 5, Fig. 2. Fig. 6 is a top plan view with the top of the casing or jacket removed.

Like letters of reference refer to like parts in the several figures.

A represents the ash-pit; B, the side walls of the furnace, comprising the fire-box and combustion-chamber; and C the boiler, which is preferably, as shown, a horizontal cylindrical return-flue boiler suitable for producing steam or hot water, as may be preferred. The boiler is supported on each side upon the longitudinal side walls of the furnace in such manner that the boiler and its

supporting-walls are free to expand and contract independently. For that purpose the boiler is provided on each side with a longitudinal flange D, which rests loosely with its downwardly-facing longitudinal tongue *b* in a groove *a*, formed lengthwise in the top of the side wall of the furnace. The side flanges D close the top portions of the space between the boiler and the side walls of the furnace, and the grooves *a* may be packed in any suitable manner to prevent leakage of gas into the surrounding space. As the side walls of the furnace and the boiler are free to move independently of each other in expanding and contracting, injurious strains are avoided.

K represents the casing or jacket which incloses the air-space in which the boiler and furnace are arranged and which is constructed of brickwork, as shown, or metal and provided in any suitable or well-known manner with air-inlets *k* and with flues *k'* for conducting the heated air to the desired points.

The side walls of the furnace are preferably corrugated vertically for facilitating expansion and contraction and increasing the radiating-surface. The furnace extends rearwardly beyond the boiler and has its rear wall B' arranged at such a distance in rear of the boiler that the hot gases after having passed along the lower portion of the boiler below the side flanges D are freely admitted to the rear ends of the boiler-flues. The top of the furnace between the rear wall B' and the rear end of the boiler is covered by a plate *c*. The rear wall B' is preferably held removably on the bottom plate *b'* of the furnace between a rib *b²*, formed on this plate, and a removable stop-bar *b³*, which may be an angle-iron, as shown in Fig. 2.

E represents the smoke-box, which is arranged at the front of the boiler and secured to the furnace-front E'. The front end of the boiler rests loosely in this box, so that the boiler can move freely in the same in expanding and contracting. Any suitable packing may be employed between the boiler and the smoke-box.

F represents a transverse bifurcated or saddle-shaped flue which is mounted on the smoke-box and communicates therewith by an opening *f'* to receive the hot gases therefrom. This flue has its two branches connected with the front ends of longitudinal radiators G, which are arranged on opposite sides of the boiler and furnace in the air-space

of the jacket or casing and at such a distance from the sides of the boiler and furnace and from the casing as to provide suitable air-passages between these parts. The branches
 5 *f* of the transverse front flue *F* open preferably into the tops of the longitudinal radiators *G*, as represented in Fig. 4. The rear ends of these radiators communicate with the branches *h* of a transverse bifurcated or
 10 saddle-shaped rear flue *H*, which is mounted upon the rear top plate *c* of the furnace and has an outlet *M*, Fig. 3, leading to the chimney. The openings *h'*, connecting the rear ends of the radiators with the rear trans-
 15 verse flue *H*, are preferably formed in the lower portions of the inner side walls of the radiators, as shown in Figs. 1 and 3.

The draft passes rearwardly through the furnace along the lower portion of the boiler,
 20 then forwardly through the boiler-flues to the smoke-box, then through the transverse front flue to the front ends of the radiators, then rearwardly through the radiators, and then from the rear ends of the radiators
 25 through the transverse rear flue *H* to the outlet.

By forming the inlet and outlet openings of the radiators respectively at or near the top and bottom thereof a thorough distribu-
 30 tion of the hot gases throughout the cross-section of each radiator is secured, the formation of dead-air spaces is prevented, and uniform heating of the radiators from top to bot-
 35 tom is effected.

In order to provide for a direct draft when desired—as, for instance, in starting the fire—the rear top plate *c* of the furnace is provided with an opening *i*, Figs. 2 and 3, which regis-
 40 ters with a similar opening in the bottom of the rear transverse flue *H*, and these openings are controlled by a pivoted damper *I*, having an actuating-arm *J*, so that upon opening this damper a direct draft from the furnace to the rear flue *H* and outlet *M* is ob-
 45 tained, while by closing the damper the draft is directed through the boiler-flues and the radiators to the rear flue *H*.

The radiators *G* are flat-sided and comparatively narrow, and their inner walls *g* are
 50 preferably curved inwardly at the top to follow approximately the curvature of the boiler in order to compel the air-current ascending between the radiator and boiler to hug the latter closely.

In the preferred construction the boiler is exposed at the top in the air-space to the extent of about one-fourth of the circumference of the boiler, and the tops of the radiators are about on a level with the top of the boiler,
 60 so that about three-fourths of the surface of the boiler is exposed to the heat in the fire-box and utilized for absorbing heat and one-fourth exposed to the air in the air-space and utilized for heating the air. The air passing
 65 upwardly through the air-space of the casing

or jacket is first heated by the hot corrugated walls of the furnace, then by the hot walls of the radiators, and finally by the exposed top portion of the boiler. The air has become heated to a considerable extent when
 70 it reaches the top portion of the boiler, and therefore produces no injurious cooling effect upon the boiler.

We claim as our invention—

1. The combination of a horizontal boiler
 75 having a return-flue for the passage of the products of combustion from the rear to the front, a furnace for the same, a longitudinal radiator arranged at the side of the furnace
 80 and boiler and spaced therefrom, means for conducting the hot gases from the boiler to the front end of said radiator, a flue connecting the rear end of the radiator with the exit for the gases, and an air-chamber in which
 85 the boiler, furnace and radiator are arranged, substantially as set forth.

2. The combination of a horizontal boiler having a return-flue for the passage of the products of combustion from the rear to the
 90 front, a furnace for said boiler, an air-chamber in which the boiler and furnace are arranged, longitudinal radiators arranged in said air-chamber on opposite sides of the boiler and furnace and separated from the
 95 boiler and furnace by air-passages, means for conducting the products of combustion from the front end of the return-flue to the front ends of said radiators, and means for discharging the products of combustion from the rear ends of said radiators, substantially
 100 as set forth.

3. The combination of a horizontal boiler having a return-flue for the passage of the products of combustion from the rear to the
 105 front, a furnace for said boiler, an air-chamber in which the boiler and furnace are arranged, longitudinal radiators arranged in said air-chamber on opposite sides of the boiler and furnace and separated from the boiler and furnace by air-passages, a smoke-
 110 box at the front of the boiler communicating with the front end of said return-flue, a transverse front flue receiving the gases from the smoke-box and conducting the same to the front ends of the radiators, and means for
 115 discharging the gases from the rear ends of the radiators, substantially as set forth.

4. The combination of a horizontal boiler having a return-flue for the passage of the products of combustion from the rear to the
 120 front, a furnace for said boiler, an air-chamber in which the boiler and furnace are arranged, longitudinal radiators arranged in said air-chamber on opposite sides of the boiler and furnace and separated from the
 125 boiler and furnace by air-passages, a smoke-box at the front of the boiler communicating with the front end of said return-flue, a transverse front flue receiving the gases from the smoke-box and conducting the same to the
 130

front ends of the radiators, and a transverse rear flue which communicates with the rear ends of the radiators and through which the gases escape therefrom, substantially as set forth.

5 5. The combination of a horizontal boiler having a return-flue for the passage of the products of combustion from the rear to the front, a furnace for the same having metallic
10 side walls which extend to the upper portion of the boiler, an air-chamber in which the boiler and furnace are arranged, longitudinal radiators arranged in said air-chamber oppo-
15 site the upper portions of said boiler and said metallic furnace-walls and separated therefrom by an air-passage, means for conducting the products of combustion from the front end of the return-flue to the front ends
20 of said radiators, and means for discharging the products of combustion from the rear ends of said radiators, substantially as set forth.

6. The combination of an air-chamber, a horizontal boiler and furnace arranged therein, and a radiator arranged lengthwise at the
25 side of the furnace and boiler and separated therefrom by an air-passage, said radiator having a continuous inner wall which is composed of an upright lower portion which is arranged opposite the furnace, and an upper,
30 inwardly-overhanging portion which projects toward the upper portion of the boiler, and means for conducting the products of combustion from the boiler to the radiator, substantially as set forth.

35 7. The combination of an air-chamber, a boiler and furnace arranged therein, the boiler having its top portion exposed above the side walls of the furnace, and longitudinal radiators arranged on opposite sides of
40 the furnace and boiler and separated from the side walls of the furnace and from the boiler by air-passages, said radiators having upright inner walls whose top portions extend inwardly beyond the lower portions and
45 toward the top portion of the boiler, substantially as set forth.

8. The combination of a horizontal boiler having a return-flue for the passage of the products of combustion from the rear to the
50 front, a furnace for the same, a longitudinal radiator arranged at the side of the furnace and boiler, means for conducting the hot gases from the boiler to the front end of said radiator, a flue connecting the rear end of the
55 radiator with the exit for the gases and communicating by a direct draft-opening with the furnace, and a damper controlling said opening, substantially as set forth.

9. The combination of a horizontal boiler
60 having a return-flue for the passage of the products of combustion from the rear to the front, a furnace for the same, longitudinal radiators arranged on opposite sides of the furnace and boiler, means for conducting the

hot gases from the boiler to the front ends of
65 said radiators, a transverse flue connecting the rear ends of the radiators with the exit for the gases and communicating by a direct opening with the furnace, and a damper controlling said opening, substantially as set
70 forth.

10. The combination of an air-chamber, a horizontal boiler arranged therein, a radiator arranged lengthwise at the side of the boiler and separated therefrom by an air-passage,
75 said radiator having the inlet for the products of combustion arranged at the top at one end of the radiator and the outlet at the bottom at the opposite end, and means for conducting the products of combustion from
80 the boiler to said inlet, substantially as set forth.

11. The combination of an air-chamber, a horizontal boiler having a return-flue for the passage of the products of combustion from
85 the rear to the front, a furnace for the same, longitudinal radiators arranged on opposite sides of the boiler and furnace, a transverse front flue connecting the front end of the boiler with the front ends of the radiators at
90 the top thereof, and a transverse rear flue connected with the rear ends of the radiators at the bottom thereof and communicating with the exit for the products of combustion, substantially as set forth.

12. The combination of an air-chamber, a horizontal return-flue boiler arranged in the same, a furnace for the boiler, a stationary smoke-box which is secured to the furnace and with which the front end of the boiler is
100 slidably connected, and longitudinal radiators arranged in said air-chamber on opposite sides of the boiler and furnace and spaced therefrom, said radiators receiving the products of combustion from said smoke-box,
105 substantially as set forth.

13. The combination of an air-chamber, a horizontal return-flue boiler having longitudinal side flanges, a furnace having side walls upon which said flanges rest and on which
110 said flanges are capable of lengthwise movement, a stationary smoke-box which is secured to the furnace and with which the front end of the boiler is slidably connected, and longitudinal radiators arranged in said
115 air-chamber on opposite sides of the boiler and furnace and spaced therefrom, said radiators receiving the products of combustion from said smoke-box, substantially as set forth.

120 Witness our hands this 21st day of May, 1905.

WILBUR G. JONES.
JOSEPH W. JOHNSON.

Witnesses:

J. EDW. MAYBEE,
P R JONES.