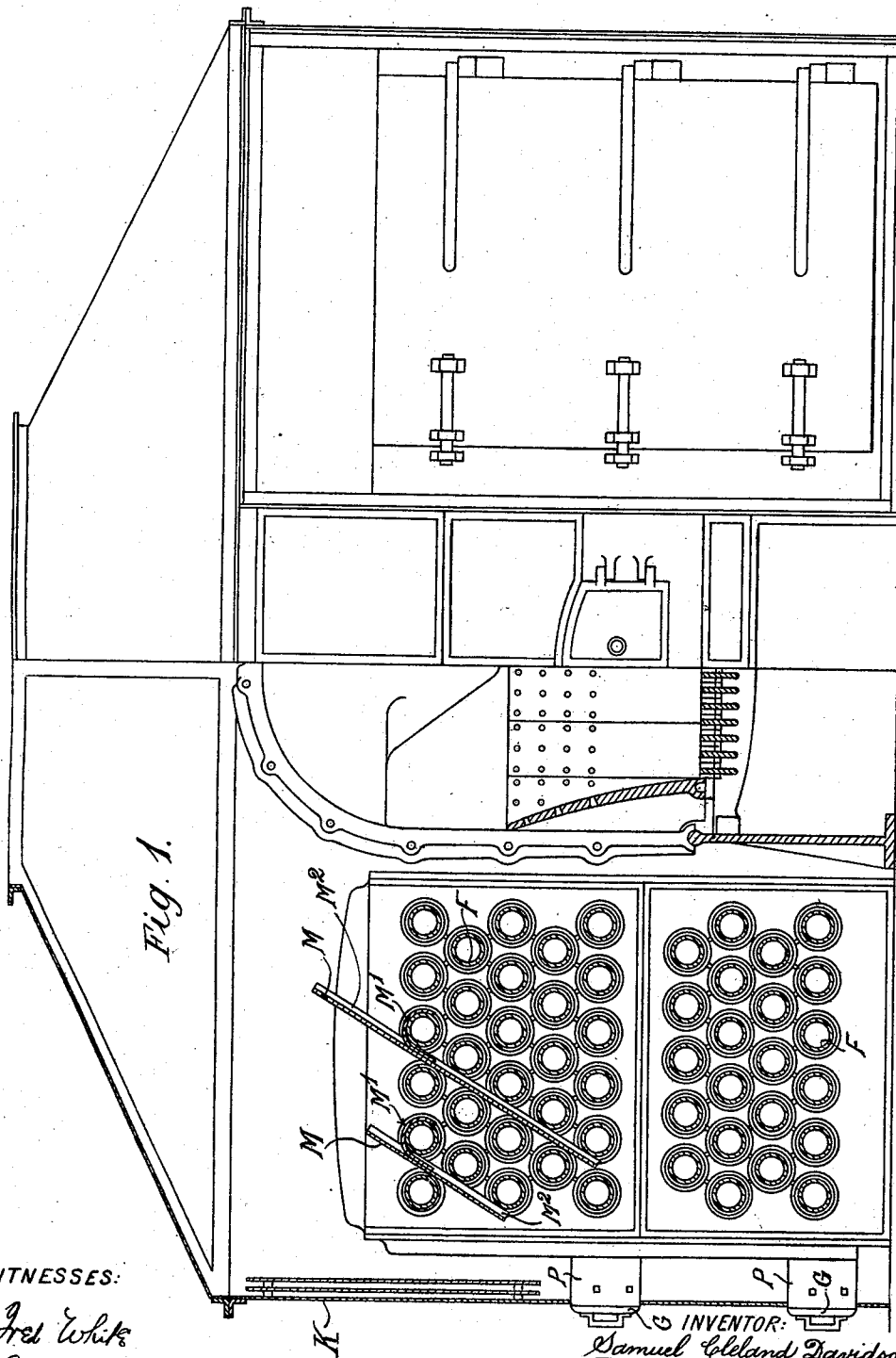


No. 867,572.

PATENTED OCT. 8, 1907.

S. C. DAVIDSON.
STOVE AND APPARATUS FOR HEATING AIR.
APPLICATION FILED SEPT. 18, 1906.

4 SHEETS—SHEET 1.



WITNESSES:

Ired White
René Muine

INVENTOR:

Samuel Cleland Davidson
By his Attorneys
Reuben C. Orason & Muine

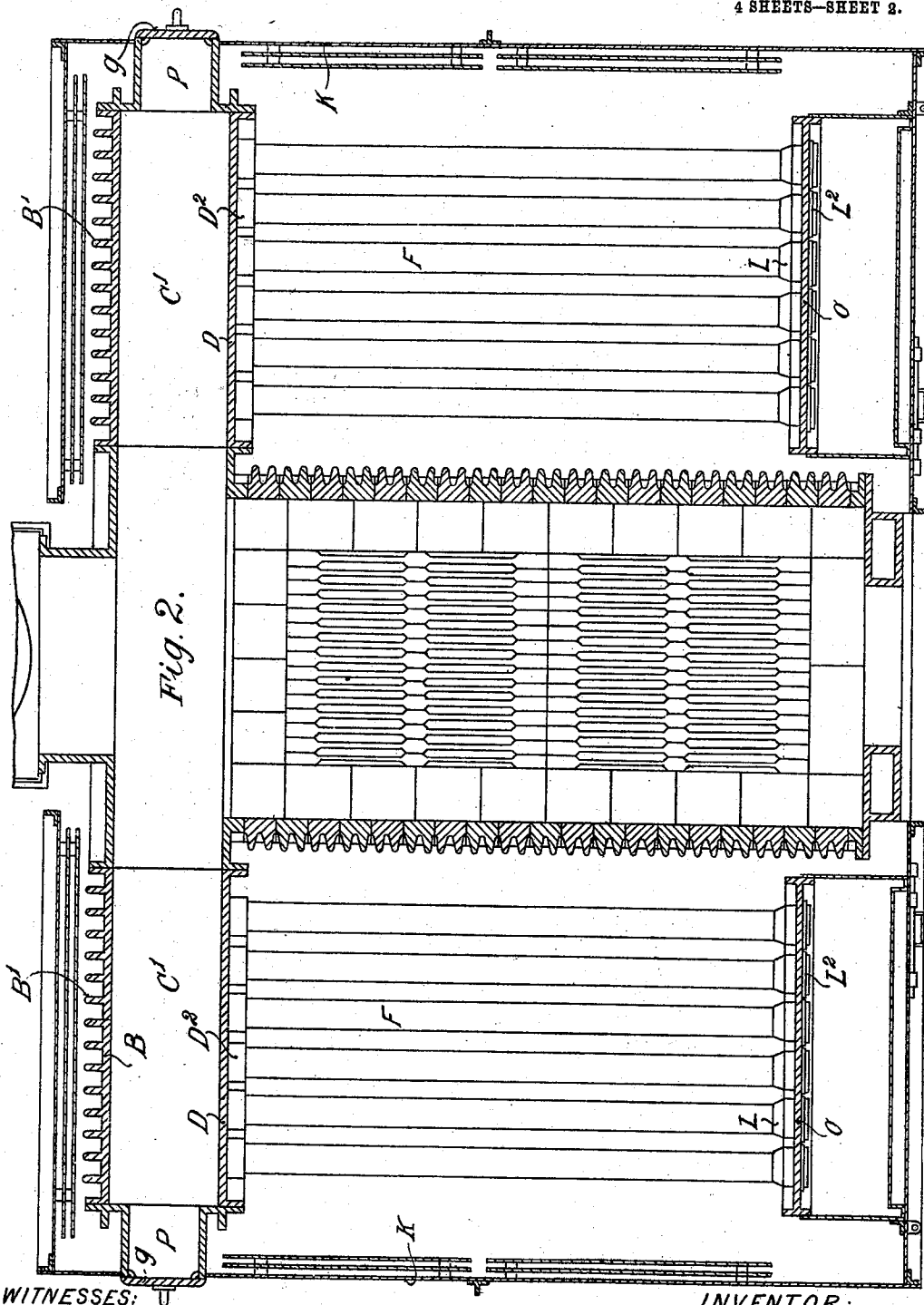
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4 SHEETS—SHEET 2.



WITNESSES:

Ed White
René Meune

INVENTOR:

Samuel Cleland Davidson,
By his Attorneys
Arthur G. Traver & Meune

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4 SHEETS—SHEET 3.

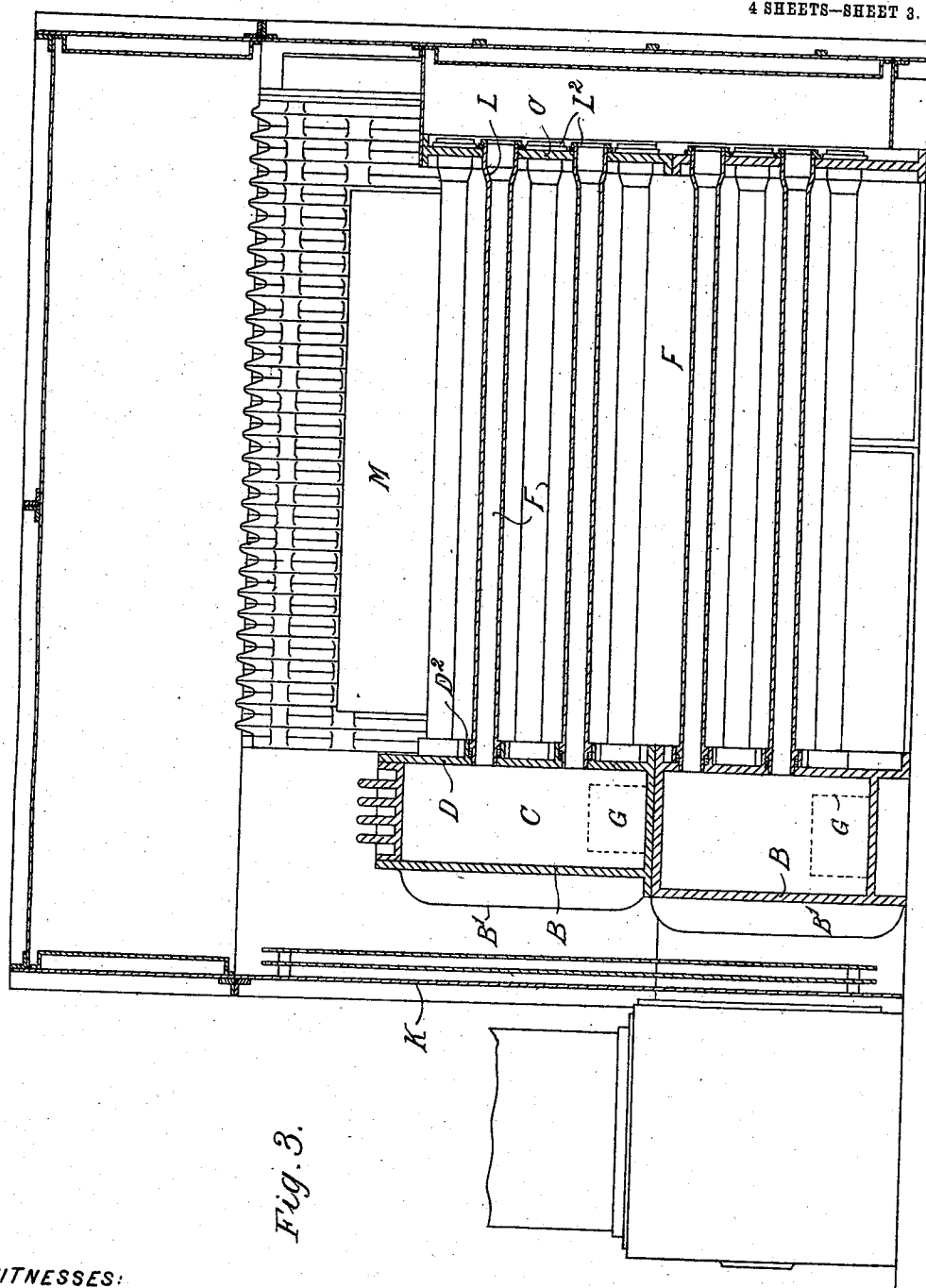


Fig. 3.

WITNESSES:

Ired White
Rene's Meune

INVENTOR:

Samuel Cleland Davidson,
By his Attorneys

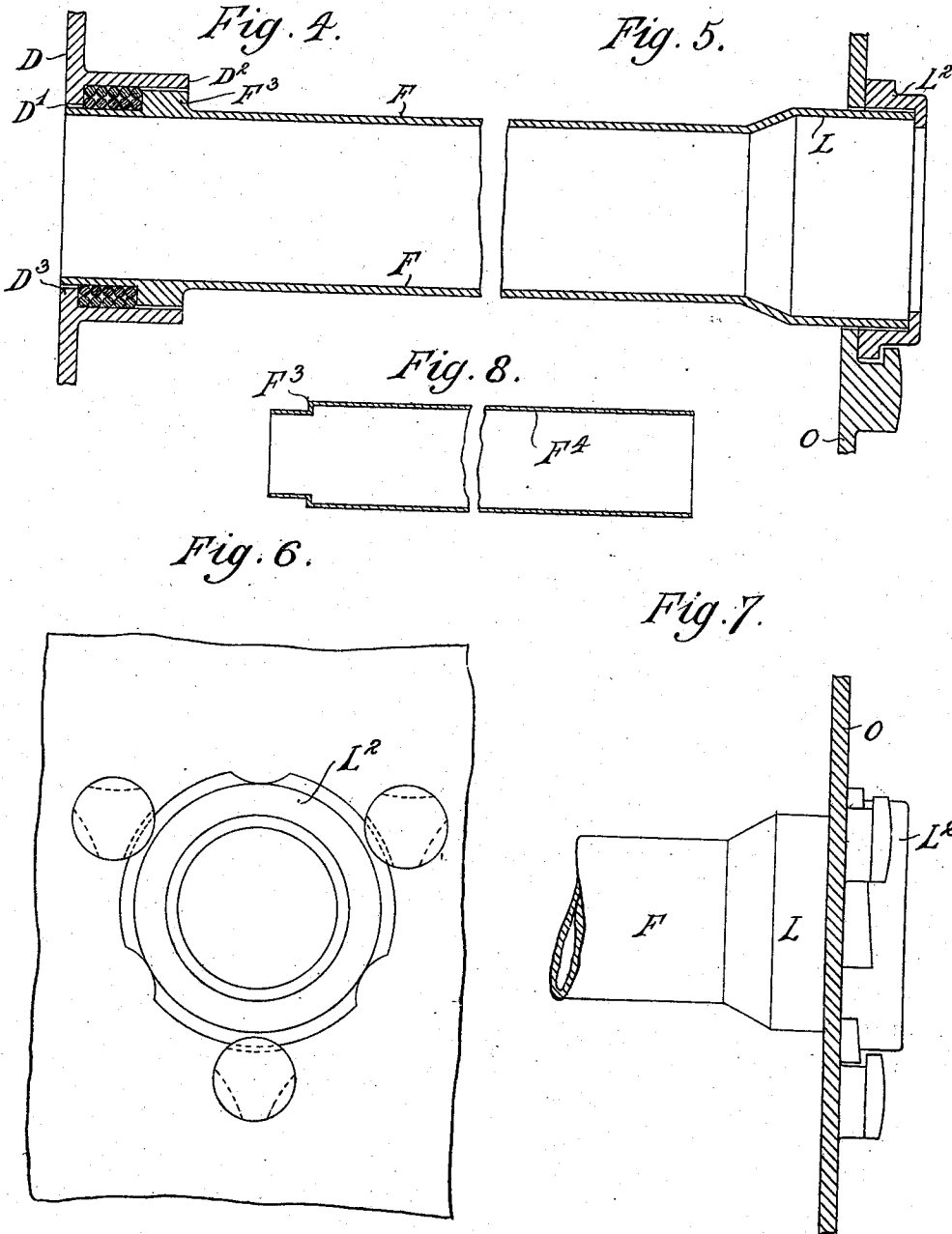
Arthur G. Orason & Meune

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4 SHEETS—SHEET 4.



WITNESSES:

Irel White
Rene Meune

INVENTOR:

Samuel Cleland Davidson,
By his Attorneys

Arthur G. Orason & Meune

UNITED STATES PATENT OFFICE.

SAMUEL CLELAND DAVIDSON, OF BELFAST, IRELAND.

STOVE AND APPARATUS FOR HEATING AIR.

No. 867,572.

Specification of Letters Patent.

Patented Oct. 8, 1907.

Application filed September 18, 1906. Serial No. 335,130.

To all whom it may concern:

Be it known that I, SAMUEL CLELAND DAVIDSON, of Sirocco Engineering Works, Belfast, Ireland, merchant, have invented certain new and useful Improvements in Stoves and Apparatus for Heating Air, of which the following is a specification.

My invention has reference to stoves or apparatus for heating air (hereinafter called stoves) and relates more especially to the type of stove described in the specification of previous Letters Patent granted to me, viz., No. 553576 dated 28th. January 1896 (hereinafter referred to as my previous specification). In this said type of stove a centrally situated furnace is employed, from which the products of combustion issue at the rear end thereof and pass through ducts or passage ways (hereinafter called back flues) to and from a series of tubes disposed on one or both sides of the furnace, and arranged horizontally and parallel with the axis of the furnace.

My herein described invention consists in an improved construction of said back flues between the rear end of the furnace and said laterally situated tubes, by providing said back flues with an improved form of tube plate, whereby the ends of the tubes leading into said back flues are so mounted upon the exterior of said tube plate, that their jointing therewith is smoke tight without requiring the ends of the tubes to be projected into the interior of the back flues and being fitted with caps as formerly, so that access is not required to the interior of said back flues and a fixed metal cover plate is then employed on the opposite side of the back flues which faces the tube plates whereby the necessity for the large hinged doors previously employed is avoided. The exterior surface of this cover plate may be corrugated or have gills or projecting ribs on its external surface to increase its air heating capacity while at same time the dusty ashes which are deposited in the back flues or the soot pushed therein when the tubes are brushed from the front end of the stove, can be more conveniently removed therefrom, and my improvement further consists in the employment of plates between the horizontal tubes at the sides of the furnace, to guide the air towards the top of the central furnace and to check the direct radiation of heat therefrom to the casing inclosing the stove.

I will describe my invention with reference to the accompanying drawings which show the improvements applied to the stove described in my said previous specification.

Figure 1 shows my improved air heating stove as a sectional view through the smoke tubes and half of the furnace on left hand side of the drawing; and as a front

elevation on the right hand side. Fig. 2 is a horizontal section of Fig. 1 above the level of the furnace fire-bars; Fig. 3 is a vertical section of Fig. 2 through the smoke tubes showing the cleaning doors in the back flues; Figs. 4 and 5, are sectional views showing respectively the inner and outer ends of the tubes; Fig. 6 is a front elevation of one of the tube retaining caps; Fig. 7 is a side elevation thereof; Fig. 8 is a section of a modified form of tube.

The letters used to indicate the various parts are the same in each figure.

In carrying my invention into effect I construct the back flues C C' with a permanently fixed metal cover plate such as B the body of which may be corrugated or have gills B' on the outer side thereof to increase its air heating surface. These fixed metal cover plates B are employed in lieu of the large hinged doors shown in my previous specification all requirement for which is now obviated by the employment of the hereinafter described improved tube plate which faces said cover plate. This tube plate is marked D and I now construct around the tube holes D' cylindrical flanges D² of somewhat larger diameter than the tube holes D' and projecting therefrom towards the front of the stove, and the ends of the tubes F are inserted through the flange D² and into the tube holes D' (see detail views, Figs. 4 to 7,) and I construct this end of the tubes with a shoulder, preferably in the form of a band or collar such as F³ around the exterior surface at a distance back from the extreme point thereof equivalent to about one-half of the depth of the flange, into which said collar fits, and to make the joint smoke tight, I lap asbestos cord or other suitable substance around the inner end of the tube and in front of said collar, so that when the end of the tube is projected into the flange, said asbestos cord gets squeezed up as a packing between said collar and the rim D³ of the tube hole at the inner end of the flange. When the end is constructed as described the opposite end L of the tube F where it is fitted into the front tube plate is constructed of larger diameter than the body of the tube, so that its outside diameter is the same as or larger than that of the above described collars F³ at the other end, and the holes in the front tube plate O through which the outer ends of the tube project, I make of just sufficient diameter to let the collar F³ of the inner end and the enlarged outer end L of the tubes pass through the tube holes in the front tube plate and so that the tube substantially fills these holes, whereby the insertion or withdrawal of said tubes can be effected from the front of the furnace by passing them bodily (inner end first) through these front tube holes. To connect the projecting outer ends of the tubes to the front tube

plate and to render the joint smoke tight I apply thereon the movable caps L^2 such as shown and described in my previous specification of 1896 or use other suitable means for this purpose.

- 5 Instead of making the tubes with an enlargement at the front end the shoulder F^3 may be provided by employing a tube such as shown in Fig. 8, the main part of the tube being of equal diameter as at F^4 while the inner end which is to fit within the flange is reduced to form a shoulder F^3 . The construction shown in Figs. 1 to 7 however provides more space between the tubes when they are placed close together.

- Referring now to the means for facilitating the removal of dust and soot from the back flues, I locate the doorway openings G G at the floor level or base of both the upper and lower compartments C C' forming said back flues, at the ends thereof which are furthest from the central furnace, and I project the frames P for said doorways out through the inclosing casing K of the stove whereby said dust or soot can be removed through said door-way openings G by a scraper and delivered into a bucket or suitable receiver in a cleanly and convenient manner.

- For the purpose of preventing and checking excessive radiation of heat from the furnace and tubes to the inclosing casing, I provide guide plates or baffles disposed in the midst of the group of tubes. One such arrangement of guide plates is shown at M M in Fig. 1. These guide plates M M are suitably supported, for instance they may be hung on the tubes by hooks such as M' or by any other suitable device and hang vertically or at an inclination between the rows of lower tubes so as to lead or deflect the main flow of air against or towards the hot side walls of the furnace, and as it is desirable that an air space should exist between each of the said plates and the tubes between which it hangs, suitable means are provided to keep the plate about midway in the space in which it hangs between said rows of tubes. For instance ribs such as M^2 may be provided on one or both sides of sufficient depth to keep the plates in the required position.

What I claim and desire to secure by Letters Patent is:—

1. In stoves and apparatus for heating air the combination of an inclosed furnace, groups of horizontal tubes at the side of said furnace, laterally extending back flues at the rear end of said furnace, fixed tube plates forming the forward walls of said flues with externally projecting cylindrical flanges around the tube holes therein, fixed rear walls to said flues having heat radiating gills on the exterior, cleaning doors disposed at the end of said flues, flues leading from said laterally extending flues to the chimney, substantially as set forth.

2. In stoves and apparatus for heating air the combination of an inclosed furnace, laterally extending back flues at the rear end of said furnace, fixed tube plates forming the forward walls of said back flues, externally projecting cylindrical flanges around the tube holes in said back tube plate, horizontal tubes having their rear ends of smaller diameter than the front ends of the tubes, shoulders upon the rear ends of said tubes said shoulders being adapted to enter within the flanges around the tube holes in the back tube plates, fixed rear walls to said back flues having radiating gills on the exterior, cleaning doors disposed at the ends of said flues, laterally extending front flues at the front ends of said horizontal tubes, tube plates forming the rear walls of said front flues, substantially as set forth.

3. In stoves and apparatus for heating air the combination of an inclosed furnace, laterally extending back flues at the rear end of said furnace, cleaning doors disposed at the end of said flues, fixed back plates to said flues with heat radiating gills on their exterior surface, a back tube plate forming the front of said back flues, flanges around the tube holes in said back tube plate, said flanges extending towards the front of the stove, tubes having shoulders at their rear ends fitting within said flanges and packings disposed around the tubes within said flanges, an enlargement at the front end of each tube of a size at least equal to said shoulders on the rear end, a front tube plate having holes for receiving the enlargements at the front ends of the tubes, means for securing the front ends of said tubes, and flues for conveying the products of combustion from said tubes to the chimney, an inclosing casing to said apparatus.

4. In an air heating stove or apparatus the combination with groups of smoke tubes disposed at the side of an inclosed furnace and an inclosing casing forming a chamber by which air to be heated is led around and amongst the group of tubes, of deflecting plates disposed in the midst of the groups of tubes and so arranged as to deflect the air towards the exterior of the side walls of the furnace and to interrupt the radiation of heat substantially as set forth.

5. In an air heating stove or apparatus the combination with groups of smoke tubes disposed at the side of an inclosed furnace and an inclosing casing forming a chamber by which air to be heated is led around and amongst the group of tubes, of deflecting plates disposed in the midst of the groups of tubes and so arranged as to deflect the air towards the exterior of the side walls of the furnace and to interrupt the radiation of heat substantially as set forth, spacing ribs on the deflecting plates and hooks for suspending said plates from the tubes.

6. A stove or apparatus for heating air, having in combination a series of tubes, front and rear plates to which the ends of the tubes are connected, said rear plate having a series of holes into which the ends of the tubes extend, and said tubes having shoulders surrounding said holes, and packings compressed between such shoulders and said rear plate, and said front plate having holes of sufficient diameter to permit the shouldered ends of said tubes to pass therethrough, and means connected with said front plate for holding said tubes in place with said packings compressed, whereby said tubes can be inserted or removed through said front plate.

7. A stove or apparatus for heating air, having in combination a series of tubes, front and rear plates to which the ends of the tubes are connected, said rear plate having a series of holes into which the ends of the tubes extend, and flanges surrounding said tubes, and said tubes having shoulders surrounding said holes and fitting in said flanges, and packings compressed between such shoulders and said rear plate, and said front plate having holes of sufficient diameter to permit the shouldered ends of said tubes to pass therethrough, and means connected with said front plate for holding said tubes in place with said packings compressed, whereby said tubes can be inserted or removed through said front plate.

8. A stove or apparatus for heating air, having in combination a series of tubes, front and rear plates to which the ends of the tubes are connected, said rear plate having a series of holes into which the ends of the tubes extend, and flanges surrounding said tubes, and said tubes having shoulders surrounding said holes and fitting in said flanges, and packings compressed between such shoulders and said rear plate, and said front plate having holes of sufficient diameter to permit the shouldered ends of said tubes to pass therethrough, and means connected with said front plate for holding said tubes in place with said packings compressed, said means comprising annular caps adapted to engage said tubes and to be fixed to said front plate.

9. In a stove or apparatus for heating air the combination with a central inclosed furnace and back and front

5 flues disposed laterally of said furnace, of horizontal tubes connecting the said back and front flues, flanges formed on the tube plate of the back flues and made of larger diameter than the holes in the said tube plate, collars on the rear ends of the tubes adapted to fit within said flanges with compressible packings between the collars and the tube plate, an enlargement in the front end of each tube at least as large in diameter as the collar upon the rear end, the front tube plate being formed

with holes corresponding to said enlargements and means 10 for securing the front end of the tubes in position, substantially as set forth.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses:

SAMUEL CLELAND DAVIDSON.

Witnesses:

JOHN CLENNER,
SAMUEL WOOD.