June 19, 1923. 1,459,649

J. S. ANDREWS

COMBUSTION APPARATUS

Original Filed July 1, 1918 2 Sheets-Sheet 1

FIG. 1.

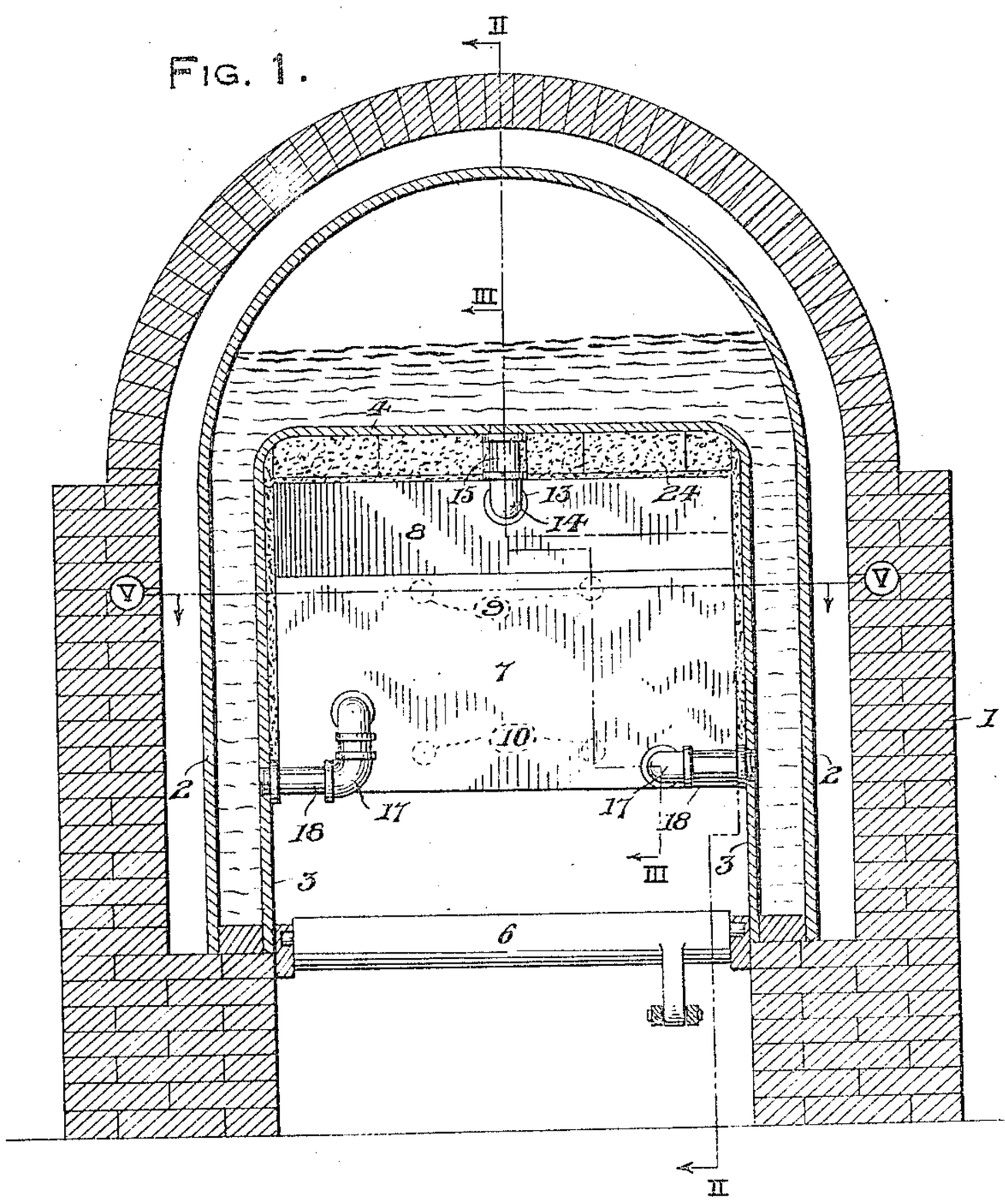

FIG. 4.

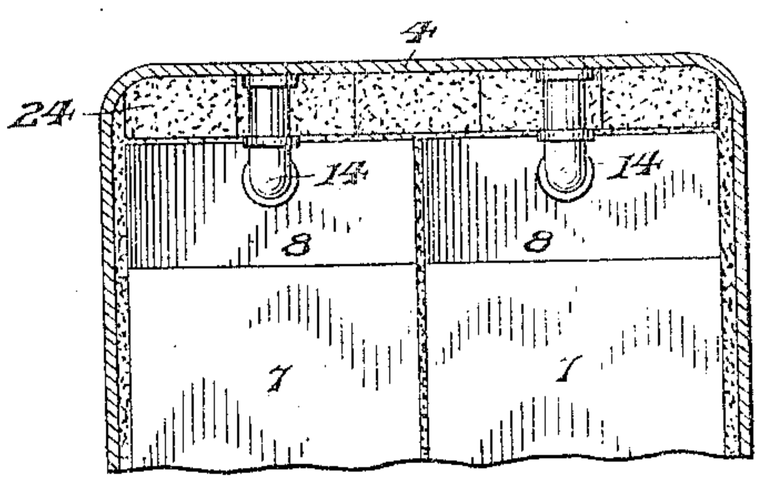

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FIG. 2.

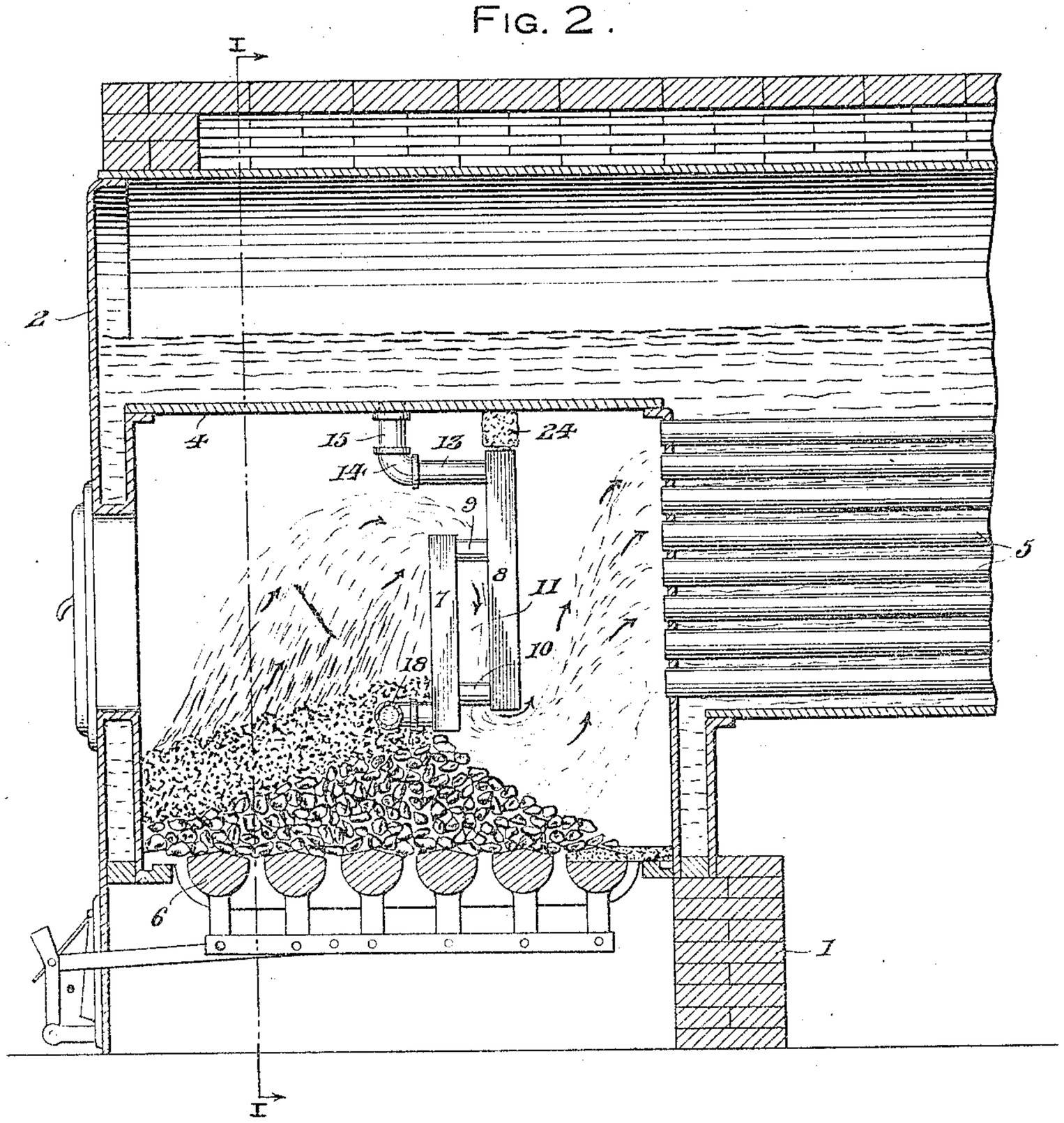


FIG. 5.

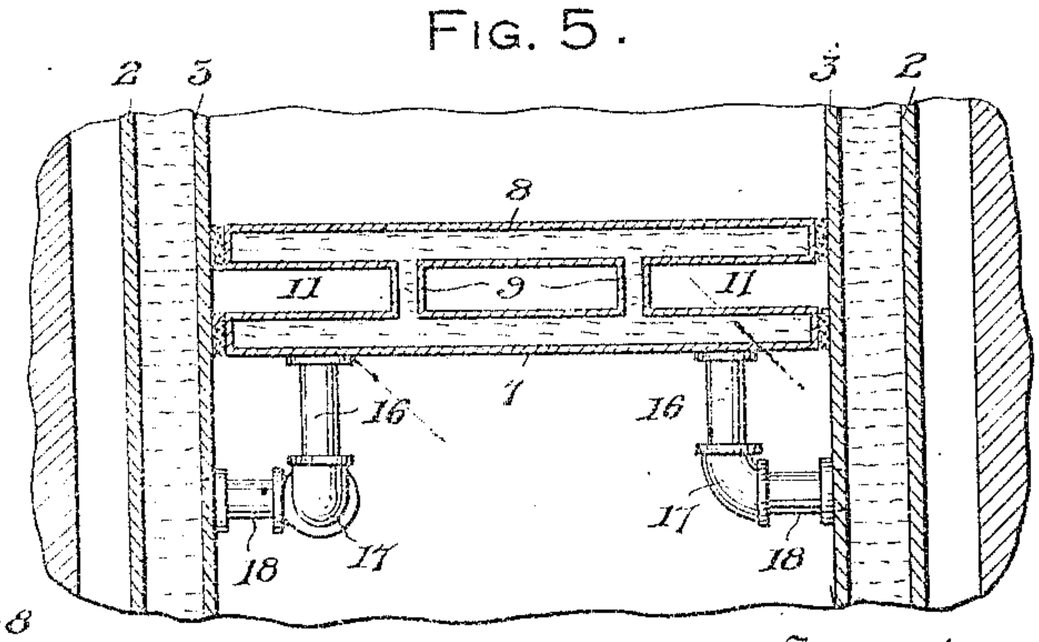
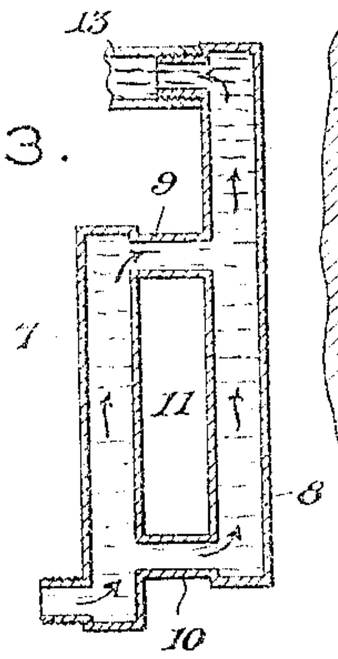


FIG. 3.



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UNITED STATES PATENT OFFICE.

JOHN S. ANDREWS, OF GARY, INDIANA.

COMBUSTION APPARATUS.

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To all whom it may concern:

Be it known that I, JOHN S. ANDREWS, a citizen of the United States, residing at the city of Gary, in the county of Lake and State of Indiana, have invented certain new and useful Improvements in Combustion Apparatus, of which the following is a specification.

My invention relates to the combustion of fuel in the furnaces and fire boxes of boilers and particularly to the use of high volatile coals therein. Under ordinary conditions a large portion of the gases and carbon given off at the first application of heat to the coal passes through the apparatus unconsumed and with entire loss of their heat values, and appears at the chimney top as atmospheric polluting smoke and vapor. It is the object of my invention, and in the practice thereof I am able to consume the gases and smoke of common bituminous coal in the furnace thereby greatly increasing their practical efficiency and conserve their entire fuel values. My improvement is simple and readily attached to fire box or tubular boilers whether already used or in process of construction, with the additional advantage of increasing their steaming capacity.

The principles of my invention are illustrated in the drawings in which,

Figure 1 represents a vertical section of a fire box on the line I—I of Fig. 2;

Figure 2 is a vertical section of the same on the line II—II of Fig. 1;

Figure 3 is an enlarged vertical section of my appliance on line III—III of Fig. 1 and illustrates the water circulation therein;

Figure 4 shows another construction of said improvement; and

Figure 5 is a horizontal section on the line V—V of Fig. 1.

Further describing my invention with reference to the drawings in which like characters of reference denote like parts,

1 is a wall upon which is supported a boiler having the shell 2, the fire box with side walls 3—3 and crown sheet 4. Flues 5 lead from the rear portion of the fire box and 6—6 are the grate bars on which the fuel is supported. Transversely of the fire box I place a unitary fire wall dependent over the grate. Said fire walls comprise a hollow front member 7, a hollow rear member 8 and tubular connections 9 and 10 by which the said front and rear members are internally connected and by which they are also spaced from each other to form the downflue 11. Said members are of suitable sheet metal and the constituent parts thereof may be secured together by welding or by riveting in the ordinary manner of boiler construction. The rear member 8 should be somewhat higher than the front member 7 and the top thereof should extend thereabove sufficiently to take the boiler connections 13 and to permit them to pass forwardly over the top of the front member. Said connections may be provided with elbows 14 and nipples 15 by which attachment is made to the crown sheet 4 and thereby interior connection made between the said rear member and the boiler. In like manner the front member 7 is internally connected with the boiler by means of tubular connections 16, elbows 17 and nipples 18 which take into the sides 3 of the fire box. The said connections with other attachments will secure the fire wall in place within the fire box but the exact number, spacing and relation thereof as well as of the tubular spacing pieces 9 and 10 are immaterial and may be varied according to the size of the device and in accordance with the judgment of the maker. It is important to have free circulation of water through the device. This should be borne in mind in arranging such details of construction although the arrangement shown may be found fully effective under all ordinary conditions. The circulation of water therethrough will be substantially as indicated by the arrows in Fig. 3. The burning of the plates, of which the dependent wall is constructed, is thereby prevented while a considerably increased steaming capacity is added to the boiler.

In installing the apparatus, the ends should fit tightly against the sides of the fire box or any spaces therebetween should be closed and sealed against the passage of gases by a fire clay or other refractory material 20. And the top of the rear member should be closed in like manner with reference to the crown sheet. In practice, I prefer to do this by means of fire brick 24 using such luting as may be necessary to make practically gas-tight joints.

In practical use when a fire box is equipped as described with my improvement the fire is built upon the grate bars 6 in the usual manner, so that the fuel forms a bed, the top of which is closely adjacent to the lower edges of the hanging fire wall formed

as above described. When additional fuel is added it will cover the space between such wall and the door. As the smoke and the free gases of combustion are given off, they pass upwardly and between the crown sheet and the top of the front member of the depending fire wall, and thence through the downflue between the two members as indicated by the arrows, thereby coming in contact with the surface of the heated coal body where they are completely consumed. As the combustion proceeds and the fuel is more or less coked, it will fall forwardly into the more highly heated area under and beyond the said hanging wall, which action should be aided in the process of firing, thereby maintaining the bright fire and the high heat of that section of the fire box. Space is thus afforded into which additional quantities of fresh fuel are supplied from time to time as needed, where it is coked and the distilled gases are given off to be passed to the front of the fire box as hereinbefore explained.

I have described my invention with reference to a fire boiler, and I have illustrated the two members forming the arch or fire wall as constructed in one piece as shown in Fig. 1, or in two pieces as shown in Fig. 4. Which particular form is used will depend on convenience of installation. In most cases it is possible to use unitary members. But whether made in one or more sections the principle of operation is the same; each member is to be considered as a unit and such constructions are to be held equivalent and so understood throughout the specification and claims.

It is also evident that my improvements may be applied to different forms of boilers as well as to new ones in course of construction, so that the form, connections and means of attachment may be greatly varied according to the necessities of the particular case without departing from the essential principles involved.

What I claim as new is:—

1. A furnace structure having a boiler, fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall including a hollow front wall member and a hollow rear wall member directly interiorly connected together and spaced from each other to form a down draft passageway therebetween and separate means interiorly connecting each of said hollow wall members directly with the interior of the boiler.

2. A furnace structure having a boiler, fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall including a hollow front wall member and a hollow rear wall member directly interiorly connected together and spaced from each other to form a down draft passageway therebetween, means interiorly connecting one of said members with the upper part of the boiler and means interiorly connecting the other of said wall members with a lower part of the boiler.

3. A furnace structure having a boiler, fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall including a hollow front wall member and a hollow rear wall member directly interiorly connected together and spaced from each other to form a down draft passageway therebetween, means interiorly connecting the rear member with the upper part of the boiler and means interiorly connecting the front wall member with the lower part of the boiler.

4. A furnace structure having a boiler, fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall being in the form of a unitary attachment and comprising a hollow front member and a hollow rear member, tubular devices interiorly connecting said members and spacing them for the establishment of a down flue therebetween, a hollow device making interior connection between the upper part of said rear member and the interior of the boiler, and a tubular device making interior connection between the lower part of said front member and the interior of said boiler.

5. A furnace structure having a boiler, fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber, and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall being in the form of a unitary attachment and comprising a hollow front member and a hollow rear member having its top higher than the top of said front member, tubular devices interiorly connecting said members and spacing them for the establishment of a down flue therebetween, a hollow device making interior connection between the upper part of said rear member and the interior of the boiler, and a tubular device making interior connection between the lower part of said front member and the interior of said boiler.

6. A furnace structure having a boiler,

fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall being in the form of a unitary attachment and comprising a hollow front member, a hollow rear member extended to a greater height than the front member and in closed relation with the top of the fire box, tubular devices interiorly connecting said members and spacing them from each other to form a down flue therebetween, a hollow device making interior connection between the upper part of said rear member and the interior of the boiler, and a tubular device making interior connection between the lower part of said front member and the boiler.

7. A furnace structure having a boiler, fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall being in the form of a unitary attachment and comprising a hollow front member, a hollow rear member, means extended above the top of said rear member to establish the same in closed relation to the top of the fire box, tubular devices interiorly connecting said member and spacing them from each other to form a down flue therebetween, a hollow device making interior connection between the upper part of said rear member and the interior of the boiler, and a tubular device making interior connection between the lower part of said front member and the boiler.

8. A furnace structure having a boiler, fire box, and ash pit, a depending baffle wall structure dividing the fire box into a front firing chamber and a rear combustion chamber and extending downwardly to the normal top level of the fuel, a grate underneath the fire box, said baffle wall being in the form of a unitary attachment and comprising a substantially vertical hollow front member, a substantially vertical hollow rear member extended higher than the front member and in closed relation with the top of the fire box, horizontal tubular devices at the tops and bottoms of said members interiorly connecting the same and spacing them from each other to form a down flue therebetween, a hollow device making interior connection between the upper part of said rear member and the interior of the boiler, and a hollow device making interior connection between the lower part of said front member and a lower part of the boiler.

JOHN S. ANDREWS.