March 11, 1930. J. W. DYAR 1,749,907

FURNACE

Filed April 27, 1925 3 Sheets-Sheet 1

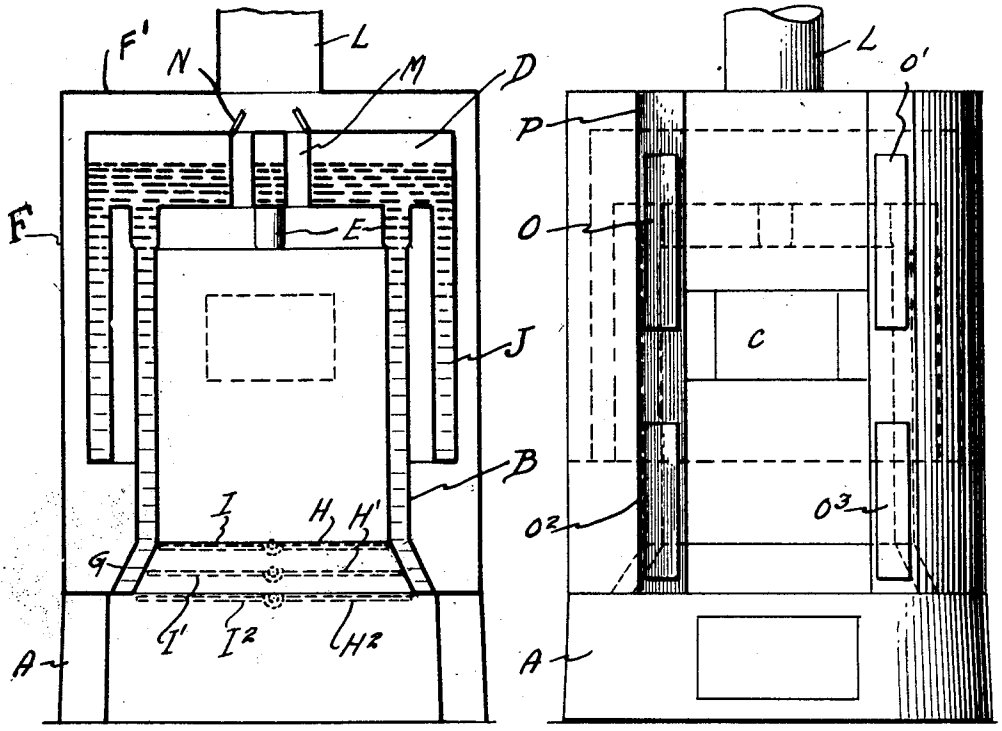


Fig. 3

Fig. 1

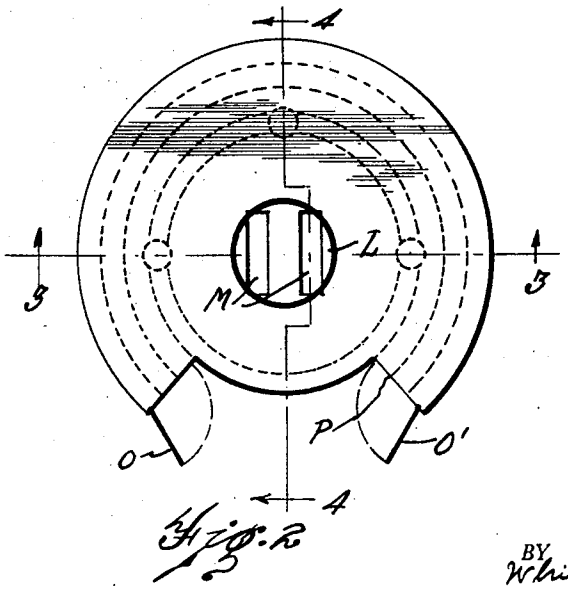


Fig. 2

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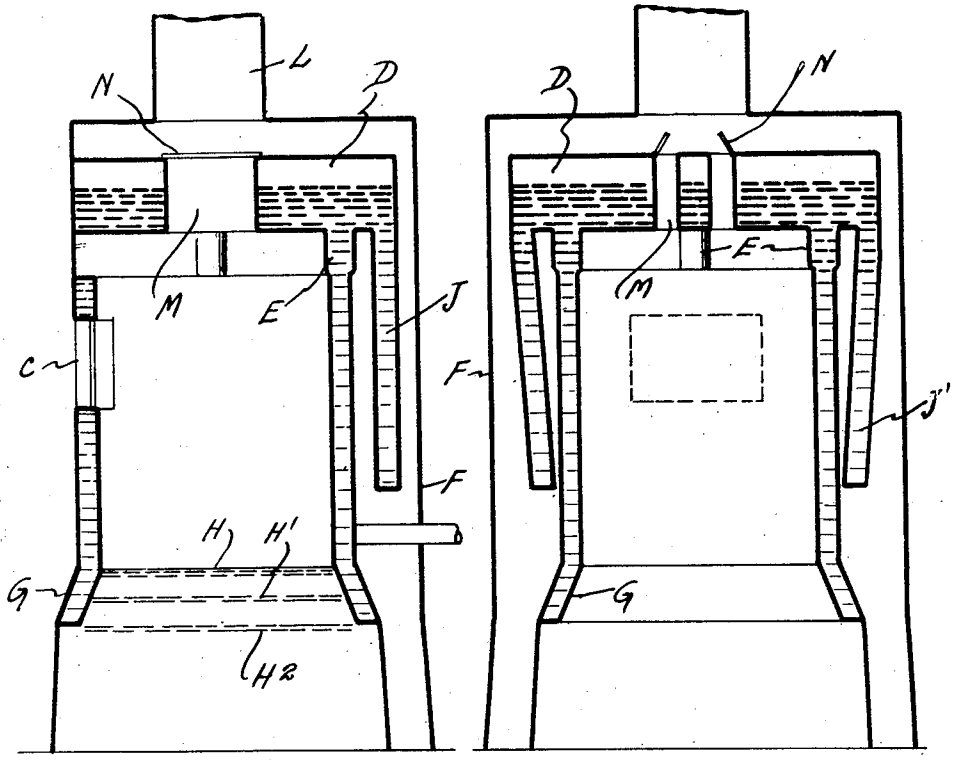


Fig. 4

Fig. 5

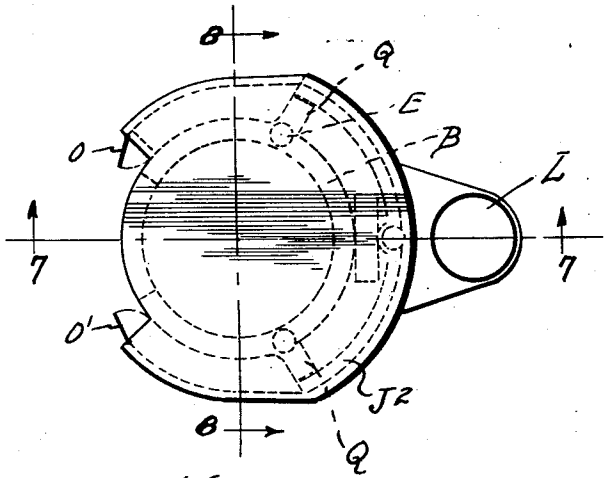


Fig. 6

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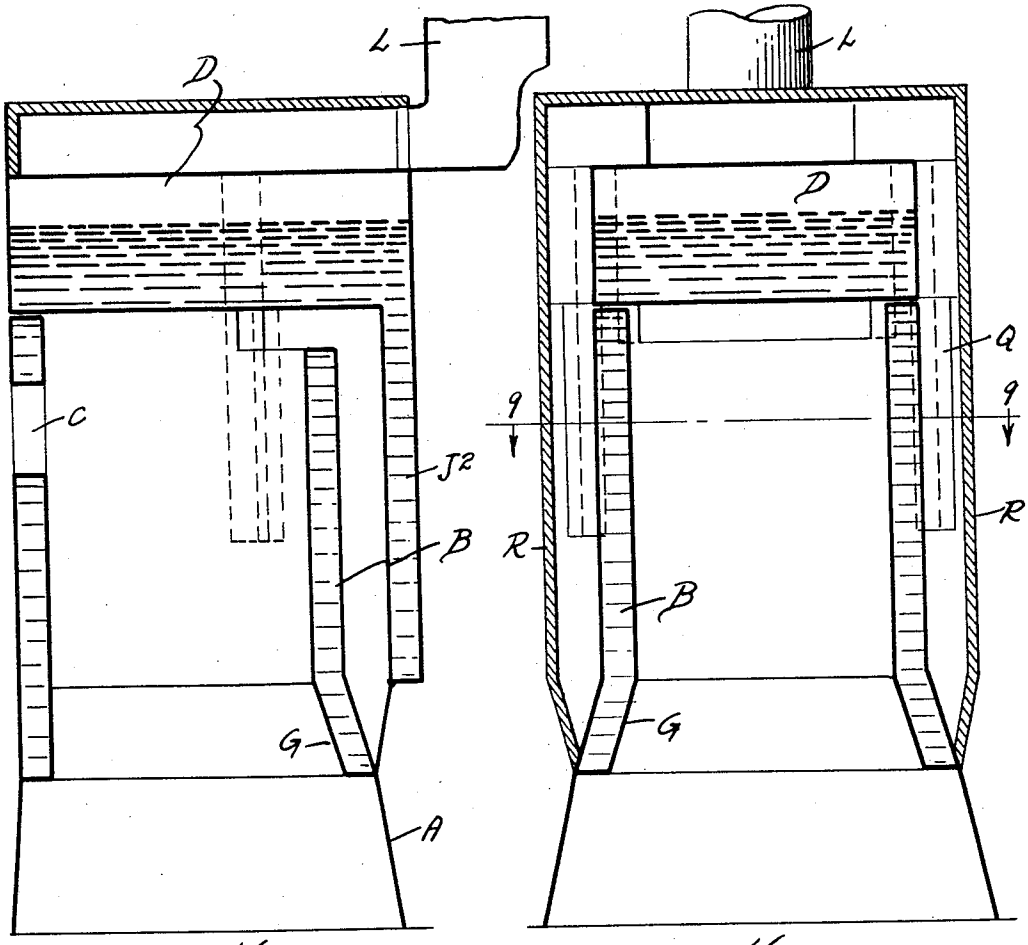


Fig. 7

Fig. 8

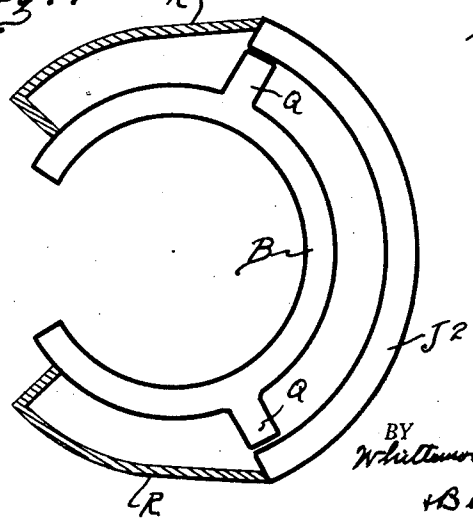


Fig. 9

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Patented Mar. 11, 1930 1,749,907

UNITED STATES PATENT OFFICE

JOHN W. DYAR, OF DETROIT, MICHIGAN

FURNACE

Application filed April 27, 1925. Serial No. 26,238.

The invention relates to hot water or steam boilers for heating plants and consists in various features of construction as hereinafter set forth. In the present state of the art it is usual to manufacture such boiler furnaces in a series of sizes having different grate areas and this usually requires a distinct set of patterns for each grate size. One of the features of my invention is a construction in which the same units may be used for various sizes of the series, thereby simplifying manufacture.

A common type of hot water boiler is one in which an annular section forms the fire pot and combustion chamber, being provided with an opening therethrough for the fire door and having the grate arranged at the base thereof and a steam dome at the top. Another feature of my improvement is a construction in which the steam dome is provided with a depending wall surrounding a portion of the combustion chamber section and compelling the gaseous products of combustion to flow downward between said sections before escaping to the chimney flue. This has the advantage not only of largely increasing the heating surface, but also of controlling the hot gases so as to obtain more uniform heating effects therefrom.

In the drawings:

Figure 1 is a front elevation of a boiler furnace of my improved construction;

Figure 2 is a plan view thereof;

Figure 3 is a longitudinal section on line 3—3 of Figure 2;

Figure 4 is a longitudinal section on line 4—4 of Figure 2;

Figure 5 is a view similar to Figure 3 showing a modified construction;

Figure 6 is a plan view of a modified construction;

Figure 7 is a longitudinal section on the line 7—7 of Figure 6;

Figure 8 is a longitudinal section on the line 8—8 of Figure 6;

Figure 9 is a transverse section on the line 9—9 of Figure 8.

A is an ash pit section of any suitable construction. B is an annular boiler section forming the fire pot and combustion chamber and which is cut away at C for the fire door opening. D is a dome or top section arranged above and spaced from the section B being connected therewith by pressed nipples E or other suitable connecting means. F is an outer jacket surrounding the greater portion of the sections B and D, having a cut away segment in the front for access to the fuel door.

As has been stated, it is usual to form boilers of this type in a series of sizes, each differing from the others in dimensions both longitudinally and radially. Variation in the radial dimension is for the purpose of altering the size of the grate, which should be proportional to the amount of heating surface and the size of the fire pot. With my improved construction I employ a single fire pot unit for several sizes of boiler, but so constructed that it may be used with grates of varying area. This is accomplished by constructing the lower portion of the section B of downwardly and outwardly flaring form and providing means for supporting exchangeable grates at different elevations within this flaring portion. Thus as shown G is the flaring portion at the base of the section B, and H, H′ and H^2 indicate the several planes in which the grates may be placed. Where the grate such as I is located in the plane H, its area is equal to the circular space within the section B. On the other hand, where the grate such as I^2 is placed in the plane H^2 at the lower end of the flaring portion G, its area will be considerably increased, while a grate I′ placed in the plane H′ midway between the planes H and H^2 will have an area in excess of the grate I which is approximately one-half the difference in area between such grate and the grate I^2. It is, therefore, apparent that without changing the section B, three or more different capacities are obtained suitable for different sizes of furnace.

The arrangement of the grates at different elevations as just described will also vary the capacity of the fire pot as the largest grate area will give the greatest depth for the fuel below the fire door. Additional surface will also be provided for the larger size

since more of the water wall B will be exposed to the direct heat from the grate when the latter is in the lower positions.

The gaseous products of combustion, after leaving the combustion chamber, are preferably directed downward within the surrounding jacket before escaping to the chimney flue. This produces a further transference of heat from the gases to the outer walls of the annular section, but there is a tendency for such gases to take the most direct path to the escape flue and not to impinge equally against all portions of the outer boiler wall. I have therefore provided intermediate the annular boiler B and the outer jacket F a water wall J, which depends from and is preferably integral with the dome of the upper section D. This wall J may extend around the greater part of the section B having merely a sufficient segment cut away for access to the fire door. This will cause the gases which pass outward from the upper end of the section B to descend between said section and the depending wall J until finally passing beneath the lower end of the latter they will again ascend in the space between said wall and the outer jacket F. They can then be conducted inward over the top of the dome D between the same and the top wall F' of the jacket, finally escaping into the centrally arranged chimney pipe L. It is obvious that the gases must be forced downward in the space between the sections B and J against the natural tendency of hot gases to rise. This has the effect of equally distributing such hot gases around all portions of the heating surface so as to obtain the maximum heating effect.

After passing beneath the lower edge of the depending water wall J the hot gases are free to ascend along the outer surface of said wall and between the same and the jacket F. There is always a tendency for rising hot gases to seek the path of least resistance, which is the hotest part of the gaseous column. Therefore, there is frequently a layer of cooler gases adjacent to the water wall which is in a more or less static condition. To avoid such an effect I may use the modified construction shown in Figure 5, in which the depending water wall J' instead of being arranged parallel to the section B is flared outward from its lower to its upper end. With such construction the outer surface of the wall J' is inclined across the path of the rising gases so that the tendency is to force such gases inward against the surface of the metal. On the other hand, the inner surface of the wall will have the hot gases forced into contact therewith on account of the downward direction of flow.

For starting the fire or stimulating it at any time it is desirable to have a direct draft and to this end I have provided through the section D one or more direct draft apertures M. These are preferably arranged centrally or in direct line with the pipe L and are normally closed by dampers N. When, however, such dampers are open, the gases can pass directly from the combustion chamber to the chimney without following the indirect route around the water wall J.

As has been stated, the jacket F and water wall J are cut away at the front of the furnace to provide access to the fire doors. This also facilitates the placing of clean-out doors through which access may be obtained to the spaces between the sections B and J and between the latter and the jacket F. Thus, as shown the doors O, O', O^2, O^3 may be placed in the oblique walls P which form the ends of the segments. When such doors are open, a cleaning brush or scraper may be readily introduced into either the space between the sections B and J or between the section J and the jacket F, thereby removing any accumulation of soot or ash.

For smaller units it may be desirable to simplify the construction by omitting the outer jacket F. Where this is done, instead of extending the water wall J completely around the section B, with the exception of the cut-out for the fire door, I extend such wall through only a portion of this distance. The remaining portion or portions of the segment may be then utilized for the up-draft, being enclosed by a complementary segmental jacket section. As shown in Figures 6 to 9, the depending water wall J^2 extends something less than one-half the circumference of the section B and has its ends opposite outwardly extending ribs Q on the section B. These ribs separate the space between the water wall J^2 and section B from that opposite the remaining portion of said section B, which as shown is enclosed by segmental jacket sections R. While this construction is not as efficient as the construction previously described, it is simpler and cheaper to build and will serve the purpose particularly for small units.

With all of the various modifications described I utilize the down-draft flue for uniformly distributing the hot combustion gases and for forcing them into contact with both the inner boiler section and the depending water wall. I have also provided a simple method of obtaining a series of different sizes of boilers, utilizing the same main section but varying the fire pot capacity and also the amount of grate area.

What I claim as my invention is:—

1. In a boiler furnace, the combination with a boiler section forming the fire pot and combustion chamber, of a downwardly flaring portion at the lower end of said section, and means for supporting grates of different areas at different elevations within said flaring portion.

2. In a boiler furnace, the combination with

a boiler section forming a fire pot and combustion chamber, of a downwardly and outwardly flaring extension of said section and means for selectively supporting grates of different area at different elevations within said flaring extension.

3. In a boiler furnace, the combination with a boiler section forming the fire pot and combustion chamber, of a top section extending across the space within said annular section and radially beyond the same, a water wall depending from the outer edge of said top section surrounding a portion of said annular section and inclined inward thereto forming a down-draft flue contracting towards its lower end, and a jacket surrounding said water wall forming an up-draft flue connecting with said down-draft flue and contracting towards its upper end.

4. In a furnace, the combination with a fire pot unit having a flaring portion, of means for selectively supporting grates of different areas at different elevations within said flaring portion to vary the heating capacity of the furnace.

5. In a furnace, the combination of a fire pot unit having a grate supporting section varying in diameter from one end to the other and provided with means for selectively supporting grates of different areas at different elevations therein.

6. In a furnace, the combination of a fire pot unit having a flaring extension, and means for selectively supporting grates of different areas at different elevations within said flaring extension.

7. In a boiler furnace, the combination with a boiler section forming the fire pot and combustion chamber, of a top section extending across the space within said first-mentioned section and radially beyond the same, a water wall depending from said top section and surrounding a portion of said boiler section in spaced relation thereto forming a down-draft flue contracting towards its lower end, and a jacket surrounding said water wall forming an up-draft flue and contracting towards its upper end.

In testimony whereof I affix my signature.

JOHN W. DYAR.