

W. MANHIRE.
FURNACE.
APPLICATION FILED MAR. 23, 1910.

Patented July 4, 1911.
3 SHEETS-SHEET 1.

996,868.

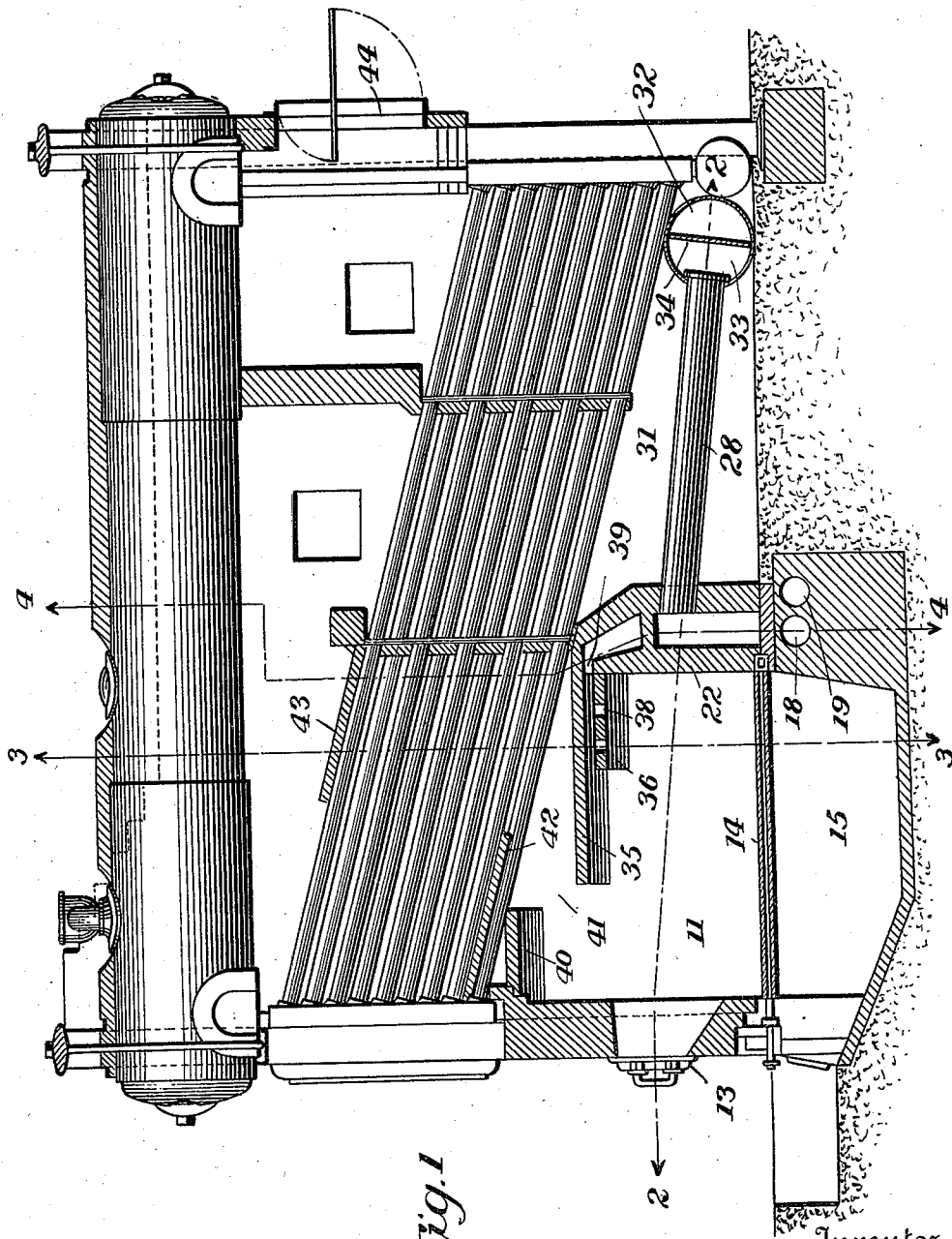


Fig. 1

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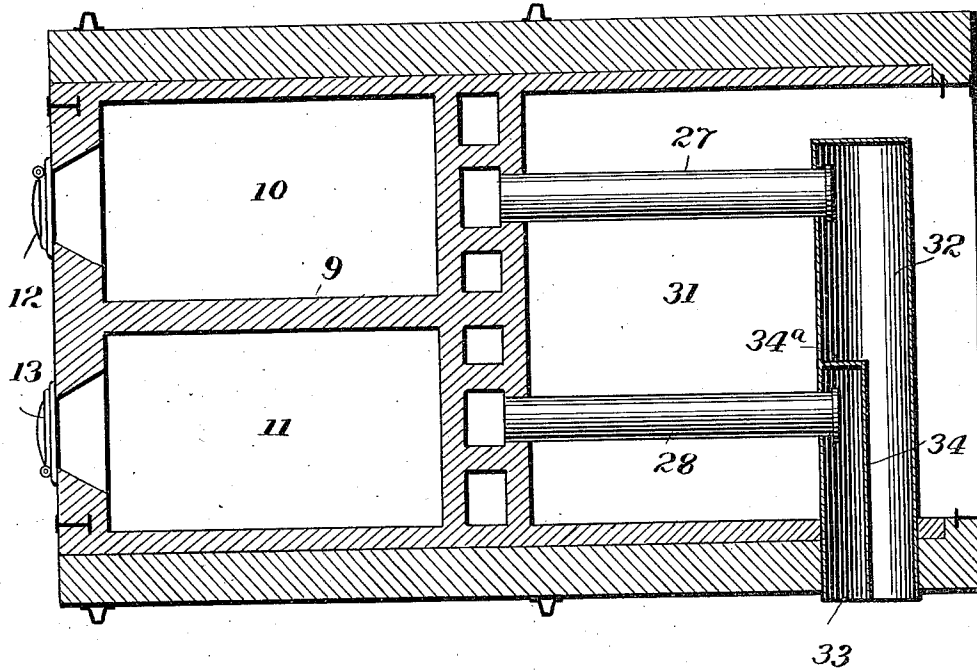
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3 SHEETS—SHEET 2.

Fig. 2



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3 SHEETS—SHEET 3.

Fig. 3.

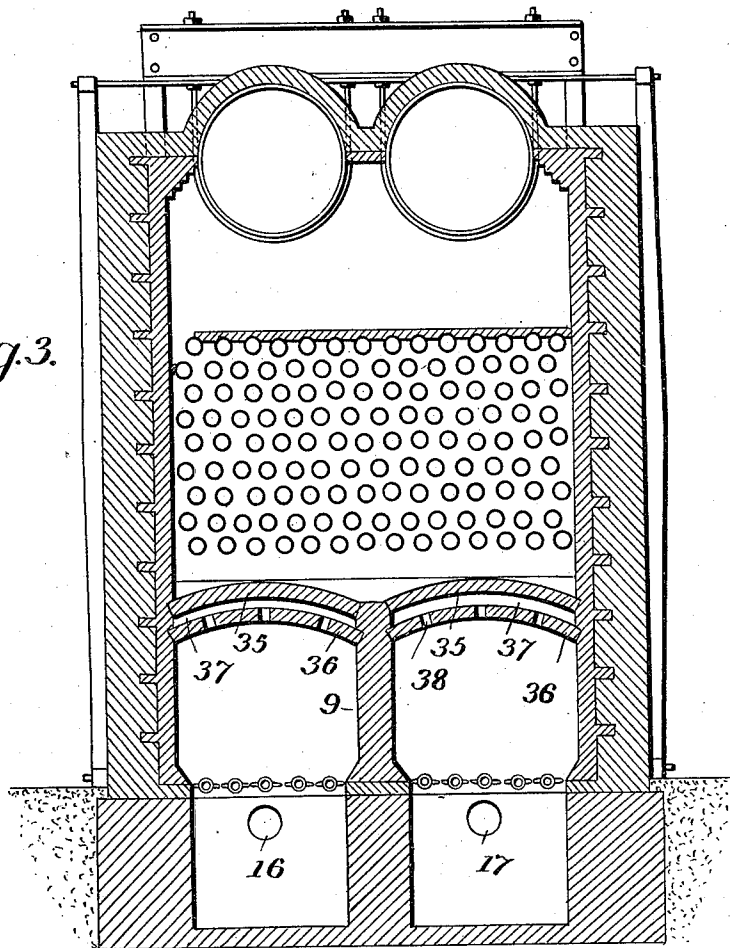
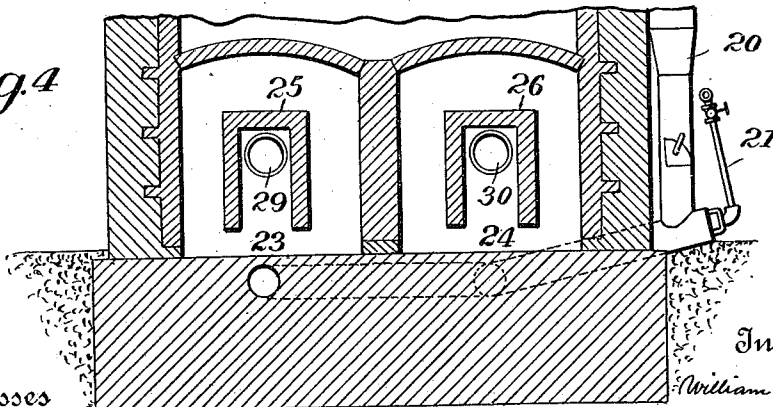


Fig. 4.



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UNITED STATES PATENT OFFICE.

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FURNACE.

996,868.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM MANHIRE, a citizen of the United States, and resident of Denver, county of Denver, State of Colorado, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to furnaces.

One of the objects of this invention is to construct a furnace in which it is insured that the combustion of the fuel will be complete.

The furnace is especially adapted for use with lignite or other high volatile coals, which give off large volumes of gases at a comparatively low temperature.

The object is to supply the gases as fast as generated with such a supply of highly heated air as will insure complete combustion of the gases and the prevention of smoke.

Further objects will appear from the detail description.

The invention will be described in connection with the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through the furnace; Fig. 2 is a section on the line 2—2 Fig. 1; Fig. 3 is a section on the line 3—3 Fig. 1; and Fig. 4 is a section on the line 4—4 Fig. 1.

In this particular embodiment of the invention the furnace is shown as applied to a steam generator, but the invention may be applied to other types of furnaces and for other uses, viz., for roasting ore, etc. It is, therefore, to be understood that this invention is not to be limited to any particular embodiment.

The furnace walls are as usual constructed of masonry and lined with fire brick, which are bonded with the masonry.

A division wall 9 runs from the front toward the back forming a pair of fire chambers 10 and 11 provided with fire doors 12 and 13 respectively. The fire chambers are provided with water cooled grates 14 which divide the fire chamber from the ash pit 15. The air is admitted to the ash pit through apertures 16 and 17, and where forced draft is used the air is forced in through pipes 18 and 19 which are connect-

ed to an air stack 20, the air being forced in by means of the usual steam apparatus 21.

A bridge 22 extends across the furnace chamber. This bridge has formed therein cavities 23 and 24, which are provided with inverted U-shaped partitions 25 and 26. Pipes 27 and 28, which are located in the combustion chamber 31, open into the cavities 23 and 24 at 29 and 30 near the upper ends of U-shaped partitions. The other ends of the pipes are connected to and open into a drum 32, which has an air inlet 33. The drum 32 is divided into two sections by means of partitions 34 and 34^a. The pipes 27 and 28 and the drum 32 are constructed of metal.

Each of the fire chambers 10 and 11 is provided with a pair of spaced arches 35 and 36, which extend from the bridge and over the grate. These arches are supported by the side walls of the furnace and the wall 9 in the manner shown in Fig. 3. The upper arch 35 extends beyond the lower arch, and the lower arch 36 has apertures 38 formed therein communicating with the space 37 formed between the arches. The cavities in the bridge are connected with the rear part of the spaces 37 by means of passages 39. The front wall of the furnace has extending therefrom an arch 40, which is located above the arch 35 and forms therewith a throat 41 for the passage of the gases. A plurality of baffle plates 42 and 43 deflect and direct the gases along the boiler tubes, the gases being discharged into the stack 44.

The hot gases passing through the throat 41 will cause air to be drawn through the open spaces 37, the cavities 23 and 24, the pipes 27 and 28 and the drum 32. The air, in its passage through the drum and pipes which are located in the combustion chamber, will be heated by the burning gases, and the heated air will be discharged into the portions of the cavities in the bridge inclosed by the U-shaped partitions 25 and 26. The air will pass downwardly and then upwardly around the partitions so that it will come in contact with the heated surfaces of the brick work. This heated air will be discharged into the spaces 37 between the arches. The highly heated air in passing through the spaces 37 will cause the

gases from the fire to be drawn in through the apertures 38 by induced action. This will cause the gases to be thoroughly mixed with a highly heated air so that chemical
 5 union between the air and gases will take place more readily. The mixture of the highly heated air and the gases in the spaces 37 will be discharged below and along the arch 35, and as the flame from the fire will
 10 play against this roof, the mixture will be highly heated so that a chemical union between the air and gases will readily take place. The gases after they leave the arch 35 are deflected against the highly heated
 15 arch 40, and hence through the throat 41 into the combustion chamber. It is, therefore, apparent that in this construction the hot gases from the fire are treated with such an abundant supply of highly heated air as
 20 will cause a complete combustion of the gases. The furnace is so constructed that the secondary air from the bridge is prevented from coming into contact with the combustible gases until a high temperature
 25 is reached. The air is conducted to the point where the greatest combustion takes place. The lower perforated arch prevents the air from being treated to the gases before the air is highly heated itself, in fact, before it
 30 is heated to the temperature of the gases themselves. The admission of the gases through the apertures 38 and the partial combustion taking place in the spaces 37, causes the air to be highly heated. The air
 35 and gases in the heated state will tend to cling to and pass along the lower face of the arch 35, and are there subjected to the flame which plays on the roof.

It is obvious that various changes may be
 40 made in the details of construction without departing from this invention, and it is, therefore, to be understood that this invention is not to be limited to the specific construction shown and described.

45 Having thus described the invention, what is claimed is:

1. In a furnace, the combination with a furnace chamber, a grate therein and a
 50 spaced arches extending from said bridge and over said grate, the upper arch extending beyond said lower arch to permit the flame from the grate to play against the same, and means for supplying air between
 55 said arches.

2. In a furnace, the combination with a furnace chamber, a grate therein and a bridge at the foot of said grate, of a pair of spaced arches extending from said bridge
 60 and over said grate, the upper arch extending beyond said lower arch, the lower arch being perforated, and means for supplying air between said arches, whereby the flame from the grate is adapted to play against the

lower arch and against the extension of the
 65 upper arch beyond the lower arch.

3. In a furnace, the combination with a furnace chamber, of a bridge and a grate therein, a pair of spaced arches extending from said bridge, over the grate, and located
 70 one above the other, the upper arch extending beyond the lower arch, an arch extending forwardly from the front furnace wall and located above said upper arch, and means for supplying air between said first
 75 mentioned arches.

4. In a furnace, the combination with a furnace chamber, of a bridge and a grate therein, a pair of spaced arches extending from said bridge, over the grate, and located
 80 one above the other, the upper arch extending beyond the lower arch, said lower arch being perforated, an arch extending forwardly from the front furnace wall and located above said upper arch, and means
 85 for supplying air between said first mentioned arches.

5. In a furnace, the combination with a furnace chamber, of a bridge therein, a pair of spaced arches extending from said bridge
 90 and constructed to leave a space open at one end, one of said arches being perforated, and the other extending beyond the perforated arch, and means for supplying air to said space, whereby the gases from the furnace
 95 are drawn into said space, mixed with the air, and the mixture discharged along the projecting part of the longer arch and into the furnace.

6. In a furnace, the combination with a
 100 furnace chamber, of a hollow bridge and a grate therein, a pair of spaced arches extending from said bridge and over the grate, said arches being located one above the other, a passage between the cavity in the bridge and
 105 the space between said arches, the forward part of the space opening above the grate, the lower arch being perforated, the upper arch extending beyond the lower arch, and means for supplying air to said bridge
 110 cavity.

7. In a furnace, the combination with a furnace chamber, of a hollow bridge and a grate therein, said bridge having a plurality of separate cavities, a drum in the furnace
 115 chamber having an air inlet, said drum being divided into a plurality of sections, and a plurality of air heating tubes in the furnace chamber connecting separate sections of the drum with the separate cavities
 120 in the bridge.

8. In a furnace, the combination with a pair of fire chambers, of a grate in each chamber, a bridge located rearwardly of said
 125 grates, said bridge having a pair of air heating cavities formed therein, a drum located in the furnace and rearwardly of said bridge, said drum having an outside air inlet, a

longitudinal partition separating the drum into two sections, and a pipe connecting each of said sections with a cavity in said bridge.

9. In a furnace, the combination with a
5 furnace chamber, of a bridge therein, said bridge having a cavity formed therein, an inverted U-shaped partition in said cavity, an inlet opening into the portion of the cavity inclosed by the partition, and an out-

let above the partition, whereby the air is 10 caused to pass downwardly, and upwardly outside of the partition to the outlet.

In testimony whereof I affix my signature in presence of two witnesses.

WM. MANHIRE.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."