2 Sheets—Sheet 1.

H. MASON & E. R. LORING.

Furnace for Steam-Boilers.

No. 217,699. Patented July 22, 1879.

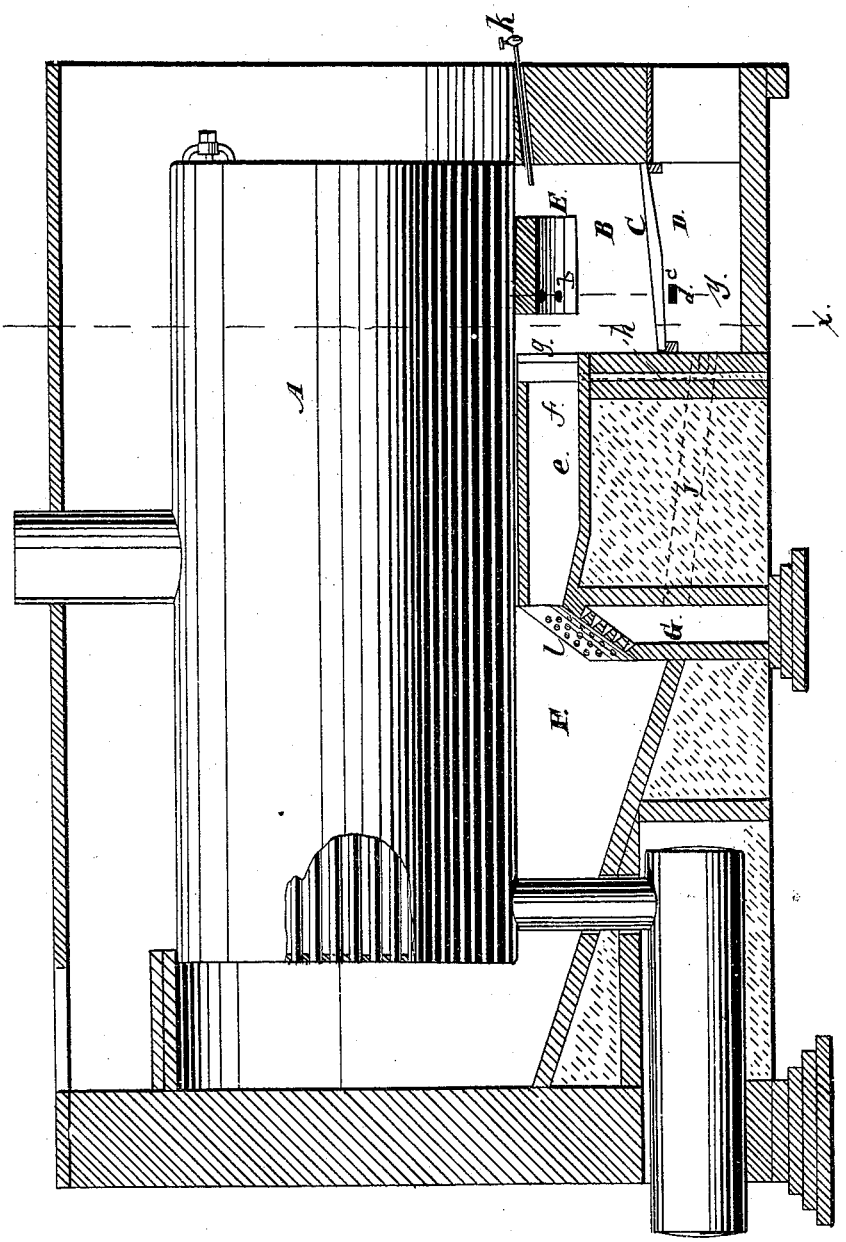

Fig. 1.

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O. W. Bond

Inventors:
Henry Mason
Edward R. Loring

2 Sheets—Sheet 2.

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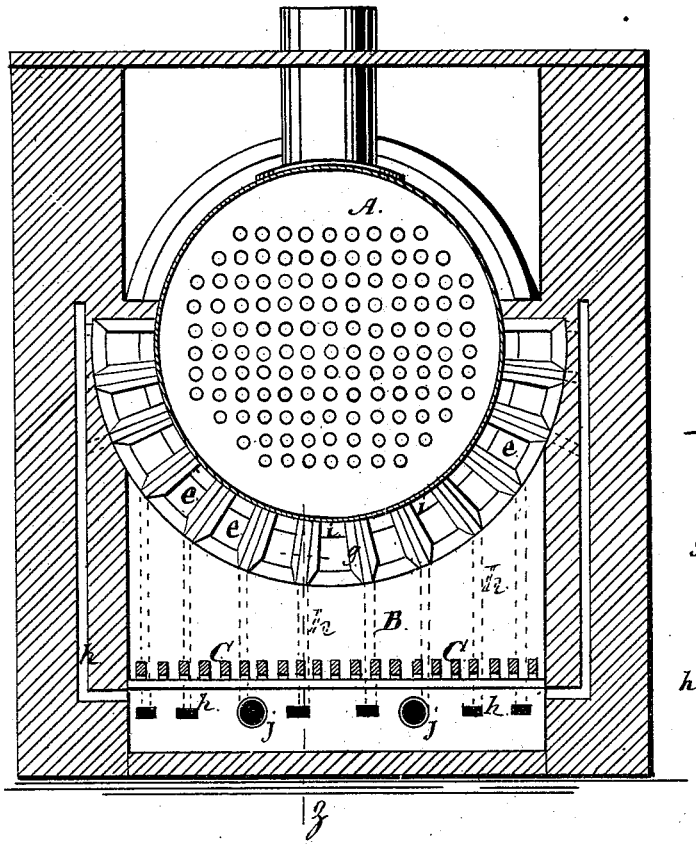

Fig. 2.

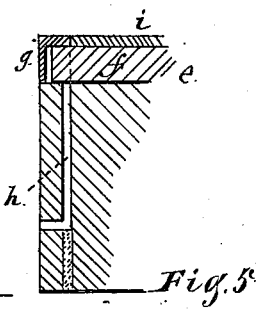

Fig. 5

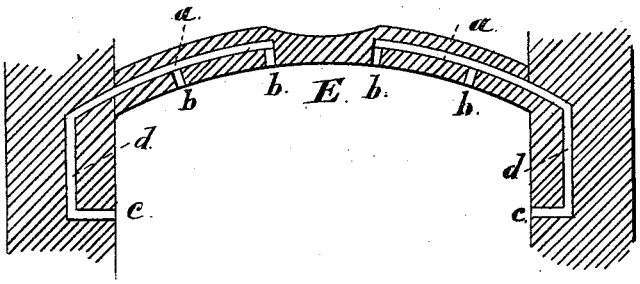

Fig. 3

Fig. 4

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UNITED STATES PATENT OFFICE.

HENRY MASON AND EDWARD R. LORING, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN FURNACES FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **217,699**, dated July 22, 1879; application filed December 18, 1878.

To all whom it may concern:

Be it known that we, HENRY MASON and EDWARD R. LORING, of Chicago, Cook county, State of Illinois, have invented a new and useful Improvement in Furnaces for Steam-Boilers, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section, some parts being shown in elevation. Fig. 2 is a vertical cross-section taken at *x* of Fig. 1. Fig. 3 is a section of the parts shown, taken at *y* of Fig. 1. Fig. 4 is a detail. Fig. 5 is a detail, being a section of the parts shown, taken on line *z* of Fig. 2.

Our invention relates to furnaces used in connection with boilers for generating steam.

Its leading object is to improve combustion without interfering with the efficiency of the heat produced; and it consists in providing a series of passages between the fuel-chamber and the combustion-chamber, as described; in providing air-passages, as set forth; and in the other features and combinations hereinafter claimed.

In the drawings, A represents a steam-boiler. B is the fuel-chamber of the furnace; C, grate-bars; D, the ash-pit. E is a radiating-arch over a portion of the fuel-chamber. It is provided with one or more air-passages, *a*, opening through passages *b* into the fuel-chamber above the fire, air being admitted into the passage *a* from the ash-pit at *c* and through a passage, *d*, which is, in fact, a continuation of *a*.

F is a combustion-chamber under the rear end of the boiler. *e* are a series of passages, which are located around the lower half of the boiler and between the fuel-chamber B and the flame-chamber F. These passages are in close proximity to the boiler, so that heat will be radiated from them to the boiler. The bottoms of these passages may be made of fire-brick; but the sides and tops thereof we make from terra-cotta, preferably using porous terra-cotta. We use this material for these parts because the heat in these passages is very intense, and terra-cotta is not as readily affected by heat as fire-brick.

f, Fig. 4, is a tile, which forms a partition or wall between two of the passages *e*. *g* are caps over the front ends, but not in contact with the front ends of the tiles *f*, there being a space between the tile and cap for the passage of air into the passages *e* from the ash-pit or other suitable place.

h are air-passages leading from the rear of the ash-pit, as shown, to the caps *g*, from which the air passes on each side of the tiles into the passages *e*. The tops *i* of these passages *e* are also made of tiles, which rest on the tiles or walls *f*, their front ends coming in close contact with the caps *g*, all the joints being closed with fire-clay. The caps *g* are closed on the top. Beneath these passages *e* are brick-work and earth, or other suitable filling, suitable provision being made for the air-passages *h*.

G is an air-chamber, into which air may be admitted from the ash-pit through tubes or passages *j*, which pass through the brick and earth-work beneath the passages *e*. This chamber G is covered with terra-cotta plates *l*, having numerous openings through the same, which admit air from G into the combustion-chamber F.

k is a pipe, through which a steam-jet may be introduced into the fuel-chamber; or an air-jet may be used.

The remaining parts are similar to corresponding parts now in use.

In use, the flame from the fuel-chamber B, together with the unconsumed gases, smoke, &c., pass into the passages *e*, where they mingle with air, which passes into such passages *e* through the air-passages *h*, and a portion of such gases and other combustible matters are consumed in the passages *e*, producing a very intense heat, and after a short time the walls of these passages *e* become exceedingly hot. All the gases and other combustible material will not be consumed in *e*, but will become intensely hot while passing through these passages *e*, and in a condition suitable to produce combustion when mingled with a sufficient quantity of air, and, passing into the combustion-chamber F in this highly-heated condition, will there mingle with air flowing into F from the chamber G through the openings in *l*, and will be mostly consumed. Combustion in the fuel-chamber will be aided by the introduction of air through the passages in the radiating-arch E before described.

When fresh fuel is put into the fuel-chamber B the tendency is to lower the temperature; but, the walls of the passages *e* having become intensely hot, heat will be radiated from them into the passages, and the temperature of the gases and other materials which are combustible, which enter these passages in this somewhat cooled condition, will be considerably raised, facilitating combustion. As combustion again becomes more perfect the walls of these passages *e* will be again intensely heated. In practice the temperature of the walls of the passages *e* will remain nearly uniform.

The arch E, the passages *e*, (the bottoms thereof excepted,) the caps *g*, and the plates or tiles over the chamber G are all preferably made of porous terra-cotta fire-tile. We now know of no other material which can be used in place thereof which will not soon be destroyed by the intense heat produced. The arch E and the passages *e*, in addition to other offices, are useful to protect the boilers from cold air when the doors of the furnace are opened.

The caps *g*, located as shown, and being filled with a passing current of air, somewhat protect the fronts of the passages *e;* and if they should be destroyed by heat they can be easily replaced. No bridge-wall is used with these passages *e*, and they protect the boiler at this point from the injurious effect of the gases from the coal without materially interfering with the heating of the boiler.

What we claim as new, and desire to secure by Letters Patent, is as follows:

1. The radiating-arch E, provided with one or more air-passages, *a b c*, located directly over and in combination with the fuel-chamber B, arranged for supplying air in jets to the products of combustion as they enter the passages *e*, substantially as and for the purposes set forth.

2. The passages *e*, located radially around the lower portion of the boiler A, and the air-passages *h*, to admit air into the passages *e*, in combination with the fuel-chamber B and combustion-chamber F, substantially as and for the purposes described.

3. The caps *g*, in combination with passages *e* and air-passages *h*, substantially as and for the purposes specified.

4. The passages *e*, located around the lower part of the boiler and in close proximity thereto, and between the fuel-chamber B and combustion-chamber F, and provided with suitable radiating covers, for the purposes of heating the gases from the fuel and protecting the boiler from the action of the coal-gases at this point without materially interfering with the heating of the boiler, substantially as specified.

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