J. M. W. KITCHEN.

HEATING APPARATUS.

APPLICATION FILED JUNE 20, 1910.

982,432. Patented Jan. 24, 1911.

Fig. 2.

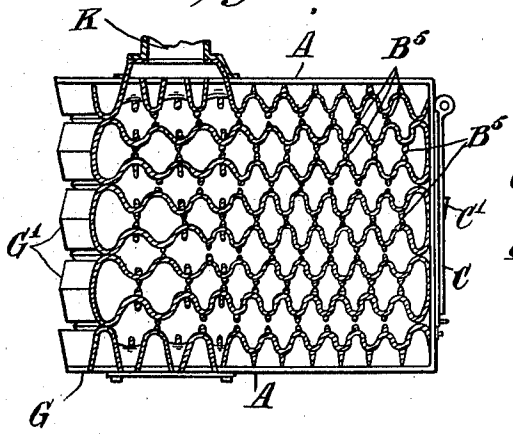


Fig. 3.

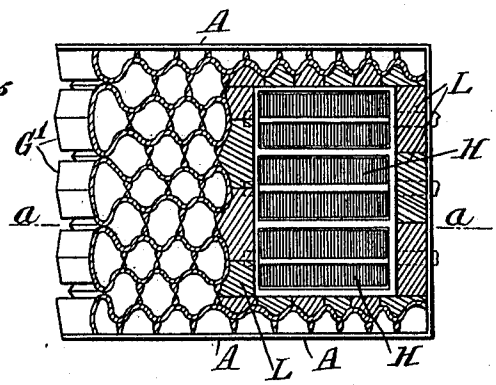
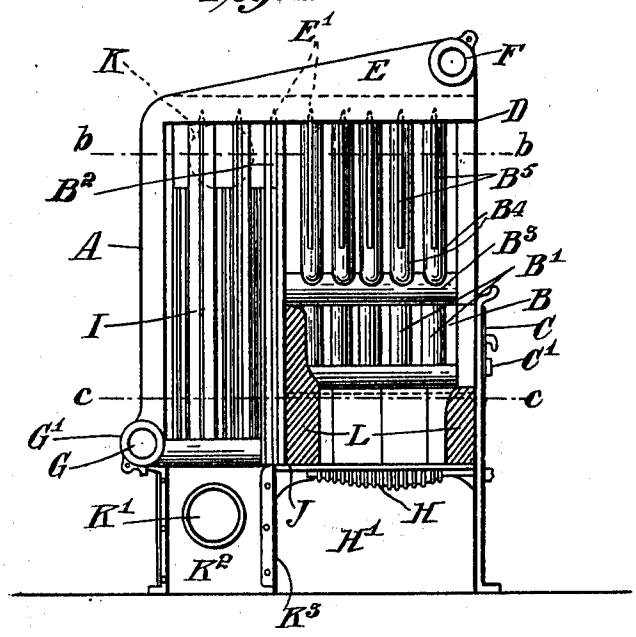


Fig. 1.



Attest:

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UNITED STATES PATENT OFFICE.

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HEATING APPARATUS.

982,432. Specification of Letters Patent. Patented Jan. 24, 1911.

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To all whom it may concern:

Be it known that I, JOSEPH MOSES WARD KITCHEN, a citizen of the United States, residing in the city of East Orange, county of Essex, State of New Jersey, have made new and useful Improvements in Heating Apparatus, of which the following is a specification.

This invention relates to a special type of boiler designed for securing the largest amount of efficiency in a boiler of moderate size and moderate cost to make, and requiring great simplicity in management.

It is designed to secure a relatively perfect combustion of the fuel and a substantially complete transmission of the heat generated to the water in the boiler at a definitely defined rate of combustion.

The principle is adopted in constructing the boiler of securing a combustion of the solid and gaseous fuel before much loss of heat from the gases occurs.

The boiler has a very large amount of heating surface exposed to the direct radiation of the heat from the fuel mass and allows for the carrying out of the principle of the vertical counter-current travel of the heating gases and the water to be heated, applying most of the highest heat of the gases to the highest level of the water containing sections, and providing for the progressive heating of the feed water by the progressively decreasing heat in the exhaust gases.

In the drawings: Figure 1 represents a transverse vertical section of the boiler taken on the line *a*—*a*, Fig. 3. Fig. 2 represents a horizontal section of the boiler taken on the line *b*—*b*, Fig. 1, and Fig. 3 is a horizontal section of the boiler taken on the line *c*—*c*, Fig. 1.

This boiler provides for an extension of the grate surface by applying connected intermediate sections laterally instead of from before backward.

The reference characters in part represent as follows:

A is the boiler.

B is the combustion chamber.

B^1 are tubular corrugations on the side sections.

B^2 is a gas opening.

C is the door.

C^1 is the draft slide.

D is the crown sheet.

E is the water head and steam dome.

F is the water or steam exit.

G is the feed water inlet.

G^1 is a push nipple hub.

H is a grate.

H^1 is the ash pit.

I is the economizer cavity.

J is a structural provision which divides the combustion chamber from the economizer cavity.

K is an upper level smoke exit.

K^1 is a lower level smoke exit.

K^2 is a cavity in the base divided by the partition K^3 from the ash pit H^1.

L are fire-brick lining the fire box of the boiler.

In this boiler provision is made for retaining the heat in the fuel mass in the fire box until after combustion is substantially perfected. Over fuel-mass air for combustion is introduced in front of the boiler immediately above the fuel, and only a very shallow length of grate bars is provided, so that the natural draft will induce by injective influence, the substantial conveyance of the air over the entire surface of the burning fuel mass from its front to its rear. There is provision made for a large amount of direct heating surface at a high level above the fuel mass. The greatest absorption of the heat is at the level of the crown sheet D directly over the fire. The intercommunicating horizontal water conduit B^3 is very narrow, and absorbs comparatively little heat. The vertical water tubes B^4 are somewhat larger in diameter, but still there is plenty of space between the sections for the passage of gases upwardly and for the direct radiation of heat from the fuel mass to the crown sheet. Provision for increased heat transmission at the highest level of the heat absorbing surfaces is gained by the fins or ridges B^5 which are projected into the gas spaces, and by the fins or ridges E^1, which project into the water spaces including those projected from above the crown sheet D as well as from the interior of the tubes D^5.

From the top of the combustion chamber the gases travel backwardly and out of the combustion chamber and from the high level smoke exit K if the fire is being started or forced, but usually the fuel travel of gases is downward through the economizer part I of the apparatus, which is composed entirely of flue surface, the gases passing out

through the low level smoke exit K^1. The feed water being introduced at the lowest level of the economizer part of the boiler travels upwardly and forward in each section, the steam or hot water passing out of the boiler at its highest level.

The absorptive abilities of the boiler are enhanced by providing the corrugated surfaces having fins or ridges extending both into the gas passages and into the water tubes and which are so placed to secure facility in molding and casting in foundry practice.

What I claim as new is:

1. The combination of (1) a vertical sectional boiler comprising connected sections laterally assembled and comprising when assembled side sections and intermediate sections, comprising a combustion chamber and fire box, an economizer cavity, a front door and plate for the lower part of said combustion chamber and said fire-box, fire-brick lining said fire box, and the rear part of said combustion chamber above the fuel mass, said fire brick preventing too quick transmission of heat to the water in said sections and preventing the heating of the water in the lower levels of said economizer cavity with high degrees of heat developed in said combustion chamber, a grate for said fire box and an ash pit thereunder, a sub-cavity under said economizer cavity, a partition dividing said sub-cavity and said ash pit, a smoke exit from said sub-cavity at a level below said intermediate sections, a high level smoke exit from said sections, said sections when assembled presenting a practically impervious partition preventing the passage of gases from said combustion chamber to said economizer cavity, except as to gas apertures at a high level of said partition, said gas apertures, a low level water inlet to said sections, a high level exit for water or steam from said sections, heat transmitting fins or ridges cast integral with said sections and in such parts and in such form as to secure a higher rate of transmission of heat at the higher levels of said sections than at a low level thereof, and push nipple connections for connecting said sections at a low level and at a high level thereof.

2. In a heating apparatus, the combination with a plurality of connected water chambered vertical sections, of a side section, said side section having an exterior plane surface and an interior corrugated surface, a front part of the interior surface facing the combustion chamber and the rear part of the interior surface facing an economizer cavity, said side sections assembling and connecting with other sections to form in the front of said apparatus a combustion chamber and forming in the rear of the apparatus an economizing cavity, said assembled sections providing for the direct vertical rise of the hot gases from the fuel mass to the crown sheet of the apparatus, a horizontal backward flow of the gases to the economizer cavity, and for a downward flow of the gases through said cavity, said combination providing for a high level exit for the gases and for a low level exit for the gases.

3. In a heating apparatus comprising two side sections and connecting with said side sections, intermediate sections, said intermediate sections having means for the presence in the front of the apparatus of a fire box and combustion chamber, and for an economizing cavity at the rear of the combustion chamber, the combustion chamber and economizing cavity having intercommunicating gas passages at a high level, but otherwise separated by a dividing partition, the front part of said apparatus providing for a direct up travel of the heating gases from the fuel mass to the crown sheet of the apparatus and for a horizontal flow of the gases at a high level from the front part to the back of the apparatus and for a plunging travel of the gases through the economizer cavity, a high level gas exit, and a low level gas exit.

4. In a heating apparatus, the combination with a plurality of connected chambered water sections arranged, assembled and collected with the sections running from the front to the rear of the apparatus, of a base with an ash pit in the front of the apparatus, a sub-cavity at the rear of the base, a partition dividing the ash pit and the cavity, a grate and a fire box above said ash pit, a fire brick lining for said fire box, said fire brick lining at the rear of the fire box being carried to a considerable height above the maintained top level of the fire mass, an interposed partition between the lower part of the combustion chamber and an economizer cavity at the rear of the combustion chamber, said combustion chamber in its higher parts comprising horizontal water tubes in said sections running from the front to the economizer cavity and vertical water tubes running from said horizontal tubes to the water heads of the sections, said water heads, an economizer cavity back of said combustion chamber filled with vertical water tubes, a gas exit from the higher level of said economizer cavity, and a gas exit at a level lower than the lowest level of the economizer cavity, water inlets to the sections from the extreme rear of the apparatus and at the lowest level of the economizer cavity, and water exits from the sections at the highest level of said sections at the front of said sections, means for feeding fuel into said fire-box from the front of said sections and for introducing air for combustion from the front of said apparatus at a level above the fuel mass in said fire box.

5. In a heating apparatus, the combination of a plurality of water chambered sections,

said sections being connected and assembled by a lateral assembling of the sections, said sections having corrugated sides forming vertical water tubes and corrugated external heating surfaces, and projecting fins or wedges from the apices and sulci of the corrugations, said fins or ridges extending interiorly into the water spaces and joining the opposing faces of the sections.

JOSEPH MOSES WARD KITCHEN.

Witnesses:
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GEO. L. WHEELOCK.