

N^o 32,204.

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UNITED STATES PATENT OFFICE.

GEORGE W. RAINS, OF NEWBURG, NEW YORK.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. 32,204, dated April 30, 1861.

To all whom it may concern:

Be it known that I, GEORGE W. RAINS, of Newburg, in the county of Orange and State of New York, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central vertical section of a boiler with my improvements. Fig. 2 is a horizontal section of the same in the plane indicated by the line *x x* in Fig. 1.

Similar letters of reference indicate corresponding parts in both figures.

This invention relates to boilers composed of a lower water-chamber and an upper water and steam chamber connected by two or more circular series of upright tubes, which surround a circular horizontal grate, and which have arranged in connection with them a curtain to produce an upward and downward draft among and between them. In the use of such boilers two difficulties have presented themselves—viz., that of obtaining sufficient grate-surface for a suitable supply of oxygen among the fuel and that of obtaining a sufficient natural draft to start the fire when the boiler is cold.

The object of this invention is to overcome these difficulties; and to this end it consists, first, in the arrangement, as hereinafter described, in combination with the circular horizontal grate and the tubes and in relation to the furnace-door, of an upright grate for admitting additional oxygen to the fire; and it consists, secondly, in establishing a direct communication between the fire-box and chimney through an opening in the before-mentioned curtain and a suitable space between the tubes opposite to said opening, such communication to be fitted with a damper, which is to be opened only while starting the fire and getting up steam, or when the fire is low and requires drawing up.

To enable others to make and use my invention, I will proceed to describe its construction and operation.

A is the lower water-chamber, of cylindrical form. B is the upper water and steam chamber, also of cylindrical form.

C C and D D are two upright concentric circular series of water-tubes connecting the chambers A and B.

E is the horizontal circular grate, arranged within the inner series of tubes, C C.

F F are upright fixed bars or plates fitted between the lower parts of the inner tubes, C C, to make a fire-box. These two series of tubes do not extend all round the grate E, but an open space is left in each series in front of the grate for the reception of the fire-door frame L, which fits in snugly between the tubes C C and D D and between the chambers A and B.

J is an upright cylindrical curb of sheet-iron surrounding the inner series of tubes, C C, extending from the lower chamber, A, to a level with the tops of the bars F F—that is to say, to within a short distance of the bottom of the upper chamber, B—and from one side of the frames round to the other. This curb is, however, not necessary.

G is a cylindrical curtain of sheet-iron surrounding the outer series of tubes, D D, extending from the bottom of the upper chamber, B, nearly to the top of the lower chamber, A, and from one side of the frame L round to the other.

H is the outer casing, surrounding the chambers A B and the tubes, having an opening to admit the fire-door frame L, and having the chimney I attached.

The door-frame L has an opening, *a a*, in the upper part for feeding in the fuel and an opening, *b b*, in the lower part for the admission of air to the fire, the upper opening being fitted with a door, M, and the lower one with a door, N, by which the draft is regulated. The lower opening is also fitted inside of the door N with the upright grate P, which constitutes a part of my invention. This grate, which may be either permanently fixed or movable, extends from the grate E nearly up to the top of the lower opening, *b b*, of the door-frame, by which opening air is admitted to and among the fuel in the fire-box both through the grate E and the grate P, the quantity supplied through P making up the deficiency in the supply through E and enabling a very perfect combustion to be effected.

Opposite to the door-frame L there is left a

wide space, *c c*, Fig. 2, between two of the outer tubes, *D D*, and opposite to this space *c c* there is an aperture, *d*, in the curtain *G*, and from this aperture the short flue *Q*, filled with the damper *R*, leads through the casing *H* to the chimney *I*.

The operation is as follows: Before lighting the fire the damper *R* and the door *N* are opened, and when the fire is lighted there is a draft from the fire-box through the spaces between the upper parts of the tubes *C C*, above the bars *F F* and curb *J*, and through the wide space *c c* between the tubes *D D*, through the opening *d* in the curb, and through the short flue *Q* to the chimney. When the fire is well started and the boiler is heated, the damper *R* is closed and the draft is over the tops of the bars *F F* and curb *J*, down between the curb *J* and tubes *D D*, under the curtain *G*, and up between the said curtain and the casing *H* to the chimney, and the heated gaseous products of combustion are

caused to have such a circulation as to produce the greatest effect. The supply of air to the fire is regulated by the door *N*, through which passes all the air admitted through both grates *E* and *P*.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The upright grate *P*, applied in relation to the grate *E*, and in combination with the circular series of tubes *C C* and their interposed bars or plates *F F*, substantially as and for the purpose herein specified.

2. The flue *Q* and damper *R*, applied in combination with the curtain *G* and the chimney *I*, and the wider space *c c* between the tubes *D D*, substantially as and for the purpose herein specified.

GEO. W. RAINS.

Witnesses:

WM. C. MILLER,

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