

(No Model.)

M. KEARNEY & M. C. HAWLEY.
FIRE BOX FOR LOCOMOTIVES.

No. 244,392.

Patented July 19, 1881.

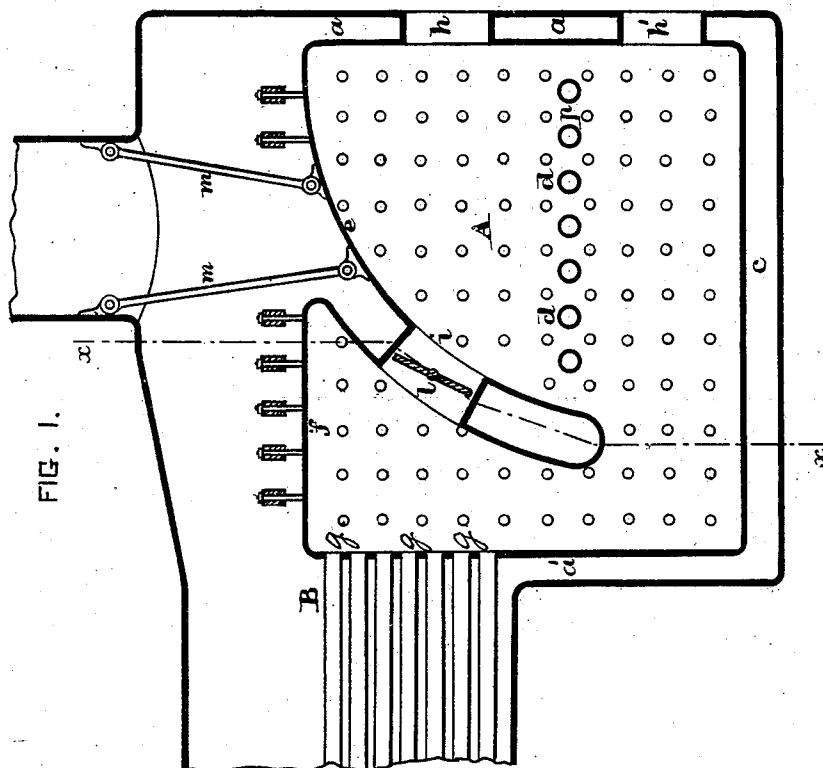
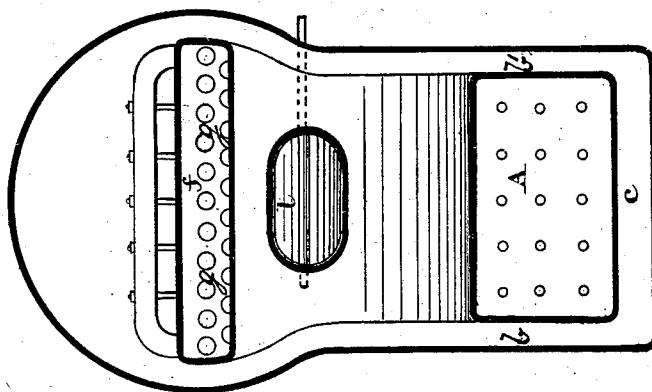


FIG. II.

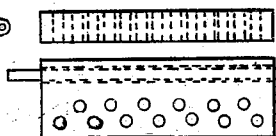


WITNESSES:

Geo. W. Ward
Levi Keane



FIG. III.



INVENTORS

Michael Kearney
Mehille C. Hawley
by F. W. Ritter, Jr. atty

UNITED STATES PATENT OFFICE.

MICHAEL KEARNEY, OF NORTH SPRINGFIELD, AND MELVILLE C. HAWLEY,
OF ST. LOUIS, MISSOURI.

FIRE-BOX FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 244,392, dated July 19, 1881.

Application filed June 3, 1881. (No model.)

To all whom it may concern:

Be it known that we, MICHAEL KEARNEY, residing at North Springfield, Greene county, and MELVILLE C. HAWLEY, residing at St. Louis, both in the State of Missouri, citizens of the United States, have invented certain new and useful Improvements in Fire-Boxes for Locomotive and other Boilers; and we do hereby declare the following to be a full, clear, and exact description of the same, which, taken in connection with the drawings forming part of this specification, will enable others skilled in the art to which it appertains to apply the same.

Our invention relates to that class of fire-boxes wherein the air for supporting combustion, together with the gases generated from the fuel, are caused to pass downward through the incandescent fuel, whereby loss of fuel is prevented and perfect combustion is obtained, and has for its object to simplify the construction and increase the durability of the fire-box, as well as to obtain the greatest evaporating or heating surface for the boiler.

To this end it consists, mainly, in carrying the crown-sheet from the rear of the fire-box downward and forward in the arc of a circle to a point on line with the grate, and then upward and backward in the arc of a circle concentric with the first until it joins the inside sheet at the back of the fire-box, so as to form a diaphragm having a water-space continuous with the boiler and its water-legs, and in combining with said diaphragm an independent transverse tubular grate whose water-bars communicate with the water-legs of the boiler, said grate being arranged in line with the lower extremity of the diaphragm formed by the crown-sheet, whereby the effects of expansion and contraction due to intense heat are counteracted and greater evaporating-surface is obtained, all as will hereinafter more fully appear.

We will now proceed to describe our invention more specifically, so that others may apply the same.

Figure I is a longitudinal vertical section of a fire-box embodying our invention and illustrating the preferred form of applying the same. Fig. II is a vertical transverse section of the same on the line *x x*, Fig. I. Fig. III

represents a dump, which may be inserted at the rear of the grate.

Like letters refer to like parts wherever they occur.

A indicates the fire-box, and B the boiler, formed with connecting water-legs *aa'* and *bb'*, and, if desired, with the bottom channel, *c*, so as to entirely inclose the fire-box A and permit the free circulation of the boiler-water around the same.

The grate is composed of a series of transverse tubular bars, *d d*, arranged sufficiently far apart to give the required air-space between the same, and in number sufficient to extend within a short distance of the front wall of the fire-box. These tubular grate-bars *d* connect with the water-legs *b b'* of the boiler, to permit the circulation of the water through the same.

e indicates the crown-sheet, which is connected at the rear of the fire-box to the sheets forming the inner wall of the water-leg, *a*, and extends downward and forward in the arc of a circle until it reaches a point within ten or twelve (10 or 12) inches, more or less, of the inside surface of the front of the fire-box and on a line with the grate-bars. Then turning to the back of the fire-box sufficiently to form a desirable water-space, it extends upward and backward in the arc of a circle concentric with the first until it joins the inside sheet, *f*, at the back of the fire-box. The edges of the crown-sheet join the sheets forming the water-legs *b b'* at the sides, so as to form a free and continuous water-channel from the water-legs through the loop of the crown-sheet.

The crown-sheet may be supported by suspension-links or stay-rods *m m* or in other suitable manner.

In the rear wall of the fire-box are two doors, *h h'*, one above and the other below the grate, and through the crown-sheet is a flue, *i*, having a damper, *l*, which may be operated in any suitable manner. The flue *i* serves for an upward draft, as well as to give access to the flues *g*.

In Fig. III is shown a dumping bar or plate, which may be arranged in the position in the grate indicated by *p*, Fig. I, and is pivoted so that it can be turned to permit the free discharge of ashes, clinkers, &c.

The operation of the devices will be the same as is common to this class of grates—that is

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to say, the fire may be started with the upward draft by opening the door *h'* below the grate and the damper *l* in the crown-sheet, and the products of combustion will then pass directly to the boiler-tubes *g* through the flue *i*. As soon as the fire is fairly started the damper or valve *l* of the crown-sheet and the door *h'* can be closed and the upper door, *h*, opened. This reverses the draft or causes the air to support combustion to pass down through the fuel, carrying with it through the incandescent fuel all gases generated from the fuel, thus insuring complete combustion and utilizing the gases, &c., which are lost when the upward draft is employed.

At any time the fires may be damped by opening the valve or damper *l* and permitting the draft from the upper door to pass directly over the fuel into the boiler-tubes *g*.

Among the advantages obtained are the combined advantages of all the best constructions of downward draft—viz., the full heating value of the fuel is obtained, no combustible gases are permitted to escape unconsumed, a greater degree of heat is obtained, and slack or fine fuel can be readily used; but owing to our method of constructing the fire-box we obtain additional advantages peculiar to our invention—viz., the crown-sheet which divides the fire-box is continuous throughout with the sheets forming the side walls and top of the fire-box, consequently the plates are free to a certain extent to spring or yield under the expansion and contraction due to the intense heat, and thus prevent or counteract any buckling of the plates, which would tend to destroy the same, and, the water-spaces of the boiler and crown-sheet being continuous, the crown-sheet (or diaphragm) is fully protected by the circulation of the boiler-water, and a more extensive heating or evaporating surface is obtained.

We are aware that fire-boxes have heretofore been constructed so as to obtain an upward draft for starting the fire and a downward draft to carry the gases developed through the incandescent fuel, and do not herein claim the same. We are also aware that water-bars,

water-legs continuous with the boiler-sheets, and independent diaphragms formed with water-spaces connecting by tubes with the boiler have each and all entered into the construction of fire-boxes, and consequently do not herein claim such devices; but,

Having thus fully described our invention and indicated the distinguishing features thereof, what we claim, and desire to secure by Letters Patent, is—

1. In a fire-box for boilers, a crown-sheet which extends downward and forward from the rear wall of the fire-box and backward and upward in the arcs of two concentric circles, said crown-sheet being continuous with the walls of the fire-box, and the water-space formed thereby being continuous with the water-space of the boiler and its water-legs, in combination with an independent water-grate composed of transverse tubular bars which communicate with the water-legs of the boiler, substantially as and for the purpose specified.

2. In a fire-box for boilers, a crown-sheet which extends downward and forward, then upward and backward in the arcs of two concentric circles to divide the fire-box into a fuel-chamber and an expansion-chamber, the plates of said crown-sheet being continuous with the walls of the fire-box, and the water-space formed thereby being continuous with the boiler and its water-legs, said crown-sheet provided with a valved flue for upward draft, in combination with tubular grate-bars arranged in line with the lower part of the curved crown-sheet and connecting with the water-legs of the boiler and the upper and lower draft-doors, substantially as and for the purpose specified.

In testimony whereof we affix our signatures in presence of two witnesses this 30th day of May, 1881.

MICHAEL KEARNEY.
MELVILLE C. HAWLEY.

Witnesses:

E. G. CHADWICK,
W. L. COYLE.