J. C. HOADLEY.

Steam-Boiler Furnace.

No. 161,122 Patented March 23, 1875.

Fig. 1.

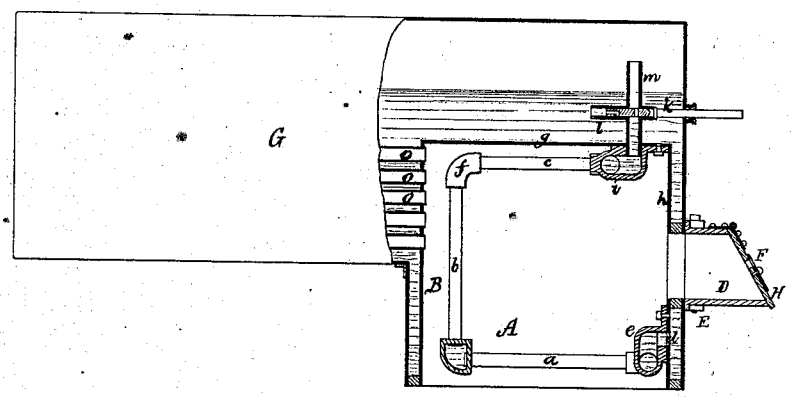


Fig. 2.

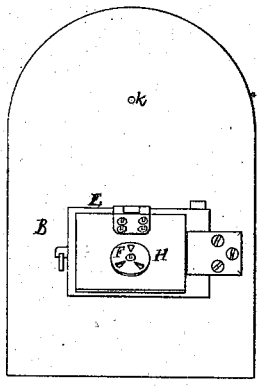
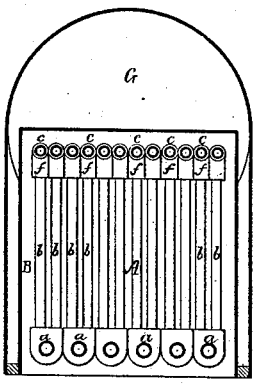


Fig. 3.



Witnesses
S. W. Pipes.
L. N. Keller

John C. Hoadley,
by his attorney,
R. M. Eddy

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

JOHN C. HOADLEY, OF LAWRENCE, MASSACHUSETTS, ASSIGNOR TO THE J. C. HOADLEY COMPANY, OF SAME PLACE.

IMPROVEMENT IN STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. **161,122**, dated March 23, 1875; application filed December 19, 1874.

To all whom it may concern:

Be it known that I, JOHN C. HOADLEY, of Lawrence, of the county of Essex and State of Massachusetts, have invented a new and useful Improvement in Steam-Boiler Furnaces; and do hereby declare the same to be fully described in the following specification and represented in the accompanying drawings, of which—

Figure 1 denotes a longitudinal section, and Fig. 2 a front-end view, of a steam-boiler and furnace provided with my invention. Fig. 3 is a transverse section taken through the grillage or tubular guard arranged within the fire-place.

My invention relates to an apparatus to be fitted into a steam-boiler of common locomotive or portable engine type, to adapt it to burning straw or other light material as sole or principal fuel to maintain steam-pressure in the boiler and supply the engine. To do this advantageously it is necessary to have a strong draft, as a very great quantity of straw must be burned, requiring a large volume of atmospheric air. So strong a draft as is necessary would, in a common furnace, lift the straw from the grate, and carry a good deal of it in an unconsumed state into the flues, which would soon become clogged, so that the draft would be impeded, and the steam-generating power of the boiler impaired. To prevent this I introduce into the fire-place or fire-box B of a boiler, G, a grating or grillage, A, which retains the straw in the fire-box until it is consumed, while the flame and smoke pass freely through to the flues and to the smoke-pipe or chimney. Such a grillage, if formed of metal or other known material, would soon be destroyed by the high temperature maintained in the fire-box, unless prevented in some way. To protect it I form it of a series of pipes or tubes, *a b c*, so that water can be made to circulate freely through it, the circulation being maintained by the heat imparted to the water in the tubes of the grating at the back or that end of the fire-box most remote from the door, and near the ends of the flues, and on top near the crown-sheet. The water is to be received through an aperture, *d*, communicating with a hollow cross-piece or header, *e*, from which a number of pipes or tubes, *a a a*, extend nearly the whole length of the fire-box B, at or about two inches distance from each other, occupying the position, and serving the purpose, of a fire-grate. At the back, and near the flue-sheet, each one of these horizontal or slightly-inclined pipes communicates with two vertical pipes, *b b*, each of which is in turn connected at the top by means of an elbow, *f*, with a horizontal or slightly-inclined pipe, *c*, running forward just below the crown-sheet *g*, nearly to the door-sheet *h*, when all these pipes communicate with a branch or narrow cross-piece, *i*, similar to the one first above described, but in this case communicating, by means of a hole in the crown-sheet, with the water above the fire-box, or, at will, into the steam-space above the water-line. For this purpose a stop-cock, *k*, is so arranged that the current can be shut off from the horizontal educt *l*, which is below the water-line, and turned upward through a vertical pipe, *m*, into the steam-space; or it may be shut off from the steam-space, or turned through the educt *l* into the water-space. The pipe *m* leads upward from the grillage into the steam-space, while the educt or branch pipe *l* leads horizontally out of the pipe *m* into the water-space. The stop-cock is to be such as will enable either pipe to be closed while the other is open; or a three-way cock may be employed, so as to open both pipes more or less, or close one and open the other. The object of this arrangement is as follows: The combustion is slow, and the generation of heat tedious, so long as only natural draft is available. The artificial draft is provided by a steam-blower, a jet of steam being let into the chimney or smoke-pipe; but this cannot be used until steam is generated to at least five pounds pressure above the atmosphere, and the process of "getting up steam," implying the heating of the entire body of water contained in the boiler to the proper temperature, is slow and tedious when straw or any similar fuel alone is used.

Now, by means of my device steam generated in the pipes constituting the grillage may be discharged into the steam-space, from which it may be drawn to supply the steam jet or blower, some time before the whole body of water in the boiler is heated up to the boiling-point. The steam-jet may thus be brought

into action several minutes earlier than if the requisite pressure must be generated by heating all the water in the boiler to the requisite degree, and so the time of getting up steam may be materially shortened. When steam is generated from the mass of water in the boiler the circulation through the pipes should or may be shut off from the steam-space, and turned down below the water-line. This arrangement has the incidental advantage that it supplies a sufficient extent of additional heating-surface to the boiler to furnish the steam to the blower or jet.

The mouth-piece or feeding-box D is attached to the door E, so that when the latter is opened the whole is moved out of the way for examining the state of the fire, or for raking out the spaces between the pipes of the grillage, or for any purpose. A flap or door, H, to open outward is hinged to the box D at its mouth, and has a register, F, for regulating the admission of air.

In the usual course of feeding in straw, a handful or wad is left in the box, closing it sufficiently, (some air is advantageous,) and the succeeding handful pushes this wad forward into the fire, and takes its place as door-stopper.

By inspection of Fig. 1 it will be seen that the special boiler on which my invention is based is one having a series of flues, *o o o*, leading out of the rear part of the fire-chamber and through the water-space of the boiler, such flues being to convey the smoke and products of combustion from the fire-box through the water, and thence to the chimney. The grillage, by its arrangement in the fire-box and with such flues, serves to prevent them from being clogged by the straw fuel.

I am aware that a series of U-shaped tubes have been used in a fire-place, and in connection with a series of tubes running lengthwise through and over such, and opening into a steam-drum, all being as shown in the United States Patent No. 94,767. I therefore make no claim to such, as in such case the volatile products of combustion do not pass through flues going through the water-space of a boiler, as in my invention. It will be seen that although the grillage A accomplishes such a result it does more—that is, by extending along the bottom, and up the rear, and through the upper part of the fire-box, such grillage serves as a screen to prevent the fuel or straw from being drawn or blown by the draft into the flues. It will be seen that the grillage and its connections with the water-space of the boiler are wholly within the fire-box, instead of being on the outside thereof. Therefore,

I claim—

1. In combination with the fire-box B and the boiler G, provided with a series of flues leading out of the rear of the said fire-box and through the water-space of said boiler, the grillage A, constructed and arranged wholly in the said fire-box B, and with the said flue, substantially in manner and for the purpose as specified.

2. The combination of the educts *l m*, provided with a stop-cock, *k*, as described, with the grillage A, boiler G, and the fire-box B, arranged as set forth.

3. The feeding-box D, combined with, and to open through, the door E, and provided with a flap, H, and register F, all substantially as shown and described.

JOHN C. HOADLEY.

Witnesses:

R. H. EDDY,

J. R. SNOW.