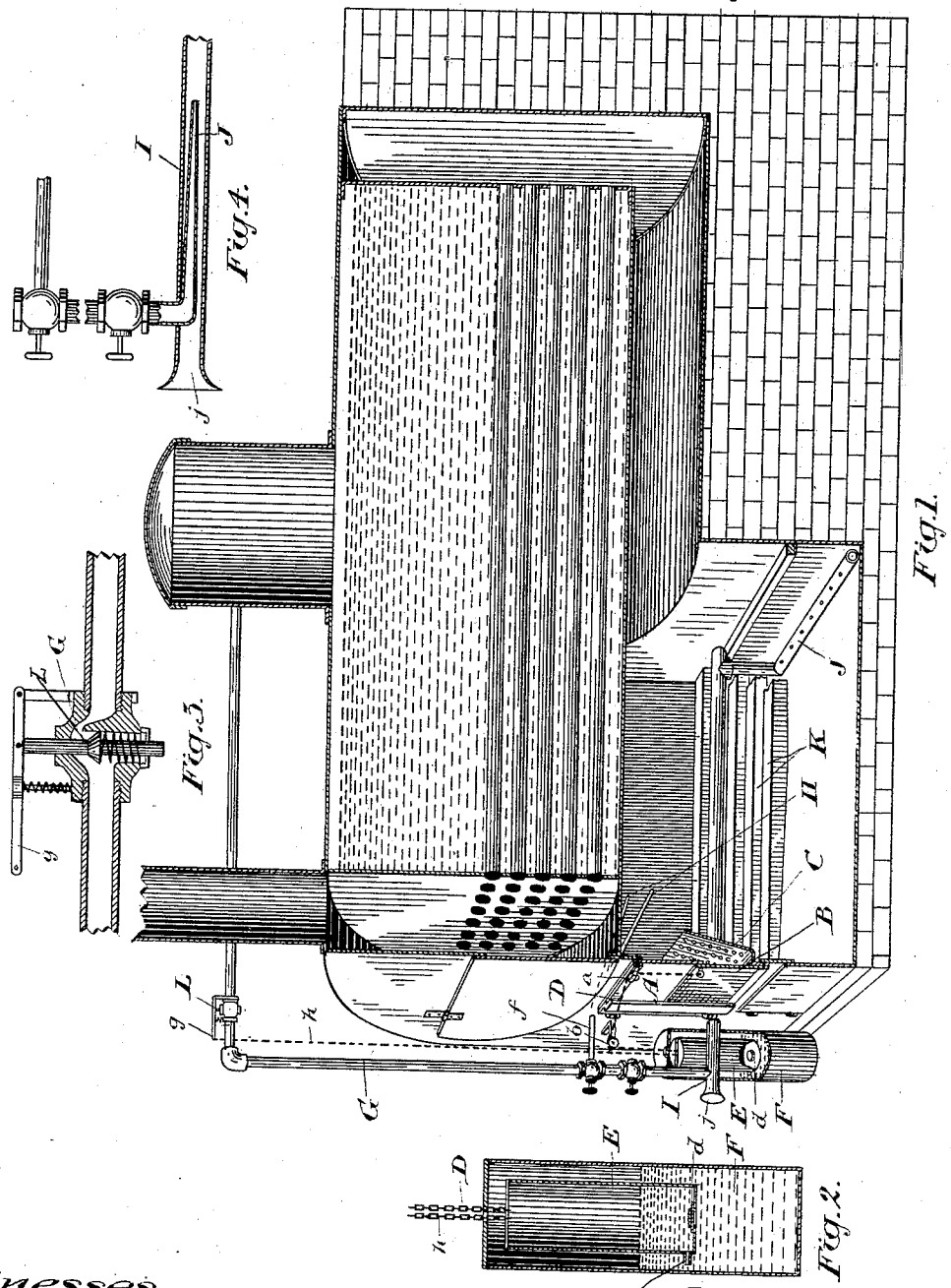
(No Model.)

J. T. & J. H. ELLIS.

FURNACE FOR STEAM BOILERS.

No. 385,509. Patented July 3, 1888.



Witnesses.

J. Edw. Mayhew.

J. M. Jackson

Inventors.

J. T. Ellis.

J. H. Ellis.

by Donald C. Ridout & Co

Attys

UNITED STATES PATENT OFFICE.

JOHN T. ELLIS AND JAMES H. ELLIS, OF TORONTO, ONTARIO, CANADA.

FURNACE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 385,509, dated July 3, 1888.

Application filed December 15, 1887. Serial No. 257,956. (No model.)

To all whom it may concern:

Be it known that we, JOHN THOMAS ELLIS, engine-driver, and JAMES HOWARD ELLIS, machinist, both of the city of Toronto, in the county of York, in the Province of Ontario, Canada, have jointly invented certain new and useful Improvements in the Furnaces of Steam-Boilers, of which the following is a specification.

The object of the invention is to design an apparatus by which atmospheric air and jets of superheated steam shall be admitted into the furnace whenever the furnace-door is opened to put in fresh fuel, the admission of the air and steam being automatically cut off a short time after the furnace-door is closed; and it consists, essentially, in forming a supplemental door in the door of the furnace and connecting it by a chain or cord to a hollow vessel arranged to fill with water when the furnace-door is opened, so that upon the closing of the furnace-door the weight of the water in the hollow vessel will hold it down, and with it hold open the supplemental door until the water has escaped from the hollow vessel, permitting it to rise until the supplemental door is closed, a steam-valve being also connected to the hollow vessel, so that it will work in conjunction with the supplemental door, substantially as hereinafter more particularly explained.

Figure 1 is a perspective sectional view of a steam-boiler provided with our device. Fig. 2 is an enlarged sectional detail of the hollow vessel and its tank. Fig. 3 is an enlarged sectional detail of the cut-off valve in the steam-pipe. Fig. 4 is an enlarged sectional detail of the injector for injecting air and steam below the grate-bars of the furnace.

A is the ordinary hinged furnace-door, through which we make an aperture protected by the vertically-sliding supplemental door B. We prefer to make this door a vertically-sliding one, as shown; but of course it might be arranged to be hinged, if desired.

C is a perforated plate connected to the door A, so that it will move with the said door, but will remain stationary during the movement of the door B. A chain or cord, D, is connected to the door B, and after passing over the pulleys *a* and *b* is connected to the top of the hollow vessel E. The pulley *a* is journaled in a bracket connected to the door A, and the pulley *b* to a bracket connected to the front of the furnace, as shown.

F is a tank designed to contain water, as shown, on which the hollow vessel E rests. A hole provided with a suitable valve, *d*, is made in the bottom of the hollow vessel E, so that when not otherwise supported it will sink in the tank, the water passing into the vessel E through the hole.

G is a steam-pipe extending down the front of the boiler and provided with two branches, *f*, leading to the jets H, while the branch I extends into the furnace and connects with a perforated pipe, J, located below the grate-bars K.

A valve, L, preferably made, as shown in Fig. 3, so that it will be held closed by the action of the springs, as indicated, is placed in the steam-pipe G, and its lever *g* is connected by a chain or cord, *h*, to the top of the hollow vessel E, as shown. The end *j* of the branch pipe I is left open, as shown in Fig. 4, so that air shall be drawn into the pipe I by the action of the steam escaping through the tapered end of the steam-pipe G, (see Fig. 4,) thus injecting a mixture of air and steam into the perforated pipe J, from which it escapes through the said perforations into the furnace through the grate-bars K.

A small hole, *k*, is made in or near the bottom of the hollow vessel E, so that any water admitted through the valve *d* will escape through the hole *k*. The vessel E is made of such a weight that it will be overbalanced by the weight of the supplemental door B; but when the door A is opened the chain or cord D, which connects the door B with the vessel E, will of course be slackened, which slackening will permit the vessel E to sink into the water contained in the tank F, the said water flowing into the said vessel through the valve *d*. Consequently when the door A is closed the weight of the water will make the said vessel so heavy that it will counterbalance the weight of the door B, thereby suspending the said door B when the furnace-door A is closed, leaving the aperture in the said door A open until sufficient water has escaped through the hole *k* to reduce the weight of the vessel E and permit the door B to fall.

Having thus fully described the construc-

tion of our invention, the following description will be sufficient to explain its operation.

When the door A is opened for the purpose of feeding the furnace with fuel, the chain D will be slackened and the vessel E will sink in its tank F, as described. Consequently the cord or chain *h* will be drawn upon and the lever *g* pulled down, so as to open the valve L, thus permitting the steam to pass from the pipe G through the jets H on top of the fuel, and simultaneously air and steam will be admitted through the perforated pipe J into the furnace from below the grates K. When the door A is closed, the supplemental door B will be suspended open by the chain or cord D, and so long as the said supplemental door B is held open fresh air will be admitted through the perforated plate C on top of the fuel in the furnace, thereby admitting sufficient oxygen and hydrogen to practically consume all the carbon thrown off by the combustion of the fresh fuel admitted into the furnace.

The period during which the hydrogen and oxygen should be admitted into the furnace, as described, will of course vary according to the style of furnace and the kind of fuel used; but this period can readily be altered by the engineer in charge by simply increasing or decreasing the size of the hole *k*, so that the water shall escape from the vessel E quicker or slower to suit the period during which the door B and valve L shall remain open.

In practice we find that two jets, H, pointing to the opposite corners of the furnace will generally be found sufficient; but we do not confine ourselves to any particular number of jets, nor do we confine ourselves to the exact style of valve L shown, nor to the exact arrangement of the pipes and other parts indicated.

What we claim as our invention is—

1. A hollow vessel located within a tank containing water and having an aperture in or near its bottom provided with a suitable valve, through which water may enter the vessel but not escape, and a smaller aperture or hole through which the water may escape slowly from the vessel, in combination with a door arranged in connection with a doorway leading to the furnace and so weighted and connected to the hollow vessel that it will be held open when the vessel has been sunk by the admission of water into its interior and will close when the water has escaped from the said vessel, and the supplemental door arranged to close slowly after the furnace-door is closed, and a steam-valve connected to said vessel and working in conjunction with the supplemental door, substantially as and for the purpose specified.

2. A hollow vessel located within a tank containing water and having an aperture in or near its bottom provided with a suitable valve, through which water may enter the vessel but not escape, and a smaller aperture or hole through which the water may escape slowly from the vessel, in combination with a valve located in the steam-pipe leading to the furnace, and with a door arranged in connection with a doorway leading to the furnace, the door and valve being so connected to the hollow vessel that said door will be held open when the vessel has been sunk by the admission of water into its interior and will close when the water has escaped from the said vessel, substantially as and for the purpose specified.

3. A furnace door, A, having an aperture in it protected by a supplemental door, B, and protected by a perforated plate, C, in combination with mechanism, as the tank F, the hollow vessel in said tank, and the cord connecting said vessel with the door B, by which the supplemental door B is held open for a limited period immediately after the closing of the furnace-door, substantially as and for the purpose specified.

Toronto, November 25, 1887.

JOHN T. ELLIS.
JAMES H. ELLIS.

In presence of—
CHARLES C. BALDWIN,
C. H. RICHES.