W S. HUTCHINSON.

Steam-Boiler Furnaces, &c.

No. 208,394. Patented Sept. 24, 1878.

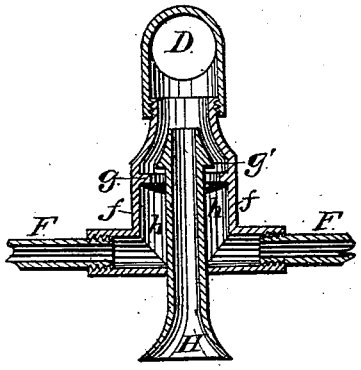

Fig. 2.

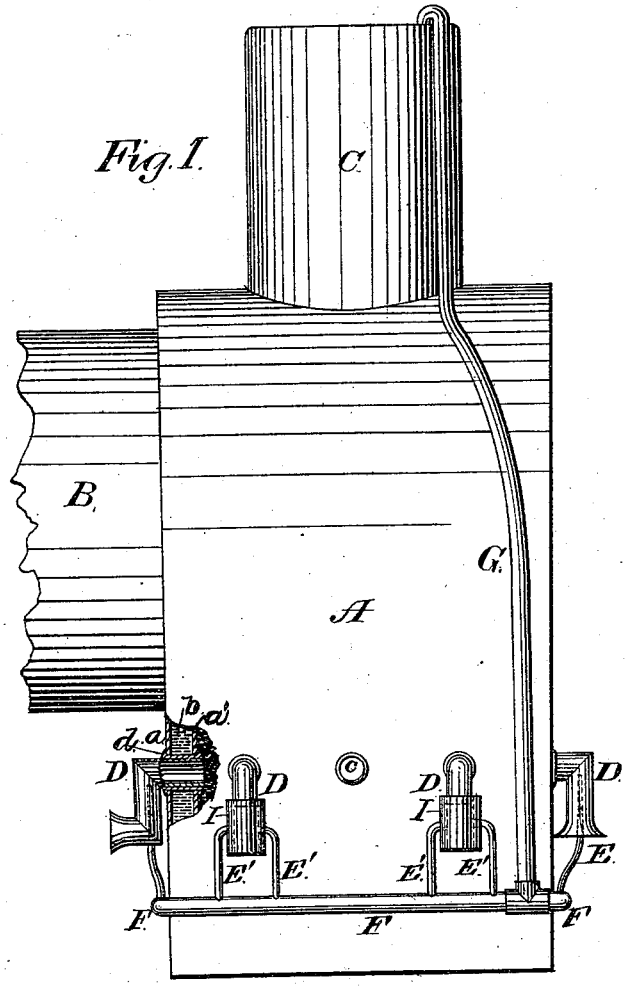

Fig. 1.

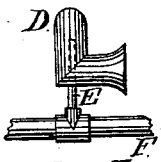

Fig. 3.

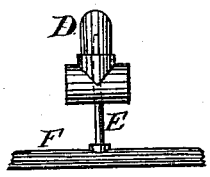

Fig. 4.

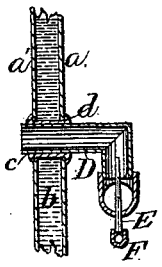

Fig. 5.

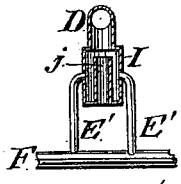

Fig. 7.

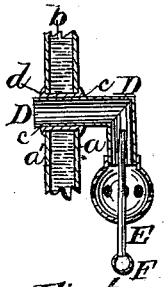

Fig. 6.

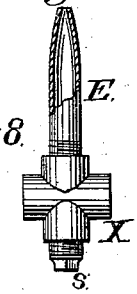

Fig 8.

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UNITED STATES PATENT OFFICE

WILLIAM S. HUTCHINSON, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN STEAM-BOILER FURNACES, &c.

Specification forming part of Letters Patent No. **208,394**, dated September 24, 1878; application filed June 10, 1878.

To all whom it may concern:

Be it known that I, WILLIAM S. HUTCHINSON, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Devices for Aiding Combustion in Steam-Boiler and other Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents a side elevation of an ordinary locomotive fire-box and portion of the boiler to which my improvement has been applied, a part of the casing of the fire-box being broken out to show details of construction. Fig. 2 represents a sectional view of a modified form of the device for mixing the air and steam before injecting them into the fire-box or furnace. Fig. 3 represents a side elevation of another modification, and Figs. 4 and 5 a side elevation and section of another modification. Fig. 6 represents a sectional view of still another modified form of the devices for mixing the steam and air. Fig. 7 represents a sectional view of the mixing devices shown in front elevation in Fig. 1. Fig. 8 represents a plan view and partial section of a modification of one of the steam-injecting nozzles as combined with the steam-pipe through an ordinary +-shaped steam-connection and detached from the air-supply pipe.

My improvement relates to certain devices for use in connection with the furnaces or fire-boxes of steam-boilers, and with any and all kinds of other furnaces, whether used for the generation of steam or for other purposes, whereby the combustion of the gaseous products of the fuel, as well as the small particles of the latter which are held in suspension in an incandescent state by said gases and the draft through the fire, are rendered more perfect and complete.

Heretofore Letters Patent No. 192,168 and Letters Patent No. 197,730 have been granted to me for certain devices for the same purpose.

My present invention consists in an improved construction of said devices, and which has its special advantages over the devices covered by said patents.

In all the object is to inject into the furnace, at suitable intervals apart, on one or more sides, and, if desired, all around the furnace, a sufficiency of air thoroughly commingled with steam, either superheated or otherwise, through a series of openings arranged immediately above the bed of incandescent fuel, so as to commingle in their mixed state with the products of combustion in their nascent state, whereby a more perfect combustion of the gases, &c., is effected, according to the thoroughness with which the air and steam are mixed. To this end free access to the mixing-pipe must be given to the air without unnecessarily enlarging the latter; otherwise a perfect mixture will not be attained.

My improvement, although illustrated in the drawing in connection with the furnace or fire-box of a locomotive-boiler, is intended for use in connection with any furnace where a very thorough combustion of the fuel is either desirable or necessary, no matter to what use the furnace is applied, whether for the generation of steam, smelting ores, metals, &c.

Referring to the drawing, A represents a locomotive fire-box; B, a portion of the boiler, and C the steam dome or chest.

The fire-box represented in the drawing is made of an inner and outer casing, *a a'*, between which is a water chamber or chambers, *b*, constructed and arranged in the usual way. Through these casings are made a series of openings, *c*, and, by preference, on each and every side all around the fire-box, and as many as may be desirable on each side, at a point or in a line a little above the level of the burning fuel. In these openings are placed tubular stay-bolts *d*, which connect the inner and outer casings, *a a'*, they being riveted for this purpose to the casing, and so as to form a water-tight joint. Into these tubular stay-bolts are inserted and secured the steam and air conduit pipes D, one in each. The conduit-pipes D are formed with an elbow on the outside of the fire-box, and into the elbow part is inserted the end of a steam-nozzle, E, which projects from and connects with

a steam-pipe, F. This steam-pipe F runs all around the fire-box, where the conduits D are inserted in each side of the fire-box, and connects with the steam-boiler, for the supply of steam to the pipes D, by means of a pipe, G, either at the steam-dome or other suitable point; otherwise it only extends to such sides as are provided with the nozzles E.

Each of the conduit-pipes D has one or two nozzles, E, for this purpose, projecting into its lower end from the steam-pipe F. The elbow part of pipes D is open at its outer end for the admission of air. Pipes D are provided with the elbow in order to extend their length without materially increasing the space they occupy in a horizontal direction, so as to give time and space for the more perfect mixture of the steam and air before the two thus mixed are injected into the furnace.

To insure a sufficiency and steady supply of air, I increase the size of the mouth of the air-pipe, or else surround the inlet of the air-pipe with a current of steam under pressure, and thereby create a greater draft of air than where the steam-pipe is simply inserted into the mouth of the tube. The former modes are shown in Figs. 3, 4, 5, and 6, and the latter in Figs. 2 and 7.

In Fig. 2 the steam-pipe F is represented as being screwed into a T-shaped piece, *f*, in the upper portion of which an internal flange, *g*, is formed. Into this piece is inserted a short bell-mouth-shaped air-conduit, H, the upper end of which may, if desired, be made to flare, or provided with an outwardly-projecting flange, *g'*.

The steam, as it enters through the pipe F, passes up into the chamber *h*, and thence through the opening formed by the flanges *g g'*, and around the upper end of tube H, and, being under strong pressure, creates a strong current of air through the latter, and which, striking the bend in the elbow above the steam and air, thoroughly mixes them before they escape from the pipe D into the fire-box.

Fig. 7 represents a similar construction. In this case the lower part of the elbow is secured to a chamber, I, through the center of which, and which nearly, but not quite, reaches to the top of said chamber I, is secured a short tube, *j*, open at both ends, it, for this purpose, being secured to the bottom plate of chamber I. The two thus constructed form a circular chamber, into the sides of which are inserted one or two tubes, E' E', two preferred, and which communicate at their lower end with the steam-pipe F. The steam, under pressure, passes into this annular chamber and over the upper end of the air-pipe *j*, creating thereby a strong current of air through the latter, and the two commingling, as in Fig. 2, thence pass into the fire-box.

In Fig. 3 pipe D and its elbow is provided with another elbow at its lower end, and which terminates in a flaring mouth, to facilitate the entrance of the air.

In Figs. 4 and 5 the elbow terminates in a sort of T-shaped mouth-piece, having two or more lateral openings, which give free access to the air.

In Fig. 6 the elbow terminates in a globularly-shaped chamber, having a series of openings through its wall for the admission of air.

In Fig. 1 are shown several other devices for the same purpose, in all of which conduit-pipe D is provided with an elbow and an enlarged opening for the admission of the air, or else two or more openings to give freer ingress to the air, and combined with a bend or elbow to insure its thorough mixture with the steam.

In Fig. 8 is represented a modification of the steam-nozzles E. In this case the nozzle E is inserted in a + shaped steam-connection piece, X, in which there are four openings, two for the steam-pipe connections, one for the nozzles E, and the remaining one—the one diametrically opposite the nozzle—for the reception of a movable screw-plug, *s*, whereby, when desired or necessary, the nozzle E can be cleared of any obstruction to the flow of steam, such as that which results from the formation of scale or rust, by simply removing the plug and using a suitable clearing-tool for the purpose.

The operation is evident, and needs no special description.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with a furnace or with the furnace and fire-box of a steam-boiler, a series of conduit-pipes, D, arranged in a line a little above the level of the burning fuel, each being provided with a downwardly-projecting elbow having an enlarged mouth, substantially as described, and a steam-pipe, F, provided with a series of nozzles, E, for the purposes set forth.

2. In combination with a furnace or with a furnace or fire-box of a steam-boiler, a series of conduit-pipes, D, arranged in a line a little above the level of the burning fuel, and each provided with a downwardly-projecting elbow for the ingress of steam through a steam-pipe, F, and with a short air-supply pipe, H, having an enlarged mouth, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WM. S. HUTCHINSON.

Witnesses:
M. H. HOUSEMAN,
A. KENNEDY.