

H. F. HAYDEN.
 Device for Feeding Air to Boiler-Furnaces.
 No. 196,897. Patented Nov 6, 1877.

Fig. 1.

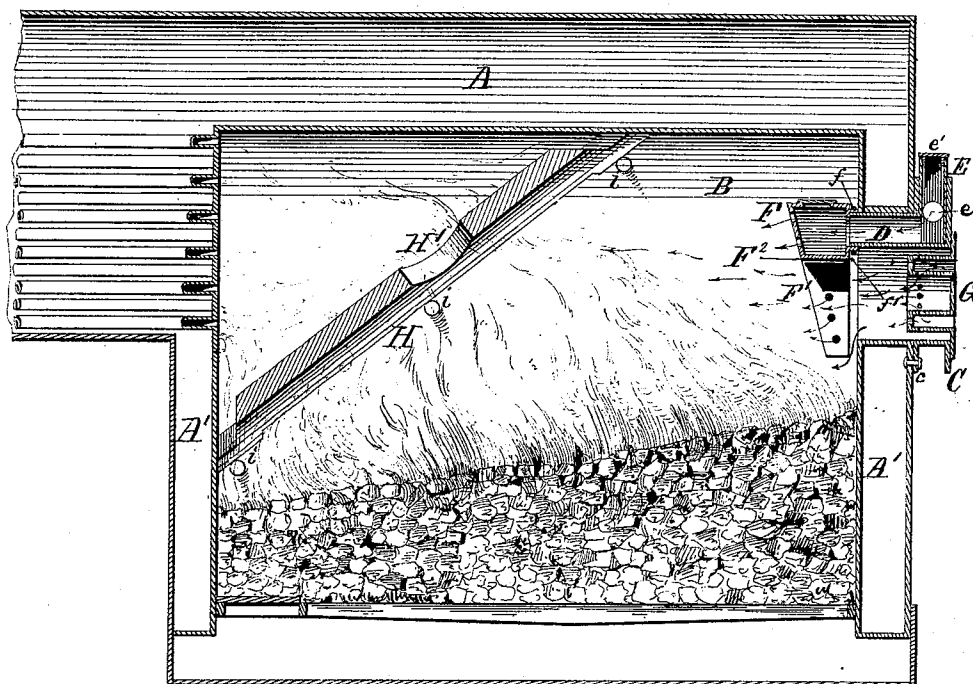


Fig. 3.



Fig. 4.

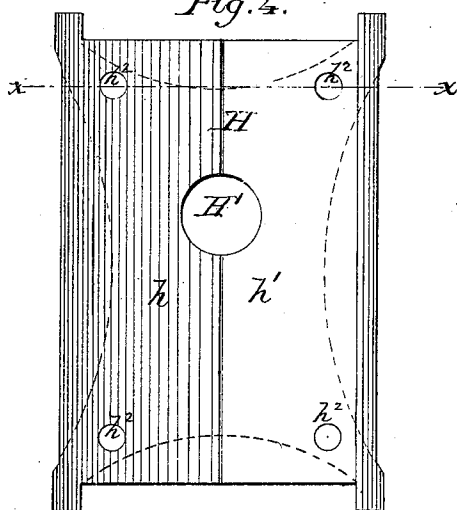
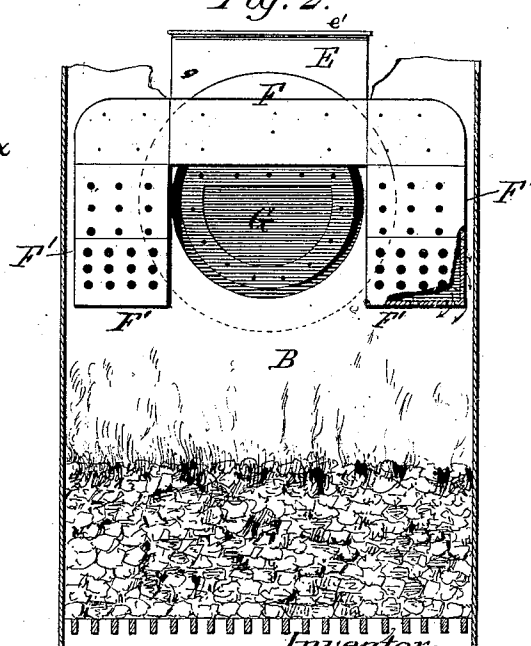


Fig. 2.



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UNITED STATES PATENT OFFICE.

HENRY F. HAYDEN, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN DEVICES FOR FEEDING AIR TO BOILER-FURNACES.

Specification forming part of Letters Patent No. 196,897, dated November 6, 1877; application filed May 24, 1877.

To all whom it may concern:

Be it known that I, HENRY F. HAYDEN, of the city and county of Washington, District of Columbia, have invented certain new and useful Improvements in Devices for Feeding Air to Boiler-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, making part of this specification, in which—

Figure 1 represents a vertical longitudinal section through the fire-box and the portion of a locomotive-boiler surrounding said box, showing my improvements. Fig. 2 is a transverse vertical section through the same, looking toward the fire-door, and showing a front view of the air-distributor. Fig. 3 represents the fire-brick arch or partition in section, and Fig. 4 is a front elevation of the same.

Similar letters of reference denote corresponding parts wherever used.

My invention relates to a novel arrangement of means for supplying air to locomotive and other furnaces for promoting combustion, as hereinafter explained.

In the accompanying drawing, A represents the boiler, with its water-legs A' surrounding the fire-pot B, said parts being of any usual or preferred form and arrangement adapting them to the purpose to which they are to be applied. C is the door frame or opening, made in any preferred form, and by preference the frame or casing is made with the double walls forming an intermediate air-duct, described in former patents to me. This air-duct may extend either wholly around the door-frame or only partially, as shown in the drawing, in the present instance, at D, at the upper part or side of said frame. The frame C extends outward from the flange c, through which it is secured to the front wall or water-leg of the furnace, and has the outer end of the duct D provided with an upright chamber, E, the side walls of which are perforated at e to receive supply-pipes or bell-mouths, with suitable valves for controlling the supply of air; and the upper end of chamber E is provided with a lid or valve, e', which may be opened or either partially or entirely closed, for increasing or regulating the supply of air, as may be desired.

The duct D projects inward beyond the front wall of the fire-pot in the form of a sleeve, adapting it to receive a similar sleeve, f, formed on the adjacent rear face of an air-distributing chamber, F. This chamber extends across the front of the fire-pot, slightly removed from the front wall thereof, and is provided with pendent arms or wings F¹ F¹, extending downward by the sides of the door-opening, and between said door and the side walls of the fire-pot, and, by preference, the entire chamber is made tapering in form from top to bottom, in such manner that while the rear wall adjacent to the front wall of the fire-pot is made about vertical, or nearly parallel with said front wall, the forward wall of the chamber is made inclined or converging toward said front wall of the fire-pot, from the top downward. The forward face of the chamber F, overhanging the fire, has numerous minute perforations formed in it, increasing in frequency and size as they approach the ends of the chamber and the bottoms of the wings or arms F¹, for the purpose of equalizing, as nearly as practicable, the distribution of air over the entire front face of the chamber, and also for protecting the distributor, through the action of the air, from the excessive heat of the fire.

If preferred, the portion of the front wall of the chamber directly in front of the supply-duct may be left without perforations, for the purpose of more thoroughly deflecting the air toward the sides or ends. The lower ends or faces of the pendent arms F¹ and the walls adjacent to the door-opening are also provided with perforations, and, if desired, the lower wall F² of chamber F, intermediate between the pendent arms F¹, may also be perforated, if required, for protecting it from the fire, and for causing a more thorough distribution of the air.

By the arrangement of the perforations as described the air is prevented from escaping into the fire-pot until it has had time to become thoroughly heated, and is thus prepared to mingle instantly with the rising gases and cinders, and thus promote their combustion, and at the same time all the distributing-perforations are brought into operation to their

full capacity, care being taken that the sum of the areas of the perforations shall not exceed the area or capacity of the supply-duct.

The wall F^2 is made to project below sleeve f , forming a shoulder at f' , which serves to deflect the air received through the open doorway, or through the perforated door itself, downward upon the surface of the fire. The upper outer side and rear walls of the chamber F , by preference, are not perforated, this arrangement serving to protect said chamber from, and prevent its being clogged by, cinders, &c., while the arrangement of the perforated surfaces, as described, tends to distribute the air evenly over the surface of the fire and to force it downward thereon, causing it to mingle with the rising products of combustion.

For more thoroughly effecting this last-named action, a deflecting bridge or partition, H , of peculiar construction is employed.

The bridge, which is, by preference, made from fire-clay, in the usual manner, is made to extend from the tube-sheet, starting at a point below the nest of tubes, forward and upward to the crown-sheet, forming a partition in the fire-box, inclining forward over the fire, as shown in Fig. 1, and supported upon water-lugs, or other suitable projections i , from the side walls of the fire-pot. The arch is, by preference, made in form (shown in Fig. 3) arching from the sides toward the tube and crown sheets, and is divided from top to bottom into two equal parts, h h' , provided with tongue and groove or other suitable form of joint for holding them together when in place. The bridge thus formed is provided either with a large central perforation, H' , about equal in capacity to the capacity of all of the tubes, and arranged in front of the nest of tubes so as to about center therewith, as shown; or, instead of this central perforation, the partition may be cut away at the sides, top, and bottom, as shown by dotted lines in Fig. 4, thus allowing the products of combustion to pass around the partition, and, as it mingles with the atmospheric air, to impinge upon the walls of the fire-pot, and thus to increase the steaming capacity of the boiler.

By this construction and arrangement the escape of the products of combustion, as they rise, is somewhat retarded, and they are all drawn to certain foci or points of escape, where the air admitted through the distributor F F' is compelled to thoroughly mingle with and complete the combustion of the escaping cinders and gases, thereby greatly diminishing the annoyance consequent upon the escape of smoke and cinders from furnaces as ordinarily constructed. This partition serves the further purpose, by its position and the intense heat to which it is subjected, of bringing the mingled air and products of combustion up to the point of ignition. It also tends to equalize the draft through the

tubes, and to prevent the lower tubes from being filled up and obstructed with cinder.

Additional smaller perforations h^2 may be made in the arch, with either the central perforation, or, where the sides and top and bottom are cut away, between the portions resting on the water-lugs or projections i , and where the central perforation is employed the sides, top, and bottom may be cut away slightly for permitting a limited circulation of the products of combustion at the sides of and around the arch or deflector, the opening between the bottom and the tube-sheet being made in all cases large enough to allow any cinder such as may get behind the deflector to fall down and out again upon the fire or grate bars.

In locomotive-boilers, where the draft created is very intense, and where, as ordinarily constructed, large quantities of cinders are drawn off and permitted to escape unconsumed, the arch or partition cut away at the sides, top, and bottom is preferred, as tending not only to increase the steaming capacity of the boiler, as explained, but as compelling the products of combustion, on their passage from the fire-pot to the tubes, to pursue a zigzag or angular course, in which eddies are formed, causing not only a thorough mingling of the air with the gases, cinders, &c., but also tending to catch the heavier particles of unconsumed cinders and returning them again to the fire, as described.

The door G is provided with the open annular depression, having the perforated inner and side walls described in a former application, and it need not, therefore, be more particularly described here. Parts of the furnace and boiler not particularly described may be constructed and arranged in any usual or preferred manner.

From the foregoing description it will be seen that air is admitted through the chamber E , duct D , and distributor F F' , across the entire front end of the fire-pot, and that, through the action of the arch or partition H , as explained, the air is caused to be thoroughly mingled with the rising products of combustion, insuring, as far as practicable, their thorough combustion before they reach the tube-sheet, the space between the partition and tube-sheet forming a combustion-chamber of sufficient extent or depth for accomplishing this after the thorough mingling of the air with the products of combustion has been effected.

The duct D may, of course, be made separate from the door-frame; but the construction described is preferred, as giving compactness and permanency to the arrangement, and as adapting the distributing stand-pipe or chamber F to be readily removed and renewed when necessary.

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

1. The combination, with the air-duct D, of the perforated distributing pipe or chamber projected within the fire-pot, and having the pendent perforated wings or arms, substantially as and for the purpose described.

2. The combination, with the air-duct D and distributing pipe or chamber F, of the upright air box or chamber E, with its inlet-openings and adjustable cover or valve, substantially as described.

3. The distributing pipe or chamber F, pro-

jected within the fire-pot, and provided with numerous minute perforations, increasing in size and frequency, either or both, as they approach the sides or ends of said pipe or chamber, as described.

In testimony whereof I have hereunto set my hand this 19th day of May, A. D. 1877.

H. F. HAYDEN.

Witnesses:

JOHN G. CENTER,

ALEXANDER MAHON.