

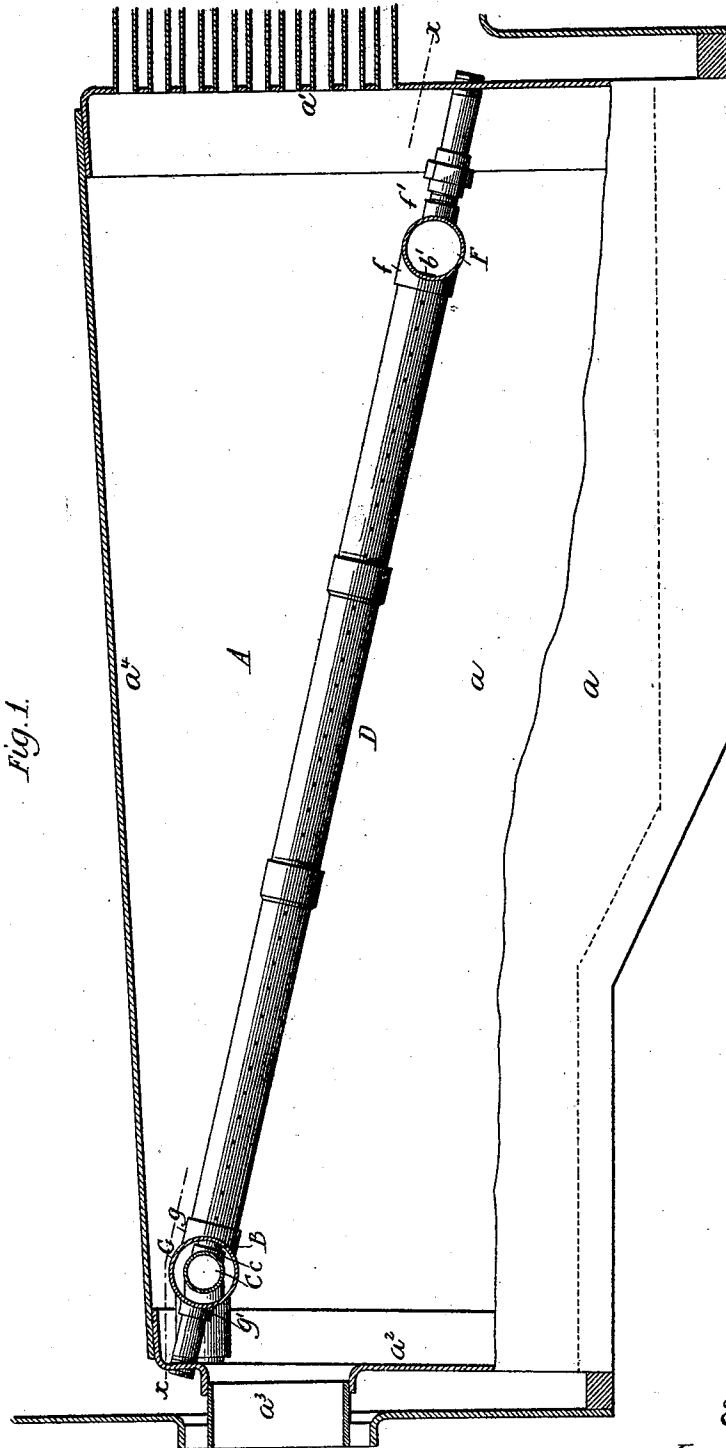
(No Model.)

3 Sheets—Sheet 1.

J. MILTON.
STEAM BOILER FURNACE.

No. 516,974.

Patented Mar. 20, 1894.



Witnesses

Wm. S. Taylor
John H. Dudley

Inventor

John Milton

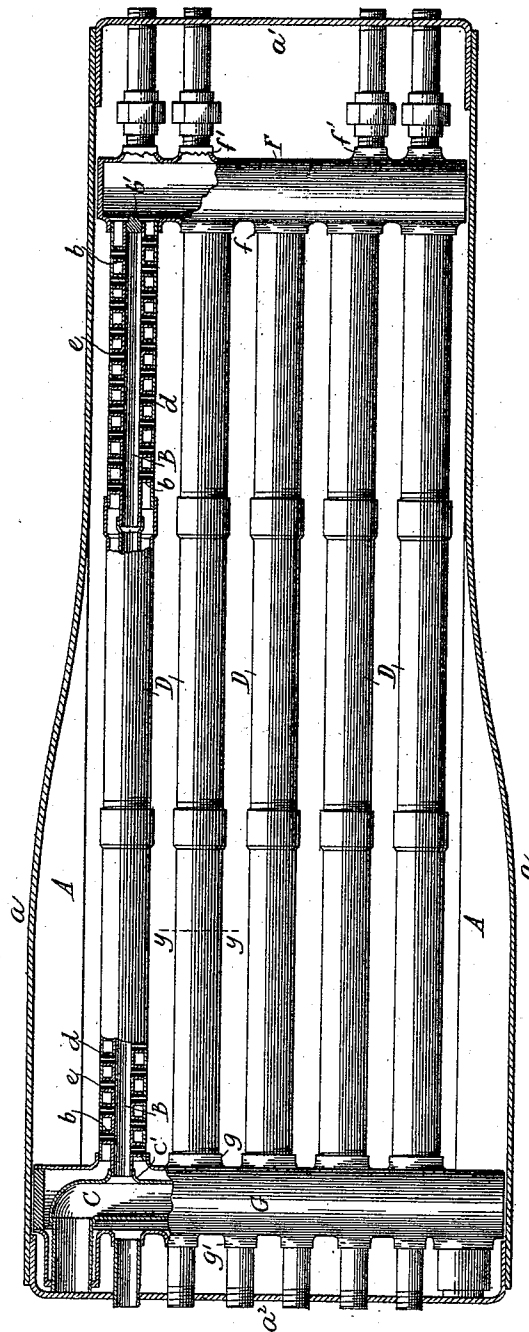
By *W. W. Dudley & Co.*
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Fig. 2.



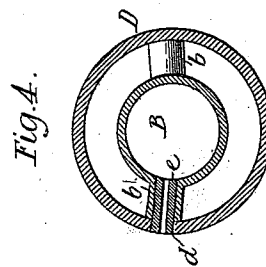
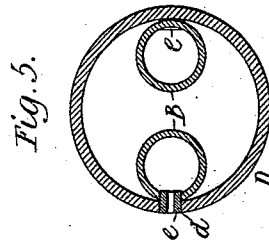
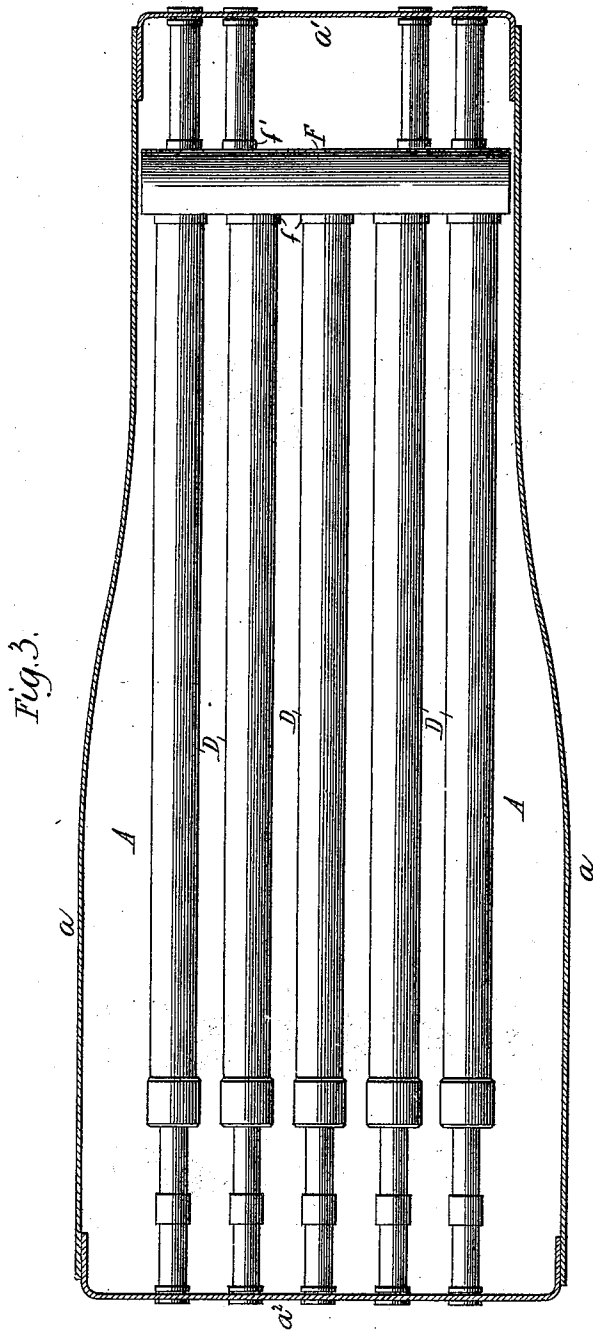
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UNITED STATES PATENT OFFICE.

JOHN MILTON, OF WASHINGTON, DISTRICT OF COLUMBIA.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 516,974, dated March 20, 1894.

Application filed December 11, 1893. Serial No. 493,338. (No model.)

To all whom it may concern:

Be it known that I, JOHN MILTON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do declare the following to be a full, clear, and exact description of the invention, such as 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 the letters of reference marked thereon, which form a part of this specification.

This invention relates to boiler furnaces, and especially to furnaces of that type wherein provision is made for the consumption of the smoke and other products of combustion with a view to preventing the discharge of smoke and cinders into the outer air and to reduce the consumption of fuel.

In my Patent No. 503,155, dated August 15, 1893, and reissued October 3, 1893, No. 11,370, I have shown and described a device adapted for application to the fire box of a locomotive and by which air under pressure is distributed in the form of a thin sheet over the surface of the bed of fuel at a certain defined plane with relation thereto and which I term the plane of combination and combustion. The air so distributed supplies the necessary quantity of oxygen to the products of combustion, to convert the carbonic oxide into carbonic dioxide, thereby multiplying the number of heat units, and entirely consuming such products as escape in the form of smoke. In this patent the air distributing pipes are protected from the action of the heat of the furnace by fire clay or other refractory envelopes having perforations which register with openings in the pipes for permitting the discharge of the air. In my Patent No. 506,128, dated October 3, 1893, I have shown and described a device for a similar purpose, but the construction differs from that just described, in that the air pipes are only partly surrounded, and by the upper portion of water circulating pipes having connections with the water space of the boiler, the use of fire clay being dispensed with.

My present invention also contemplates the introduction of air in such a quantity and under such conditions, as that sufficient oxygen

is combined or mingled with the products of combustion to insure as complete a consumption of the same as possible, and added to these conditions, the distribution of the air is made at the point or plane where the most intimate combination and perfect combustion is attainable.

My present invention also contemplates the employment of metallic pipes for the introduction and distribution of air, and to insure the longevity thereof said pipes are inclosed by water pipes which are in communication with the water space of the boiler. This arrangement has the double advantage of insuring maximum durability, and also of being rigidly connected with the sheets or walls of the fire box thereby precluding accidental displacement and liability of fracture. The connection between the parts, moreover, is of such a nature as that the device as a whole is practically homogeneous, and the degree of expansion is substantially the same throughout.

In the accompanying drawings I have shown an arrangement of pipes and connections adapted for application to a furnace of the locomotive boiler pattern, and the same will be fully and clearly set forth in the following description, but I do not wish it understood that I confine myself to this construction and arrangement, as my invention is susceptible of being modified, and applied to any other type of boiler furnace as well, and the drawings serve merely for the purpose of illustration.

In the said drawings—Figure 1 is a vertical central longitudinal section of enough of a locomotive engine with my device applied to show the general application and arrangement. Fig. 2, is a sectional view taken on the line $x-x$ of Fig. 1, showing my device partly in plan, and partly in section. Fig. 3, is a plan view partly in section of a modified form of my invention. Fig. 4 is a transverse section on line $y-y$ of Fig. 2, showing an arrangement of the pipes and their connection and Fig. 5, is a view similar to Fig. 4, showing a modified arrangement of the pipes.

Like letters of reference denote like parts in the figures of the drawings.

Referring to the drawings by letter, A denotes the fire box of a locomotive of common construction.

a , represent the side sheets, a' the flue sheet, a^2 the back sheet provided with the stoking hole a^3 , and a^4 is the crown sheet. These sheets are protected in a well known

5 manner from the action of the heat of the fuel, by water from the boiler which circulates around the box between said sheets and the shell of the boiler, or in what is technically known as the water space.
 10 Within the fire box is arranged my improved smoke consuming device which is preferably in the nature of a diaphragm and formed of a series of air distributing pipes which receive a supply of air from any suitable
 15 source, and which are entirely inclosed by a series of water pipes having connections with the water space of the boiler, which arrangement, as above stated, protects the diaphragm from the action of the heat produced
 20 by the burning fuel. I prefer to locate this diaphragm at a plane with relation to the surface of the bed of fuel as will secure by an intimate combination or mingling of the air from the pipes with the products of combustion, the most complete consumption of the
 25 latter, with the objects of burning the smoke and other visible gases, and of reducing the consumption of fuel, which latter is accomplished by the increase of heat derived from the action due to the admission of the air,
 30 and the increase in the heating surface due to the employment of the water pipes.

I will now describe in detail the construction of the diaphragm both in the preferred
 35 arrangement, and in the modified forms, but I would here state that I do not confine myself to such constructions as the same are susceptible of further modifications without departing from the spirit of my invention.

40 In Figs. 1 and 2 I have shown a diaphragm composed of five air distributing pipes designated by the letter B, and these pipes are each cast or otherwise made in one piece or in sections as shown. On each side of each
 45 of the air pipes are formed, and preferably by casting the same integrally, a series of lugs b which are centrally perforated or apertured, the perforation or aperture extending also through the pipe, and is internally screw
 50 threaded as shown. The outer ends of the lugs are preferably curved concentrically for a purpose to be made apparent. These five air pipes, there may be a greater or less number, are each connected at one end to a manifold C, which as shown has a series of internally
 55 screw-threaded lugs c to receive the threaded ends of the pipes, and connections are made by means of sections of pipe c' between the manifold and the air supply which
 60 are not here shown. The other ends of the air pipes are closed by plugs b' preferably screwed into place.

The water pipes are shown at D and are made in one piece or in sections, as conditions permit, and are each provided on each
 65 side with a series of openings d screw threaded,

ed, and which in practice register with the perforations in the lugs b . When the connections between the water and air pipes are to be made, the air pipes are inserted end-
 70 wise into the water pipes, the curved ended lugs fitting closely the inner surface of the latter, and when the openings in the water pipe register with the perforations in the lugs, a series of perforated screw threaded nipples
 75 e are inserted through the said openings and into the lugs, and by this arrangement water and steam tight joints are made between the pipes and at the surface of the water pipes. At each end of the water pipes or if preferred
 80 at only one end, connections are made to manifolds which are in turn connected to the water space of the boiler in order that water may be permitted to circulate freely around the air pipes. The forward manifold
 85 F is provided with screw threaded lugs f for connection with the water pipes, and with similar lugs f' for connection by sections of pipes and unions with the water space. The rear manifold G is sufficient in size to receive
 90 and provide for water space around it, the manifold for the air pipes, and the connections between it and the water pipes, and the water space of the boiler are made by the use of perforated lugs g g' in a similar manner
 95 to the connections for the manifold F.

In Fig. 3 I have shown a construction embodying all of the essential elements of that shown in Figs. 1 and 2. In this arrangement
 100 I have shown but one manifold for the water pipes, and the number of connections has been reduced. It is evident however that my device may be still further modified, hence I do not confine myself to any construction which may properly be included in the general
 105 idea.

I may arrange the air pipe and the inclosing water pipe concentrically or eccentrically, or I may as shown in Fig. 5, employ two or
 110 even a greater number of air pipes. The air may be supplied in any way that will cause a distribution under pressure, it being necessary, in view of the strong draft, to force the air sufficiently to break up the body of products of combustion to insure its admixture
 115 therewith.

In the operation of my invention, air being supplied from any suitable source, finds its way out through the perforated nipples and is distributed in the form of a thin sheet
 120 which readily combines and mingles with the products of combustion and furnishes a quantity of oxygen sufficient to produce a rapid consumption of the said products within the fire box. The effects of such operation are
 125 that the products of combustion which eventually escape and find an outlet through the stack or chimney are entirely freed from carbon and hence there are no visible gases and little or no dirt and cinders. The combustion of the gases within the fire box add to
 130 the quantity of heat obtainable from the fuel

and this result together with the large extra heating surface of the water pipes reduces the consumption of fuel to a marked degree.

The pipes for supplying the air being protected by water, are practically indestructible so far as the heat of the fuel is concerned, and having rigid connection with the fire box cannot be displaced under ordinary conditions.

The pipes when connected form practically a homogeneous body, hence there can be no difference in the degrees of expansion between the inner and outer pipe.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a boiler furnace, the combination with the fire box of a series of laterally perforated water pipes having connections with the water space of the boiler, and a series of air pipes located within the water pipes and having exteriorly projecting perforated lugs abutting against the inner surface of the water

pipes, and nipples passed through the perforations in the water pipes and into said lugs, substantially as and for the purposes set forth.

2. In a boiler the combination with the fire box of a series of laterally perforated water pipes arranged longitudinally therewith, a series of air pipes within the water pipes having integral exteriorly projecting perforated lugs, nipples passed through the perforations in the water pipes and into said lugs, manifold connections for the water pipes in communication with the water space of the boiler, and manifold connections for the air pipes located within the water pipe manifold connections, in communication with an air supply.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN MILTON.

Witnesses:

WILL T. NORTON,
JOHN W. DUDLEY.