

(No Model.)

P. J. DONAHUE.
SMOKE CONSUMING FURNACE.

No. 538,667.

Patented May 7, 1895.

Fig. 1.

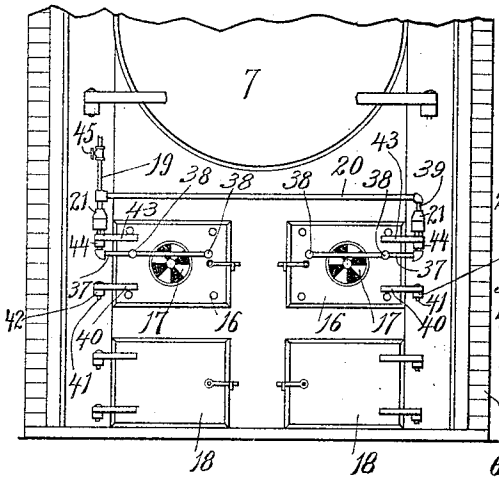


Fig. 2.

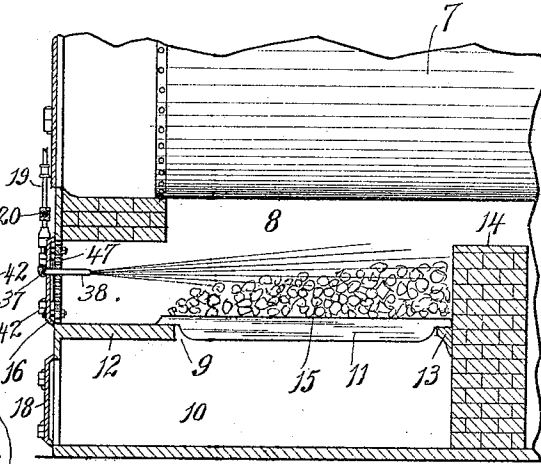


Fig. 6.

Fig. 4.

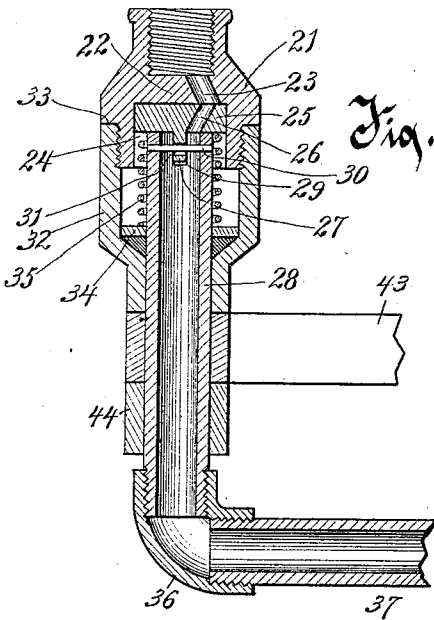


Fig. 3.

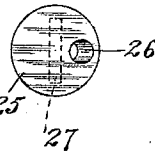
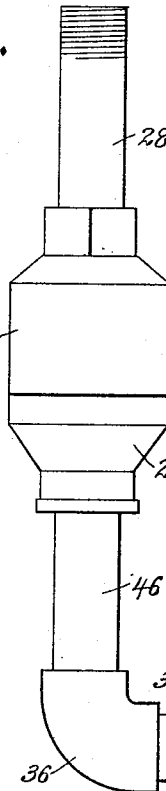
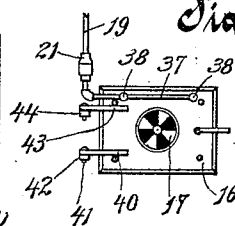


Fig. 5.



Witnesses.

C. N. Kuey
Anna V. Faust.

Inventor.

Patrick J. Donahue
By *Benedict & Mossell*
Attorneys.

UNITED STATES PATENT OFFICE.

PATRICK J. DONAHUE, OF MILWAUKEE, WISCONSIN.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 538,667, dated May 7, 1895.

Application filed June 11, 1894. Serial No. 514,121. (No model.)

To all whom it may concern:

Be it known that I, PATRICK J. DONAHUE, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Smoke-Consuming Furnaces, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in smoke consuming furnaces, having particular reference to that class of devices wherein a steam blast is provided for facilitating the draft of air into the furnace, and for creating a heat of sufficient intensity to consume the smoke and gases arising from the fuel.

The object of the invention is to provide, in this class of devices, a most simple, efficient and economical construction for the purpose.

A further object is to provide a simple and improved means whereby the supply of steam may be conveniently regulated by the opening and closing of the furnace doors.

In the accompanying drawings, Figure 1 is a front elevation of a steam-boiler furnace provided with my improved attachments. Fig. 2 is a longitudinal vertical sectional view thereof. Fig. 3 is a sectional view of the valve-regulating mechanism. Fig. 4 is a detail plan view of the disk. Fig. 5 is a detail elevation of one of the furnace-doors, showing a modification thereof; and Fig. 6 is a detail elevation of a modified form of steam-pipe.

Like numerals of reference denote like parts throughout the several views.

Referring to the drawings, the numeral 6 indicates the usual masonry for supporting a boiler 7. Below the boiler is formed a furnace chamber 8, which has an opening 9 therein communicating with an ash-pit 10 below. Grate bars 11, are supported over this opening, the front ends of said grate bars resting on the bottom 12 of the furnace chamber, and the rear ends thereof on a ledge 13 projecting from the bridge wall 14. The fuel supported on the grate bars is indicated by the numeral 15.

The numerals 16, 16 indicate two doors leading to the furnace chamber, said doors being provided with damper-regulated openings 17. Below the doors 16, 16 are other doors 18, 18,

by means of which access may be obtained to the ash-pit.

The numeral 19 indicates a steam pipe extending from a suitable source of supply (not shown). This pipe has extending therefrom across the front of the furnace, immediately above the doors 16, 16, a horizontal extension 20. At the left hand end of Fig. 1 the main steam pipe 19 extends slightly below the horizontal extension, and its threaded end engages the female threads of a cap-piece 21. This cap-piece is provided with an interior horizontal partition 22 having an inclined opening 23 therethrough. Beneath the horizontal partition 22 the cap-piece is chambered or recessed, as indicated at 24. Into this chamber or recess fits a disk valve 25, which is provided with an opening 26 therethrough, which is inclined in an opposite direction to, and is adapted to be brought into register with, the opening 23 of the partition. From the under side of this disk depends a transverse rib or lug 27 which fits into the upper end of a tube 28, the ends of the rib or lug fitting in diametrically-opposite recesses, such as 29, in the end of the tube. A rivet 30 passing transversely through the upper end of this tube and through a slightly elongated opening 31 in the rib or lug, holds the disk to place on the top of the tube, the elongation of the opening 31 permitting a slight play of the disk.

The numeral 32 indicates a casing, through the bottom of which the tube 28 passes. The upper threaded end of this casing takes on to the lower threaded end of the cap-piece 21, and bears with its end against a shoulder 33 of said cap-piece. Fitting in the conical bottom of this casing is a plate 34, against which the lower end of a coiled spring 35 bears, said coiled spring surrounding the tube 28, and having its upper end bearing against the under side of the disk 25.

Coupled to the lower end of the tube 28 by an elbow joint 36 is a horizontal pipe 37, which extends in front of the left hand furnace door 16, across the damper-regulated opening 17, being provided on opposite sides of said opening with inwardly-projecting nozzles 38, 38, which nozzles extend through the furnace door, on a true horizontal plane as shown clearly in Fig. 2.

Extending downward from the right hand end of the horizontal pipe 20 is an extension 39, and coupled to this extension are parts exactly similar to the parts on the left, and designated by the same reference numerals.

The numerals 40, 40 indicate the lower leaves or straps of the hinges of the furnace doors. These straps or leaves project outwardly, and pins 41 are passed through the eyes thereof which register with the eyes of knuckles or lugs 42 projecting forwardly from the door casing, in the usual manner in hinges.

The upper leaves of the hinges of the furnace doors are designated by the numerals 43. Instead of pins, such as 41, passing through the outer eyes of these leaves, the tubes 28 pass therethrough, and also pass through upper knuckles or lugs 44. When the furnace doors are closed the apertures 23 and 26 of the valve and the partition, respectively, are in register, as clearly shown in Fig. 3, so that a clear passage for the steam to the furnace is provided. In opening the doors, however, the extensions 37 coupled to the tubes 28, have the effect of turning the tubes, and the disks 25 carried by said tubes are likewise turned, whereby the openings 26 are thrown out of register with the openings 23, and the passage for the steam to the furnace thereby closed.

In the drawings, I have shown the disk 25 as loosely fitted to the upper end of the tube 28, and capable of having a slight vertical play. This is the preferable construction, inasmuch as by the action of the coiled spring 31, said disk is always held firmly to its seat, against the pressure of the steam, and as wear occurs by friction the spring at once takes up such wear, and thereby maintains at all times a firm bearing of the disk against its seat. I do not, however, wish to be understood as limiting myself to this construction, as it is obvious that successful results might be obtained by forming the disk 25 rigid with the upper end of the tube 28. The construction shown is the preferred form, and is perhaps the one which will be adopted in practice.

In Fig. 5 I show a slightly modified construction, wherein the steam pipe forms no part of the hinge of the door. The extension 37 in this form extends across the front of the door above the damper regulating opening 17.

Fig. 6, illustrates a modification in the arrangement of the device for controlling the flow of steam to the furnace. In this view the parts shown in Fig. 3 are exactly reversed, that is to say, the tube 28 is uppermost and connects at its lower end to that end of the casing 32 which occupies the lowermost position in Fig. 3. The upper end of the tube 28 in Fig. 6 connects directly to the main steam pipe 19. Another pipe 46 is shown as connected to the female threaded end of the coupling 21. The extension 37 is connected to the lower end of the pipe 46 by means of the elbow joint 36. When the door is opened, there-

fore, the extension 37 will have the effect of turning the coupling 21 and attached casing 32, and consequently throw the aperture 23 of the coupling out of register with the aperture 26 of the disk 25. This disk, therefore, in this form remains fixed against rotation. It will therefore be apparent that the successful operation of the device is not necessarily limited to the form illustrated in Fig. 3. In fact, the construction illustrated in Fig. 6 works equally well, and in practice might perhaps be found to be most desirable.

In the operation of my invention, the damper-regulated openings being open steam is allowed to pass freely to the furnace by turning a cock 45 in the steam pipe. This steam is ejected forcibly out of the nozzle 38 horizontally over the top of the coals or fuel 15, as clearly shown in Fig. 2. As the steam is ejected on opposite sides of the air openings, and in a straight horizontal line, it will most efficiently draw in the air through the openings, thereby creating a most intense and direct draft. This air will be drawn by the steam over the tops of the burning coals, whereby the smoke arising therefrom is consumed, and the gases ignited before passing over the bridge wall.

It is obvious that, if desired, steam alone may be admitted merely by closing the air opening 17, and opening the cock 45, or air alone admitted by opening the damper-regulated opening 17 and closing the cock 45. In starting the fire, or firing up, or examining the interior of the furnace, it is of course necessary to open one or both of the furnace doors 16. In so opening, it is of course desirable to shut off the flow of steam, and it is for this reason that I provide the valve 25, operated in the manner set forth.

The plates 47 at the back of the doors 16, shown clearly in Fig. 2, are perforated for the purpose of spreading the air as it is drawn in by the action of the ejected steam.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a smoke consuming furnace, the combination, of a furnace chamber, a door therefor, a vertical steam pipe, a coupling, said coupling provided with an interior apertured partition, the aperture leading to a chamber of the coupling, a tube forming a continuation of the steam pipe, a disk fitting in the chamber of the coupling and connected to the tube in such manner as to have vertical play, said disk also provided with an opening, a horizontal pipe extending in front of the door, and provided with nozzles extending through the door, and a tubular connection between the horizontal pipe and the parts carrying the steam controlling ports or openings, whereby when the door is opened said ports are thrown out of register, and when the door is closed the ports are thrown into register, substantially as set forth.

2. In a smoke consuming furnace, the com-

bination of a furnace chamber, a door there-
 for, a steam pipe, a coupling, said coupling
 provided with an interior apertured partition,
 the aperture leading to a chamber of the
 5 coupling, a tube forming a continuation of
 the steam pipe, a spring-actuated disk fitting
 in the chamber of the coupling, and con-
 nected to the tube, in such manner as to have
 vertical play, said disk also provided with an
 10 opening, a horizontal pipe extending in front
 of the door, and provided with nozzles ex-
 tending through the door, and a tubular con-
 nection between the horizontal pipe and the
 parts carrying the steam controlling ports or
 15 apertures, whereby when the door is opened,
 said ports are thrown out of register, and
 when the door is closed the ports are thrown
 into register, substantially as set forth.

3. In a smoke consuming furnace, the com-
 20 bination of a furnace chamber, a door there-
 for, a steam pipe, a coupling, said coupling
 provided with an interior apertured partition,
 the aperture leading to a chamber of the
 coupling, a tube forming a continuation of
 25 the steam pipe, a disk fitting within the
 chamber of the coupling and connected to the
 tube in such manner as to have vertical play,
 said disk also provided with an opening, a
 casing for the tube, a coiled spring surround-
 30 ing the tube, said spring bearing at one end
 against the disk to hold said disk yieldingly
 to its seat, a horizontal pipe extending in
 front of the door, and provided with nozzles
 extending through the door, and a tubular

connection between the horizontal pipe and 35
 the parts carrying the steam controlling ports
 or openings, whereby when the door is opened
 said ports are thrown out of register, and
 when the door is closed the ports are thrown
 into register, substantially as set forth. 40

4. In a smoke consuming furnace, the com-
 bination, of a furnace chamber, a door there-
 for, a steam pipe, a coupling, said coupling
 provided with an apertured partition, the
 aperture leading to a chamber of the coup- 45
 ling, a tube forming a continuation of the
 steam pipe, an apertured disk fitting in the
 chamber of the coupling, said disk provided
 with a projecting lug extending into the end of
 the tube, said lug provided with an elongated 50
 opening, a transverse pin passing through the
 end of the tube, and through the opening of
 the lug, a horizontal pipe extending in front
 of the door, and provided with nozzles extend-
 ing through the door, and a tubular connec- 55
 tion between the horizontal pipe and the parts
 carrying the steam controlling ports or open-
 ings, whereby when the door is opened said
 ports are thrown out of register, and when the
 door is closed the ports are thrown into reg- 60
 ister, substantially as set forth.

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

PATRICK J. DONAHUE.

Witnesses:

ARTHUR L. MORSELL,
 ANNA V. FAUST.