

F. L. DORNBROOK,  
BOILER SOOT BLOWER.  
APPLICATION FILED MAY 15, 1914.

1,337,828.

Patented Apr. 20, 1920.

2 SHEETS—SHEET 1.

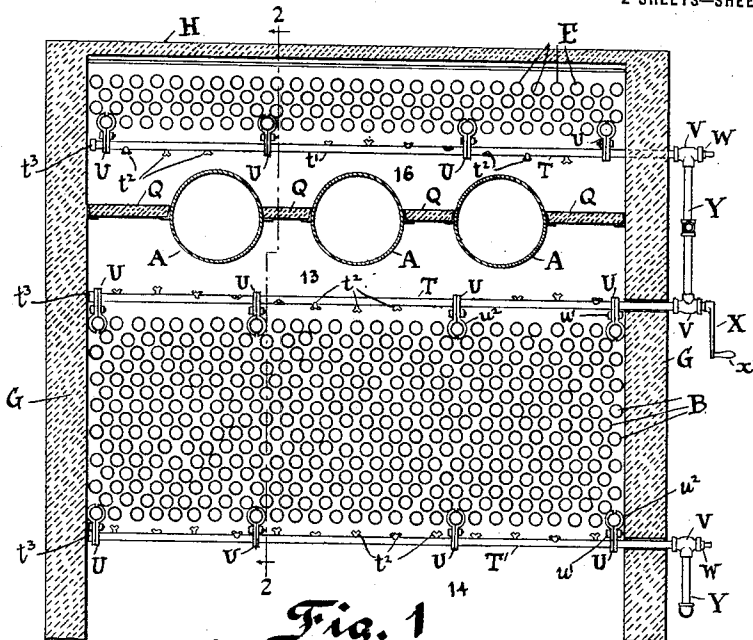


Fig. 1

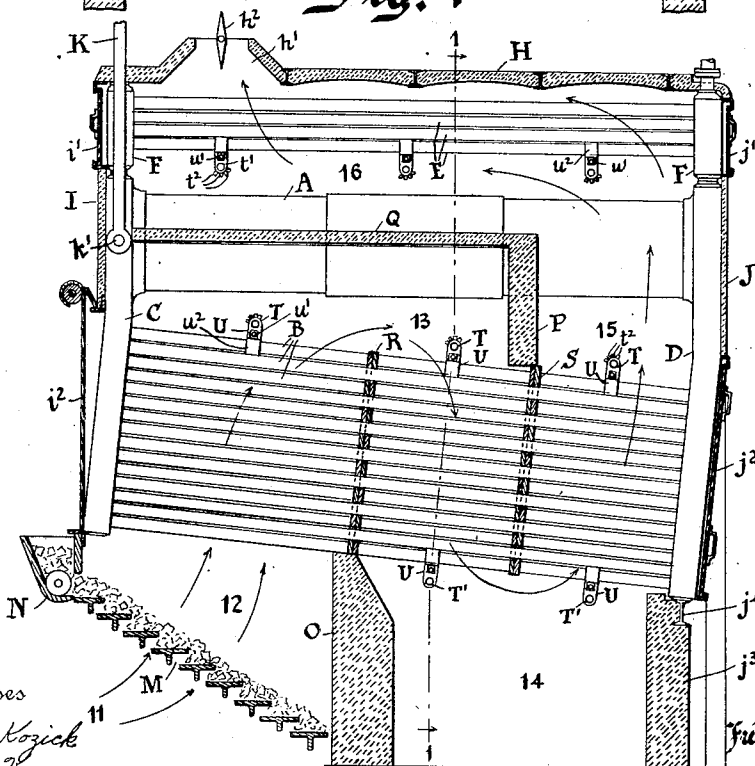


Fig. 2

Witnesses  
Edward Kozick  
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By *George Dornbrook* Attorney

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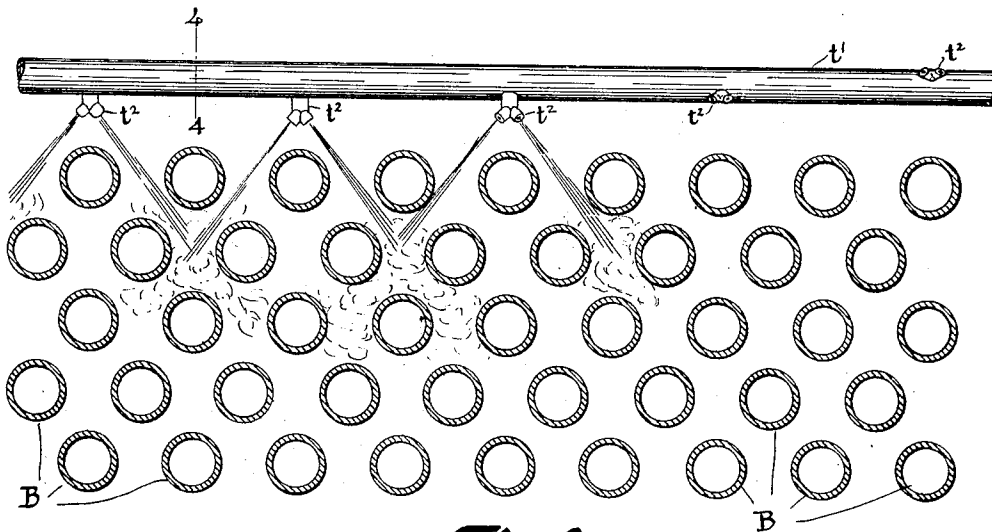


Fig. 3

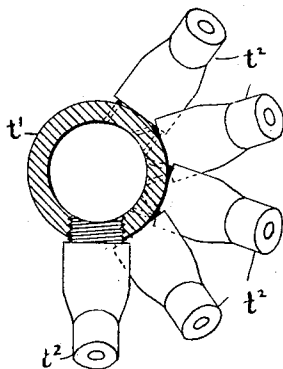


Fig. 4

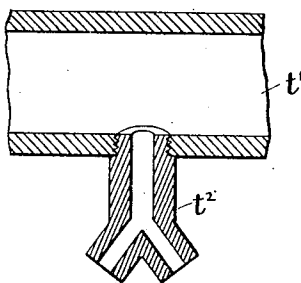


Fig. 5

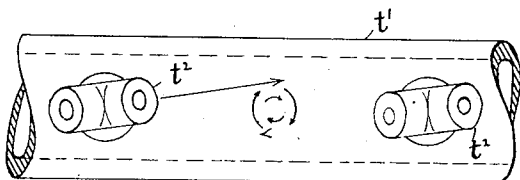


Fig. 6

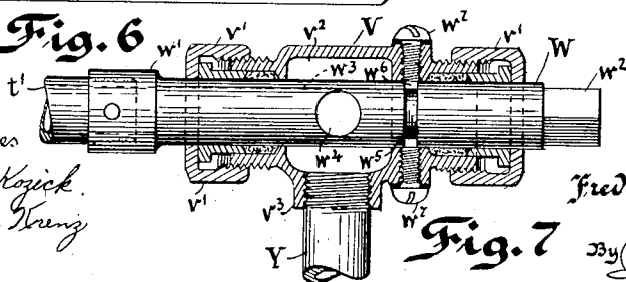


Fig. 7

Witnesses

Edward Kozick.  
Cyril Krenz

Fred L. Dornbrook, Inventor

By *Harold H. Moore* Attorney

# UNITED STATES PATENT OFFICE.

FRED L. DORNBROOK, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE VULCAN SOOT CLEANER COMPANY, A CORPORATION OF DELAWARE.

## BOILER SOOT-BLOWER.

1,337,828.

Specification of Letters Patent.

Patented Apr. 20, 1920.

Application filed May 15, 1914. Serial No. 838,712.

*To all whom it may concern:*

Be it known that I, FRED L. DORNBROOK, of Milwaukee, Wisconsin, have invented Boiler Soot-Blowers, of which the following is a specification.

This invention relates to devices for removing the soot or deposited carbon from the tubes of water-tube boilers. The object which I have in view is to provide a device which can be installed in a boiler of any width at moderate expense and by a simple manipulation will effectively clean the tubes or remove the soot therefrom mechanically in a thorough manner.

Heretofore devices for such purpose have been devised consisting of steam-pipes mounted transversely or parallel to the tubes and having lateral nozzles through which steam jets were delivered. These devices, however, at least such of them as are known to me, have all proved defective and unsatisfactory in use in case of boilers provided with a heavy bank of tubes either very wide or very deep, for the reason that the jets from the nozzles do not effectively reach the surfaces of the tubes in such manner as to remove the soot therefrom. It is obvious that such jets acting in an individual capacity will drive merely in straight lines between the tubes, consequently cannot reach the surfaces of the tubes which lie behind other tubes, and it is these surfaces which largely carry the soot.

It is the main object of this invention to construct such a blower upon a new principle: to wit, by so directing the several jets that they will coöperate one with another, acting in such a manner as to produce atmospheric eddies or whirls in the inter-tube-spaces, which therefore produce cross currents, that is to say, currents lying transversely to the jets themselves, so as to reach every part of the surface of the tubes in a forcible manner and drive off the soot which is deposited thereon. I aim furthermore so to construct the device that it will completely remove all the soot, not merely from the tubes, but from the boiler and flue surfaces, and thereby act as a cleaner for same; and I have proved by long continued use that it will do so.

My invention embodies not merely this new principle but also other novel construc-

tions which are auxiliary thereto, as will appear from the following detailed description and are embodied in my claims.

For the better understanding of my invention I have described in the following specification some of the most improved forms thereof, illustrating the same in the accompanying drawings, wherein—

Figure 1 is a transverse section on the plane 1 of a water-tube boiler having a number of my improved soot-blowers mounted in position therein, same being taken on the section-plane 1 of Fig. 2;

Fig. 2 is a longitudinal section thereof on the plane 2;

Fig. 3 is a partial section on the plane 1 on a larger scale, showing the upper part of the bank of water-tubes and a part of one of the soot-blowers;

Fig. 4 is a transverse section of one of the soot-blowers on the plane 4 and on a still larger scale;

Fig. 5 is a fragmentary longitudinal section through a portion of the soot-blower pipe and one of the lateral nozzles;

Fig. 6 is a fragmentary side-view of another form of soot-blower, showing a somewhat different disposition of the nozzles to effect the same results; and

Fig. 7 is a longitudinal section through the rotary joint at the end of the soot-blower pipe.

In these drawings the several reference letters designate the same respective parts in each figure.

For the sake of illustration I have shown in Figs. 1 and 2 a common type of water-tube boiler and setting, the same comprising the boiler-drums A, bank of water-tubes B, headers C and D at front and rear completing the circulation through the water-tubes and drums, and a superheating device comprising another bank of tubes E with headers F mounted above the boiler-drums A which receive the generated steam from the gas-space in said drums and deliver it thence to the steam-mains for consumption. The boiler-setting comprises the side-walls G; the top-closure or roof H; the front-closure comprising the insulated wall I, doors  $i^1$  and rolling curtain-door  $i^2$ ; the rear-closure comprising insulated wall J, doors  $j^1$  and  $j^2$ , and back-wall  $j^3$  which is provided

with a beam  $j^1$  across the top to support the rear end of the boiler, whose front end is supported by eye-bars K, engaging pins  $h^1$  in headers C; the grate M and automatic fuel-feed N; the bridge or partition-wall O; and the overhead firebrick wall P and horizontal partition Q, with the baffle-plates R and S, which, in conjunction with the walls O, P and Q, act to direct the gases; whose direction is from the ash-pit 11 to the fire-box 12, thence upward through the bank of tubes B to the combustion-chamber 13 which is under the drums A, thence downwardly between the baffle-plates R and S into the soot-chamber 14, thence upwardly again behind the baffle-plate S to the flue 15 which is behind the wall P, thence to the overhead chamber 16 or part of the flue which lies horizontally along the top of the drums and between the superheater-tubes E, and finally out to the chimney or stack through the flue-opening  $h^1$  in the roof H, which is governed by the damper  $h^2$ .

The above description, it is to be understood, relates only to known features and not to those of my invention. Eight of the latter are shown as installed, six of which are designated as a whole T, and the other two, which are on the under sides of the bank of tubes B, are designated  $T^1$  as they present a slight difference in their construction.

Each of the soot-blowers comprises a pipe  $t^1$  which is mounted either upon or under one of the banks of tubes and transversely thereto, so that it will be readily seen the blower is adaptable to batteries of boilers or tubes of any width whatever. Said pipe  $t^1$  is mounted preferably in the apertures of clips U, each clip comprising a pair of plates united by a bolt  $u^1$  and having at one end a pair of semi-cylindrical sockets  $u^2$  adapted to engage and be clamped by the bolt  $u^1$  upon one of the tubes B, and perforated at the other end with a hole which forms a bearing for the pipe  $t^1$  which passes through it. The pipe  $t^1$  carries a plurality of bifurcated nozzles  $t^2$ , the peculiarity of which is that the two branches thereof are directed substantially along the oblique lines of the intertube-spaces as shown in opposite directions, so that the jets of the different nozzles cross each other on their way through said intertube spaces; and further, that the jets do not lie in the same plane but in planes somewhat separated from each other, in such manner that in crossing each other whirls or eddies are set up, which being transverse to the directions of the jets effectively reach those intertube-spaces through which the jets themselves do not pass.

Two ways of effecting this condition are shown in the drawings; but I do not pretend that they are the only ways in which it may be accomplished so that the same principle

is involved. In Figs. 1, 3 and 4 the nozzles  $t^2$  are set helically upon the pipe  $t^1$ , that is to say, they are set in different radial planes about the axis of the pipe, while in Fig. 6 they are set in the same plane, but the plane of bifurcation of each nozzle is slightly angular to the axis of the tube, so that the crossing jets do not lie in the same plane.

Means for supplying the tubes  $t^1$  with steam and for rotating them are provided. Such means as illustrated comprise the hollow joint-box or steam-box V, in which rotates the cylindrical member W, having on one end a socket head  $w^1$ , into which the end of the pipe  $t^1$  screws, and on the other end a square  $w^2$ , adapted to receive a crank X provided with a handle  $x^1$  for turning it. The box V has packing glands  $v^1$  on its ends and a central steam-chamber  $v^2$  with a screw-threaded side-outlet  $v^3$  to receive the steam-supply pipe Y. The member W has a bore  $w^3$  for a part of its length which opens laterally at  $w^4$  into the chamber  $v^2$ , whereby the member W, and with it the pipe  $t^1$ , can be continuously rotated by means of the crank X without interfering with the supply of steam. For providing against endwise movement a groove  $w^5$  is formed in the member W, which is engaged by the bossed ends  $w^6$  of the screws  $w^7$ . Any other means for accomplishing the same result of rotating or oscillating the pipe  $t^1$  while supplying steam thereto may be adopted. At its inner end said pipe is closed by a cap  $t^3$ .

The soot-blowers  $T^1$  which are below the bank B are arranged differently from the blowers T in that the arrangement of the nozzles  $t^2$  does not follow a continuous helical line around the pipe  $t^1$  but said nozzles are disposed all on one side of the pipe, shifting their angles in a zig-zag manner, and means are provided (such as for example a stop-pin in the groove  $w^5$ ) for limiting the angle through which pipe  $t^1$  can be turned, so that at no time can it be turned so far as to cause the jets to blow down into the soot-receiving chamber 14, because it is not desired to disturb or stir up the soot which is deposited in said chamber.

In the same manner various changes and modifications in the constructions as herein shown may be adopted without departing from the spirit of my invention and I wish it understood therefore that the latter is not otherwise limited than by the proper scope of my claims.

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

1. In a flue cleaner system, a fluid distributing pipe having openings therein with the adjacent openings in different radial planes, and a nozzle for each opening having

an axial opening terminating at the outer end in a V-shaped passage to project spaced jets from each nozzle with the adjacent jets of opposed nozzles traveling in proximity to set up a vortex of whirling motion therebetween.

2. In a flue cleaner system, a fluid distributing pipe having openings therein with the adjacent openings in adjacent radial planes, and a nozzle for each opening having a Y-shaped passage to project spaced jets from each nozzle, with the adjacent jets of opposed nozzles traveling in proximity and free of contact to set up a vortex of whirling motion therebetween.

3. In a flue cleaner system, a fluid distributing pipe provided with outlets spaced apart along the pipe having their axes inclined toward each other and located in parallel planes so spaced that the nozzles will project spaced crossing jets in sufficient proximity to create a whirling action in the gases between the jets.

4. In a flue cleaner system, a fluid distributing pipe provided with jets of outlets spaced apart along the pipe, adjacent outlets of each set having their axes inclined toward each other and lying in parallel planes which are inclined to the axis of the pipe and so spaced as to produce crossing

jets which create a whirling action of the intervening gases.

5. In a flue cleaner system, a fluid distributing pipe having openings therein spaced apart along the pipe, and a nozzle for each opening having diverging outlets with the axes of adjacent outlets of adjacent nozzles inclined toward each other and located in parallel planes so spaced that the nozzles will project crossing jets in sufficient proximity to create a whirling action in the gases between the jets.

6. In a flue cleaner system, a fluid distributing pipe having openings therein spaced apart along the pipe and a nozzle for each opening having a Y-shaped passage defining spaced outlets with the adjacent outlets of adjacent nozzles having their axes inclined toward each other and lying in parallel planes which are inclined to the axis of the pipe and so spaced as to produce crossing jets which create a whirling action of the intervening gases.

In witness whereof I have signed my name in the presence of two witnesses.

FRED L. DORNBROOK.

Witnesses:

HERBERT FURICK,  
F. H. SWEFLOW.