March 29, 1932. F. C. AREY 1,851,559

FLUID COOLED CLEANER ELEMENT

Filed Dec. 1, 1930

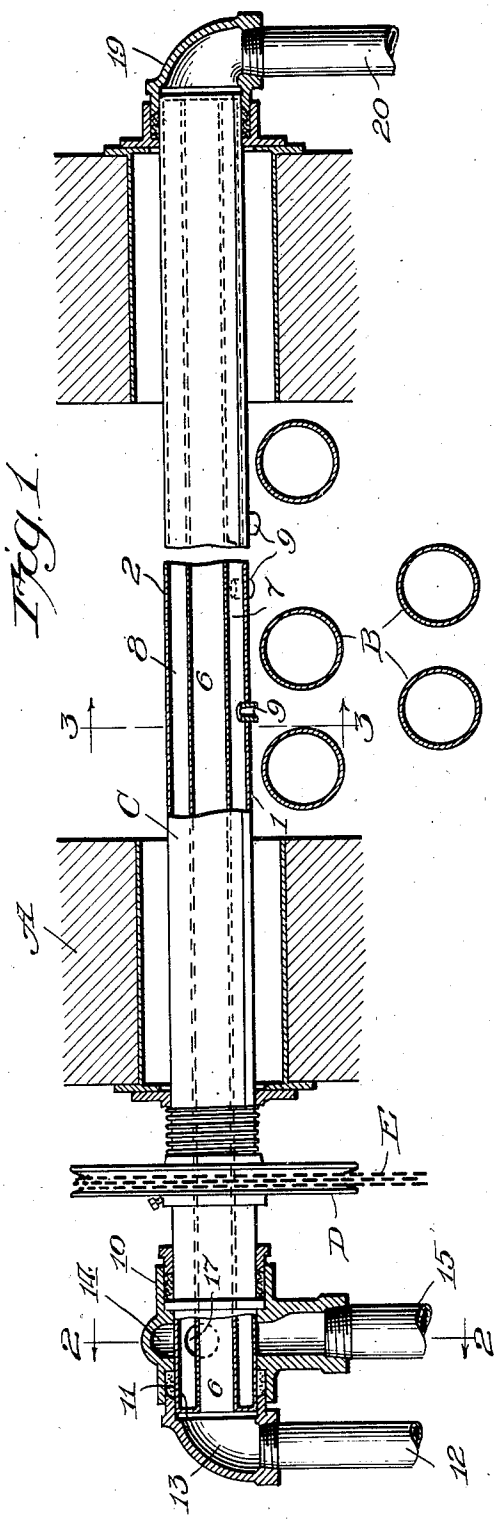

Fig. 1.

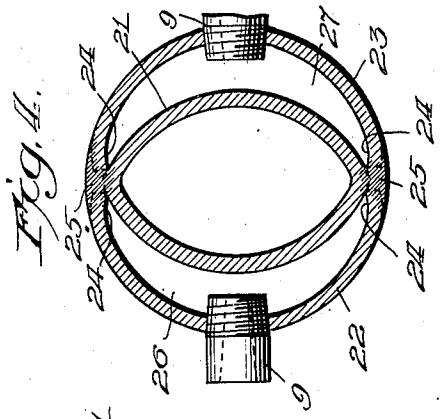

Fig. 4.

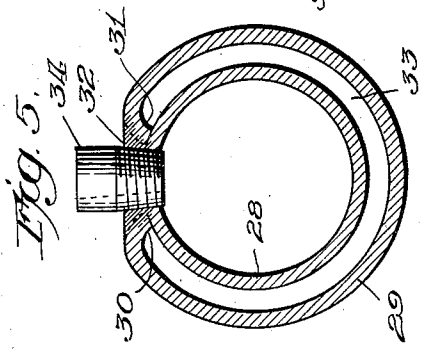

Fig. 5.

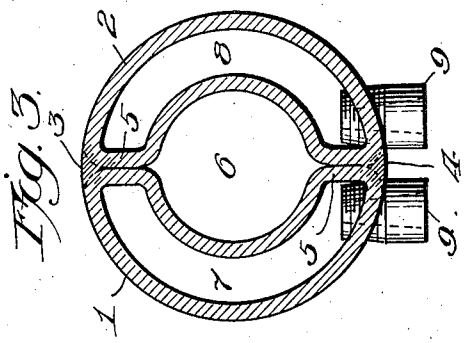

Fig. 3.

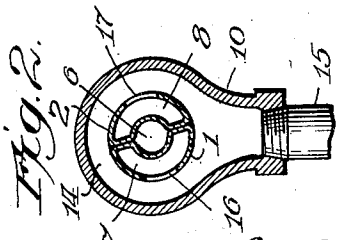

Fig. 2.

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UNITED STATES PATENT OFFICE

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FLUID COOLED CLEANER ELEMENT

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It is common practice to provide boilers of the water tube and return tube types, super-heaters and economizers with permanent soot cleaning elements. These elements are usually in the form of tubes extending transversely of the boiler tubes and provided with nozzles or other outlets from which steam or other cleaning medium is discharged. These cleaning elements become very hot, requiring numerous supports to prevent them from sagging and thus interfere with their rotation or oscillation. Furthermore, the heating elements deteriorate rapidly through being heated to high temperatures. Various expedients have been suggested to cool these cleaner elements so as to prevent them from becoming heated to an objectionably high degree; air, water and heat insulating solids having been proposed for this purpose. So far as I know, however, none of these suggested cooling methods have been found feasible in actual practice, because of complication of structure, failure in operation due to unequal expansion and contraction of the various parts and loss of boiler heat on account of the cooling medium.

The object of the present invention is to produce a novel self-cooling cleaner element which shall be simple in construction, rugged, capable of withstanding all of the stresses resulting from the expansion and contraction of the parts thereof and reduce the amount of heat extracted for cooling purposes to a minimum.

In carrying out my invention, I produce a tubular cleaning element composed of walls or sheets shaped and welded together to provide separate passages extending lengthwise through the same, at least one of the passages being substantially surrounded by the remainder; the steam being discharged through nozzles that are carried by and extend through only a single wall. In the preferred arrangement, the central passage carries the water or other cooling medium, the steam or other cleaning medium flowing through the outer passage or passages whose outer walls are exposed directly to the heat in the furnace or the like. In such an arrangement the cooling medium acts efficiently to prevent overheating of the outer walls of the cleaning element, whereas these walls and the steam serve to insulate the cooling medium from the direct heat of the furnace. Consequently, the cooling medium does not absorb heat directly from the furnace, but only from the metal of the cleaning element, thereby keeping the temperature of the cleaning element down with a minimum absorption of heat from the furnace.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a vertical section through a fragment of a boiler or furnace setting, equipped with one of my improved cleaner elements which is shown partly in elevation and partly in section; Fig. 2 is a section on line 2—2 of Fig. 1; Fig. 3 is a section on line 3—3 of Fig. 1, on a larger scale, only the tubular cleaning element being shown; and Figs. 4 and 5 are views similar to Fig. 3, showing two different modifications.

Referring to Fig. 1 of the drawings, A represents a boiler, furnace or heater setting containing the usual or any suitable tubes B for containing the water to be heated. C is a tubular cleaning element mounted in the usual or suitable way so as to extend transversely of the tubes B, the cleaning element being provided, outside of the setting, with means for turning or oscillating the same, as, for example, a sprocket wheel D and chain E.

The cleaning element may be constructed as shown in Figs. 2 and 3, being composed of two pipes or conduits 1 and 2, each having the shape of a semi-cylindrical hollow trough. The two pipe sections are placed with their concave sides toward each other and their corresponding edges in registration with each other; and they are welded together, as indicated at 3 and 4, so as to form a single integral structure. The resulting structure, therefore, takes the form of a pipe or tube surrounded by a larger pipe or tube joined

thereto by means of diametrically opposed webs 5, 5; the interior of the element as a whole being divided into a central passage 6 and two curved passages 7 and 8 that substantially surround the central passage. The outer cylindrical wall of the element carries nozzles 9 distributed lengthwise of the element, some of the nozzles communicating with the chamber 7 and the remainder communicating with the chamber 8. The nozzles may be placed in two rows arranged on opposite sides of and near one of the connecting webs 5.

The water or other cooling medium flows through the passage 6, whereas the steam employed for cleaning purposes flows through the passages 7 and 8. It will be seen that, since the cleaning element may be said in effect to be composed of an integral body of metal, the cooling medium will absorb heat from the outer wall of the element through the thick connecting webs between the inner cylindrical wall and the outer cylindrical wall, but will absorb no heat directly from the medium surrounding the cleaning element as a whole. The nozzles are carried directly by the outer wall of the device, and, therefore, will not loosen in service, as would be the case if the steam were carried by the inner passage 6 and the nozzles had to extend through and be fixed to two separated walls.

The cooling medium and the steam may be supplied and handled in any suitable manner. In the arrangement shown in Fig. 1, one end of the cleaning element extends into ends rotatable in a stationary head 10. The adjacent ends of the chambers 7 and 8 are closed by an end wall 11 welded or otherwise secured in place, whereas the corresponding end of the passage 6 is left open. The cooling medium is supplied through a pipe 12 into a chamber 13 in the head in direct communication with the open end of the passage 6. Between its ends the head has a chamber 14 surrounding the cleaning element and connected to a steam supply pipe 15. The cleaning element is provided with holes 16 and 17 in its peripheral wall, in registration with the chamber 14; one of the walls leading into the passage 7 and the other into the passage 8. Consequently, steam will flow from the pipe 15 into the chamber 14 and through the holes 16 and 17 to the chambers 7 and 8. The passage 6 is open at the opposite end of the element, also; this end of the cleaner element being rotatable in a stationary hollow chamber 19 provided with a discharge pipe 20. Therefore, the cooling medium that is delivered by the pipe 12 and flows through the cooling passage or chamber of the cleaning element is discharged into and carried away by the pipe 20.

In Fig. 4, I have illustrated a modification in which the element is composed of a central pipe or tube 21, oval in cross section, and two semi-cylindrical pipe sections 22 and 23 whose long marginal edges are bent inwardly slightly, as indicated at 24; these marginal edges being engaged with the inner pipe or tube at the ends of the long transverse diameter of the latter. The three pieces are assembled into a unitary structure by welding, as indicated at 25. The cooling fluid flows through the inner tube or pipe and the steam through two passages or compartments 26 and 27 lying on opposite sides of and substantially surrounding the tube or pipe 21. The steam discharge nozzles 9 are mounted directly upon the pipe sections 22 and 23.

In Fig. 5, I have illustrated a construction embodying only two passages or compartments. The cleaning element in this figure is composed of an ordinary cylindrical pipe 28 enclosed within a larger cylindrical pipe 29. The pipe 29 is split at one side along a longitudinal line, and the marginal portions adjacent to the dividing line are bent inwardly, as indicated at 30 and 31, a radial distance approximately equal to the difference between the internal radius of the member 29 and the external radius of the member 28. The two pipes or tubes are joined together by welding the in-turned portions or flanges 30 and 31 to the pipe 28, as indicated at 32.

One of the fluids flows through the interior of the pipe 28, whereas the other fluid flows through the curved passage or chamber 33 that almost surrounds the pipe or tube 28. This particular construction makes it possible to carry the steam at the center and the cooling medium on the outside, without requiring the nozzles to extend through two walls, if it be desired to cool the outer walls of the device through direct contact with the cooling medium instead of by conduction through the connecting bodies between the inner and outer walls. Since it is evident that the nozzles may be mounted in the outer wall, I have simply shown the alternate construction in which the nozzles, one of which, shown at 34, is screwed into the pipe or tube 28 in the space between the in-turned marginal portions or flanges 30 and 31 of the outer tube or pipe.

While I have illustrated and described only a few preferred forms of my inventon, I do not wish to be limited to the exact structural details illustrated and described; but intend to cover all forms and arrangements coming within the definitions of my invention constituting the appended claims.

I claim:

1. A tubular cleaning element for a soot cleaner apparatus composed of walls integrally united with each other throughout their lengths and forming fluid-carrying passages, one of which is central and substantially surrounded by the remainder, and nozzles extending through a single wall and placing one of said passages in communication with the medium surrounding the element.

2. A tubular element for a soot cleaner apparatus composed of metal walls so welded together along longitudinal lines as to form a central passage for water and a plurality of separate passages for steam lying in opposite sides of and substantially surrounding the central passage, and steam delivery nozzles mounted in the outermost walls and leading from all of said steam passages.

3. A tubular cleaning element for a soot cleaner apparatus consisting of two pipe sections in the form of semi-cylindrical hollow troughs placed with their concave sides facing each other and welded together at their meeting edges, and nozzles mounted in the walls forming the periphery of the tubular element.

4. A tubular cleaning element for a soot cleaner apparatus consisting of a pipe oval in cross section and two trough-shaped sections lying on opposite sides of the pipe and having their edges welded thereto in the vicinity of the ends of the long transverse axes of the pipe and forming with the pipe two separate steam chambers substantially enclosing the pipe, and there being steam outlets from the steam chambers through the periphery of the tubular element.

5. A tubular cleaning element for a soot cleaner apparatus consisting of a tube, a second larger tube surrounding the first tube and divided at one side along a longitudinal line, the marginal portions adjacent to the line of division of the larger tube being bent inwardly into engagement with and being welded to the first tube, and nozzles projecting from the first tube between the said marginal portions of the outer tube.

In testimony whereof, I sign this specification.

FRED C. AREY.