

No. 855,563.

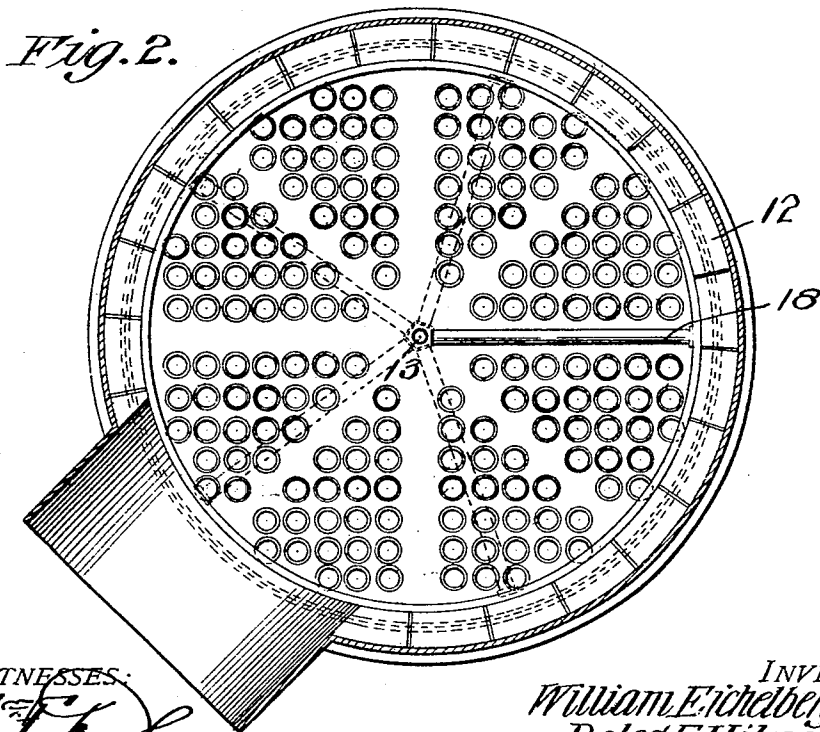
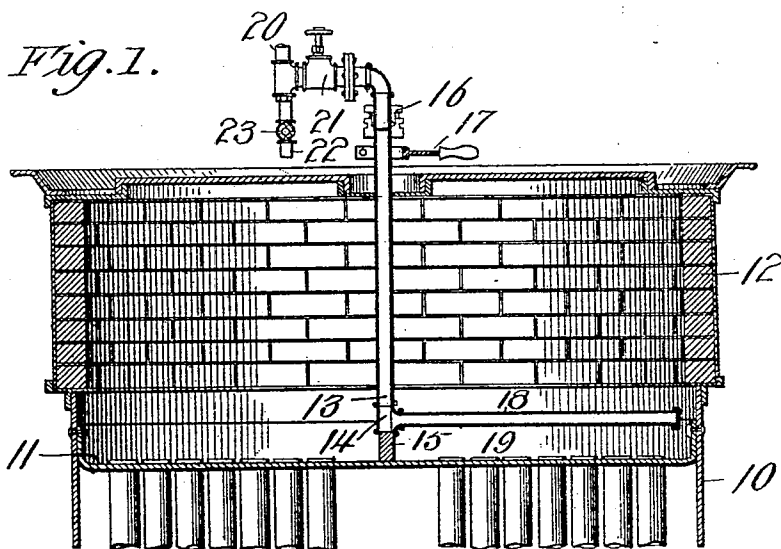
PATENTED JUNE 4, 1907.

W. EICHELBERGER & D. E. HIBNER.

BOILER FLUE CLEANER.

APPLICATION FILED MAR. 22, 1907.

2 SHEETS—SHEET 1.



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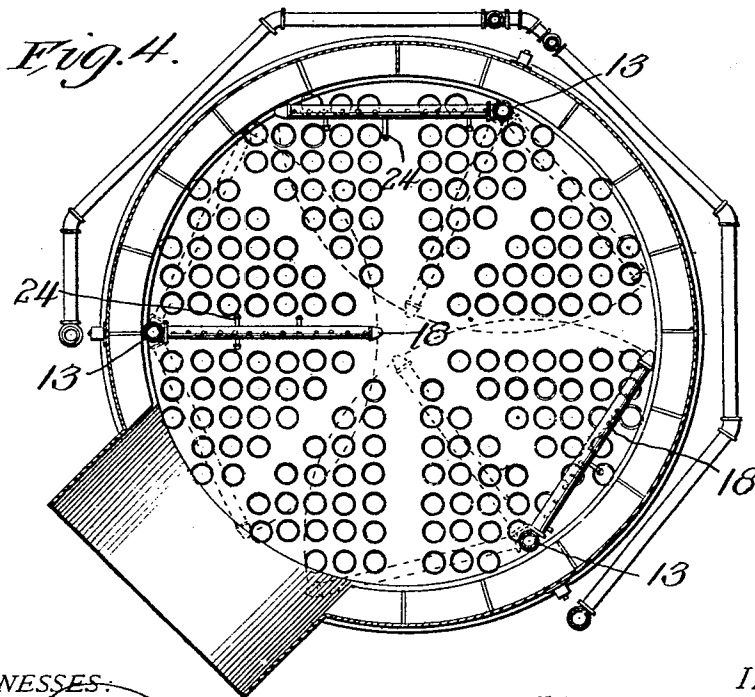
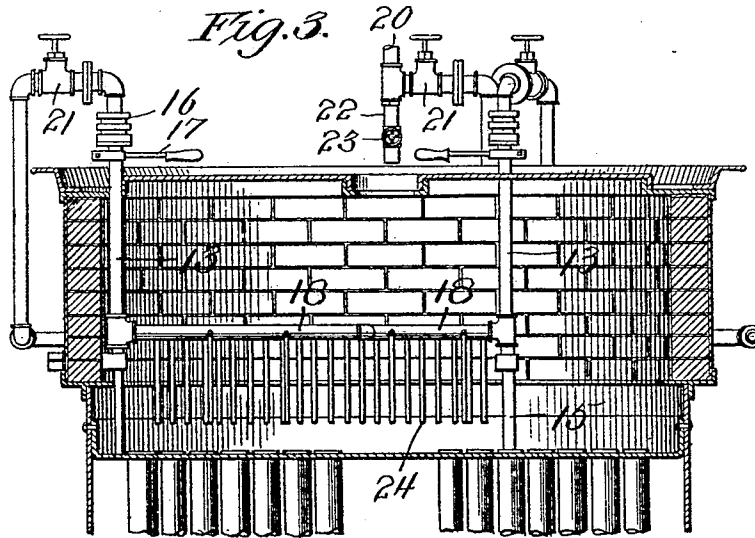
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

WILLIAM EICHELBERGER AND DELOS EUGENE HIBNER, OF DUBOIS, PENNSYLVANIA, ASSIGNORS TO THE VULCAN SOOT CLEANER COMPANY OF PITTSBURG, PA., OF DUBOIS, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

BOILER-FLUE CLEANER.

No. 855,563.

Specification of Letters Patent.

Patented June 4, 1907.

Application filed March 22, 1907. Serial No. 363,893.

To all whom it may concern:

Be it known that we, WILLIAM EICHELBERGER and DELOS EUGENE HIBNER, citizens of the United States of America, residing at Dubois, in the county of Clearfield and State of Pennsylvania, have invented certain new and useful Improvements in Boiler-Flue Cleaners, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to apparatus for cleaning out the smoke flues of tube steam boilers, and has particular relation to apparatus for injecting a steam or other jet into the flues for the purpose indicated.

A device forming the subject-matter of this application is particularly designed and adapted for use in connection with vertical fire tube boilers, and aims to provide a cleaner especially effective for cleaning that type of vertical boilers that have tubes in the whole of the tube sheet.

As the deposit of the soot particles is greatest adjacent the outlet end of the tube, decreasing in thickness toward the inlet end, owing to the continued confinement of the gases within the tube during the passage therethrough and the resultant restricted space within which to retain the soot particles in suspension, the tube presents, when the apparatus is to be brought into action, appearance of having an opening there-through which is of decreasing size from its inlet to its outlet end. This is due to the fact that the initial deposits are adjacent the outlet end of the tube which deposits tend to form a wall to not only restrict the size of the opening at that end and thereby decrease the ability of the natural draft to carry off a maximum number of soot particles, but such restriction causes the deposits to take place at an earlier stage during the passage through the tube of the gases, and thereby build up the gradually increasing thickness of soot deposits, the greatest thickness being adjacent the outlet end. When therefore, the jet is brought into action, it attacks, under full pressure, that portion of the deposit which is of least resistance and drives it forward into a gradually decreasing open-

ing with the result that there is a tendency to re-deposit the particles toward the outlet end of the tube and thereby further increase the thickness of the deposits at such points. As the jet passes onward, with decreasing power or pressure, the amount of work to be done is gradually increased, until, if sufficient pressure be applied, the entire deposit is forced out of the tube in a manner similar to the action of a piston, the action being such that the impact force of the steam decreases as the resistance afforded by the increased thickness of deposit increases. When, however, the jet is introduced into the outlet end of the tube, against the natural draft, the action is radically different. In such case the attack is first made upon the deposit of greatest thickness and resistance (due to the compacting of the soot particles by the passage of the natural draft), the attack being made by the maximum power and pressure of the jet. The dislodgment of the particles forces them against the natural draft and in the direction of decreasing resistance, the opposition of natural draft and the jet tending to hold the soot particles in suspension. When the jet is cut off, the natural draft, under its normal action, will then carry off the deposits, the liability of deposit at this time being reduced owing to the fact that the particles are placed in rapid movement by the jet, which movement would tend to prevent such deposit. By such construction, it will be readily understood, therefore, that the resistance decreases as the impact force or pressure of the jet decreases, thereby equalizing the forces and necessitating the use of steam jets of less power, as well as permitting of a more rapid cleaning of the tube.

Another disadvantage resulting from the use of a cleaning apparatus located at the inlet end of the tube lies in the fact that the inlet end of the tube lies within the combustion chamber, where the apparatus is subjected to the action of the heated gases prior to the extraction of heat therefrom, with a consequent liability of being rapidly made useless by being burned out.

The object of our invention is, therefore, to provide an apparatus for injecting a jet

into the outlet end of the tubes of boilers for the purpose of cleaning the soot therefrom.

A further object is to provide a structure of this character which is capable of a rotative movement over the ends of such tubes and which will be retained permanently in position at such outlet end.

To these and other ends, the nature of which will be readily understood as the invention is hereinafter disclosed said invention consists in the improved construction and combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views,—Figure 1 is a vertical section taken through the upper end of a vertical tube boiler, showing one form in which our invention may be applied. Fig. 2 is a horizontal sectional view of the same taken on line 2—2 of Fig. 1. Fig. 3 is a view similar to Fig. 1, but showing a plurality of cleaners. Fig. 4 is a sectional view taken on line 4—4 of Fig. 3.

10 designates a boiler of the vertical tube type, the upper end of which only is shown in the drawings; 11 designates the tube sheet of the boiler, and 12 the walls of the smoke box located above the tube sheet. These may be of any preferred structure, that illustrated in the drawings being what is known as the "Manning" boiler.

Referring first to the form shown in Figs. 1 and 2, 13 designates a vertically-extending pipe extending through the top of the smoke box, said pipe having its lower end connected to a T-coupling 14, the lower end of which is mounted on a suitable support 15 carried by the tube sheet and located preferably at the center thereof, the connection between the coupling and the support being such as to permit of a rotative movement of the coupling on the support without, however, permitting of the escape of steam. The upper end of the pipe 13 is connected to a suitable swivel joint 16, and below said connection is mounted a suitable handle 17 by means of which the pipe 13 may be rotated. 18 designates a horizontally-extending pipe, closed at one end and having its other end secured in the T-coupling 14. The pipe 18 is provided with a series of perforations 19 along its bottom for the passage of steam in the form of jets, the steam being projected into the ends of the tubes 19. 20 designates the steam supply pipe, 21, the valve controlling the inlet of steam into the pipe 13, and 22 the drip pipe controlled by the valve 23.

By the construction shown it will be seen that the steam jets pass from the pipe 18 in close proximity to the ends of the tubes 19 so that the jets will pass into the tube with practically the full pressure of steam. As the

pipe 18 is rotatable so as to permit it to pass through an entire circle, it will be understood that each of the tubes will be subjected to the action of the jet during a complete revolution of the pipe 18 in the smoke box.

The structure shown in Figs. 3 and 4 differs from that shown in Figs. 1 and 2 in that a plurality of pipes 13 are employed, preferably three in number, and mounted adjacent the walls of the smoke box. In this construction the support 15 is of a greater length to permit of the use of depending tubes or pipes 24 mounted on the sides of the pipe 18. The pipes 24 are provided in order that steam jets may be injected into the flue tubes adjacent the sides of the boiler at points where the jets from the perforations 19 would not reach owing to the end of the arm or pipe 18 contacting with the wall of the smoke box during a rotative movement of the pipe 18. As shown, each pipe 13 is provided with independent steam-inlet controlling means.

Owing to the fact that the steam jets issue from the pipe 18 in a manner to provide practically a single line of jets, any tendency to materially affect the draft through the flue tubes is eliminated, as such tube openings as are being operated upon at one time are not in mass but spaced apart and in a single line. Hence the natural draft will be quickly renewed in a tube operated upon owing to the fact that adjacent tubes permit the passage of the draft which, after issuing from the end of the tube would tend to form a suction within the tube in which the draft has been checked and thereby quickly re-establish normal conditions, such suction aiding in carrying off the suspended soot particles before given an opportunity to be re-deposited.

The construction herein disclosed is intended primarily for vertical tube boilers, and the parts, while remaining permanently within the smoke chamber or box and having no movement other than a rotative one, will not be liable to become burnt out owing to the fact that the heat of the gases has been absorbed by the contents of the boiler before it reaches the smoke box.

While a preferred form of apparatus is herein disclosed, it is to be understood that we do not limit ourselves to the precise embodiment of the invention shown, as it will be observed that the invention in its broad aspect contemplates the provision of a soot cleaner arranged in the smoke box end of vertical fire tube boilers and effective for the cleaning of the tubes of such boilers, whether the latter be of a type in which the tubes cover only a portion of the diameter of the tube sheet, or of that type of vertical flue boiler that has flues in the whole of the flue sheet. We therefore reserve the right to use any and all modifications as may fall within the spirit and scope of the invention as herein described and claimed.

Having now described our invention, what we claim as new is—

1. The combination with a boiler having vertical flue tubes, of means permanently located with respect to the tube sheet of the boiler for injecting a soot cleaning agent into the outlet ends of the tubes.
2. The combination with a boiler having vertical flue tubes and a smoke box at the outlet end thereof, of means located within the smoke box for injecting a soot-cleaning agent into the outlet ends of the tubes.
3. The combination with a boiler having vertical flue tubes and a smoke box at the outlet end of said tubes, of rotatable means located within the smoke box for injecting a soot-cleaning agent into the outlet ends of the tubes.
4. The combination with a boiler having flue tubes, a tube sheet, and a smoke box at the outlet end of the tubes, of means supported by the tube sheet and the walls of the smoke box and located within the smoke box for injecting a soot-cleaning agent into the outlet ends of the tubes.
5. The combination with a boiler having flue tubes, a tube sheet, and a smoke box at the outlet end of the tubes, of rotatable means supported by the tube sheet and the walls of the smoke box and located within the smoke box, for injecting a soot-cleaning agent into the outlet ends of the tubes, said means being adapted to inject the agent into a plurality of tubes at the same time.
6. The combination with a boiler having vertical flue tubes, of means for injecting a soot-cleaning agent into the tubes in opposition to the natural draft of the boiler, said agent and the natural draft holding the dislodged soot-deposits in suspension pending the discontinuance of the injection of the agent.
7. The combination with a boiler having a plurality of vertical flue tubes, of means located in the smoke box of the boiler for injecting a soot-cleaning agent into a predetermined number of said tubes in opposition to the natural draft through the tubes being operated upon, said agent and the natural draft holding the dislodged soot-deposits in suspension pending the discontinuance of the injection of the agent, the natural draft of adjoining tubes remaining unaffected during the injecting operation.
8. The combination with a boiler having flue tubes, a tube sheet, and a smoke box adjacent the outlet ends of said tubes, of a pipe rotatably supported by said tube sheet and the walls of the smoke box, a perforated pipe secured to and extending at right angles to said pipe, and a series of pipes secured to the sides of the perforated pipe, said series extending in a plane parallel with the rotatable pipe, means being provided for controllably delivering a soot-cleaning agent to said pipes.
9. The combination with a vertical fire tube boiler having flue tubes and a smoke box at the outlet ends of the tubes, of rotatable means supported by the tube sheet of the boiler for injecting a soot cleaning agent into the outlet ends of the tubes.
10. A soot-cleaner for vertical fire tube boilers, comprising a steam injecting pipe rotatably-mounted in the smoke box of the boiler above the outlet ends of the boiler-flues and connected to a suitable steam supply.
11. A soot-cleaner for vertical fire tube boilers, having a steam injecting pipe arranged for rotation in the smoke box of the boiler being supported and held above the tube sheet of said boiler.
12. A soot-cleaner for vertical fire tube boilers in which the fire tubes cover the entire diameter of the tube-sheet, comprising a steam-injecting pipe arranged in the smoke box of the boiler and rotatably-supported by the tube-sheet of said boiler, and having a range of movement to cover each of the fire tubes.
13. The combination with a boiler having vertically-extending flue tubes, and a smoke box at the upper end of said tubes, of means located within the smoke box and supported by the tube sheet for injecting a soot-cleaning agent into the outlet ends of the tubes, said means being movable in such manner as to permit each of the tubes to be acted upon.
14. The combination with a boiler having vertically-extended flue tubes, and a smoke box at the upper end of said tubes, of rotatable means located within the smoke box and supported by the tube sheet for injecting a soot-cleaning agent into the outlet ends of the tubes, the range of movement of said means covering each of the flue tubes of the boiler.

In testimony whereof we affix our signatures in the presence of two witnesses.

WILLIAM EICHELBERGER.

DELOS EUGENE HIBNER.

Witnesses:

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CHARLES EDWARD HAND.