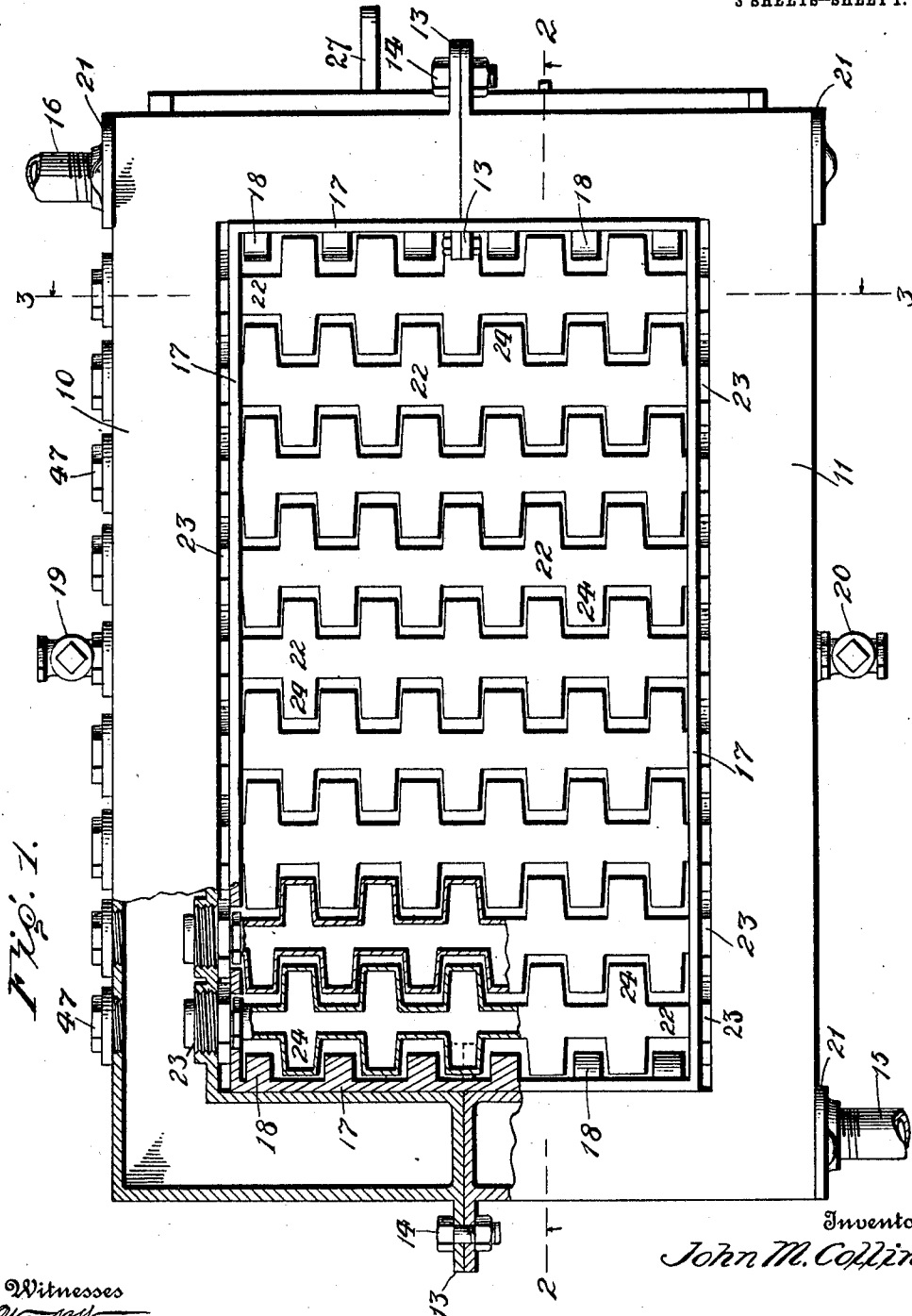


J. M. COLLINS.
FEED WATER HEATER.
APPLICATION FILED DEC. 20, 1910.

1,003,877.

Patented Sept. 19, 1911.

3 SHEETS-SHEET 1.



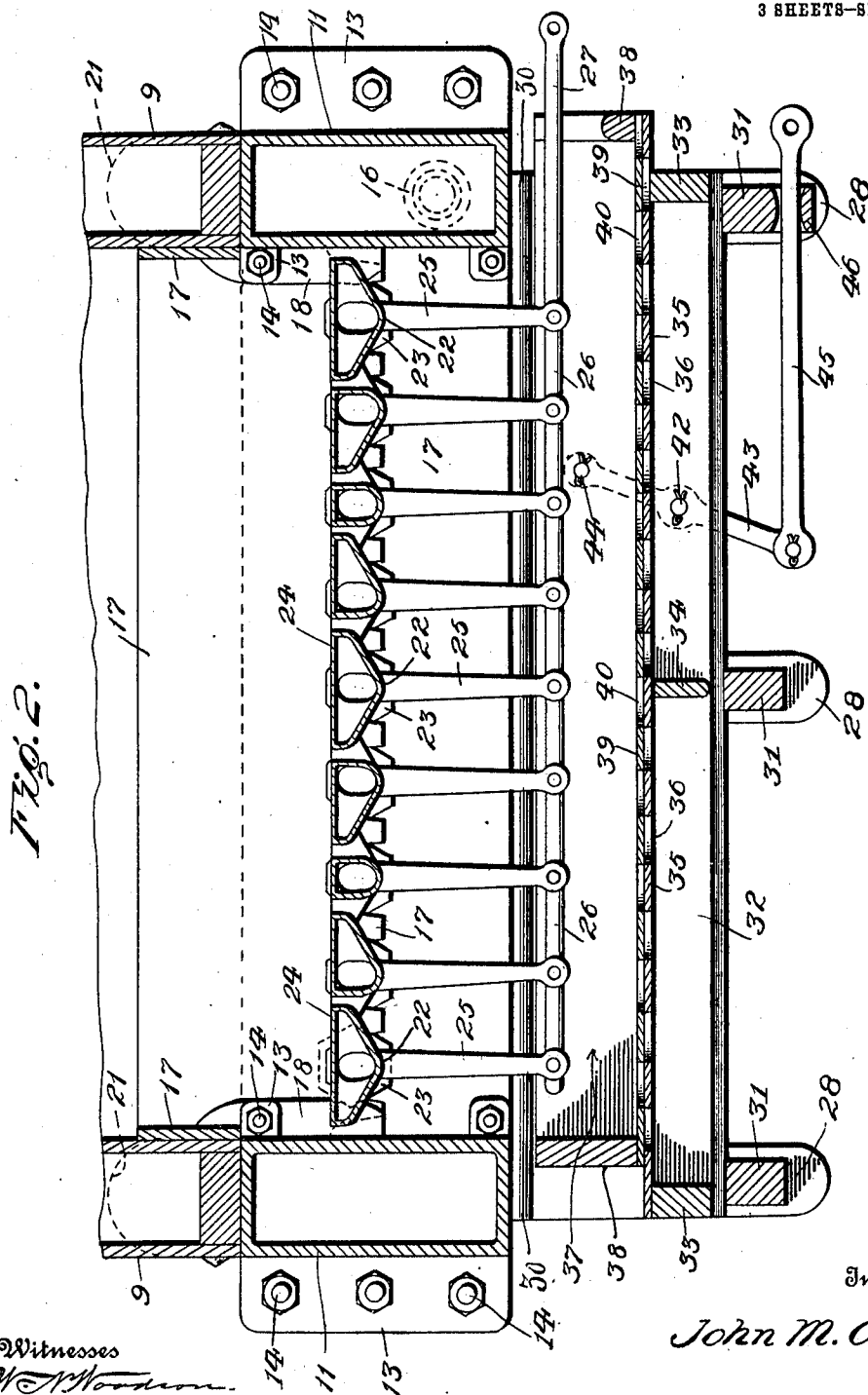
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3 SHEETS--SHEET 2.



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JOHN M. COLLINS, OF SOUTH PITTSBURG, TENNESSEE.

FEED-WATER HEATER.

1,003,877.

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Application filed December 20, 1910. Serial No. 598,349.

To all whom it may concern:

Be it known that I, JOHN M. COLLINS, citizen of the United States, residing at South Pittsburg, in the county of Marion and State of Tennessee, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to improvements in attachments for steam generators for heating the feed water prior to its passage to the boiler and which likewise operates to precipitate matter which may be contained in the water and which is capable of being precipitated by heat, and has for one of its objects to provide a simply constructed device of improved construction, increased efficiency and utility, and which may be applied to boilers or other generators of different constructions without material structural changes either in the generator or the attachment.

Another object of the invention is to provide a device of this character which may be attached to a generator beneath the fire box and which contains the grate mechanism of the generator, and wherein the feed water is heated prior to its passage into the boiler.

Another object of the invention is to provide a device of this character which combines a feed water heater, the grate mechanism, and an effectual receptacle for the ashes, cinders, and live coals which may be deposited from the grate and holding them in suspension to enable the heat contained therein to be utilized in the heater.

Another object of the invention is to provide a device of this character combining a feed water heater, a grate mechanism having hollow grates through which water from the heater is caused to circulate.

With these and other objects in view the invention consists in certain novel features of construction as hereinafter shown and described and then specifically pointed out in the claims; and, in the drawings illustrative of the preferred embodiment of the invention, Figure 1 is a plan view of the improved device, detached from the boiler and partly in section; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a section on the line 3—3 of Fig. 1, Figs. 2 and 3 each having in addition in section the lower part of

the water leg of a boiler. Fig. 4 is a sectional detail, enlarged, of one of the stuffing boxes of the hollow rolling grate bars.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The improved device is designed to be applied below the fire box of a generator and contains the grate mechanism, and may be adapted without material structural change to boilers of different constructions, but for the purpose of illustration is shown applied to a conventional water leg portion 9 of a boiler.

The improved device comprises a two part hollow casing 10—11, the casing members having perforated flanges 13 at their confronting ends to receive tie bolts 14 to enable the casing members to be rigidly coupled. The casing members are preferably formed to correspond to the water leg portion 9 and to extend below the same, and when applied to an ordinary generator will generally be of the same thickness as the water leg portion and form a downwardly directed continuation of the same, as shown in Fig. 2, but it will be understood that the casing members may be of any required size and not necessarily limited to the size of the water leg portion. The inlet or supply pipe 15 is conducted into the casing member 10, while the outlet or discharge pipe 16 is arranged to lead from the casing member 11, the inlet and outlet pipes being preferably arranged to lead from the diagonally opposite corners of the two part casing, as shown in Fig. 1. Blowoff connections 19—20 are also connected into the casing members, to enable the water to be blown out when required and thus free the casing members from the accumulations of sediment. Any suitable means may be employed for connecting the casing members to the boiler, and for the purpose of illustration brackets 21 are shown for this purpose. The casing members may be constructed of any suitable material, but for the purpose of illustration each casing member is shown formed from a single casting, and when thus constructed the brackets 21 will be cast integral with the casing members.

The space within the united casing members corresponds to the fire box area of the

generator, and the grate mechanism is connected into and supported by the casing members. The grate members are hollow and are so connected to the casing members as to permit the water to freely circulate therethrough. Any required number of the grate bars may be employed, and constructed of any required size and of any suitable material, but for the purpose of illustration an improved form of grate bar is shown and comprises a central longitudinal hollow member 22 connected at its ends by suitable stuffing or packing devices 23 connected into the inner walls of the casing members and operate to permit the grate bars to be oscillated, while at the same time preventing the escape of the water or steam. Each grate bar is provided with laterally extending hollow projections 24 which are arranged to interlap with each other, as shown in Fig. 1. Each grate bar member 22 is provided with a depending arm 25, the arms being coupled at their lower ends by links 26 and the terminal bar at one side provided with an operating lever 27. By this means the grate bars may be oscillated for dumping the grate or relieving the bars from ashes, and cinders in the ordinary manner.

Depending from the lower face of the members 10—11 are hangers 28, the hangers being secured in any suitable manner to the casing members, for instance by bolts 29 engaging supporting ribs 30 depending from the casing members. The hangers are coupled at suitable intervals by transverse tie members 31, the hangers and tie members forming a supporting frame spaced below the casing members. Bearing upon the transverse members 31 is an oblong frame formed of sides 32 and ends 33 and likewise supported intermediate the ends with an additional transverse member 34. The frame 32—33—34 forms a support for a plate 35 having numerous relatively large perforations or openings 36. The side members 32 are secured by bolts or other suitable detachable fastening devices to the hangers 28. Located between the plate 35 and the supporting plates or ribs 30 is another frame formed of sides 37, transverse members 38 and a plate 39, similar to the plate 35 and likewise provided with apertures or openings 40. The plates 35—39 are superposed, as shown in Figs. 2 and 3, and the upper frame 37—38, together with its plate 39, is movable upon the lower plate, so that when the upper frame with its plate 39 is located in one position the openings 36—40 will register, and when the upper frame and its plate are moved into another position the passage through the openings will be cut off, the object to be hereinafter explained. Connecting two of the hangers 28 is a horizontal member 41 and pivoted at 42 to this horizontal member is a lever arm 43. The lever

arm is pivoted at 44 to one of the side members 37 of the upper frame and provided at its other end with an operating rod 45, the latter leading over a guide 46 connected to one of the hangers 28. By this means it will be obvious that by actuating the rod 45 the upper frame may be oscillated upon the plate 35 to cause the apertures 36—40 to be located in registering position, or the passage through the apertures to be cut off if required.

Located in the casing member 10 opposite each of the plate members 22 is a plug 47 whereby means are provided for inserting a cleaning brush into each of the hollow grate bars. By this means the grate bars may be kept free from accumulations of scale or other objectionable matter. The space between the plate 39 and the grate bars is sufficient to permit a relatively large quantity of ashes and cinders to accumulate before being discharged. By this means the falling cinders and heated ashes are permitted to remain beneath the grate bars until practically all of the heat contained therein has been radiated and passes upward through the grate bars into the fire chamber. By this means the heat is more completely utilized and less waste results during the firing operations. After the heat has been fully absorbed from the ashes and cinders the operator manipulates the rod 45 to move the plate 39 into position to bring the apertures 40 in registering position with the apertures 36, so that the accumulations of ashes and cinders may be caused to pass through the registering apertures. By this means the upper frame may be discharged of its load of accumulated ashes, and after this is accomplished the plate 39 is returned to its former position to cut off the apertures and provide for the accumulation of another bed of ashes and cinders.

Means are provided in the improved device for protecting the inner walls of the casing sections and likewise to protect the stuffing boxes 23, and comprises a rectangular frame formed with vertical sides 17 and so located as to bear inside of the inner walls of the casing sections, the portions of the frame 17 which come opposite the stuffing box being provided with cavities to bear over the stuffing boxes, and the remaining walls provided with projections 18 which extend into the spaces between the projections 24 of the terminal grate bars, so that no abnormally large openings are left in the grate bar structure. By this means the walls of the casing sections 10—11 are protected from direct contact with the fuel upon the grates. The protecting frame is readily detachable, so that when burned out may be replaced with a new one without detaching any of the other parts.

One of the casing members will prefer-

ably be permanently attached to the generator, while the other casing member will be removable, so that when new grate bars are to be connected into the device it will only be necessary to remove one of the casing members, together with the attachments whereby the transverse members 31 and one of the side members 32 of the lower frame are connected, and without disturbing the remaining portions of the apparatus. By this simple arrangement it will be obvious that an effectual device is produced whereby the feed water may be heated to a high degree before passage to the generator, and thus materially decrease the amount of fuel required to generate the steam therein. It will also be obvious that any properties contained in the water which is capable of being precipitated by heat will be precipitated in the casing members, and will not therefore pass into the boiler. By this means the accumulation of scale is prevented in the boiler and the tendency to "foam" also obviated, as the particles of matter which produce the foaming action are retained in the casing members. No tendency will therefore exist in the boiler of clogging the water gages by mud or lime. By forming the grate bars hollow and causing the water to constantly flow therethrough, the latter are protected from the action of the heat, and will thus outlast the ordinary grate bars. When applied to locomotive boilers the labor of firing is materially decreased, as it will be impossible to feed cold water into the boiler, as all the feed water must pass through the casing members.

The improved device is especially adapted for generators employed in connection with turbine engines, as the steam can be generated much more readily when the feed water is highly heated before being passed to the boiler.

The improved apparatus may be constructed of any suitable material, either cast iron, malleable iron, or steel, and it is not desired therefore to limit the device to

any specific material which may be employed in its construction.

Having thus described my invention, what is claimed as new is:

1. The combination with a steam generator including the fire box portion thereof, of a feed water heater comprising a hollow casing conforming to and extending below the walls of the fire box, a plurality of hollow grate bars each formed with a plurality of hollow lateral projections and mounted for oscillation in said casing portions and communicating respectively with the interiors of the same, an inlet for water connected into one of said casing portions, a discharge for water leading from the other casing portion, a lining for said hollow sections extending above the same, and filler members carried by said lining and depending between the walls of the casing sections and the terminal grate bars and likewise between the outer projections of the same.

2. A feed water heater comprising an outer casing arranged to surround a rectangular interior opening, a grate device supported within said casing, an intake connection at one side of said casing, an outlet at the opposite side of said casing, a plate connected below said casing and spaced from the same and provided with a plurality of apertures spaced apart, a receptacle slidable upon said plate and in position to receive the droppings from said grate device, the bottom of said receptacle being provided with perforations corresponding to and adapted to register with the apertures of said plate when in one position and cut off the perforations when in another position, and means for actuating said receptacle.

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

JOHN M. COLLINS. [L.S.]

Witnesses:

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LEE DILLARD.