Nov. 22, 1938. B. M. THOMPSON 2,137,253

APPARATUS FOR THE FIRESIDE CLEANING OF BOILERS

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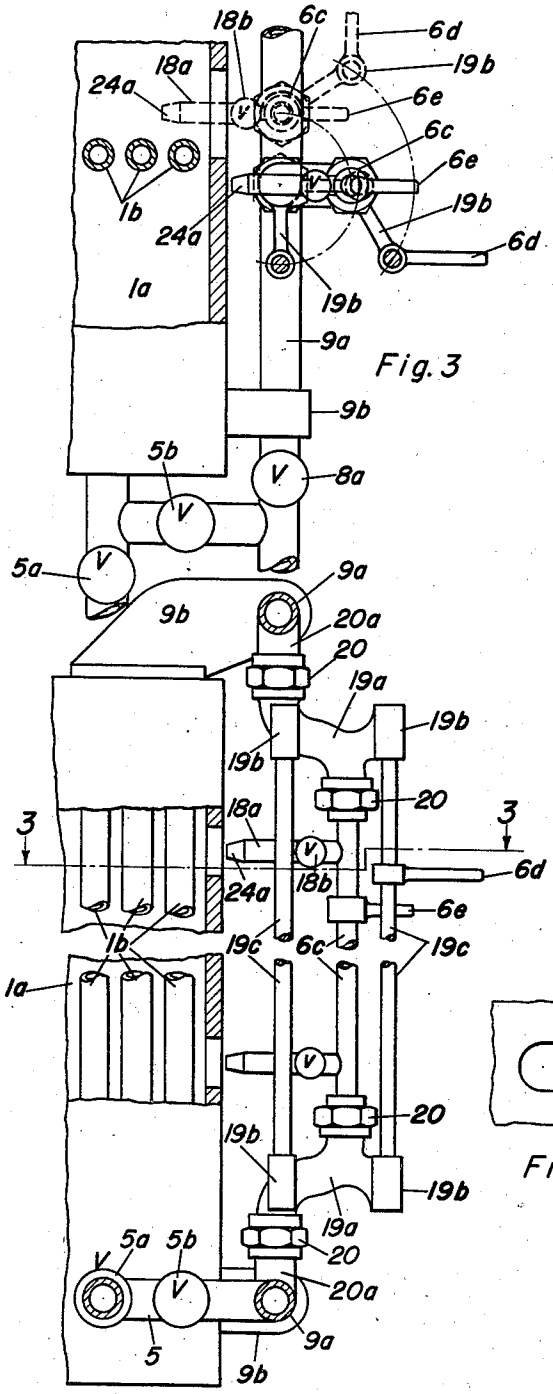


Fig. 3

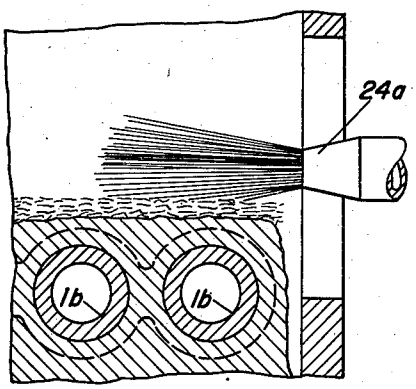


Fig. 5

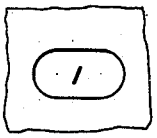


Fig. 2

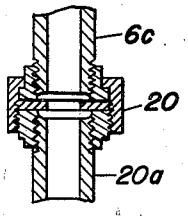


Fig. 4

Fig. 1

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APPARATUS FOR THE FIRESIDE CLEANING OF BOILERS

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6 Claims. (Cl. 122—392)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

My invention relates broadly to apparatus for cleaning combustion deposits from the firesides of boiler tubes. The accumulation of such deposits is a normal occurrence and results in loss of boiler efficiency due to the heat insulating action of the deposit on the tubes.

The present invention is an improvement on my Patent 1,812,375, issued June 30, 1931.

My said patent discloses a method and means whereby such deposits may be removed only when the boiler is substantially cold or cool enough to allow personnel to enter the combustion chamber to apply cleaning water directly to the tubes. The invention of my said patent when employed with boilers lined with refractory material, required the use of a shield to prevent contact of the cleaning water with the refractory material.

By the use of my present invention the tubes may be cleaned while the boiler is hot and in use, and without the use of a shield, by regulating the amount and temperature of the cleaning liquid so that the heat within the boiler and about the tubes may transform it into steam before it has travelled far enough to contact the refractory material.

The sudden cooling occurring in the accumulated deposit due to the action of the cleaning fluid, when used in this fashion, will cause rapid contraction to occur in it and result in its cracking off the tubes. This cooling effect is due both to the temperature difference between the cleaning fluid and the deposit and to the absorption of heat occurring when the fluid is transformed into steam adjacent the tubes. If the deposit is porous, penetration of the fluid in a liquid or vaporous state and its rapid heating and expansion after penetration will aid in the cleaning action.

In the use of my present invention, less water and time is required for the cleaning operation and the boiler need not be placed out of commission for the cleaning operation.

Sea water may be used to advantage in practicing my invention and boiler compound may be added to the cleaning fluid if desired.

In the drawing:

Fig. 1 is a vertical elevational view in partial section, with the central portion broken away, of a boiler having the apparatus of my invention attached thereto.

Fig. 2 is a view of a fragment of the boiler shell showing one of the openings 1 therethrough.

Fig. 3 is a sectional plan view of a portion of Fig. 1 taken on line 3—3 thereof.

Fig. 4 is a central longitudinal sectional elevational view of a conventional pipe union employed in the apparatus.

Fig. 5 is an enlarged sectional end view of a pair of boiler tubes and the adjacent boiler wall showing the combustion deposit on the tubes and the action of the cleaning fluid impinging thereon.

In the drawing, wherein like characters of reference indicate the same parts, the shell of the boiler has provided therein a combustion space 1*a* occupying a portion of its fireside, through which extend a number of boiler tubes 1*b*. At a point preferably intermediate each row of tubes 1*b* a series of holes 1 extend through the shell of the boiler to the fireside thereof.

In the cleaning apparatus, as shown in Figs. 1 and 3, cleaning water supply pipes 9*a* extend along near the top and bottom of the boiler, being supported thereon by brackets 9*b*. The lower pipe 9*a* is provided with a valve 8*a* controlling the supply of cleaning fluid thereto. From each of the pipes 9*a* extends upwardly or downwardly a short length of pipe 20*a* against whose free end, with or without intermediate packing, is the beaded end of a goose-neck pipe 19*a* which is secured thereto by a pipe coupling 20. Between the free ends of the opposite goose-neck pipes 19*a* and coupled thereto by pipe couplings 20 extends a vertical pipe 6*c*. At spaced intervals along this pipe short branch pipes 18*a* fitted with valves 18*b* and ending in nozzles 24*a*, extend at right angles thereto. The spacing of these branch pipes is such that the nozzle ends lie opposite the holes 1 in the boiler shell. Each of the pipe couplings 20 permits relative movement of the pipe ends coupled thereby. Extending from each of the goose-neck pipes 19*a* are two rigid projections 19*b*. Each of these projections is provided with a socket. Extending between these projections and rigidly held thereby are two rods 19*c* which run parallel to pipe 6*c*. The pipe 6*c* is provided with a handle 6*e* for rotating it about its longitudinal axis and one of the rods 19*c* is provided with a handle 6*d* by means of which the whole assembly may be rotated about an axis running through pipes 20*a*. This axis lies to one side of the row of holes 1, as shown by Fig. 3. As many rows of holes 1 as desired may be provided along the side of the boiler and a separate pipe 6*c* may be provided for each row of holes.

When not in use for cleaning the deposits from the tubes of the boiler, each pipe 6*c* with its gooseneck pipes 19*a* is adapted to be in a plane parallel with the side of the boiler and to one side of the openings 1 therethrough, as shown in full lines in Fig. 3 with the nozzle end of

each pipe 18a away from the row of holes 1. By the independent turning of their respective pipe 6c in bearings provided at opposite ends of each pipe 6c by the coupling members 20 with the nozzle ends of pipes 18a away from each row of holes 1, such holes may be employed, when open therefor, as peepholes to ascertain the condition of the tubes 1b as to deposit and otherwise. When in use for cleaning the boiler, with the structure indicated in Figs. 1 and 3, the cleaning water is admitted to the lower pipes 9a each through their valves 8a, thence the cleaning water rises through each of the lower gooseneck pipes 19a into each of the vertical pipes 6c, and thence through valves 18b to their respective nozzle pipes 18a. The valves 18b may each be opened one at a time to the desired extent while the valves 8a are open for cleaning the rows of tubes successively, or the different valves 18b may be opened, each to the desired extent, and the cleaning water turned on and off as desired by the valves 8a. The nozzle ends 24a of each of the nozzle pipes 18a are brought to register with their respective rows of openings 1, in which position they are shown by dotted lines in Fig. 3, by the turning of pipe 6c upon its bearings in the pipe coupling members 20 at opposite ends of pipe 6c. The angle at which each nozzle end 24a discharges the cleaning water through the openings 1 is controlled by the turning of each of the pipes 6c and its opposite gooseneck pipes 19a about the outer ends of the gooseneck pipe 19a. The thus obtained angularity of discharge of approximately 150° of the water from each nozzle tip 24a within the boiler from each of the opposite sides of the boiler, affords a wide range of the application of the cleaning water applied over a substantial length of many of the boiler tubes 1b which are required to have their exterior deposits removed.

The gooseneck pipes 19a, with their associated intermediate pipe 6c, may be turned in their respective bearings in the inner and outer ends of each of the pairs of gooseneck pipes 19a until the nozzles of pipes 18a are brought into registration with the associated row of openings 1 whereupon discharge of water from such nozzles through openings 1 will remove the deposit from adjacent tubes 1b; then by turning the assembly in its respective bearings the nozzle pipes 18a may be inserted into their respective openings 1 substantially to their valves 18b and a substantial angularity of application of the cleaning water from each row of nozzle pipes 18a through its row of holes 1 may be discharged upon the tubes 1b by turning the respective pipes 6c somewhat upon the bearings provided at the opposite ends of each such pipe 6c. This latter angularity of discharge is limited by the relative sizes of the pipes 18a and the holes 1 through which they extend; but a substantial angularity of discharge is readily obtainable without unduly large holes 1. The holes 1 are preferably oblong with their largest dimension at right angles to the axis of pipes 6c, as indicated in Fig. 2. This increases the angularity of discharge of the cleaning water from nozzle pipes 18a in either of the aforesaid instances of whether the nozzle pipes 18a are projected into their respective openings 1 or remain adjacent the mouth of such openings.

Instead of the joints heretofore described between pipes 19a, 20a as well as between opposite ends of pipes 6c and 19a, the pipes may be merely the usual threaded connections and the threads turn upon each other to obtain the desired occasional limited relative turning of the respective pipes.

Instead of gooseneck pipe 19a being provided with beaded ends, the standard form of pipe coupling shown in Fig. 4 may also be employed for a turnable pipe coupling with substantial packing intermediate the turnable coupling elements as therein shown.

Fig. 5 shows at a an accumulation of combustion deposit such as may occur upon certain of the tubes 1b in heavy firing with protracted intervals between cleanings. The widely flaring stream of liquid, with or without a typical cleaning preparation added thereto for rendering the liquid neutral or alkaline, coming from nozzle 24a, through opening 1 either directly contacts deposit a or is transposed into steam as indicated by the light dotted lines adjacent the surface of a. The manipulation of nozzle 24a causes the liquid to be applied to deposit at different points along deposit a.

Typical of all boilers, the one shown in Figs. 1 and 3 is provided with a blow off valve 5a connected to a low point in the water to be transposed into steam. Upon the boiler side of said valve 5a or to any other desirable point where hot water is available in boilers, maintaining its contained water at an insufficient pressure and temperature to be converted into steam when released at substantially atmospheric pressure, I connect a pipe 5 having valve 5b, which pipe 5 leads to pipes 6c where the cleaning water is not desired from a source without the boiler.

In taking the cleaning water from the bottom blow-off or other connection from preferably the low point of the boiler, it combines into a single operation the otherwise separate tasks of blowing-down the boiler to clear same of sediment and of cleaning the boiler fireside by my improved method, and thus usefully employs the blow-down water which otherwise would be wasted.

A further advantage of using the blow-down water for said cleaning I have found to be that the blow-down water contains minute solid particles in suspension, which enter the boiler fireside with the velocity of the cleaning water and exert impact upon, as well as contribute to the removal of, the deposit and thus increase the efficiency of the cleaning operation.

This invention may be used by and for the Government of the United States of America for governmental purposes without the payment of any royalty thereon or therefor.

Having now so fully described my invention in its method and apparatus aspects that others skilled in the art may thereupon be enabled to readily make and use the same, what I claim is:—

1. Apparatus for cleaning combustion deposit from the firesides of boilers while being subjected to substantial working heat, comprising, in combination, a boiler having tubes and a casing provided with fire-sides therein and openings through the casing at intervals, and means for applying through said openings liquid in exposed jets under pressure adjacent the hot combustion deposit upon said tubes, said means comprising an outwardly extending pair of spaced apart arms each having parallel bearings at opposite ends, a revoluble pipe extending between and mounted in the bearings of the adjacent ends of said arms, bearing brackets receiving the bearings at the outer ends of said arms, said brackets being mounted to one side of said openings at intervals, at least one of said arms and its bearing bracket

being hollow for supplying water to said pipe, lateral nozzles extending from said pipe one into each of said openings at intervals, and a rigid connection extending between said arms, there being such temperature gradient between such deposit and said jets exposed to the heat that said deposit is contracted and cleaned from the place adjacent which said liquid is applied, there being such relation of the heat within the boiler and the space between the tubes containing the deposit that the applied liquid may be transformed into steam before it may contact any injurable portion of the fire-sides.

2. The apparatus of claim 1 further characterized by an operating handle mounted upon said pipe.

3. Apparatus for cleaning combustion deposit from portions of boilers comprising in combination a pipe having at least one lateral outlet extending therefrom and adapted to receive a combustion deposit removing fluid, a portion of the boiler being provided with an opening therethrough for each of said lateral outlets, and means for pivotally mounting said pipe for movement about an axis located at a distance from and substantially parallel to the longitudinal axis of said pipe, said means comprising an outwardly extending pair of spaced apart arms each having parallel bearings at opposite ends, said pipe being mounted in the bearings at the adjacent ends of said arms, bearing brackets receiving the bearings at the remaining ends of said arms, said brackets being mounted to one side of the openings extending through a portion of the boiler, at least one of said bearing brackets and its cooperating arm being hollow to supply water to said pipe.

4. The apparatus of claim 3 characterized by an operating member extending laterally from said pipe.

5. The apparatus of claim 3 characterized by a rigid connection extending between said pair of arms.

6. The apparatus of claim 3 characterized by a rigid connection extending between said pair of arms, and a projection on said pipe whereby it may be manually rotated.

BERIAH M. THOMPSON.