Sept. 7, 1943. F. D. WALKER 2,328,589

SCALE REMOVER

Filed June 7, 1940

Fig. 1

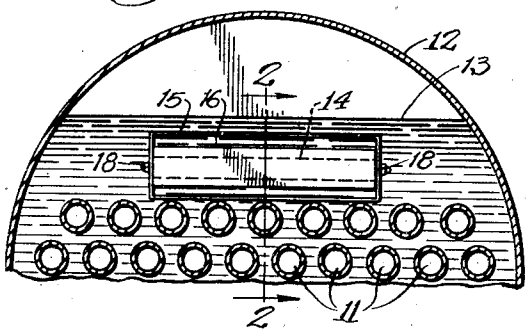


Fig. 2

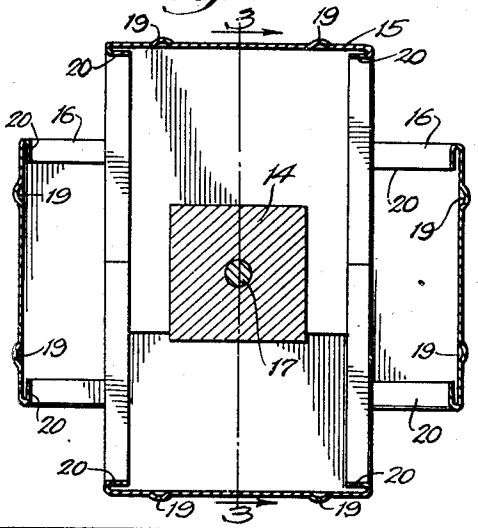
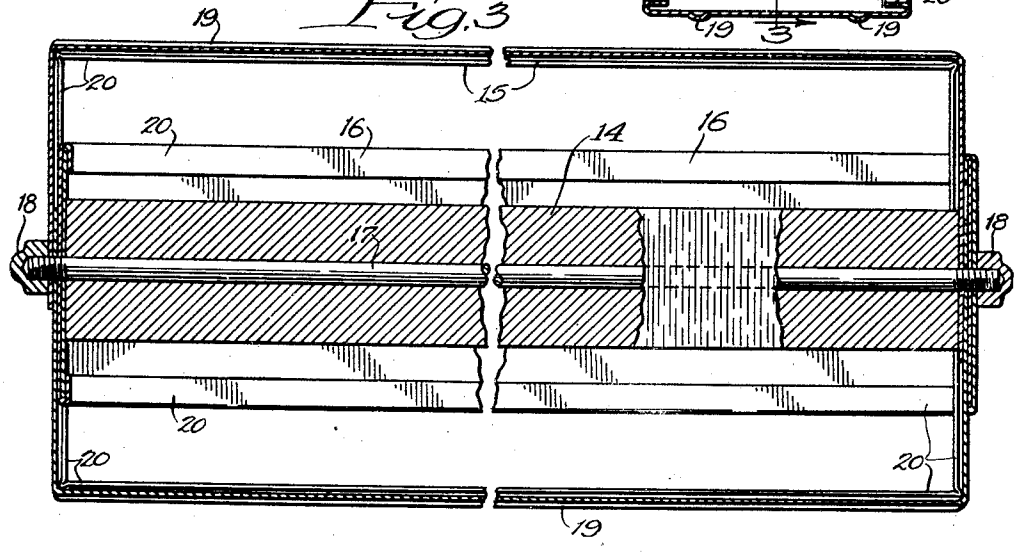


Fig. 3



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SCALE REMOVER

Foster D. Walker, Plano, Ill.

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3 Claims. (Cl. 204—197)

This invention relates to a device for dislodging accumulating scale within a boiler or other vessel containing water, the special features of construction inhering in an electrode of zinc which is especially formed to enhance its electrolytic action when combined with another metal, as copper, having a different electrical potential.

Water commonly used in boilers contains various stable soluble salts of calcium, magnesium and the like which remain behind and become more concentrated as steam is withdrawn from the boiler and which usually are deposited as scale on the surfaces of the boiler and tubes in contact with the water. Various means have from time to time been proposed to prevent the deposition of this scale or to remove it when formed from the boiler. For example, use has been made of two metals having different electrical potentials, so that when brought into contact at spaced points and placed in hot water in a boiler, a form of voltaic cell is provided; a small but persistent current is thereby caused to flow, and this will effect the precipitation of salts which would otherwise be deposited as incrustations on the boiler surfaces. This precipitate is in a finely divided state and falls to the bottom of the boiler where it is removed as sludge.

An object of the present invention is to provide an improved electrolytic device which is particularly effective in bringing about the precipitation of such salts to prevent their deposition as scale. More particularly, the improvement is concerned with an electrode of zinc which is so constructed as to increase the area of exposed metal on its surface thereby adapting it to receive a higher concentration of hydrogen ions. As a consequence, the electrolytic action is enhanced with a resulting increase in the effectiveness of the device to remove scale.

This and other objects are accomplished by my invention, of which one embodiment is shown in the accompanying drawing, wherein—

Figure 1 is a partial vertical section through a water tube boiler showing the improved electrolytic device forming the subject matter of this application in position for use;

Fig. 2 is an enlarged vertical section of the electrolytic device taken on line 2—2 of Fig. 1, looking into the device toward one end thereof, and

Fig. 3 is a longitudinal section of the device taken on line 3—3 of Fig. 2.

As herein illustrated, the device for preventing formation of scale in a boiler is shown as placed upon the upper tier of tubes 11 within a fire tube boiler 12, the water line 13 within the boiler being at or above the device so that the latter is at all times submerged in whole or in part. The device consists essentially of a bar 14 of zinc associated with a second metal, as copper, having a sufficiently different electrical potential to produce the electric current flow that is requisite for the purposes of this invention. This second electrode, as of copper, may take the form of generally rectangular, longitudinally open housing surrounding the zinc bar and consisting preferably of two pairs of complementary sheet metal strips 15 and 16, each strip of each pair of strips being bent through 90° adjacent its ends with the bent ends of each pair overlapped opposite the bar ends 14, as shown in Figs. 2 and 3, for convenient securement thereto as by means of a longitudinal bolt 17 which is extended therethrough to receive nuts 18 on its opposite ends. While various materials may be used for the strips 15 and 16, particularly since little or no corrosion thereof will occur, I prefer to use sheet copper for this purpose. For added stiffness and for convenience in handling, these strips 15 and 16 which parallel the zinc bar 14 and extend in planes normal to each other may be reinforced with beads and turned edges as at 19 and 20, respectively.

The feature of importance to my invention is the construction of the zinc bar itself. If the bar be cast, as is usual, it will be relatively porous, with a reduced exposure of surface area where electrolytic action takes place. The crystal growth that attends cooling of a cast zinc bar is responsible for the presence of these many voids. While such a bar in association with a copper electrode will produce some beneficial results, when placed in a boiler, its action is relatively weak. A device so made is incapable of operating satisfactorily under many conditions. By contrast, the zinc bar of my invention is relatively non-porous. This comes about from the fact that pressure, applied in a rolling operation, will greatly reduce the size of these crystals, thereby closing the voids. As a result the bar presents an increased area of exposed metal on all its surfaces where a higher concentration of hydrogen ions may take place. Such a surface promotes electrolytic action, and because of the greater density of the bar throughout its body its dissolution will be more uniform and lasting.

When the present device is placed in use, there will be a very substantial amount of precipitation with an attending deposition of insoluble calcium and magnesium salts which then fall to

the bottom of the boiler where they may be readily removed, thereby preventing the precipitation of these same salts upon the inner surfaces of the boiler as scale.

I claim:

1. A scale preventing device for submergence in the liquid within a boiler comprising an axially apertured bar of densified zinc constituting an electrode, a longitudinally open housing electrode surrounding said bar, said housing consisting of complementary metal strips extending longitudinally of the bar in planes normal to each other with their adjacent edges in spaced relation, whereby to provide continuous openings at the sides and ends of the housing to facilitate flow of the liquid therethrough, the ends of the strips each being bent through an angle and lying in overlapped relation adjacent the bar ends, a bolt passing through said ends and the aperture in the bar to secure the strips and bar together, said strips being of a metal of different electrical potential from said bar.

2. A scale preventing device for submergence in the liquid within a boiler comprising an axially apertured bar of densified zinc constituting an electrode, an open housing electrode surrounding said bar, said housing consisting of complementary metal strips extending longitudinally of the bar in planes normal to each other with their adjacent edges in spaced relation, whereby to provide continuous openings at the sides and ends of the housing to facilitate flow of the liquid therethrough, each of said strips having reinforcing beads and turned edges, the ends of the strips each being bent through an angle and lying in overlapped relation adjacent the bar ends, a bolt passing through said ends and the aperture in the bar to secure the strips and bar together, said strips being of a metal of different electrical potential from said bar.

3. A scale preventing device for submergence in the liquid within a boiler comprising an elongated bar of densified zinc rectangular in cross section and constituting an electrode, an open housing surrounding said bar, said housing consisting of complementary substantially flat metal strips extending longitudinally of the bar in spaced relation to and parallel with the respective sides thereof and in planes substantially normal to each other with the adjacent edges of the strips in spaced relation, whereby to provide continuous openings at the sides and ends of the housing to facilitate flow of the liquid therethrough, the ends of the strips each being bent through an angle and lying in overlapped relation adjacent the bar ends, and means extending through said overlapped ends and into said bar for securing the strips and bar together as a unit, said strips being of a metal of different electrical potential from said bar.

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