

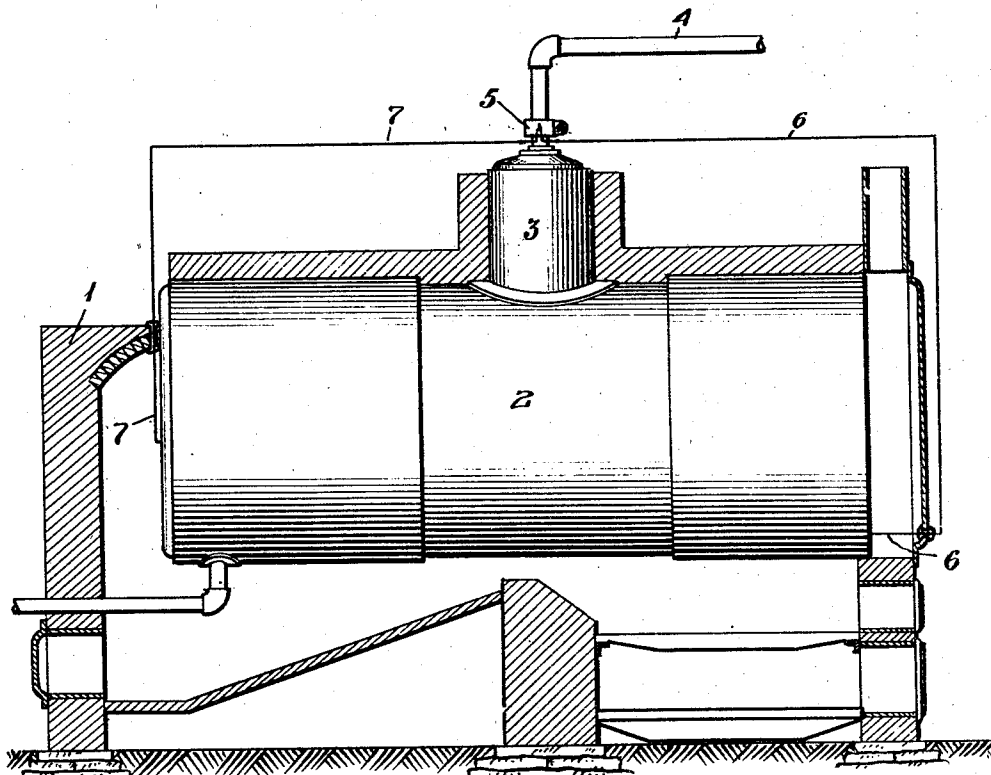
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METHOD AND APPARATUS FOR ELIMINATING SCALE IN FLUID CONTAINERS

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METHOD AND APPARATUS FOR ELIMINATING SCALE IN FLUID CONTAINERS.

Continuation of application Serial No. 668,191, filed October 12, 1923. This application filed July 25, 1924.
Serial No. 728,278.

To all whom it may concern:

Be it known that I, KARL SCHNETZER, a citizen of Czechoslovakian Republic, residing at Aussig-Schreckenstein II, Czechoslovakia, have invented new and useful Improvements in Methods and Apparatus for Eliminating Scale in Fluid Containers, of which the following is a specification.

My invention relates to processes and apparatus for the elimination and prevention of the formation in fluid containers such as, boilers, evaporators, economizers, condensers, cold water pipes, hot water apparatus and the like, of scale produced by sediment or precipitates in the fluid therein contained.

When a fluid is being processed in a container, for example, when steam is being produced from water in a boiler, sediment contained in, or precipitates formed in the fluid, produce a scale like formation adhering to the inner surfaces of the fluid container. This scale clogs fluid passages, reduces the rate at which heat may be passed through the walls of the container either to or from the fluid, and particularly in the case of boilers, causes over heating and eventually burning out of the boiler shell.

In connection with steam boilers it has been proposed to prevent the formation of scale by the employment of electricity in such a way as to cause an electrolysis of water, for example, by conducting current into the liquid and causing it to flow into the boiler shell. For this purpose electrodes are employed that are either immersed in the liquid in the interior of the boiler, or the like, as in the Cumberland and Siemens process or are suspended in the feed-water tank or embedded in the earth as in the Renger-Fuhrmann process. It has also been proposed to connect the apparatus to be protected with a circuit of a source of direct current having a moderate voltage in such a manner that the apparatus lies within the negative part of the total drop in voltage. Furthermore in the British Patent No. 174,905 there is described a process designed for the protection of boilers and the like in which the boiler is connected to the negative

pole of an insulated source of direct current at voltages between 110 and 500 volts while the positive pole remains free.

An object of my invention is to provide a process and apparatus for the protection of metallic fluid containers that will eliminate the formation and adhesion of scale and the like therein without injury to the container itself. In the practice of my invention an electric current is used of which the voltage is below that at which the particular liquid that is in the container or conduit would be electrolytically decomposed if the gases resulting from decomposition were allowed to accumulate and produce their normal pressures in opposition to further decomposition. For example, in the case of the steam boiler the liquid is water and in order to electrolytically decompose water between platinum electrodes, under such conditions that the gases of decomposition accumulate and exert atmospheric pressure, 1.7 volts are necessary to continue the electrolytic decomposition. Thus in the elimination of the formation and adhesion of scale in steam boilers, in the practice of my invention, a voltage considerably less than 1.7 volts is employed because the employment of a voltage that will effect electrolytic decomposition of the water under ordinary circumstances will effect an electrolytic corrosion of the boiler shell. While it is my belief that in the practice of my invention, for example, in connection with steam boilers, the employment of a voltage of less than 1.7 volts produces such electrolytic action as will prevent formation and adhesion of scale because the pressure of the electrolytically freed gas (hydrogen) is dissipated by the combination thereof with iron oxide to reduce the oxide, I do not intend to be bound by this theory but consider that my invention includes the use of currents having such a voltage that the formation and adherence of scale is prevented without the occurrence of electrolytic corrosion of the container or conduit. Thus while 1.7 volts are required to decompose water, for example, between platinum elec-

trodes, because of the building up of the pressure of the free gases, a lesser voltage will effect some decomposition of water if the gases (hydrogen) are immediately dissipated, so that they do not build up a pressure as by being taken into combination, for example, by acting to reduce an oxide that is present, but as above stated I do not intend to be bound by this theory.

As an illustration of the practice of my invention, that will aid in the understanding thereof but to which, it is to be understood, my invention is not limited, I have found that the formation and adherence of scale in such water containing devices as steam boilers, condensers, evaporators, economizers, conduits, etc., may be eliminated by the use of electric currents at voltages from .005 to .05 volts. In accordance with my invention the voltage employed is of such value that the elimination of the formation of encrustation or scale is effected without appreciably accelerating or augmenting the corrosion of the container beyond what would normally occur in the absence of the application of current thereto for the prevention of such encrustation or scaling. The value of the voltage that will meet both of these conditions under all circumstances cannot be specified because the voltages applied in accordance with my invention will vary with the circumstances surrounding the particular article to be protected. A convenient source of currents of such strength and voltage is a thermo-couple or a battery of thermo-couples, the junction of which may be heated by heat from the container or a convenient furnace.

In the practice of my invention, the electric current employed is conducted directly to the container and flows from the container instead of being conducted to the fluid and caused to flow from the container, or vice versa, in such a manner that the current flows across the line between the fluid and the container. Thus in the example described, for the purpose of assisting in the understanding of my invention, a thermo-couple, or other source of a comparable electric current, will have its terminals connected to remotely spaced parts of the boiler shell preferably at points as far distant from one another as possible.

In the drawings there is shown a boiler installation embodying my invention and whereby my invention may be practiced.

The usual masonry setting 1 supports the boiler shell 2 which may be of any type, but a return-tube boiler is indicated. The steam dome 3 has leading from it the main steam header 4. The clamp 5 holds the junction point of a thermo-couple in close contact with the steam pipe and insulated wires 6 and 7 lead from the terminals of the thermo-couples to opposite ends of the boiler. Thus

an electric circuit, having as its source of electricity a thermo-couple, is closed through the metallic container, and a current is passed through the walls of the container that has a voltage below that which will cause appreciable electrolytic corrosion of the container beyond what would normally occur if such a current were not applied to and passed through the container or conduit, but which voltage is sufficient to effect elimination of the formation and adhesion of scale within the boiler.

This application is a continuation of my copending application Ser. No. 668,191, filed October 12th, 1923.

While I have described my invention in great detail and have referred to the details of a particular embodiment and application thereof, I do not intend that my invention shall be limited to such details but that it shall include such modifications and variations as fall within the hereunto appended claims.

What I claim and desire to secure by Letters Patent is:

1. The method of protecting metallic surfaces in contact with a body of fluid against formation and adhesion of scale thereon which comprises including the metallic surface in a metallic electric circuit, causing electric current to flow in said circuit so formed while maintaining across that part of said metallic surface that is included in said circuit a voltage below that which will cause appreciable electrolytic corrosion of the metallic surface beyond what would normally occur in the absence of said voltage, and thereby preventing the formation and adhesion of scale on said surface.

2. The method of protecting metallic surfaces in contact with a body fluid against formation and adhesion of scale thereon which comprises passing an electric current through the metallic surface without directly introducing the same into or withdrawing it from the fluid and thereby protecting said surface against formation and adhesion of scale while the voltage of said current is maintained below that which will cause appreciable electrolytic corrosion of the metallic surface beyond what would normally occur in the absence of said current.

3. In combination with a metallic container or conduit adapted for the processing of fluid, an electric thermo couple having its terminals respectively connected to said container or conduit at remotely spaced points thereof and being of such character and so adjusted as to protect said container or conduit against formation or adhesion of scale while producing between said points of connection a voltage below that which will cause appreciable electrolytic corrosion of said container or conduit beyond what would occur in the absence of said current.

4. In combination with a metallic container or conduit adapted for the processing of fluid, a source of electric current having its terminals respectively connected to said container or conduit at remotely spaced points thereof and capable of producing in the circuit so formed a current having a voltage and amperage of such value as to prevent formation of scale on said container or conduit without appreciably accelerating electrolytic corrosion thereof. 10

In testimony whereof, I have signed my name to this specification.

KARL SCHNETZER.