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T. J. JOHNSTON

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WATER HEATING COIL

Filed Oct. 20, 1927

Fig. 1.

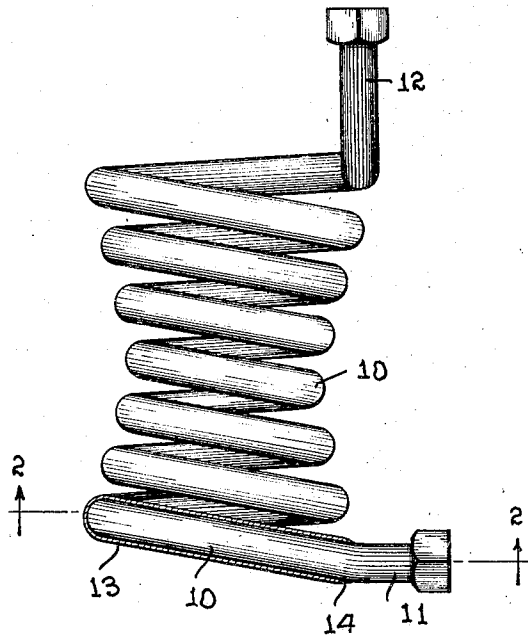


Fig. 2.

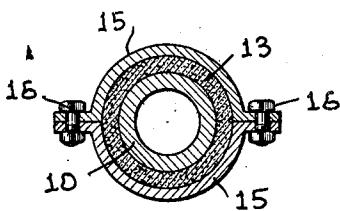
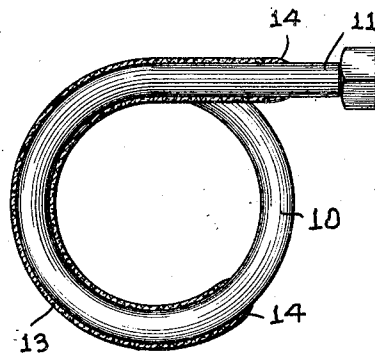


Fig. 3.

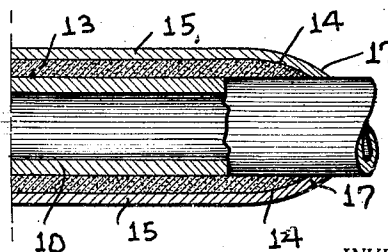


Fig. 4.

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WATER-HEATING COIL

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This invention relates to an improvement on commonly used household water heaters. Such water heaters are generally provided with water coils disposed in a vertical casing which holds at the bottom thereof a gas heater for heating the coils and the water which passes therethrough. The cold water generally enters into the coil at the lower extremity thereof and passes upwards. During the passage of the water through the coil, it is heated by the gas flame.

In the use of such water heaters, serious trouble has arisen due to the fact that the lowest convolution of the water coil frequently becomes punctured. When a puncture occurs in the coil, it cannot be repaired very effectively except by the removal of the entire coil and substituting a new one therefor. Efforts are frequently made to braze or solder the puncture and sometimes the punctured convolution is cut off from the remainder of the coil and the new convolution is substituted in its place. In each of these methods of repairing the burned out coil, new points of weakness are substituted for the old. The soldered or brazed puncture is itself weak and rarely lasts for a long period while the point of junction between the new convolution and the old coil also constitutes a weak point where new punctures frequently appear.

The puncturing described above is due in part to each of two causes, one cause being the local overheating due to the constant play of portions of the flame on one or more spots of the lowest convolution. This may cause excessive overheating at one spot of the coil and followed by the destruction of the coil at that particular spot. The other cause is the fact that portions of the coil may happen to be constantly played upon by the oxidizing portion of the flame. This causes slow oxidation of the metal disposed at that particular spot with the result that the material weakens at that point and ultimately causes a puncture.

It is therefore the object of the present invention to protect the lowest convolution of the coil against any local overheating and against any oxidation of the metal tube.

It is the object of the present invention to

subject the lowest convolution of a heating coil to such treatment and to provide it with a coating, preferably of refractory material, which will protect the lowest convolution of the coil against local overheating and prevent the occurrence of punctures described above.

Another object of the invention is to provide a coating over the lowest convolution of the coil which will serve to distribute the heat evenly over the surface of the convolution, thereby preventing any local overheating and preventing any punctures.

Another object of the invention is to provide the lowest convolution of the coil with a coating of material which will not itself be attacked by the excessive heat to which the lowest convolution is subjected, thereby protecting the coil and which will at the same time not interfere with the transmission of heat from the burner to the coil and the water in the coil.

Another object of the invention is to provide a coating for the lowest convolution which will closely adhere to the copper tubing and will not be subject to accidental removal from the copper tubing.

Other objects of the invention will be understood from the description and the drawings which constitute a part of this application.

In the drawings:

Figure 1 shows a heating coil having its lowest convolution provided with the coating.

Figure 2 is a view taken along the line 2-2 of Figure 1, showing the coating in section.

Figures 3 and 4 are partial sections of the coil and the mold utilized in the application of the coating to the coil.

In the drawings, reference character 10 shows the heating coil which is provided with the cold water inlet 11 at its lower extremity and hot water outlet 12 at its upper end. The coating of refractory material 13 is shown applied to about three-quarters of the lowest convolution and extends from a point near the cold water inlet to a point reaching about three-quarters of the way around the convolution. The ends of the coating are tapered as shown at 14.

The coating 13 may, if desired, be made

of any material which will withstand the high heat to which it is subjected and which will, at the same time, adhere to the tubing and has the quality of offering the desired protection for the tubing and is still capable of being applied in thin enough coatings so that it will not interfere with the transmission of heat from the burner to the water passing through the tube.

I have found that a mixture of ground fire clay and ground asbestos or mineral wool mixed with water glass as a binder, gives a coating which may be applied in thicknesses not exceeding one-quarter of an inch and which will give all the desirable results enumerated above. The proportions of the three ingredients of the coating may be varied considerably. The asbestos or mineral wool due to its fibrous structure, serves to bind the fire clay and hold the same in its original form while the water glass serves as a binder to give the mixture the desired consistency and continuity.

In the application of the above coating to the heating coil, the lower convolution of the heating coil is first covered with a coating of water glass which may be applied with a brush or in any other manner. The coil is then subjected to baking in an oven or if this entire process is applied to a water heater which is already installed, it is subjected to baking merely by subjecting it to the burner which is a part of the water heater. This bakes and hardens the thin coating of water glass with the result that it offers a footing or a binding action between the coil and the subsequently applied coating which consists of fire clay, asbestos and water glass.

The coating itself is preferably applied by means of a split mold 15. The interior diameter of the mold 15 exceeds the outer diameter of the coil 10 by an amount sufficient to provide the necessary thickness of coating. The mixture of the refractory material is applied to each half of the mold slightly in excess of the amount necessary. The mold is then applied to the lowest convolution and the excessive material is removed and the two halves of the mold are clamped together by means of the bolts 16. The free ends of the mold are tapered as shown at 17. After the mold and the refractory material is applied and clamped on the heating coil, it is subjected to a baking process which need not exceed a period of fifteen or twenty minutes. This serves to harden the refractory material and to cause the same to adhere to the coating of water glass on the coil. After the baking has been completed and after the apparatus has cooled, the mold is removed, leaving the desired coating on the coil.

I have found that a coil bearing a coating which has been applied in the manner described above, can withstand continuous application of heat either from a gas burner or

coal fire for very long periods without being punctured. Repeated tests of coils treated in the manner described above and comparison of such tests with untreated coils show that the coating described above does not interfere with the transmission of heat from the flame or burner to the water in the coil.

While the coating described above affords all the advantages sought by the present invention, the composition of the refractory layer may be varied by the admixture of a small amount of steel wool throughout the body of the refractory material. The steel wool serves the function of conducting the heat from the refractory layer and from the ambient admixture to the coil. When steel wool is incorporated in the refractory material, asbestos may be eliminated if desired, for the reason that the steel wool due to its fibrous structure, has an interlacing effect upon the mixture and aids it in retaining its form. In the place of steel wool any other heat conducting material may be dispersed through the refractory composition when it is in its pasty form, such as steel filings and the like.

Having described my invention, I do not wish to be limited by the specific embodiment shown herein since obviously many changes may be made by those skilled in the art without departing from the spirit of my invention.

What I claim is:

1. A household water heater comprising a metallic vertically disposed heating coil adapted to cooperate with a gas flame to heat a stream of water passing through said coil and having its lowest convolution exposed to the oxidizing action of the flame and to direct play of the flame, said lower convolution having a thin exposed heat conducting coating for protecting said convolution against puncture, said coating comprising a baked layer of nonmetallic refractory material.
2. A household water heater comprising a metallic vertically disposed heating coil adapted to cooperate with a gas flame to heat a stream of water passing through said coil and having its lowest convolution exposed to the oxidizing action of the flame and to direct play of the flame, said lower convolution having a thin exposed heat conducting coating for protecting said convolution against puncture, said coating consisting of a baked layer of nonmetallic refractory material and metal interspersed therein.
3. A household water heater comprising a metallic vertically disposed heating coil adapted to cooperate with a gas flame to heat a stream of water passing through said coil and having its lowest convolution exposed to the oxidizing action of the flame and to direct play of the flame, said lower convolution having a thin exposed heat conducting coating for protecting said convolution against puncture.

ture, said coating comprising a baked layer of non-metallic refractory material, and a layer of water glass disposed between said coating and said convolution.

5 In testimony whereof I affix my hand this 18th day of October, 1927.

THOMAS J. JOHNSTON.

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