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METHOD OF CLEANING TUBES AND THE
LIKE

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The invention relates to a process or method of cleaning the interior of heating or cooling coils which are formed of metal having a high co-efficient of expansion.

To this end, the principal object of my invention, generally stated, is to provide a method or process by which metal tubes used either for heating or cooling may be safely and quickly cleansed of deposits formed on their interior walls so as to prevent the loss of efficiency of these mechanisms during their continued use over a long period of time.

A further object of the invention is to provide means for rapidly and efficiently treating radiators of gas engines and the like to remove therefrom deposits which prevent the intimate contact of the cooling or heating fluid with the interior surface of the tubes and which in this way materially reduce the efficiency of such structures for the use for which they are intended.

These and other objects and advantages of the invention should be readily apparent from the detailed description of the various steps of the process as hereinafter pointed out.

Before describing my method in detail it is advisable to point out that in tubes of the character described and in automobile and gas engine radiators the impurities carried by the circulating fluid will, to a large extent, be deposited upon the interior surfaces of the tubes, which deposits materially affect in the first instance the transfer of heat either to or from the tubes to the surrounding medium and which deposits, due to accretion, finally so limit the flow of fluid through the tubes as to destroy the efficiency of such tubes. Owing to the thin walls of the tubes and to the fact that they are very largely used either in convoluted or spiral form, it is impossible to use mechanical means to effectively cleanse the interior of these tubes. Various chemical means have been used but chemicals which are sufficiently strong to attack and dissolve the deposits upon the interior of the tubes have almost universally been found to be of sufficient strength to attack either the tubes themselves or the soldered joint by which one or more of these tubes may be united to form a continuous passageway.

In carrying out my invention I disconnect the tubes from the other portions of the mechanism and then introduce into the tubes a fluid at a comparatively low temperature. Owing to the extremely high temperature of the next step in my process, I have found it beneficial, but not essential, to use a fluid as near the freezing point

of that fluid as is feasible, but, as stated above, a wide range of temperatures of the initial step in my process permits the use of a fluid ranging in temperature from 32° F. to 85° F. without detriment to the complete process. After permitting the fluid to remain in the tubes for a sufficient length of time to bring the temperature of the tubes to substantially the same temperature as the fluid or by continuing the flow of the fluid through the tubes until they have acquired the temperature of the fluid, I then introduce into the said tubes a jet of live steam. The pressure of the steam, together with the condensation of the same by the fluid within the tubes, causes a rapid rise in temperature of the tubes and the continual application of the steam forces the fluid out of the tubes and subjects the entire length of each tube to a flow of live steam and this flow is allowed to continue until the tube or tubes have reached the temperature of the live steam. After this step of my process has been carried on until the tubes have acquired this temperature, the steam valve or pipe is disconnected and fluid of substantially the original temperature is again introduced into the tube or tubes. The steps of flowing a liquid at a low temperature through the tubes and then forcing the same from within the tubes by the application of live steam may be and preferably are repeated until the fluid flowing from the tubes is substantially free of foreign matter.

I have found that by my method it is possible to thoroughly cleanse the interior of heating or cooling tubes by breaking down deposits within the tubes and causing the same to be expelled from the tubes. The cleansing action of my process is believed to be due to the rapid expansion and contraction of the tubes, to the effect of the rapid change of temperature upon the scale or deposits within the tube or tubes, and to the action of the live steam upon said deposits or sludge which has accumulated within the tubes. In fact, repeated tests have shown that by the method herein described radiators and other tubes may be rapidly restored to substantially their original condition without the use of acids, alkalis and the like and without detriment to their structure or to the means by which the tubes are connected.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A method of removing mineral deposits from the interior of tubes formed of metal having a high co-efficient of expansion by utilization of the difference between the co-efficients of expansion

and contraction of the deposits and the tubes, which consists in rapidly cooling said tubes by filling the same with a liquid at comparatively low temperature, causing said liquid to remain within said tubes until the same have acquired the temperature of the said liquid, forcing said liquid out of said tubes by applying thereto a steam jet, continuing the flow of steam until the temperature of the said tubes has been raised to the temperature of the said steam, and then flowing a liquid through said tubes.

2. A method of removing mineral deposits from the interior of convoluted tubes formed of metal having a high co-efficient of expansion by cooling and heating said tubes in rapid succession, which consists in flowing through said tubes a liquid at a temperature below the initial temperature of said tubes and between 32° F. and 85° F., permitting said liquid to continue to flow until the tubes have acquired the temperature of the liquid, immediately thereafter introducing a jet of live steam into said cooled tubes for a sufficient time interval to raise the temperature of said tubes rapidly to substantially the temperature of said steam, and then rapidly reducing the temperature of said tubes by subjecting the same to a flowing liquid.

3. The method of removing mineral deposits from the interior of convoluted water tubes formed of copper or the like by subjecting said tubes to rapid changes in temperature and thereby utilizing the difference between the coefficients

of expansion and contraction of the deposits and the tubes, which comprises rapidly cooling said tubes by flowing through the same a cold liquid and immediately thereafter heating said tubes by introducing therein a heated fluid, said fluid being at a temperature of at least 212° F.

4. The method of removing mineral deposits from the interior surfaces of the tubes of an automobile radiator by utilizing the difference between the coefficients of expansion and contraction of the deposits and the tubes, which comprises rapidly cooling said tubes by subjecting the same to a flow of cold water, immediately thereafter heating said tubes by subjecting said surfaces to the high temperature and to the effects of live steam, subsequently causing a cooling liquid to flow through said tubes to rapidly reduce the temperature thereof, and repeating said steps until the water flowing from said tubes is substantially clean.

5. A method of removing mineral deposits from the interior of metal tubes by utilization of the differences between the coefficients of expansion and contraction of the metal and the deposit and the effect thereupon of rapid changes in temperature consisting in cooling said tubes by flowing therethrough a cooling liquid, and immediately thereafter introducing steam into said tubes to heat the same to substantially the temperature of said steam.

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