UNITED STATES PATENT OFFICE.

AMOS DENSMORE, OF MEADVILLE, PENNSYLVANIA.

IMPROVEMENT IN HEAT-CONDUCTING MEDIA.

Specification forming part of Letters Patent No. **195,584**, dated September 25, 1877; application filed September 21, 1877.

To all whom it may concern:

Be it known that I, AMOS DENSMORE, of Meadville, Crawford county, Pennsylvania, have invented an Improved Liquid for Transmitting Heat in Liquid-Heating, Circulating, and Radiating Apparatus, of which the following is a specification:

The object is a cheap, inoffensive, safe liquid, of perfect fluidity, but which will neither boil nor freeze easily, and the nature of the invention is in the solution of nitrate of soda in apparatus for heating and circulating liquid and transmitting and radiating heat in dwellings or other buildings and in railway cars or other vehicles.

The following description fully illustrates the invention:

Make a solution of nitrate of soda, fill with it the pipes or vessels in which it is to be heated and circulated, make a fire in the heater, and the invention is complete.

Heating and circulating liquids in conducting and radiating pipes is a common device; so, also, the use of oil, mercury, hydro-carbon, brine, glycerine, paraffine, and other liquids in heating, circulating, and radiating apparatus is common and well-known. Thomas Fowler, of Torrington, England, in 1828, described the use of oil in such apparatus; Hargrave & King, in 1865, patented the use of mercury in such apparatus; W. C. Baker, in 1866, patented the use of hydro-carbon, and in 1867, patented the use of brine and glycerine, in such apparatus; and in 1869, C. A. Seeley patented the use of paraffine in such apparatus; but some of these liquids are costly, others are dangerous, others injurious to the apparatus, and others not sufficiently non-boiling and non-freezing.

Salt-water or brine, the patent of W. C. Baker, before referred to, has proved the best liquid heretofore used for the purpose. It is cheap and tolerably efficient. But it boils too easily, and sometimes it freezes. A better liquid is needed; and the solution herein described is practically as cheap as brine, is as perfectly fluid, but neither boils at so low nor freezes at so high a temperature, and is therefore exceedingly efficient.

An ideal liquid for the purpose is one perfectly fluid but which never can make steam nor freeze; for steam will find all upper corners, cavities, and "traps" possible, and thereby stop or impede circulation; and any liquid which may freeze, and expand by freezing, may burst and destroy the apparatus.

Since long before patents were granted for liquids for this purpose, chemistry has taught that every substance technically known as a salt, whether from a metallic or alkaline or other base, when dissolved in water, will reduce the temperature at which the solution will freeze below the freezing point of water, and will raise the temperature at which it will boil above the boiling point of water; but each has a different property or characteristic from all others, and no one is necessarily the equivalent of any other in any given particular: nothing but test and experiment can determine the result of any one placed under any given conditions.

For instance, the solubility of nitrate of soda is greater than that of salt, and the solution of nitrate of soda will boil at a higher and freeze at a lower temperature than that of salt: the saturated solution of nitrate of soda and water consists of 224.8 parts of nitrate of soda to 100 of water, and boils at 250 and freezes at —15° Fahrenheit; while the saturated solution of salt and water consists of 41.2 of salt to 100 of water, and boils at 227 and freezes at —4° Fahrenheit.

And the excellence of the solution herein described for transmitting heat in such apparatus is not only in its cheapness, safety, inoffensiveness, and fluidity, but in the necessarily high temperature at which it boils and low temperature at which it freezes.

The denser or greater the solution, the nearer it is to the point of saturation, the better is the liquid for the purpose.

Therefore, I claim as follows:

The solution of nitrate of soda for transmitting heat in liquid-heating, circulating, and radiating apparatus, substantially as described.

AMOS DENSMORE.

Witnesses:
JAMES DENSMORE,
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