W. S. HADAWAY, JR.

HEATING APPARATUS.

APPLICATION FILED JULY 11, 1917.

1,356,818. **Patented Oct. 26, 1920.**

Fig. 2.

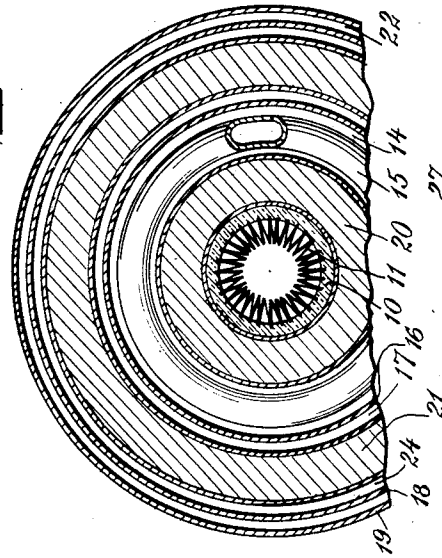


Fig. 4.

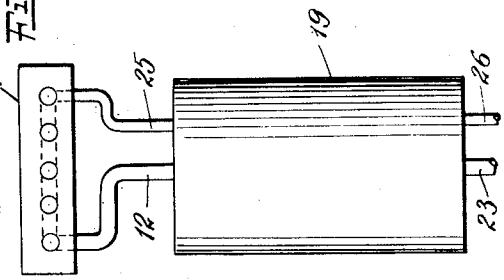


Fig. 1.

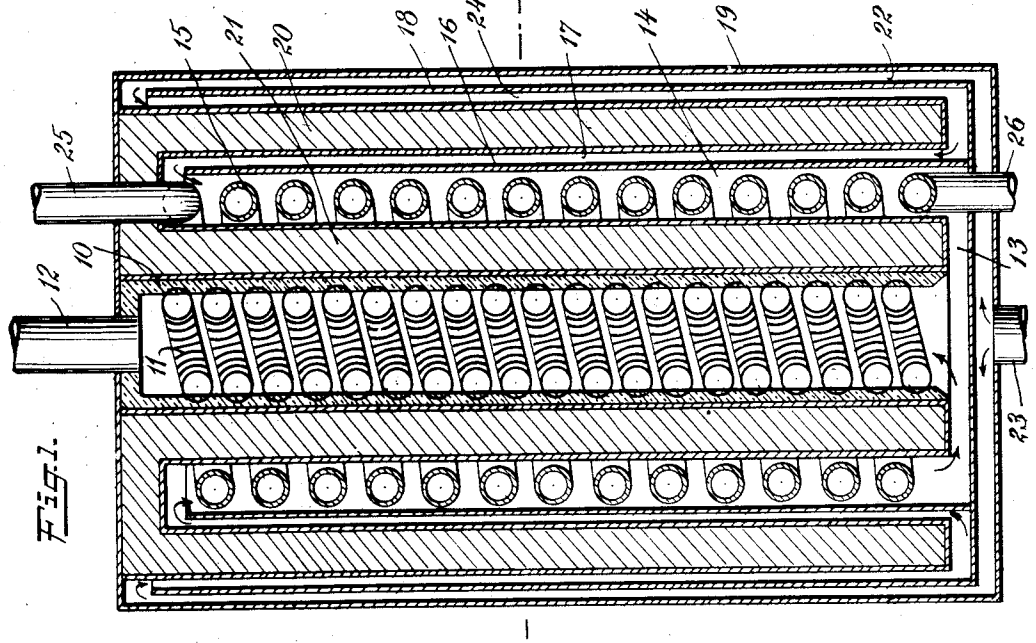
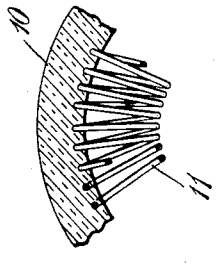


Fig. 3.



Inventor

William S. Hadaway Jr.

By his Attorneys

Marshall & Dearborn

UNITED STATES PATENT OFFICE.

WILLIAM S. HADAWAY, JR., OF NEW ROCHELLE, NEW YORK.

HEATING APPARATUS.

1,356,818. Specification of Letters Patent. Patented Oct. 26, 1920.

Application filed July 11, 1917. Serial No. 179,837.

To all whom it may concern:

Be it known that I, WILLIAM S. HADAWAY, Jr., a citizen of the United States of America, and a resident of New Rochelle, county of Westchester, and State of New York, have invented certain new and useful Improvements in Heating Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to heating apparatus and has special reference to means for increasing the temperature of hot vapor such as steam in order to adapt it for various heating purposes.

One object of my invention is to provide a simple and compact heater for the aforesaid purpose in which the heat losses are minimized and the amount of energy necessary for producing the superposed heat reduced to a relatively small value.

Another object of my invention is to provide a heating device which shall embody what may conveniently be termed a heat exchange in which the heat remaining in the steam or gas after it has passed through the working member, is utilized to increase the temperature of the incoming vapor.

Another object of my invention is to provide an electric vapor heater that shall be simple and durable in construction and effectively give up its heat to the vapor which passes therethrough.

Another object is to provide a vapor heater having means for taking up heat from the exhaust of a working member to which hot vapor is supplied from the vapor heater, and furthermore having a heat conserving jacket to reduce the losses.

In order that my invention may be thoroughly understood I will now proceed to describe the same in the following specification and then point out the novel features thereof in appended claims.

Referring to the drawings:

Figure 1 is a sectional elevation of a heater arranged and constructed in accordance with my invention.

Fig. 2 is a sectional plan view of the same structure taken on the line 2—2 of Fig. 1.

Fig. 3 shows the electric heating element of the device on a larger scale.

Fig. 4 is a simple diagrammatic view illustrating one way of utilizing my invention.

The structure illustrated comprises an inner tubular body 10 of fire clay or the like into which is molded a resistance wire helix 11 wound in helical form.

The arrangement is such that the resistance conductor may be of very considerable length and its exposed surface extensive.

An outlet pipe 12 is connected to the tubular member 10 at its upper end and it communicates at its lower end through a passage 13 with an outer annular chamber 14 in which a heat exchange pipe or tube 15 is disposed in helical form.

A cylindrical baffle plate 16 surrounds the exchange tube 15 and provides a relatively narrow annular passage 17 through which the steam or other vapor flows before it reaches the chamber 14.

A baffle member 18 in the form of a cup contains the parts already described and in conjunction with an outer casing 19 and insulating spacers 20—21, provides a thin inlet passage 22 of annular form. An inlet pipe 23 is connected to the casing 19 at the bottom and hot vapor such as low pressure steam, for example, may be supplied through the pipe 23 through the annular chamber 22, thence upwardly to the edge of the cup 18 near the top of the structure, thence downwardly through an annular chamber 24 within the cup 18; thence upwardly through the annular passage 17, then downwardly through the chamber 14 in which the heat exchange tubes 15 are disposed and then upwardly through the tubular member 10, and finally out through the pipe 12.

The steam in passing through the passages 22 and 24 forms an outer steam jacket for the device which prevents loss of heat. The steam is itself heated by the exchange tube 15. It then enters the tubular member 10 and is heated to a relatively high temperature, which is determined by the work to be done, by the electric heating element 11. The highly heated vapor or gas then passes through the pipe 12 to any suitable working member or radiator where heat is required for use. From the working member or radiator the discharged vapor at a lower temperature passes through a pipe 25 into the exchange tube 15 and finally is discharged from the pipe 26 at the lower end of the device.

The exhaust steam may enter the exchange tube at a temperature considerably higher

than that of the incoming steam in the chamber, but its heat is quickly given up in raising the temperature of the incoming steam.

The form of the working member constitutes no part of my present invention, but for purposes of illustration I have shown a heating coil designated 27 in the diagrammatic view of Fig. 4.

My invention may be embodied in other structures which differ materially from that shown and described and I intend that only such limitations be imposed as are indicated in the appended claims.

What I claim is:

1. The combination with a heat radiator and a source of hot vapor, of a heater comprising an outer passage constituting a vapor jacket, an intermediate passage, a heat exchange pipe therein connected to the outlet end of the radiator, and an inner member for supplying heat to the vapor at a relatively high temperature.

2. The combination with a heat radiator and a source of hot vapor, of a heater comprising an outer passage constituting a vapor jacket, an intermediate passage, a heat exchange pipe therein connected to the outlet end of the radiator, and an inner tubular member embodying an electric heater for supplying heat to the vapor.

3. The combination with a heat radiator and a source of hot vapor, of a heater comprising an outer passage constituting a vapor jacket, an intermediate passage, a heat exchange pipe therein connected to the outlet end of the radiator, and an inner member connected to supply hot vapor to the radiator and comprising an electric heater of helical form.

4. The combination with a heat radiator and a source of hot vapor, of a heater comprising an outer passage constituting a vapor jacket, an intermediate passage, a heat exchange pipe therein connected to the outlet end of the radiator, and an inner member composed of a tubular body of refractory material having a resistance element in the form of a helix and wound in helical shape partially molded into its wall.

5. The combination with a heat radiator and a source of hot vapor, of a heater comprising a passage constituting a vapor jacket, a passage connected to the outlet end of the radiator, heat exchange means therein, and means for supplying heat to the vapor at a relatively high temperature.

6. The combination with a heat radiator and a source of hot vapor, of a heater comprising a passage constituting a vapor jacket, an inner member for supplying heat to the vapor at a relatively high temperature, an intermediate passage connected to the outlet end of the radiator and heat exchange means in the intermediate passage.

7. The combination with a heat radiator, and a source of hot vapor, of a heater comprising an outlet passage constituting a vapor jacket, an inner member connected to supply hot vapor to the radiator, an intermediate passage, and heat exchange means therein connected to the outlet end of the radiator.

8. The combination with a heat radiator, and a source of hot vapor, of a heater comprising an outer passage constituting a vapor jacket, an inner member connected to supply hot vapor to the radiator and composed of an electric heater of helical form, an intermediate passage, and heat exchange means therein connected to the outlet end of the radiator.

9. The combination with a source of vapor having a fixed temperature, of a heater comprising an outer passage constituting a jacket connected to said source and adapted to be limited in temperature by the vapor temperature at the source.

10. The combination with a heat radiator and a source of hot vapor, of a heater comprising an outer passage constituting a vapor jacket limited in temperature by the temperature of said source, an inner member for supplying heat to the vapor at a relatively high temperature, and an intermediate passage connected to the outlet of the radiator.

11. A heater comprising an outer passage constituting a vapor jacket adapted to be connected to a source of hot vapor and limited in temperature thereby, an inner member for supplying heat to the vapor, and an intermediate passage adapted to receive exhaust vapor from a working member and having a heat exchange means therein.

In witness whereof, I have hereunto set my hand this 6 day of July, 1917.

WILLIAM S. HADAWAY, Jr.