This invention relates to a process and apparatus for heating metallic conduits of various shapes, such as tubular elements, or pipes, fixtures, etc., through which pass materials that are to be kept in fluid condition. For example, a heating device such as an electric heater may be located in proximity to the conduit so that heat may be transferred by conduction to the metal that is to be heated, this heat, of course, first passing through electrical insulating material surrounding the resistance wire and finally reaching the conduit that is to be heated. At the same time the conduit is additionally heated by passing an electric current through the metal itself, thus causing heat to be generated due to the resistance of the passage of the current.

The electrical or other type of heater that is to be used in this invention is preferably made in such a shape that it may be firmly attached to the flange of a metal fixture in such a manner that heat is readily transferred by conduction from the heater to the fixture itself. The heater may be provided with a lug or extension to serve as a convenient contact for the electrical terminal from which the current is to be carried into the metal that is to be heated.

The invention will be understood from the description in connection with the accompanying drawings, in which:

Fig. 1 is a section through the heater;
Fig. 2 is an enlarged section along the line a— a of Fig. 1;
Fig. 3 is a side view of a modification;
Fig. 4 is a detail of Fig. 3; and
Fig. 5 is a view showing how the electric heater may be installed.

In the drawings, reference character 1 indicates the resistance wire which may consist of a spiral wire 2 embedded in the refractory insulating material 3. The wire 2 and insulating material 3 is surrounded by a metal jacket 4. This electric heater is mounted in a disc-shaped metallic mounting 5 that has a central opening 6 therethrough corresponding in shape and size to the hole or passage through the pipe or fixture in connection with which the heater is to be used. The mounting 5 may also be provided with an annular row of holes 7 near the periphery thereof to accommodate bolts for fastening the heater to the flange of a pipe or fitting. The mounting 5 is also provided with a lug or extension 8 to facilitate connecting the terminal of a source of electric current therefor.

In the modification shown in Figs. 3 and 4 a series of electric heaters 10 are placed in holes in a metal mounting 11 that may be square in shape having a central hole 12 therethrough corresponding to the hole 6 in Fig. 1 and also having a lug 13 corresponding to the lug 8. The electric heaters 10 may, as shown more clearly in Fig. 4, consist of a spiral wire 14 mounted in insulating material 15 surrounded by the metal holder 16. The shape and size of the holder 16 will be such as to fit closely in the holes of the mounting 11.

When it is desired to use the device for heating a fixture such as a T, for example, the mounting 5 or 11 may be interposed between the flange 17 (Fig. 5) on the pipe 18 from the tank 19 and the flange 20 on the T 21 and may be securely fastened therebetween by means of the bolts 22. Other mountings may be similarly disposed along the pipes or in proximity to fixtures as may be needed and upon becoming heated by passing electric current into the heating wires thereof, the heat will be readily conducted from the heater itself along paths parallel to the line of flow in the conduit at said point to the part to be heated thus enabling the liquid which might otherwise freeze to pass readily through the pipe or fixture.

At the same time a current of electricity from a source 23 may be passed into the lug 8 of the mounting 5 and passed from thence into the fixture 21 and pipe 24 back to the source 23. This auxiliary current will also aid in heating the parts that are to be kept warm, or it might be used exclusively for heating certain portions of the pipe system.

It is obvious that instead of having the heater heated by electricity as above described, it may be heated by having a coil or pipe therein and passing hot fluid through the same.

This invention has been found to be generally useful where it has been desirable to
prevent pipes or fixtures from becoming plugged up by material becoming stiff or solidifying due to its temperature being lowered. A particular example of the use of this invention is in connection with a mixture of sodium and potassium hydroxide. This mixture has a solidifying point of about 200°C, the product becoming quite viscous or stiff slightly above this temperature for which reason it is desirable to maintain the piping system which is to handle this product at a temperature of about 225°C. The most difficult parts of a piping system to heat are the fittings such as T’s, cocks and the nozzles connecting the piping system with a vessel. This difficulty is apparently mainly due to variance in cross section of the metal forming these parts and to their large radiating surfaces. A mounting or heating device such as has been described above will generate sufficient heat at these points where maintenance of the required temperature is most difficult and at the same time afford means for passing current through these parts and through sections of piping of uniform cross section which are easily heated by means of passage of current therethrough. Where the connecting nozzle to a tank or other vessel is of a rectangular, elliptical or other special shape, the corresponding shape of opening is made within the heating device and the surfaces of contact made sufficient to conduct the required amount of heat into the flange attached to this nozzle and both the flange and parts of the nozzle will be maintained at the required temperature.

I claim:

1. The process of heating a metallic conduit carrying a fluid which comprises transferring heat to said conduit by conduction and in a path parallel to the line of fluid flow from a source of heat in proximity thereto, while generating heat within said conduit by passing a current of electricity therethrough.

2. The process of heating a metallic conduit carrying a fluid which comprises electrically generating heat at a plurality of points surrounding said conduit, and conducting the heat to the conduit in a path parallel to the line of flow.

3. An apparatus for heating comprising a conduit, a resistance element surrounding said conduit and electrically insulated therefrom, and means for passing an electric current through the conduit and through the resistance element.

4. An apparatus for heating a pipe line comprising a pipe having a flange at an extremity, a resistance element disposed adjacent to said flange and electrically insulated therefrom, means for passing an electric current through the pipe to heat the same, and means to pass an electric current through the resistance element.

5. In a device of the class described, the combination of a metallic disc having a centrally disposed opening therethrough, and an electric heater mounted in said disc disposed about said opening, said heater comprising a hollow toroidal shaped metal jacket containing electrical insulating material in which is embedded a resistance element.

6. In a device of the class described, the combination of a hollow ring-shaped metal jacket containing within it and electrically insulated from it a resistance element embedded in refractory insulating material, said jacket being mounted on a metallic disc concentrically about an opening therein which is adapted to be brought into juxtaposition and alignment with the opening that is surrounded by the metal to be heated, and a lug on said disc for attaching an electrical conductor thereto.

7. In combination, a metallic disc having an opening centrally disposed therethrough, a heating element mounted in said disc comprising a resistance element embedded in refractory material and a metal jacket surrounding the same, a tubular element having flanges at its extremities, and means for securing said metallic disc and tubular member together with the openings in alignment.

8. In combination, a metallic disc, an insulated electric heater mounted therein partly in circumference about an opening in said disc, a metallic tubular member, means of assembling said tubular member in juxtaposition to said disc containing said heater so that the openings therethrough will be in alignment, and means for passing an electric current through said heater and through said tubular element.

9. In an electric heating device for heating metal surrounding an opening, the combination of a metallic plate having a centrally disposed opening therethrough, said opening being of a size and shape adapted to be brought substantially into juxtaposition and alignment with the opening surrounded by the metal to be heated, a resistance element embedded within and surrounded by refractory insulating material and a metal jacket surrounding said insulating material, said metallic jacket being mounted in said metallic plate.

10. In an electric heating device for heating metal surrounding an opening, the combination of a metallic plate having a centrally disposed opening therethrough, said opening being of a size and shape adapted to be brought substantially into juxtaposition and alignment with the opening surrounded by the metal to be heated, a resistance element embedded within and surrounded by refractory insulating material, and a metal jacket surrounding said insulating material, said metallic jacket being mounted in said metallic plate.
plate and concentrically disposed about said opening.

11. In combination, a metallic plate having an opening centrally disposed therethrough, an insulated electric heater mounted in said plate in proximity to said opening, a tubular metallic member, means for assembling said plate in juxtaposition with said tubular member so that the openings in the plate and tubular member will be aligned, and means on said disc and on said tubular member for connecting them into an electrical circuit.

In testimony whereof I affix my signature.

JUSTIN F. WAIT.