This invention relates to water and corrosion resistant coatings and method of producing the same. It is particularly directed to a process or method of treatment of steel or iron pipes that have been covered with relatively thick coatings of corrosion preventing or resisting materials which include plastics such as asphalt, asphaltic emulsions, pitch, tar, or similar bituminous substances, with inert fillers and cementitious or fibrous binders. These may be applied in one or more layers, with or without reinforcing or external wrapping or rigid outer coatings, and with or without initial priming coats of various bituminous compositions.

One of the objects of this invention is to provide a method for treating such previously formed coatings which will render them more efficient and impervious to the passage of moisture or electric currents.

Another object is to provide a method of heat treatment of previously coated pipe which will cause said coating to be more adherent to the pipe, which will drive out any moisture contained in the coating immediately adjacent the pipe surface, and will cause any thermo-plastic layer or component next to the surface of the pipe to become temporarily soft or semi-fluid, promoting evaporation and thereby permanently rendering said coating more resistant to the passage of moisture or electric currents.

Another object is to provide a method of heat treating a pipe coating in place in which any films of foreign matter or discontinuities in a plastic component of the coating will be broken down to permit the plastic material to form a continuous and homogeneous medium.

Other objects and advantages of this invention will be apparent from the description of a preferred method which follows.

Previous methods of protecting iron and steel pipes from corrosion include the dipping of the individual sections of the pipes into tanks of bituminous or plastic varnishes or enamels to provide a uniform coating on one or both surfaces of the pipe. The varnishes usually contain an oxidizable component such as linseed oil, and are of the nature of a japaen which is adapted to be baked after its application to the pipe sections. This baking involves heat treatment, usually in an oven, which oxidizes one or more of the components of the varnish or volatilizes certain light fractions so that the resulting coating is hard and glassy. It has long been recognized that these coatings will not stand rough handling, nor will they prevent corrosion for any appreciable period when eventually deformed or ruptured by expansion and contraction of the pipe and soil stress concentration.

Various thick coatings which may utilize sand, graded aggregates, fibrous materials, Portland cement, and some sort of plastic or bituminous binder have been developed and certain of these have been found to give adequate corrosion protection. Certain of these coatings are applied hot, at temperatures of the order of 300-400° F. The asphaltic or bituminous component of coatings of this nature is usually fluid enough at such temperatures to form a complete moisture and electric current resisting film at the surface of the pipe, and thus affords practically perfect protection.

It is not always practical or economical to apply hot coatings under all the conditions which may be encountered in the laying of pipe lines and the like, consequently coatings have been developed which do not require the use of heat. These may contain “cut-back” asphalts in which a volatile thinner or flux is added to make the asphalt fluid at the temperature of application. This volatile thinner eventually evaporates from the finished coating and leaves the asphalt of the desired hardness.

Other types of coatings involve the use of bituminous emulsions in which a dispersion agent is used to make an emulsion of asphalt or the like in water. In these types the dispersed particles of bitumen are surrounded by water, which is completely dispersed through the coating and is removed therefrom, in part, by a process of evaporation. This evaporation is oftentimes not quite complete and leaves the coating a partial conductor for electric currents. A further disadvantage of certain coatings of this type is the presence of the dispersion agent of the original emulsion in the final coating even after the water has substantially disappeared. This dispersion agent is believed to be present in thin films between the discrete, unfused particles of asphalt, thereby leaving minute passages through which moisture may penetrate and electric currents pass. By the practice of this invention, these films or discontinuities are believed to be destroyed by the heating and slight flow of asphalt or other thermoplastic material in that part of the coating next to the outer surface of the pipe.

Furthermore, it is sometimes customary to apply a priming coat to the steel pipe before any sort of thick coating is placed thereon. This priming coat may be a “cut-back” asphalt, a hot bituminous application, or a bituminous emulsion of a consistency which will permit of its cold application by usual painting methods. In the latter case, the same films and discontinuities may be present in what appears to be a perfect layer of asphalt on the pipe surface. It has been found that completely coated or merely primed pipes of the types just described...
have their corrosion resisting properties and electrical resistivities greatly improved by heating the primed and/or coated pipe internally to a degree which will cause that portion of the coating next to the pipe surface to melt or at least separate to the extent that it will flow together and as to become continuous and homogeneous; to repel moisture from the surface of the pipes if any be present, as in a coating made from emulsified asphalt; and also, in the latter case, to break down any minute films of dispersion agents, which may be present between the adjacent asphalt particles and which may cause the degree of electrical conductivity that is sometimes found in such coatings. It is also likely that the adhesion to the pipe of any of the coatings which are applied over a priming coat of bituminous material, as well as the flexibility of the coating material itself, is improved by some degree of flow or migration of the softened bituminous or thermoplastic material therewith.

As an example of a method of carrying out the process of the invention and the results, a core-steel pipe was coated to a substantial thickness with a cold mastic made by mixing mineral aggregates with bituminous emulsion. It was found that a low voltage would cause electric current to pass through the coating to the pipe internally to cause a melting or flowing of the bitumen adjacent the outer pipe surface the coating was rendered resistant to the passage of electrical currents of like intensity and under a like potential.

Again when a steel pipe was coated with a bituminous primer before applying a mastic wrapping as above, the heat treatment of the invention produced similar results, and in addition served to bond the bitumen of the two coatings together so that a homogeneous, continuous and closely adherent bituminous layer was produced adjacent the pipe surface.

Inasmuch as there are a very great number of different bituminous and other thermoplastic products used in such coatings, and because of their widely varying properties, it is obviously impractical to specify temperature ranges for all types of coatings in a description of this nature. One test of heating temperature which has proved practical for bituminous coatings is the visual observation of the coating at the ends of the individual pipe sections, which ends are practically always left bare for a short distance to facilitate welding or otherwise joining the sections together. The pipe sections, after the coating has set or hardened, may be heated with warm air or flue gas from a furnace, or by means of an oxy-acetylene, oxy-butane, or plain gas or oil torch, moved slowly and uniformly therethrough. When the desirable temperature of the pipe has been attained, the uncoated ends which usually have some fragments of priming adhering thereto, and of the exposed end of the coating, near the pipe surface, will assume the typical black and shiny appearance of incipient melted bitumen. Care should obviously be taken to prevent too rapid heating or over-heating of the pipe, which might cause the loosening of the coating. Ordinarily the effect of pipe expansion need not be considered, as coatings containing an appreciable percentage of bituminous or thermoplastic materials are elastic enough to accommodate the slight degree of expansion which will occur. The heating is preferably done with a pipe in a horizontal position, and the pipe may be rotated continuously or at intervals to facilitate even heat distribution.

While this method has been described as being practically applicable to pipes which have been coated with thermo-plastic or bitumen containing materials, it is also conceivable that it could be applied to other structures. If necessary, the coated metal could be heated by passing electric currents therethrough or even by inducing electric currents therein by magnetic induction. Consequently, it is to be understood that the invention is not limited to the specific examples disclosed and all such modifications and changes as come within the scope of the claims are embraced thereby.

I claim:

1. A method of the character described for the manufacture of coated metal pipe, the steps of applying a covering of a thermoplastic bituminous material to one surface of said pipe, applying a layer of an initially plastic material on top of said coating, said top layer comprising an inert filler, a bituminous plastic and a cementitious binder, and adapted to form a rigid outer coating, and subsequently increasing the dielectric strength of the composite coating by heating the metal pipe to a temperature sufficient to cause separation of the bituminous material without loosening of the coating from the pipe.

2. A method of the character described for the manufacture of coated metal pipe, according to claim 1, in which said last named layer comprises a mineral aggregate, a bituminous emulsion, and a cementitious binder.

3. A method of the character described for the manufacture of coated metal pipe, according to claim 1, in which said last named layer comprises an, inert filler, an asphaltic emulsion, and a cementitious binder.

4. A method of the character described for the manufacture of coated metal pipe, according to claim 1, in which a hot fluid is passed through the coated pipe to heat the same.

5. The method of improving the corrosion preventive or water-proofing of a metallic structure comprising the steps of applying to a said structure a first coating comprising a thermoplastic bituminous material, applying a relatively thick coating of corrosion resisting material comprising a plastic bituminous substance, an inert filler and a cementitious binder, and subsequently heating the metal of said structure to a temperature sufficient to cause flow of the thermoplastic bituminous material of said first coating without loosening of the coating from the structure.

6. A method of the character described, according to claim 5, in which said plastic bituminous substance of said thick coating is an asphaltic emulsion.

7. A method of the character described for the continuous or partially continuous metallic structure comprising the steps of applying to said structure a first coating comprising a thermoplastic bituminous material, applying a relatively thick coating of corrosion resisting material comprising a plastic bituminous substance and a mineral aggregate, and subsequently heating the metal of said structure to a temperature sufficient to cause flow of the thermoplastic bituminous material of said first coating without loosening of the composite coating from the structure.

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