D. HURLEY & J. E. O'SHEA.

METHOD OF DRYING AND IMPREGNATING ELECTRICAL CONDUCTORS.

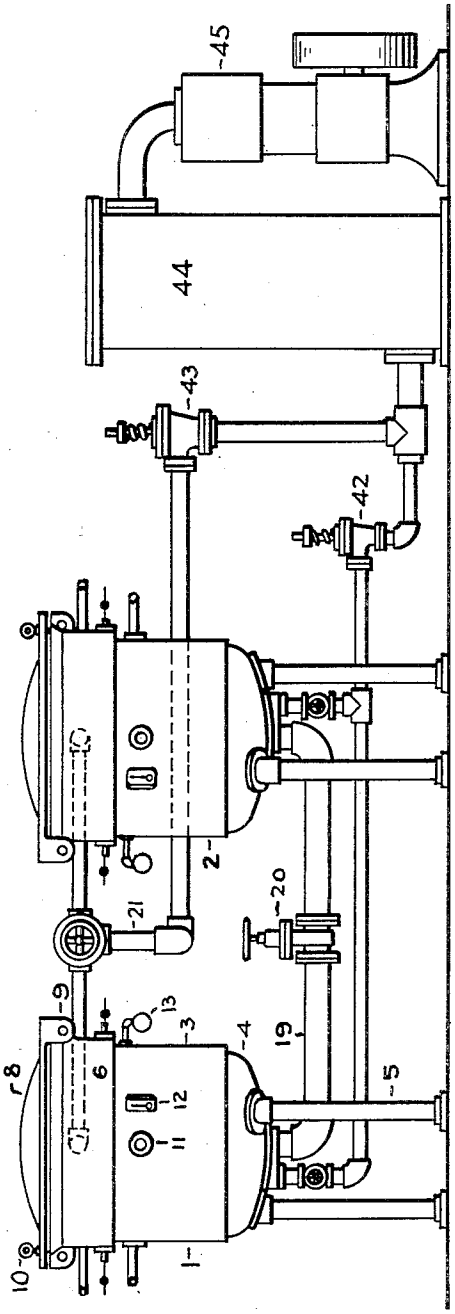
APPLICATION FILED MAR. 17, 1909.

1,163,342.

Patented Dec. 7, 1915.

4 SHEETS—SHEET 1.

FIG. 1.



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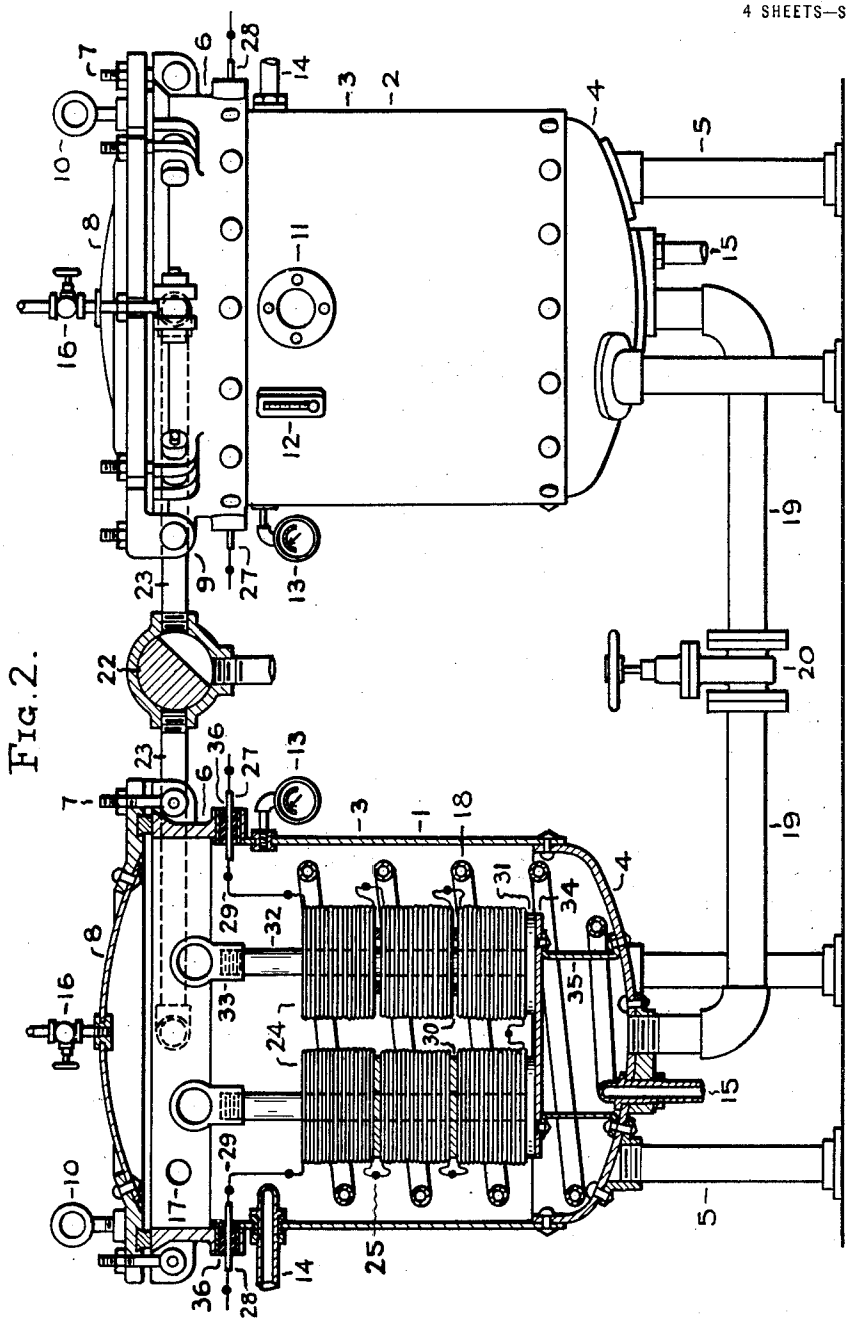


FIG. 2.

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4 SHEETS—SHEET 3.

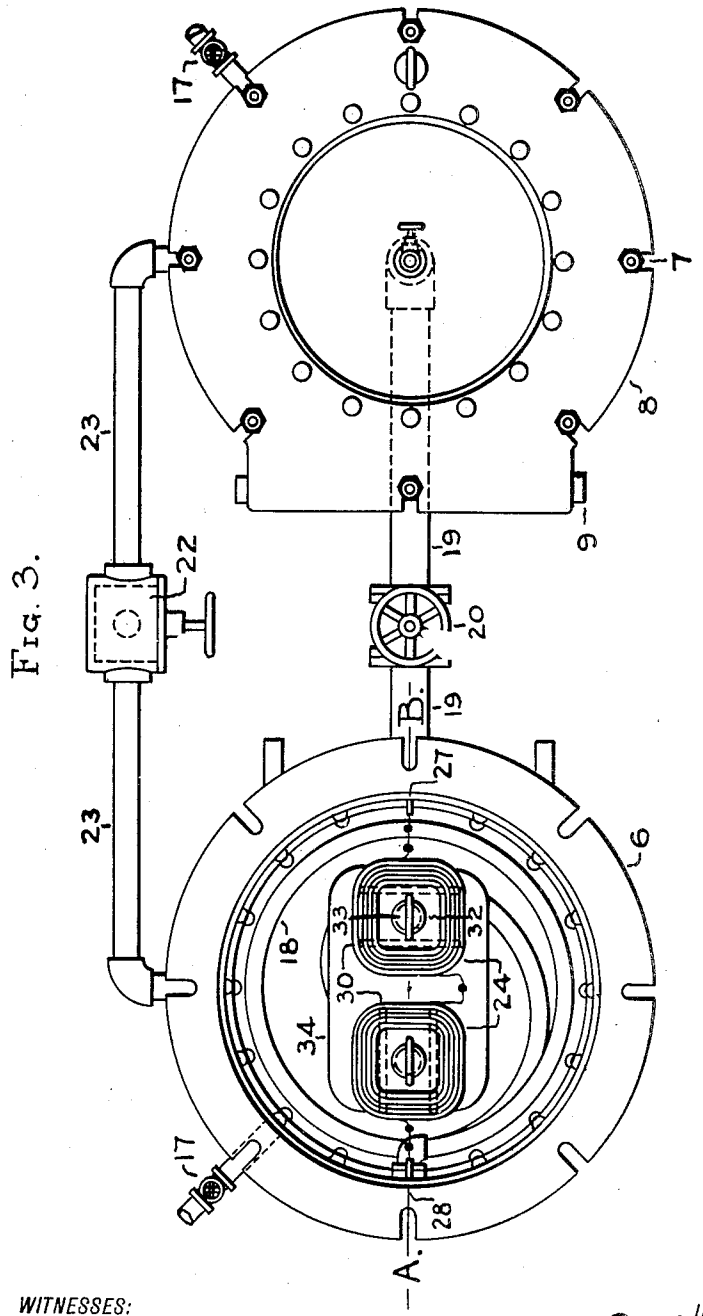


FIG. 3.

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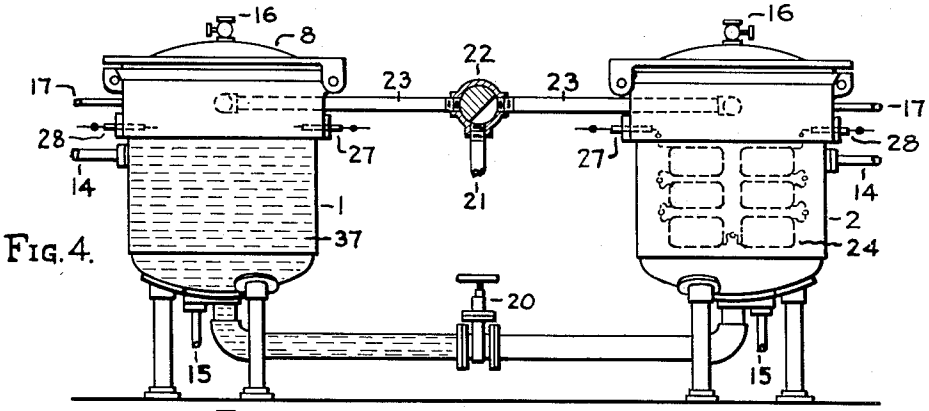


FIG. 4.

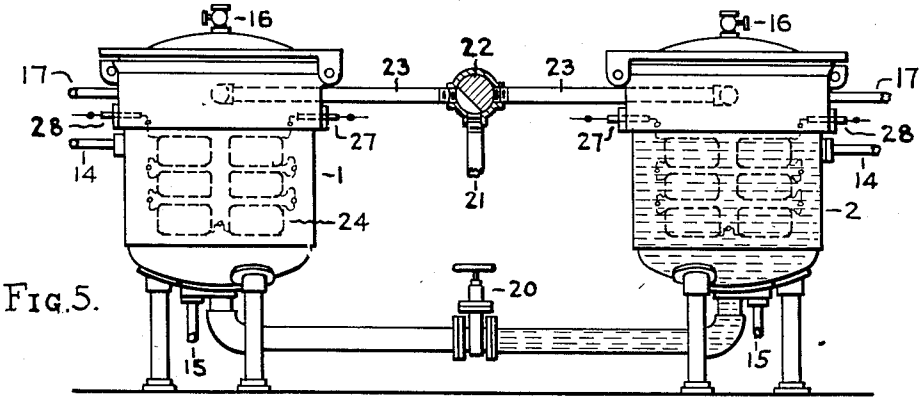


FIG. 5.

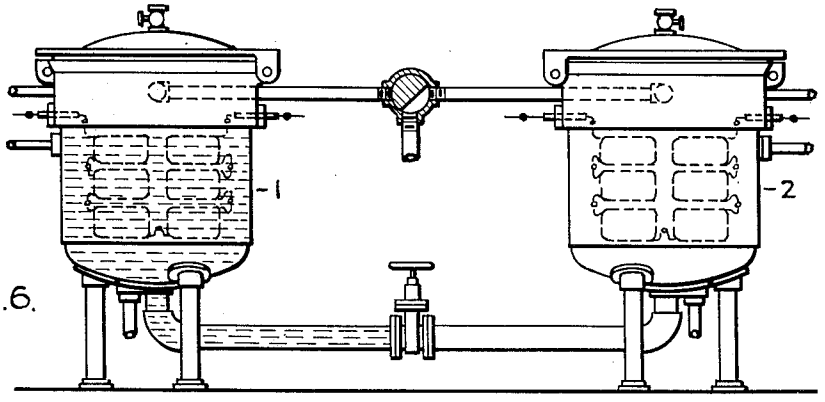


FIG. 6.

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METHOD OF DRYING AND IMPREGNATING ELECTRICAL CONDUCTORS.

1,163,342. Specification of Letters Patent. Patented Dec. 7, 1915.

Application filed March 17, 1909. Serial No. 483,932.

To all whom it may concern:

Be it known that we, DANIEL HURLEY and JOHN E. O'SHEA, both of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Methods of Drying and Impregnating Electrical Conductors; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention is related to the art of impregnating covered electric conductors such as cables, armature magnets, field coils, etc.

We have found that in order to bring the substance to be impregnated into the proper condition of dryness for receiving the impregnating solution it should be heated both internally and externally and that these two heatings should be accomplished simultaneously, quickly and to a uniform extent. Too much drying has a tendency to impair the paper insulation or other covering upon the cable, so that if only external heating were employed the outer surface would be over dried before the heat had fully penetrated to the core.

The paper covering usually employed on electric wires is a non-conductor of heat and hence the difficulty in causing external heat to penetrate to the core or wire. This leaves insufficiently heated and dried that portion of the paper covering adjacent the wire which is the portion subjected to the greatest strain.

We have also found it is essential that the impregnating compound be heated at its contact with the cable since the solutions ordinarily employed are viscous and if the only heating medium has been previously applied or is exerted only by steam coils immersed in the liquid the viscosity of the latter at its contact with the cable is so great as to preclude it from diffusing in the interstices of the cable covering. In a relatively small volume of this compound the heat thereof at the steam coil may be sufficiently great to render it mobile while at the cable covering its viscosity would be too great for impregnation. This difficulty is increased by the fact that too much heat imparted to the liquid at the steam coil will result in superheating and decomposing the liquid.

According to our method the conductor is placed within a steam heated tank into the walls of which extend terminals of an electric circuit. The conductor to be treated is electrically connected to this circuit and forms part thereof. On closing the electric circuit and causing sufficient current to flow therein that part of the circuit within the tank becomes heated and the heat dries the conductor covering internally. While this is continuing the conductor is externally heated as by a steam coil. When these internal and external heatings have continued sufficiently long a vacuum is created within the tank which aids effectively the drying of the conductor. After heating in the presence of a vacuum but while maintaining the internal and external heatings the hot impregnating liquid is introduced into the tank and subjected to pressure which forces it into the open and thoroughly dried interstices of the covering.

The mechanism by which the steps recited may be performed is especially adapted to the simultaneous but separate heating of the conductor and of the impregnating compound and the employment of two tanks so connected that they may be alternately used, the insulating compound being heated in one tank and then transferred to the tank containing the conductor, the first tank being then employed for heating and drying a second conductor after which the impregnating compound may be returned from the second tank.

In the accompanying drawing we have illustrated mechanism appropriate for carrying out the process described.

Figure 1 is a side elevation of a complete plant for drying and impregnating. Fig. 2 shows one of the tanks in detail and the other in vertical section on line A, B, Fig. 3. Fig. 3 is a top plan view showing one of the tanks with its cover removed. Figs. 4, 5 and 6 show stages in the reversible process of using the two tanks.

Referring to the drawings, 1 and 2 represent inclosed tanks of substantially the same design, hence a detail description of one will suffice. 3 is a cylindrical casing to

which is fastened a lower head 4 supported by legs 5. The casing has also fastened to it a top ring or flange 6 which carries swinging bolts 7 for clamping and fastening a cover 8. 9 is a cover hinge and 10 a lifting eyebolt. 11 is a liquid gage glass and hand hole which indicates the proper height for impregnating liquid. 12 is a thermometer showing the temperature of the inner chamber. 13 is a vacuum gage. We have shown a coil 18 with inlet 14 at the upper part of the tank and outlet 15 at the lower part thereof. This method of construction provides for access and freedom of expansive and contractive movement of the heating coils independently of the casing. The external heating fluid, as steam, enters at 14, passes through the nest of coils 18 and discharges at 15, thereby accomplishing a free circulation and drainage while imparting an even distribution of heat in the chamber. 16 is a free air supply valve. Through port 17 connection may be made to an air compressor when impregnation is desired at a greater pressure than atmospheric. 19 represents a pipe having a valve 20 connecting the tanks and conveying impregnating liquid from one to the other. The connection 21 leads from a vacuum pump 45 into tanks 1 and 2, through the rotating valve 22 and through pipes 23. 42 is a steam supply controlling valve and 43 is a vacuum controlling valve. 44 is a condenser. The office of these elements in a heating and drying apparatus is embraced by Letters Patent No. 946,843, issued to us January 18th, 1910.

We have shown the steps of the process applied to field coils 24. These are shown connected together as at 25 and to electric terminals 27 and 28 as at 29. The field coils are shown separated by spacers 30 to allow for exposure of the material to the heating and to the impregnating liquid. The material is mounted on racks which comprise base flanges 31 and posts 32 having eyebolt nuts 33. The posts extend through the wire coils 24 and when cover 8 is open they are readily lowered into and removed from the tank. Flanges 31 rest on plates 34 which are supported by posts 35.

36 represents insulation bushings for terminals 27 and 28.

In performing the process, it will be assumed that the conditions illustrated in Fig. 4 are existing, that is, the wire conductors 24, having a covering such as paper or cotton, are placed in tank 2 and connected with the electric terminals 27, 28. The current is then turned on and passes through the conductor, heating it and its covering internally. At the same time steam is admitted through the steam coil 18 and its influence heats the conductor covering externally. At the proper time the vacuum is created in tank 2 by the pump 45 and with the aid of the vacuum thus created, the conductor, already thoroughly heated, is effectively dried by the internal and external heat. While the drying in the vacuum is being continued the impregnating compound in tank 1 is heated and held ready for use. Then valve 20 is opened to allow the impregnating compound to pass from tank 1 to tank 2, into which it rushes by reason of the vacuum. Valve 20 is then closed and the liquid is allowed to stand with the conductor immersed therein, and, if necessary, compressed air from a suitable source may be admitted to tank 2 above the liquid through port 17 (shown in Figs. 2 and 3) to force the liquid into the conductor. During the impregnating the internal and external heatings are continued. The heat created by the current passing through the conductor not only thoroughly dries the inner part of the covering but it heats the liquid at the point of its diffusion in the interstices of the covering.

When the liquid is transferred from tank 1 as before stated that tank is at once available for use and as shown in Fig. 5 another set of conductors 24 may be placed therein and dried by the two heatings and the vacuum, so that when the conductor in tank 2 is fully treated the liquid may again go to tank 1 as shown in Fig. 6.

The advantages of our invention are that it insures the covering upon the conductor being thoroughly and quickly dried to a uniform extent internally and externally without impairing its integrity by too much drying; the impregnating compound is maintained in a fluid state without superheating; the vacuum created while the combined heatings are maintained readily evaporates the moisture, and the air pressure insures the thorough diffusion of the impregnating compound in the covering.

We claim as our invention:—

1. The described process of impregnating covered electric conductors consisting of passing an electric current through a conductor to heat the covering thereof internally in an air-tight compartment, heating said conductor covering externally at atmospheric pressure, reducing the pressure in said compartment while continuing the internal and external heatings, and applying an impregnating compound during the heating action.

2. The described process of impregnating covered electric conductors consisting of passing an electric current through a conductor to heat the covering thereof internally in an air-tight compartment and simultaneously heating said conductor covering externally at atmospheric pressure, re-

ducing the pressure in said compartment and continuing the heating action, applying an impregnating compound to the conductor covering, and forcing it into contact therewith by pressure within the compartment.

In testimony whereof, we have signed this specification in the presence of two subscribing witnesses.

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JOHN EDMUND O'SHEA.

Witnesses:
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W. A. TENNEY.