

UNITED STATES PATENT OFFICE.

CHARLES P. STEINMETZ, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE
GENERAL ELECTRIC COMPANY, OF NEW YORK.

INSULATING ALTERNATING-CURRENT CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 619,360, dated February 14, 1899.

Application filed July 15, 1898. Serial No. 686,123. (No model.)

To all whom it may concern:

Be it known that I, CHARLES P. STEINMETZ, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Insulating Alternating-Current Circuits, (Case No. 863,) of which the following is a specification.

My present invention has reference to the effective insulation of apparatus or circuits carrying alternating currents at high potentials.

As an example of the kind of apparatus to which the invention may be usefully applied I describe in this case the method of protecting by my invention an electric condenser, the insulation of which by usual methods presents great difficulties. This is not meant, however, to exclude other cases in which it may be equally well used, as will be apparent from the appended description.

In building condensers or other apparatus to be subjected to high alternating potentials it is essential to exclude air as completely as possible, since the least trace of air in the insulation will, under the high electrostatic stress due to the alternating-current flow, eventually cause heating and the ultimate disruption of the insulation. The usual expedient heretofore adopted has been to exhaust the air by a vacuum-pump and to fill the spaces with insulation melted and poured in. The usual organic materials, however, occlude air with such tenacity that even after an extended application of the vacuum, a noticeable and deleterious amount of air remains in the insulation. By my invention I obviate the difficulty by filling the condenser with a light hydrocarbon, which readily penetrates all of the interstices of the apparatus and the insulation. The hydrocarbon is then removed, carrying with it any trace of air.

In the practical use of the invention several different methods may be employed, any of which I consider within its scope. For instance, I may place the condenser in a vacuum space, exhausting the air as far as possible and then filling the apparatus with the hydrocarbon. The latter (which should be chosen so that it boils above the melting-point of the permanent insulating material

and below the temperature at which it is applied) will then penetrate and fill all cavities. After this the hydrocarbon may be eliminated by heat or the vacuum-pump, or by both combined, and the melted insulating compound admitted. Thus every trace of air will be removed by the change of tension of the hydrocarbon vapor, and such traces of the latter as may remain will either combine with the insulating material or be innocuous, inasmuch as it is a good insulator.

In order to avoid the inconvenience of the vacuum, I may assemble the condenser or other apparatus under a body of hydrocarbon. Afterward it is removed and placed in the melted insulating compound and heated until the hydrocarbon has vaporized and its place has been taken by the melted insulation.

Suitable substances for use with my invention are the usual light fluid hydrocarbons, such as gasolene, benzene, kerosene, the alcohols and aldehydes, anilin oil, &c. Ordinarily the hydrocarbon acids would not be suitable.

As a permanent insulator I may use any of the well-known dielectrics, of which paraffin may be taken as an example, and this substance is well adapted to the purposes of my invention. I have ordinarily used gasolene as the best of the light hydrocarbons for my purpose because it is cheap and volatile; but the others indicated above might also be used.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The art of eliminating air from an insulating compound or dielectric, which consists in substituting a vaporizable compound for the occluded air, and then vaporizing the compound so that the air is carried away by the change of tension.

2. The art described of eliminating air from an electric apparatus to be subjected to alternating stresses, which consists in forcing out the occluded air by an insulating vapor.

3. The art described of eliminating air from an electric apparatus to be subjected to alternating stresses, which consists in replacing the air by a light liquid insulator, then vaporizing the liquid, and substituting a permanent insulator.

4. The art of eliminating air from an insulating material or apparatus to be subjected to alternating stresses, which consists in forcing into the air-spaces a light hydrocarbon, 5 vaporizing the hydrocarbon, and substituting a permanent insulator.

5. The art of eliminating air from an insulating material or apparatus to be subjected to alternating stresses, which consists in im- 10 mersing the material or apparatus in a light hydrocarbon, vaporizing the hydrocarbon, and forcing in a melted permanent insulating material.

6. The art of eliminating air from insula-

tion or apparatus, which consists in filling 15 the air-spaces with a hydrocarbon which boils above the temperature at which the selected permanent insulator melts, and below that at which it is to be applied, then applying the melted, permanent insulator and vaporizing 20 the hydrocarbon.

In witness whereof I have hereunto set my hand this 8th day of July, 1898.

CHARLES P. STEINMETZ.

Witnesses:

B. B. HULL,
M. H. EMERSON.