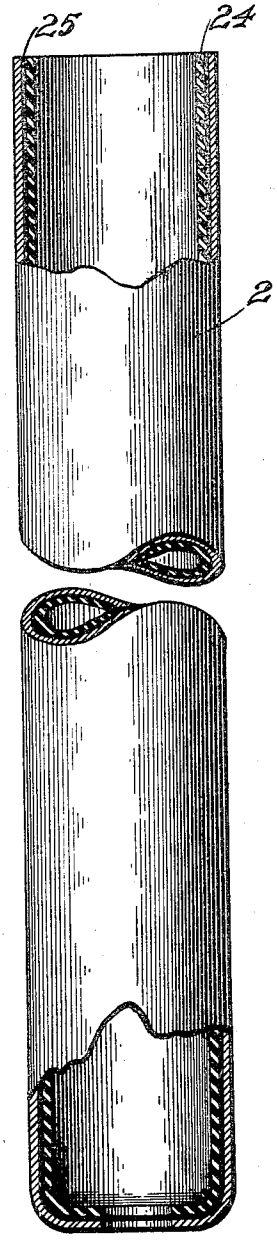
L. & H. L. BRADLEY.

PROCESS OF LINING CONTAINERS.

APPLICATION FILED DEC. 27, 1909.

1,124,281. Patented Jan. 12, 1915.



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UNITED STATES PATENT OFFICE.

LYNDE BRADLEY AND HARRY L. BRADLEY, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO ALLEN-BRADLEY COMPANY, A CORPORATION OF WISCONSIN.

PROCESS OF LINING CONTAINERS.

1,124,281. Specification of Letters Patent. Patented Jan. 12, 1915.

Original application filed December 14, 1908, Serial No. 467,352. Divided and this application filed December 27, 1909. Serial No. 535,223.

To all whom it may concern:

Be it known that we, LYNDE BRADLEY and HARRY L. BRADLEY, citizens of the United States of America, and residents of Milwaukee, county of Milwaukee, and State of Wisconsin, have invented a new and useful Improvement in the Process of Lining Containers, of which the following is a specification.

Our invention pertains to a process of applying an insulated lining to the interior walls of containers, vessels, etc., and relates especially to the process of placing such linings on the insulated resistor tubes or containers shown in our application filed December 14, 1908, Serial Number 467,352, of which this application is a division.

The object of our invention is to provide an insulated lining possessing maximum heat resisting and wear resisting qualifications.

In resistor containers or retainers no device has been known heretofore which combines maximum qualifications as to electrical insulation, heat-resisting and wear-resisting properties.

In the drawing which accompanies and forms a part of this specification—Figure 1 illustrates a form of resistor or container tube such as is adapted to use in our invention disclosed in the application referred to above.

Referring to Fig. 1, a metal tube 2 is lined with the insulating lining 24, attached to the wall of the tube by a layer of cement 25, as hereinafter described; the cement layer 25 being also an insulator, preferably.

While we shall describe the process for applying the insulating lining to one form of container or retainer, it is understood that the process may be used with containers, vessels, etc., of any shape or form. The process of lining such a tube as that shown in the figure is as follows: A metal tube or container is coated on the interior with glass or porcelain enamel, similar to that used on cooking utensils. This enamel is a composition resembling glass and variously known as "porcelain enamel," "vitreous enamel" and "glass enamel," and is in common use throughout the arts. The method of applying the coating of enamel to the interior of the tube is well understood in the arts and need not be described here. This enamel lining has about the same coefficient of expansion as the metal wall of the tube, and has the further characteristic that when heated to a high temperature it becomes plastic and permits a certain slight relative movement between the surfaces of the refractory lining, later applied, and the metal container, which it cements together.

Upon the completion of the enameling process the tubes are placed in a machine designed to rotate or spin them with great rapidity upon their longitudinal axes. One end of the tube is then closed with a rubber stopper and a mixture of silica cement, potter's clay and water is poured into each tube. The silica cement employed in this mixture is a material well known in the arts and is used for lining Bessemer converters. It is composed of ground ganister rock and fire clay. The potter's clay we use is preferably dark potter's clay of the grade known as "stoneware clay." We have found that a mixture of the following proportions is effective, although this is largely a matter of judgment, skill and experience, and will vary with the characteristics of the different batches of material used: Water, nine parts; potter's clay, eight parts; silica cement, five parts by weight. The clays are dried separately at ordinary temperatures, ground to pass a 70-mesh, and sifted. The water is placed in the mixing vessel; then the potter's clay, and thoroughly mixed; then the silica cement. The mixture is stirred thoroughly, then allowed to stand about fifteen minutes and again stirred thoroughly and used. A predetermined amount of the clay mixture having been poured into the tube, the remaining open end of the tube is closed by a cap and the tube is rocked endwise to spread the cement fluid in pouring through the entire length of the tube. The tube is then locked in the horizontal position and rotated rapidly; the centrifugal action is such that the solid particles of the mixture are spread evenly around and along the inner wall of the tube, most of the water remaining on the exposed surface. This rotating process consists of whirling the tubes for a period, then draining for a period and again whirling and draining until the coating of cement and clay has a characteristic degree of solidity and moisture, which is largely a matter of personal judgment and skill on the part of the operator. The tubes are then allowed to dry slowly in a vertical

position, heat or forced air currents being used with caution, if desired. They are then raised to a temperature of about 80 degrees centigrade; this temperature causes the clay compound to assume a permanent condition and also causes the glass enamel to soften sufficiently to adhere to the clay coating, thus acting as a medium for binding the refractory lining of the metal tube. The clay lining if left in this form would not have sufficient mechanical strength to withstand the service for which it is intended, therefore it is hardened by being saturated with a solution of silicate of soda; this saturation is accomplished by filling the tubes with a solution of about 1400 specific gravity for twelve hours. The tubes are then cleared with a small rubber vessel or squeegee, or rinsed with water and are ready for a final baking.

For final baking a small receptacle containing one ounce of water is placed within each tube. A cap is placed on the top of the tube and they are put into an oven which previously has been raised to as high a temperature as will permit the operator to place the tubes in it with the hands unprotected. It is then raised to a temperature of about 400 degrees centigrade, and allowed to remain so for a period of about two hours. This baking with moisture is for the purpose of permitting the drying to proceed from that wall of the clay lining which is nearest the glass enamel. When cool the tubes are inspected and any crystals of silicate of soda which may be found on the surface of the clay wall are ground away; such tubes as pass inspection are then ready for service and may serve for containing any resistor, whether compressible or not.

Having fully described our invention, what we claim as new and desire to secure by United States Letters Patent is—

1. The process of making an insulation-lined container which consists of lining a tubular metal container with enamel which becomes plastic when heated; then lining said container with a coating of refractory clay; then heating the container, thus lined, until the enamel softens and adheres to the clay lining; and then impregnating the clay lining with a solution of silicate of soda, and then drying it.

2. The process of making an insulation-lined container which consists of lining a tubular metal container with an enamel which becomes plastic with heat; then placing in the container, so lined, a plastic mixture of refractory clay and water; then spinning the tube on its axis to distribute the clay mixture evenly upon the wall of the tube; then drying said clay lining; and then heating the tube, so lined, to cause said cement lining to adhere to said clay lining.

3. The process of making an insulation-lined container which consists of lining a tubular metal container with an enamel which becomes plastic with heat; then placing in the container, so lined, a plastic mixture of refractory clay and water; then spinning the tube to distribute the clay mixture evenly upon the wall of the tube; then drying said clay lining; then heating the tube, so lined, to cause said cement lining to adhere to said clay lining, and subsequently impregnating the clay lining with a solution of silicate of soda to harden it.

4. The process of making an insulation-lined container which consists of placing a quantity of refractory clay, in a plastic state, in a tubular container; then spinning said tube on its axis at a high rate of speed to distribute the plastic clay evenly upon the inner walls of the tube, and then baking the tube, so lined, to cause said clay lining to set in permanent form.

5. The process of making an insulation-lined container which consists of placing a quantity of refractory clay, in a plastic state, in a tubular container; then spinning said tube on its axis at a high rate of speed to distribute the plastic clay evenly upon the inner walls of the tube; then baking the tube, so lined, to cause said clay lining to set in permanent form; then impregnating said clay lining with a solution of silicate of soda, and finally drying it.

Signed by us at Milwaukee, county of Milwaukee, and State of Wisconsin, in the presence of two witnesses.

LYNDE BRADLEY.
HARRY L. BRADLEY.

Witnesses:
JOHN F. HARPER,
LAWRENCE FLEMING.

Correction in Letters Patent No. 1,124,281.

It is hereby certified that in Letters Patent No. 1,124,281, granted January 12, 1915, upon the application of Lynde Bradley and Harry L. Bradley, of Milwaukee, Wisconsin, for an improvement in "Processes of Lining Containers," an error appears in the printed specification requiring correction as follows: Page 2, line 3, for the numeral "80" read *800;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of February, A. D., 1915.

[SEAL.]

J. T. NEWTON,

Acting Commissioner of Patents.