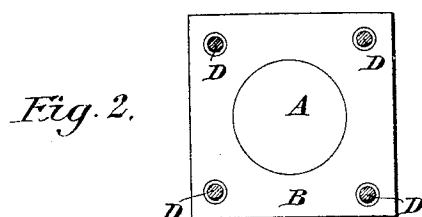
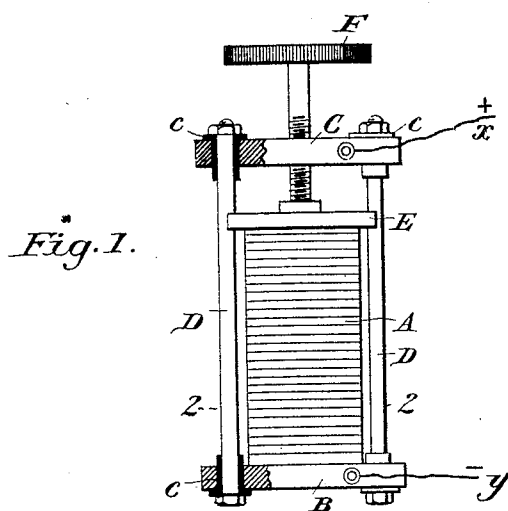


(No Model.)

A. J. MARQUAND & D. LOWDON.
MANUFACTURE OF ELECTRICAL RESISTANCES.

No. 571,489.

Patented Nov. 17, 1896.



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UNITED STATES PATENT OFFICE.

AUGUSTUS JOHN MARQUAND, OF CARDIFF, AND DAVID LOWDON, OF
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MANUFACTURE OF ELECTRICAL RESISTANCES.

SPECIFICATION forming part of Letters Patent No. 571,489, dated November 17, 1896.

Application filed June 25, 1896. Serial No. 596,956. (No model.)

To all whom it may concern:

Be it known that we, AUGUSTUS JOHN MARQUAND, of Bute Docks, Cardiff, in the county of Glamorgan, and DAVID LOWDON, of Barry Graving Dock, Barry Dock, near Cardiff, England, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in the Manufacture of Electrical Resistances, of which the following is a specification.

The object of our invention is the manufacture of electrical resistances to be used as regulators, the resistance being variable at will by the variation of the pressure to which the resisting material is exposed. Such regulators are needed for dynamo-electric machines, electric heaters, electroplating-baths, lamps, and a variety of other uses. We make use of resilient sheets of fibrous material carbonized by exposure to heat in the presence of carbonaceous vapor and with the exclusion of air. We use the word "carbonized" to mean the deposition of conducting carbon within the pores and on the surfaces of the material.

Preferably we proceed as follows: We take woven asbestos cloth and we coat it on both surfaces with coal-tar, which we apply by means of a brush, having thinned the tar to a suitable consistency by the addition of a solvent, such as benzin, and preferably we dust the coated surfaces with powdered sulfur. The sheet of fabric so prepared we inclose in an iron or other box to prevent access of air and we heat the box and its contents in a furnace to a full red heat. We remove the box from the furnace and allow it to cool before opening it. It will be found that the asbestos fiber has become carbonized, the vapor from the tar being decomposed by the heat and its carbon deposited in the fiber, probably in a graphitic condition. The fabric is now ready for use. It is cut up into pieces of size convenient for the purpose for which the resistance is required, and the pieces are arranged in piles of the required depth to at-

tain the resistance and to pass the quantity of current which the electrician desires. These dimensions are regulated by well-known rules.

The degree of electrical resistance of the fabric will depend much on the temperature to which it has been exposed, the higher the temperature the less the resistance. The heat employed should, however, not be excessive, as extreme temperatures somewhat impair the resilience of the fabric, which it is important to preserve.

Pressure may be applied to the pile by means of a screw approximating two metal plates, between which the pile is held. In some cases it is convenient to apply the pressure by means of levers, and other means may be resorted to. While the pressure is gradually increased the resistance of the pile decreases with regularity, and as the pressure is relieved the resistance of the pile is progressively regained.

We can obtain like results in using asbestos cardboard, and many organic substances may replace tar in carbonizing the fiber.

The process above described may be varied without departing from our invention.

In the accompanying drawings, Figure 1 is a view, partly in elevation and partly in section, of an electrical resistance embodying our invention. Fig. 2 shows a transverse section on the line 2 2 of Fig. 1.

The asbestos cloth A is preferably made in the form of disks supported on a base-plate B, which is connected with another plate C by means of posts D, which are insulated from the plates by means of bushings c. A plate E is arranged to be moved toward and from the plate B by means of a screw F, passing through the plate C. The pressure on the plates may be conveniently varied by means of the screw.

x and y indicate the terminals of the electric circuit.

Having now particularly described and ascertained the nature of our said invention and

in what manner the same is to be performed,
we declare that what we claim is—

1. An electrical resistance composed of as-
bestos cloth having deposited in its texture
5 carbon resulting from the decomposition of
carbonaceous material in contact with the
asbestos cloth.

2. An electrical resistance which can be
varied at will and which consists of a press
10 by which a gradual pressure is applied to a
pile forming part of an electric circuit, such
pile being composed of asbestos cloth having
in its texture deposited carbon resulting from

the decomposition of carbonaceous matter in
contact with the asbestos cloth.

AUGUSTUS JOHN MARQUAND.
DAVID LOWDON.

Witnesses to the signature of Augustus
John Marquand:

F. P. JONES-LLOYD,
GUY E. DAVIS.

Witnesses to the signature of David Low-
don:

J. L. MILES,
GUY E. DAVIS.