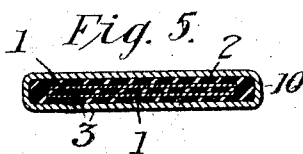
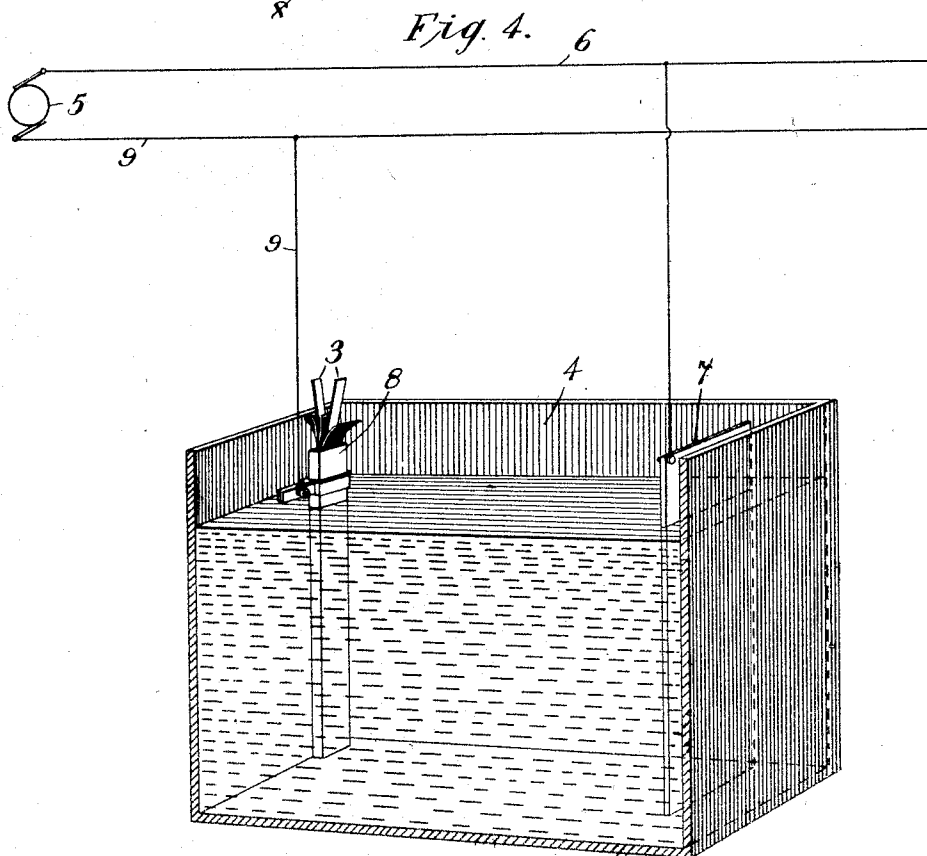
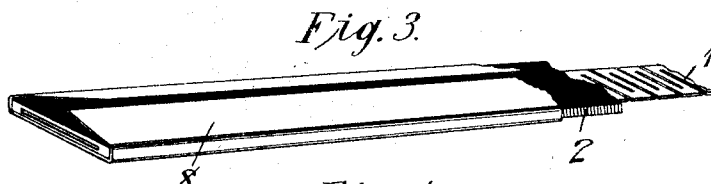
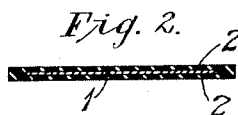


W. S. HADAWAY, JR.
ELECTRIC HEATING DEVICE AND PROCESS OF CONSTRUCTING THE SAME.
APPLICATION FILED FEB. 25, 1909.

1,042,432.

Patented Oct. 29, 1912.



WITNESSES:

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ELECTRIC HEATING DEVICE AND PROCESS OF CONSTRUCTING THE SAME.

1,042,432.

Specification of Letters Patent.

Patented Oct. 29, 1912.

Application filed February 25, 1909. Serial No. 479,978.

To all whom it may concern:

Be it known that I, WILLIAM S. HADAWAY, Jr., a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Electric Heating Devices and Processes of Constructing the Same, of which the following is a specification.

10 My invention relates to electric heating and resistance devices and it has special reference to such devices as are inclosed in casings of heat-conducting material and are adapted to be immersed in water or other liquid.

One object of my invention is to provide a device of the class above indicated that shall be durable in construction and effective in operation.

20 A second object of my invention is to provide a simple process by which a device of the class just referred to may be advantageously constructed.

In order that electric heaters may be economically operated, either when they are immersed in water or other liquid, or when they are operated in the air, it is desirable to provide a water-tight casing for the resistance element which shall be relatively rigid and durable and a good conductor of heat. Metal casings are usually employed for this purpose, but it has been found difficult to avoid air spaces between the metal covering and the insulation which necessarily surrounds the resistance element within the covering.

30 According to my present invention, I provide a heating device in which the metal inclosing casing is held in very close engagement with the insulation surrounding the resistance element, the arrangement of parts being such that the heat generated within the casing is rapidly conducted to its outer surface, from which it is dissipated into the surrounding medium.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a sectional view of the resistance element and the insulation as they appear before the parts are assembled. Fig. 2 is a similar view of the resistance element after it has been embedded in the insulation, as hereinafter pointed out. Fig. 3 is a perspective view of a portion of the resistance

element with a covering of sheet metal or metal foil partially applied to it. Fig. 4 is a diagrammatic view illustrating one of the steps which may be employed in practising my improved process, and Fig. 5 is a sectional elevation of the completed heating device.

Referring to the drawings, a resistance element 1 in the form of a conducting ribbon which is provided with a plurality of slots to produce a zig-zag path for the electric current, is illustrated, but, while this form is considered preferable, it may be replaced by any suitable resistance element within the scope of my invention.

The resistance ribbon is first assembled between similar strips 2 of insulating material, the construction of which is such that they are fused together upon the application of heat, forming a substantially homogeneous body of insulation, in which the resistance element is embedded (See Fig. 3). The insulated ribbon is then inclosed in a suitable metal casing 8 which is either pressed or brought by other means into close engagement with it. The resistance terminals may be located at the same end or at opposite ends of the unit, as may be desired, both arrangements being well known in the art. If the form of the completed heater is relatively simple, the casing may be applied, as hereinafter pointed out, after the resistance element has been formed into the desired shape. It will usually be found preferable, however, to bend the heater into its final form after the resistance element has been assembled in the casing and the device is otherwise complete. Considerable advantage is gained by compressing the metal casing in order to bring the insulation and the resistance element under pressure and thereby to exclude air and improve the thermal-conductivity of the device.

One method by which the coating may be successfully formed on the insulated resistance element comprises the following steps: First, the insulated resistance ribbon is wrapped with copper foil or with a thin covering of heat-conducting material. A deposit of copper or other suitable material is then produced upon the metal covering electrolytically, or otherwise.

Referring to Fig. 4 of the drawings, the resistance or heater unit 3 is immersed in

a suitable liquid, its covering of sheet metal forming one electrode of an electroplating cell 4. Energy is supplied from any suitable source, such as generator 5, through conductor 6, to an electrode 7, circuit being completed from this point through the metal casing 8 on the surface of the resistance unit and conductor 9 to the opposite terminal of the generator. The electroplating process is continued until a relatively thick coating of metal 10 is deposited on the resistance unit. In this way, a water-tight heat-conducting sheath or covering is provided which is in close contact with the insulating sheath 2 and is sufficiently strong to withstand the wear and tear of ordinary use.

It will be readily understood by those skilled in the art that the heater unit should be kept in a relatively simple form until after the electroplating process is completed in order that the walls of the deposited coating may be more nearly uniform.

While it is considered preferable to use copper foil or some similar material for first covering the insulating sheath, this material may be replaced by an application of graphite or other conducting material on which a suitable deposit of heat-

conducting material may be electrolytically produced.

It will, of course, be understood that structural modifications may be effected in the device, and that various methods may be utilized for producing it.

I claim as my invention:

1. The process of constructing an electric resistance or heater which consists in coating an insulated resistance element with conducting material and electrolytically producing a deposit of heat-conducting material thereon.

2. The process of constructing an electric resistance or heater which consists in embedding a resistance ribbon in an insulating sheath, covering the insulation with metal foil and electrolytically producing a deposit of heat-conducting material on the outer surface of the covering.

In testimony whereof, I have hereunto subscribed my name this 20th day of Feb., 1909.

WILLIAM S. HADAWAY, JR.

Witnesses:

W. B. UNDERWOOD,
B. B. HINES.