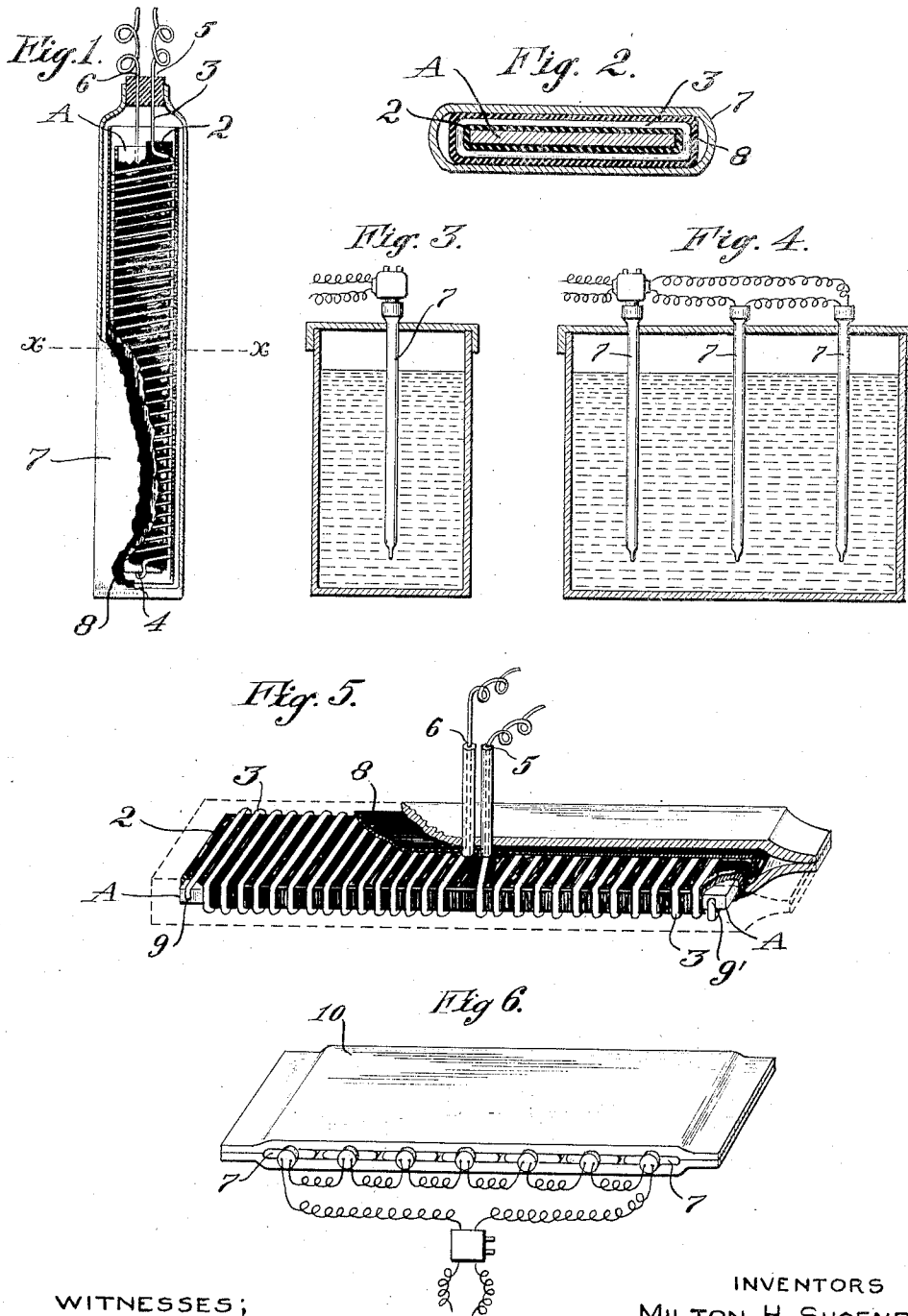


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 ELECTRICAL HEATER.
 APPLICATION FILED JAN. 28, 1909.

976,404.

Patented Nov. 22, 1910.



WITNESSES;
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ELECTRICAL HEATER.

976,404.

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To all whom it may concern:

Be it known that we, MILTON H. SHOENBERG, a citizen of the United States, and GEORGE T. MARSH, a citizen of Australia, both residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Electrical Heaters, of which the following is a specification.

Our invention relates to improvements in electrical heaters.

It consists in the construction of a resistance unit or element, in the form of a device which is capable of being used as an immersion, fluid heater, as an element for stoves, radiators, and for such purposes generally, as such devices may be employed for.

Referring to the accompanying drawings for a more complete explanation of our invention,—Figure 1 is a sectional elevation of a unit. Fig. 2 is an enlarged section on the line $x-x$ Fig. 1. Fig. 3 is a view showing the invention as applied. Fig. 4 is a view showing the invention as connected in series. Fig. 5 is a perspective in section of a modified form. Fig. 6 is a perspective showing the invention as applied in heating.

It is the object of our invention to provide what may be termed a "unit" or "element" complete in itself, and in readiness to be employed for any of the purposes to which it is fitted, by simply introducing it to the position where it is to be operated, and connecting its terminals with the source of an electrical current; and these independent units may be added to or multiplied, forming a series of any desired extent. When return wires are employed in resistance coils of this character, it is found that they get so hot that they frequently burn the insulation employed, and cause a short circuit.

In the present device a metal core A is shown as in the form of a flat plate of sufficient length, width and thickness, and this core is inclosed with an insulating material 2, such as mica or the like. Around this insulating material is wound the resistance element 3 which may consist of a wire, either naked, or thinly coated with a substance which is resistant of moisture, and which may also be an insulating coating for the wire. This wire is coiled around the outside of the core, and if not in itself insulated, with a sufficient distance between the turns so that the insulating coating 2 will

prevent short circuiting. One end of the wire is connected with the core A, as shown at 4, and the other end is connected with a terminal as at 5. The core A also has a terminal as at 6, and through these, connection may be made with a source of electrical energy.

In order to protect the whole we have shown a flattened tube 7 within which the element is inclosed. This tube may preferably be made by taking an ordinary cylindrical tube of such size as may be necessary, flattening it, introducing the previously named elements into the tube, and then compressing the tube firmly upon a contained core of wires; a suitable insulator 8 being interposed between this exterior tube and the wires. The lower end of the tube is then the only portion that needs to be closed and sealed, and by having no joints upon the edges of the tube, there is little danger of the device getting out of order. Single elements like this may be employed to heat small bodies of liquids, such as water, acid or saline solutions, or fluid with low resistances, where it is not possible to employ the unprotected wires which are only useful for such purposes when used in conjunction with fluids of high resistance. As many of these units may be employed as may be found desirable to produce the necessary degree of heat. We have found it advantageous to connect the terminals 5 and 6 near the center of the device, and make two coils, one connecting with each end of the core A as at 9—9' and having the opposite ends of the coils connecting with the terminals 5 and 6 as shown, in Fig. 5. By employing a series of these units, and compressing them between exterior plates 10 as shown in Fig. 6, the device may be used as a heating stove, or radiator, and by the employment of a sufficient number of these units a very considerable heat may be developed.

Having thus described our invention, what we claim and desire to secure by Letters Patent is—

1. An electrical heating element consisting of a single conducting core of solid metal, a conducting resistance coil wound about said core, an insulating medium interposed between the core and coil, an insulation inclosing the coil, an exterior closed seamless tube flattened and compressed upon the outside of the exterior insulation, said

resistance coil being connected at one end with the core and at the other end with an electrical terminal, said core having a connection with a similar terminal.

5 2. The combination in an electrical heater, of a plurality of single flat conducting cores, conducting resistance coils wound about the cores, insulating mediums interposed between the coils and cores, other insulations
10 inclosing the coils, exterior closed seamless tubing flattened and compressed upon the outside of the exterior insulations, a con-

tainer adapted to receive a plurality of individual heating elements, and connections in series between said members.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

MILTON H. SHOENBERG.
GEORGE T. MARSH.

Witnesses:

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