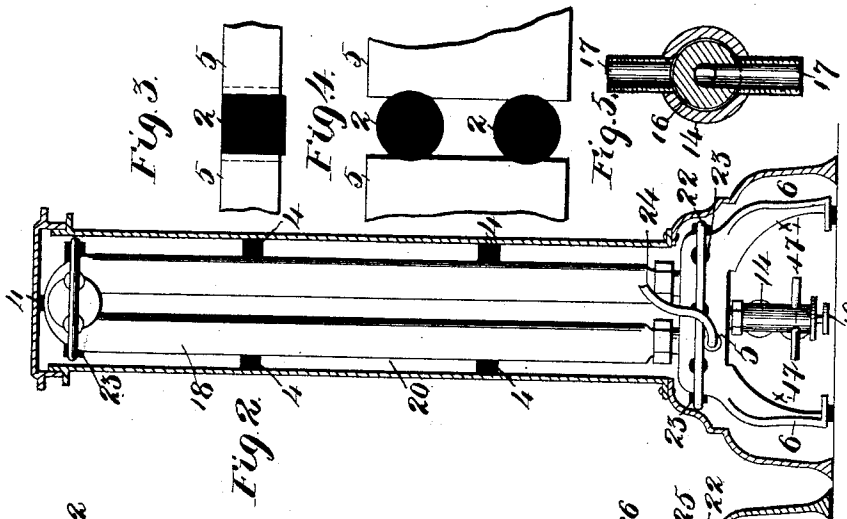
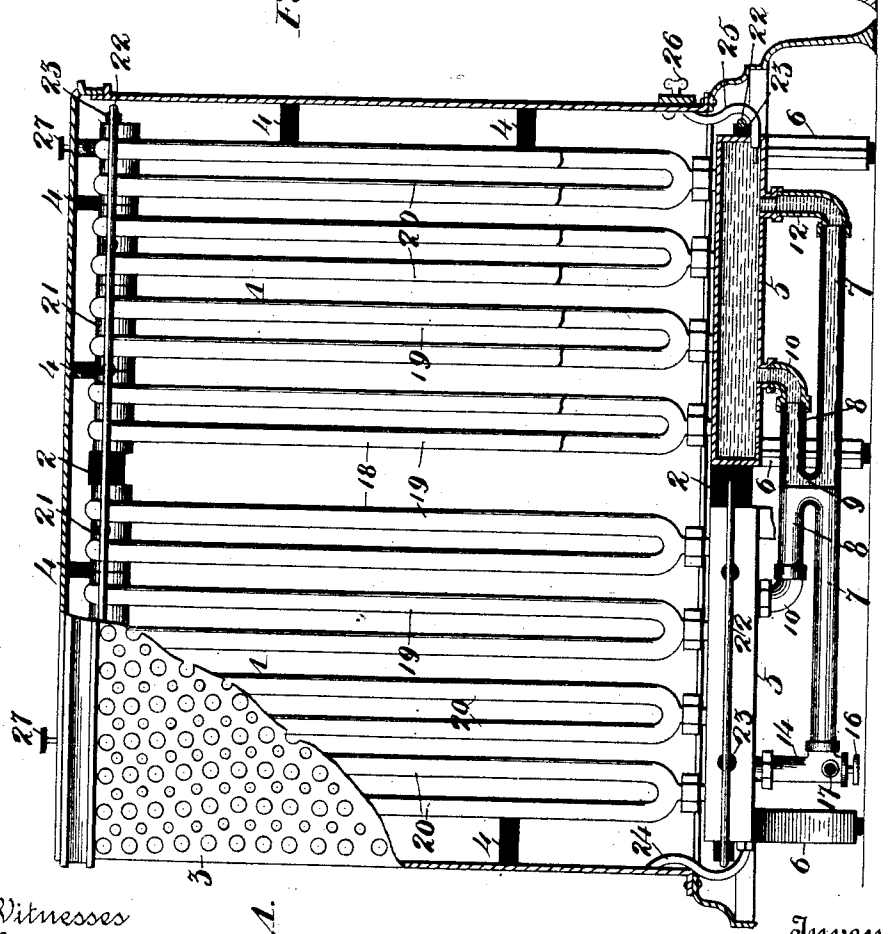
(No Model.)

W. D. HOUGH & E. Z. BURNS.

ELECTRIC RADIATOR.

No. 513,109. Patented Jan. 23, 1894.





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WALTER D. HOUGH AND ELMER Z. BURNS, OF NIAGARA FALLS, NEW YORK.

ELECTRIC RADIATOR.

SPECIFICATION forming part of Letters Patent No. 513,109, dated January 23, 1894.

Application filed January 9, 1893. Serial No. 457,723. (No model.)

To all whom it may concern:

Be it known that we, WALTER D. HOUGH and ELMER Z. BURNS, of Niagara Falls, county of Niagara, State of New York, have invented certain new and useful Improvements in Electric Radiators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention has relation to electric heaters and consists in the novel arrangement and combination of parts more particularly described in the specification and pointed out in the claims.

In the drawings Figure 1 is a vertical longitudinal section of our complete invention with parts broken away to more clearly show the interior construction thereof. Fig. 2 is an end view of the same with the casing in section. Figs. 3 and 4 are detail views showing the manner in which the two sections of the heater are insulated from each other. Fig. 5 is a cross section of the two-way valve taken on the line *x*—*x* of Fig. 2.

The same figures of reference indicate like parts in the several views.

The radiator to be described is composed of two sections 1, 1, insulated from one another at certain points by insulating blocks 2, 2, preventing the electric current from passing directly from one section to the other.

3 represents a perforated shield or casing of well known construction and is insulated from the radiator proper on all sides by insulating blocks 4, thus preventing the current of electricity from passing into said casing.

5, 5, represent two chambers which are supported a suitable distance from the floor or bottom of the radiator upon feet or standards 6, providing a sufficient space below said chambers for the necessary parts and connections containing the liquid or water to be heated by the passage of the current.

7 represents a pipe of suitable length and cross-sectional area to produce the necessary resistance within the liquid passing through the same, and 8 a pipe of a length varying with different radiators but of similar or relative cross-sectional area to the pipe 7, the said pipes being in communication with each other at 9, the shorter pipe 8 being located immediately above the pipe 7. As shown in the drawings the pipes 7 and 8 are parallel to one another, the pipe 8 directing the course of the liquid or fluid in its circulation through the radiator. The opposite ends of the short pipe 8 are provided with couplings 10, and the opposite ends of said couplings connect with the chambers 5, 5, from the bottom thereof and are in communication therewith.

12 represents a coupling one end of which is connected to one end of the pipe 7, and the opposite end of said coupling is in connection with the bottom of one of the chambers 5 and in communication therewith.

14 represents a coupling in connection with one of the chambers 5 and one end of the pipe 7. Within said coupling 14 is located a suitable valve 16 closing or opening the lateral ports 17, 17, which are in communication with the interior of said coupling. One of said ports 17 is for the introduction of the liquid and the other serves as a drip opening.

18 represent the radiator pipes which are divided into two series, the series 19, 19, being connected to the chambers 5, 5, opposite the couplings 10, 10, connected to the pipe 8, through which series the fluid in its circulation first ascends, and then descends through the series of pipes 20, 20, the lower ends of which are also in communication with the said chambers 5, 5, and immediately over the couplings 12 and 14 forming a continuation of the pipes 7. The resistance to the passage of the electric current of course develops the necessary amount of heat to raise the temperature of the liquid within the pipe 7, and as each particle of liquid is heated it ascends *via* passage 9. As it enters the pipe 8 the liquid current diverges, a portion thereof ascending *via* one branch of the pipe 8 and a portion ascending *via* the second branch of said pipe. In practice, the cross-sectional areas of the pipes 7 and 8 are so proportioned that the liquid current takes the course as here described. All of said radiator pipes 18 are in communication with one another at their upper ends by passages 21 through which the liquid also passes in its circulation.

In order to hold the two sections of the radi-

ator together and reinforce the construction thereof, we employ bands 22, which are passed around the upper ends of the radiator pipes and chambers 5, 5, respectively, but insulated therefrom by blocks 23.

The current of electricity is introduced through one of the chambers 5 by the conducting wire 24, the current passing through the liquid *via* couplings 10 and 14, thence through the liquid contained in pipes 7 and 8 forming the resistance and heat developer, thence through couplings 10, and 12 to the opposite chamber 5, and out by the conductor 25, which wire is in connection with a suitable switch 26 for controlling the current. The pipes 7 and 8 being composed of suitable insulating material, for example glass or other like substance, of course the electric current is forced to take the path as described. The insulating blocks 2, 2, prevent the said current from passing from one section of the radiator to the other, except by way of the liquid contained in the pipes 7 and 8. 27, 27, represent two air vents which are in communication with the upper ends of the series of pipes, and perform their usual function. The pipes 7 and 8 are proportioned in cross-sectional area and length to develop any degree of resistance, the current under all circumstances being forced to pass through the liquid or fluid contained therein, the pipes 8 directing the liquid in its initial circulation toward the series of pipes constituting the radiator.

We do not limit ourselves to the precise details of construction nor to the particular kind or character of liquid or fluid employed to develop the necessary heat units for the generation and production of heat.

Having fully described our invention, what we claim is—

1. An electric radiator comprising two sections, the metallic parts of which are insulated from one another, a pipe or pipes in communication with the said sections, but insulated therefrom, and suitable electrical connections for said sections substantially as set forth.

2. A radiator consisting of two sections united together but insulated from one another, chambers 5, 5, forming a part of said sections, pipes located below said chambers in communication with the same but insulated therefrom, radiator pipes in connection with the said chambers and suitable electrical connections for the two sections, substantially as set forth.

3. A radiator consisting of two sections insulated from one another, each section comprising two series of pipes 19 and 20, chambers 5, 5, in connection with the said series, insulating pipes 7 and 8 in communication with one another and with the said chambers, the exits of said pipes 8 being directly beneath the series 19, and the exits of pipe 7 below the series 20, and suitable electrical connections for the two sections substantially as set forth.

In testimony whereof we affix our signatures in the presence of two witnesses.

WALTER D. HOUGH.
ELMER Z. BURNS.

Witnesses:
SAML. OUTWATER,
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