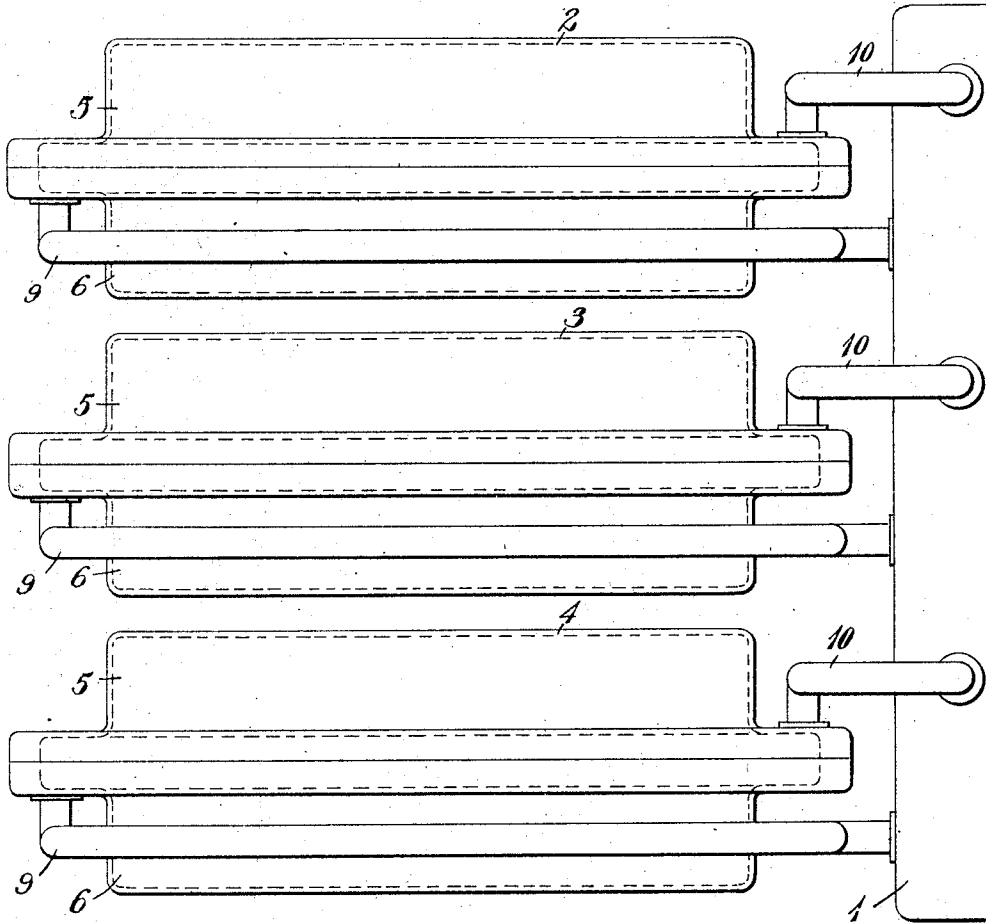


C. AALBORG.
ELECTRICALLY HEATED BOILER.
APPLICATION FILED JULY 8, 1909.

974,330.

Patented Nov. 1, 1910.
2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Frederic H. Miller
R. J. Carlson

INVENTOR

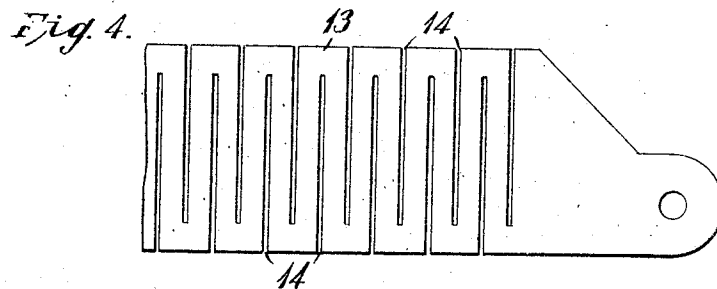
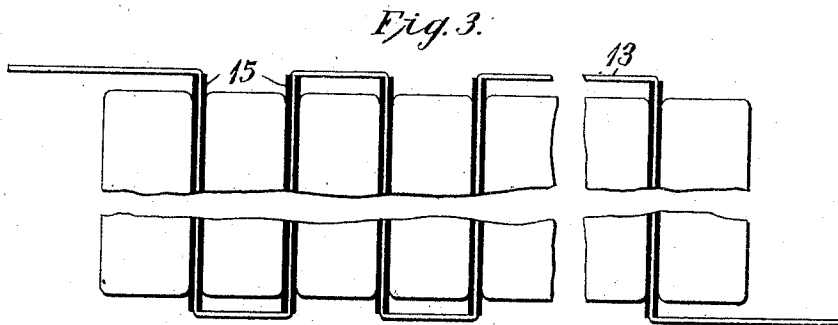
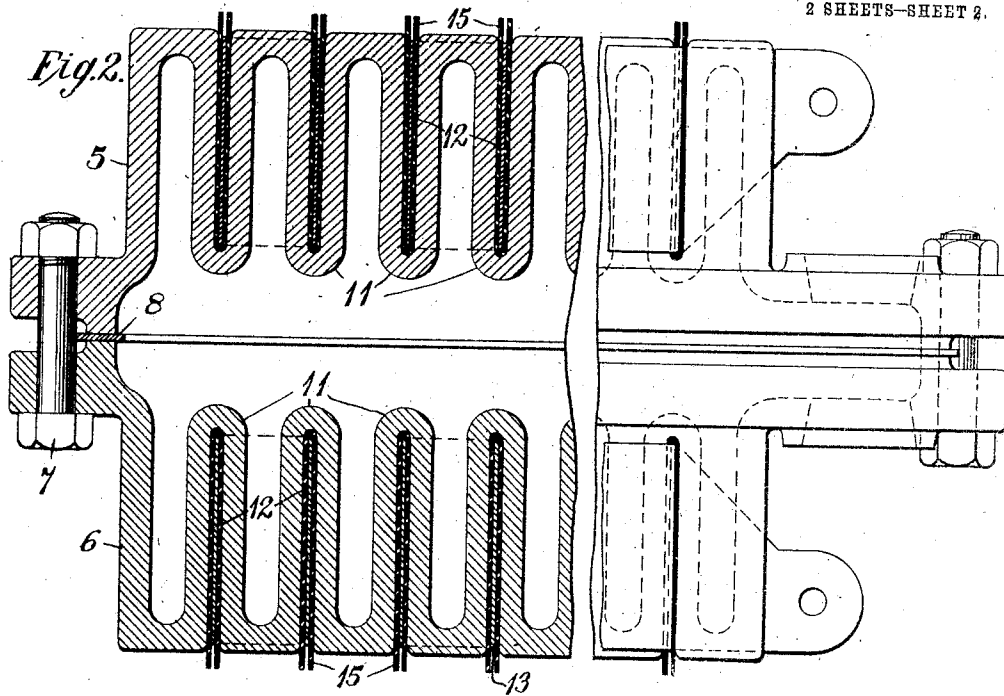
Christian Aalborg
BY
Wiley C. Carr
ATTORNEY

C. AALBORG.
ELECTRICALLY HEATED BOILER.
APPLICATION FILED JULY 8, 1909.

974,330.

Patented Nov. 1, 1910.

2 SHEETS—SHEET 2.



WITNESSES:
Fred H. Miller
R. J. Dearborn

INVENTOR
Christian Aalborg
BY
Wesley C. Carr
ATTORNEY

UNITED STATES PATENT OFFICE.

CHRISTIAN AALBORG, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRICALLY-HEATED BOILER.

974,330.

Specification of Letters Patent.

Patented Nov. 1, 1910.

Application filed July 8, 1909. Serial No. 506,604.

To all whom it may concern:

Be it known that I, CHRISTIAN AALBORG, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electrically-Heated Boilers, of which the following is a specification.

My invention relates to electrically heated boilers or steam generators, and it has for its object to provide a device of this character that shall be simple and durable in construction and that shall provide a maximum heating surface with a minimum external radiating surface.

Figure 1 of the accompanying drawings is an elevation of a boiler constructed in accordance with my invention and having a plurality of units arranged in multiple, Fig. 2 is a view partially in section and partially in elevation of one of the units shown in Fig. 1, Fig. 3 is an elevation at right angles to that of Fig. 2, and Fig. 4 is a detail view of a portion of the resistance element which is embodied in the apparatus shown in the other figures.

Referring to the drawings, the structure here shown comprises a tank or boiler 1 in which water, or some other fluid to be heated, is contained and a plurality of like heater units 2, 3 and 4 which are connected to the tank 1 in multiple arrangement.

Each of the units is composed of a body member, preferably constructed of cast metal, having two similar halves 5 and 6 which are clamped together by any suitable means, such as bolts 7, the joint between the two halves being carefully fitted and provided with a suitable packing 8.

Each of the units is provided with an inlet pipe 9 and an outlet pipe 10, so that a continuous circulation of liquid may be effected from the tank through the unit and back into the tank. Each of the castings 5 and 6 is provided with a plurality of inwardly extending projections 11 in which relatively narrow slots 12 are cut from the outer surface of the unit so that its surfaces become deeply corrugated but the proportioning of the width of the projection to the width of the slots is such that a large internal area is exposed to the contact of the liquid, while the outer surface is only

broken by the narrow slots 12 in which the resistance units 13 of the device are disposed. 55

As shown in Fig. 4 of the drawings, each resistance unit comprises a strip or ribbon of steel, or other suitable conducting material, having a plurality of slots 14 cut alternately from opposite edges to provide a zig-zag path for the electric current. The slots 12 are first provided with insulating cells 15 of U-shaped section and then the resistance ribbon is forced into place between the layers of insulation and is wound back and forth through successive slots, it being carried beyond the ends of the castings in order to avoid grounding thereon. (See Figs. 2 and 3). 60

It is evident that a very large proportion of the heat generated in the resistance strip or ribbon is transmitted directly through the adjacent walls of the castings to the liquid within, while the external radiation is reduced to a minimum by reason of the form of the casting. If sufficient heat is imparted to the liquid within the unit to materially increase its pressure, this increased pressure will tend to force the walls of the device even more firmly into contact with the insulated resistance element. The electrical connections between groups of resistance may be arranged in any suitable manner, according to the heat required, and the voltage of the circuit from which energy is received. 85

I desire that variations in size and arrangement of parts, which do not depart from the spirit of my invention, shall be included within its scope.

I claim as my invention:

1. An electrically heated steam generator comprising a relatively flat resistance element, a receptacle having a plurality of ribs or projections on the inner surfaces of its walls, and slots cut in its outer wall and extending into the projections or ribs to receive said resistance element, whereby the fluid pressure within the receptacle compresses the resistance element. 90

2. An electrically heated steam generator comprising a cast metal receptacle having inlet and outlet ports at opposite ends, and a plurality of parallel ribs projecting inwardly from its walls and parallel slots cut into the ribs or projections from its outer surface, and a resistance strip or ribbon 105

threaded back and forth through the slots for transmitting heat through the projections into the liquid contained within the receptacle, whereby the fluid pressure within
5 compresses the resistance strip or ribbon.

3. A heating receptacle for liquids having inwardly projecting ribs provided with recesses, and an insulated resistance element seated in said recesses, whereby the fluid

pressure in the receptacle compresses the resistance element. 10

In testimony whereof, I have hereunto subscribed my name this 28th day of June, 1909.

CHRISTIAN AALBORG.

Witnesses:

R. J. DEARBORN,
B. B. HINES.