

No. 846,982.

PATENTED MAR. 12, 1907.

E. S. CLARK.

BOILER.

APPLICATION FILED MAR. 6, 1906.

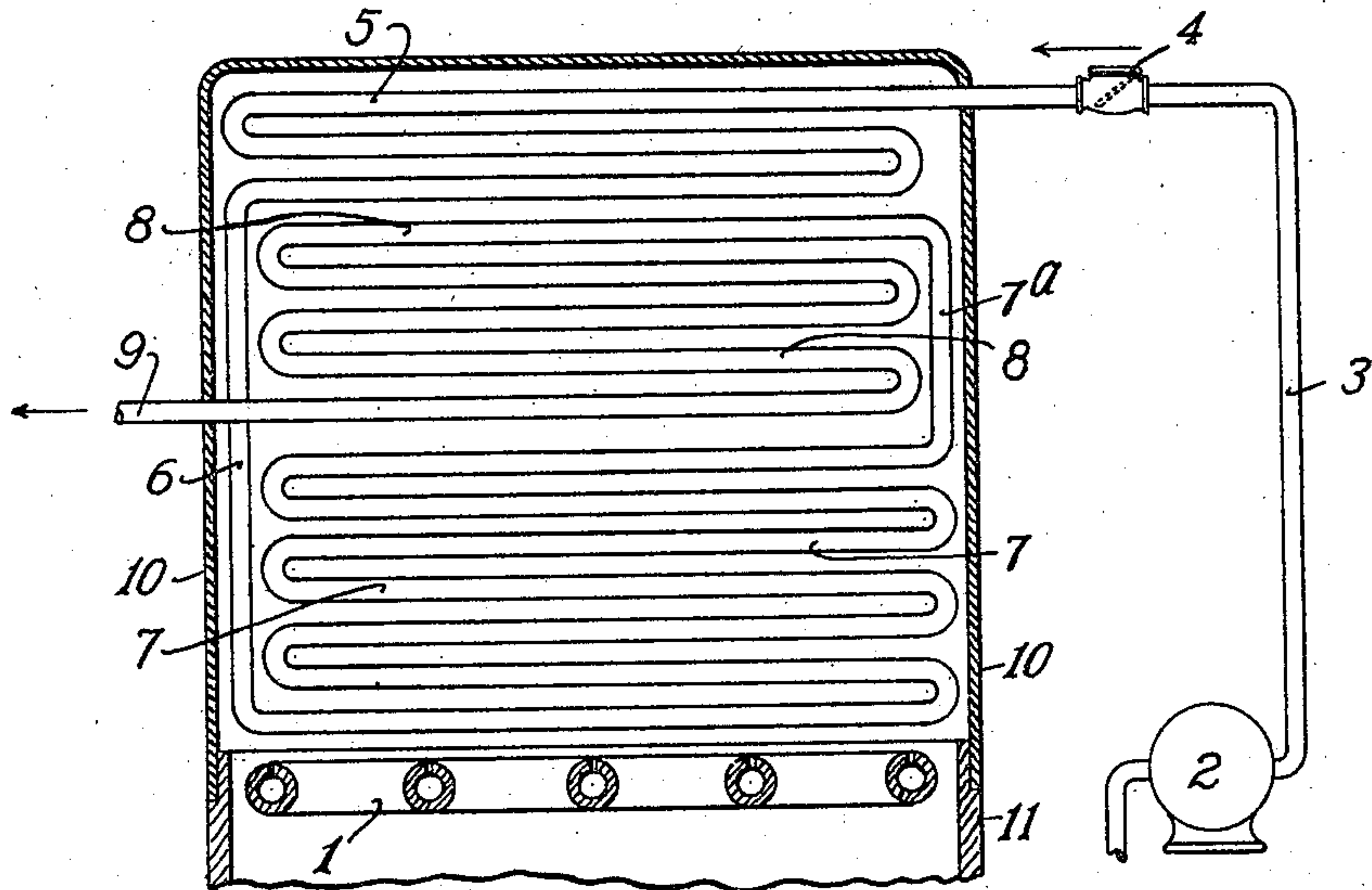


FIG. 1.

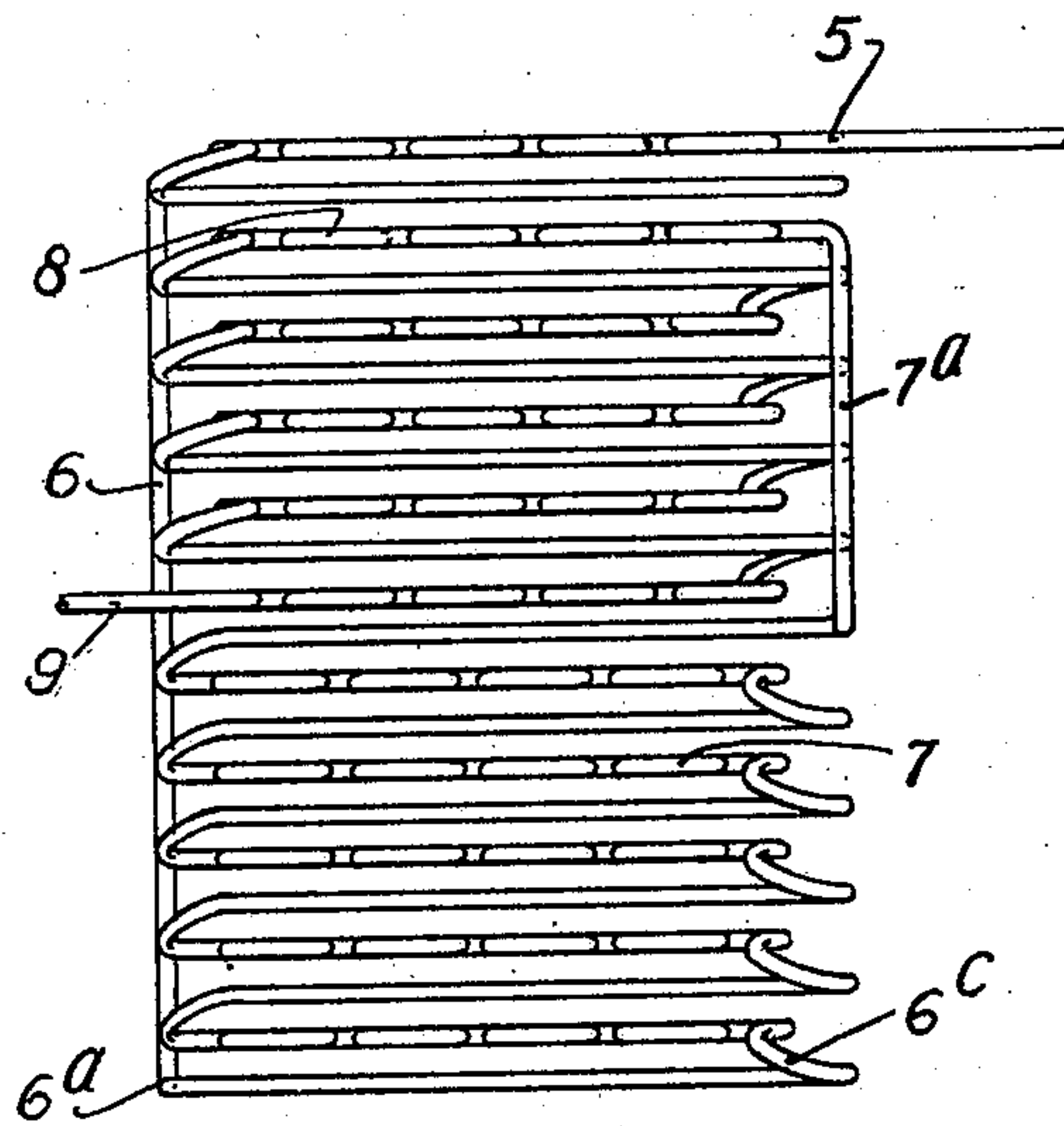


FIG. 2.

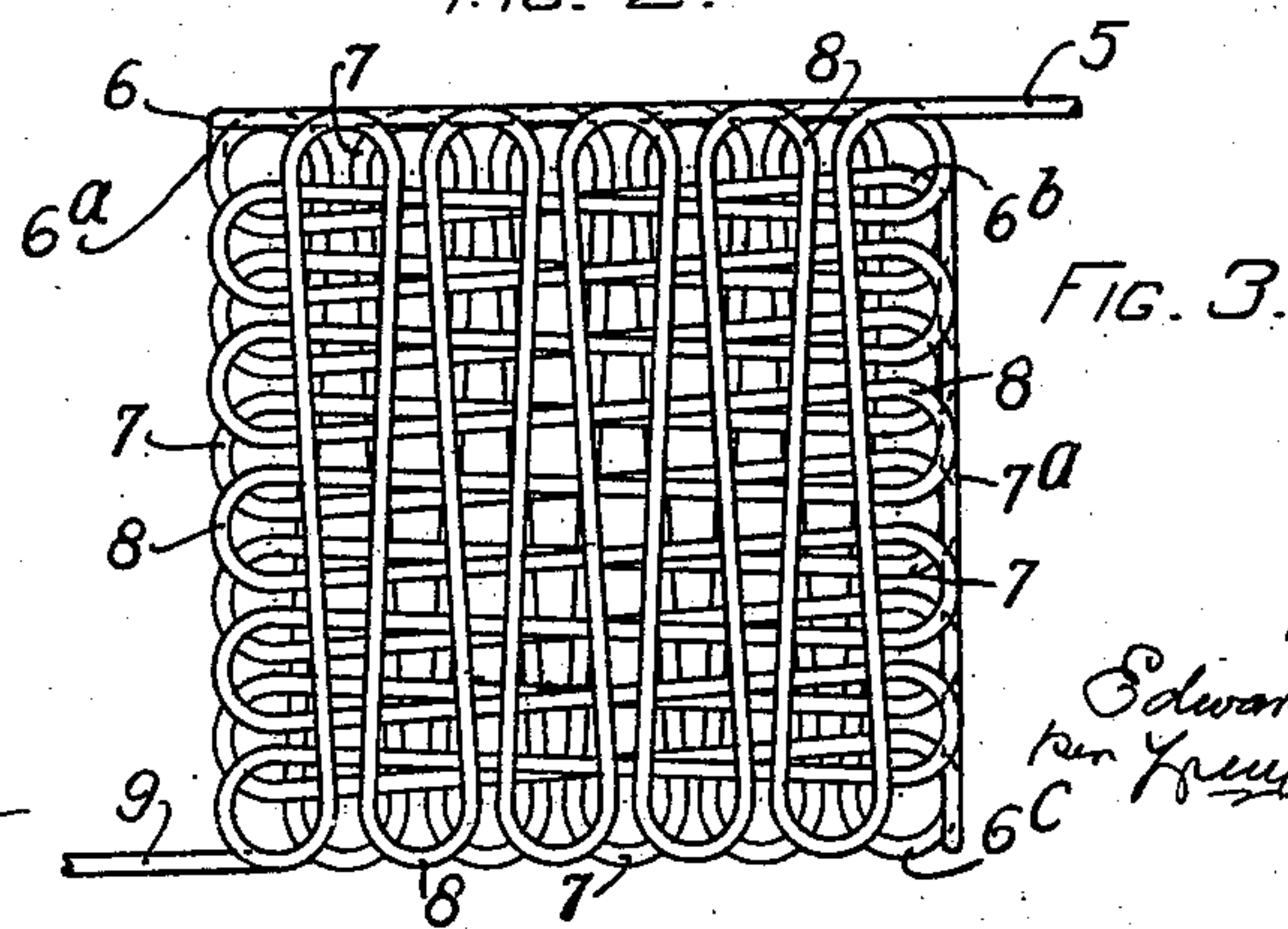


FIG. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

EDWARD S. CLARK, OF BOSTON, MASSACHUSETTS.

BOILER.

No. 846,982.

Specification of Letters Patent.

Patented March 12, 1907.

Application filed March 6, 1906. Serial No. 304,609.

To all whom it may concern:

Be it known that I, EDWARD S. CLARK, a citizen of the United States, residing at Dorchester, in the county of Suffolk and State of Massachusetts, have invented a new and useful Flash-Boiler, of which the following is a specification.

This invention consists of a single continuous tube, without joints or fittings, bent upon itself in successive layers so as to form a flash-boiler of approximately cubical form, and has for its object the construction of such a boiler in the manner described, so as to present the largest amount of heating-surface to the direct impact of the heat employed, to prevent losses by heat radiation away from the boiler itself, produce an economical steam-generating means, and at the same time presenting the least resistance to the flow of water and steam through the successive retroversions of the tube by the use of long radius bends, and the entire absence of shoulders caused by fittings or other mechanical means of uniting a multiplicity of tubes.

Figure 1 is a diagrammatical view of this boiler, in which 1 is any suitable liquid-fuel or gas burner. 2 is a pump forcing water by means of a pipe 3 through a check-valve 4 into a tube 5 6 7 8 9, comprising the steam-containing element of a flash-tube boiler. 10 is a suitable casing inclosing said steam-containing element, and 11 is a case inclosing the liquid-fuel or gas burner.

Fig. 2 is a side elevation, and Fig. 3 a vertical plan of the steam-containing element of this boiler as preferably constructed. The liquid to be evaporated is forced by the pump 2 through the pipe 3, thence through the check-valve 4, and enters the steam-containing element through the tube 5. This tube enters the enveloping-case 10 at the upper rearward side, as shown in the drawings, passes horizontally to the forward side, where it is immediately bent upon itself, and is thence bent back and forth in a direction generally at right angles to that of the entrance-tube 5 until such retroversions reach nearly to the opposite side of the casing. It is then bent through two hundred and seventy degrees at point marked 6^c and is then retroverted upon itself in a general direction parallel to the entrance-tube 5 until another layer or section is formed of practically the same lateral dimensions as the first-formed section. The tube then descends vertically

through the part marked 6 to the lower part of the casing, directly adjacent to the liquid-fuel or gas burner. The tube then bends forward at 6^a, then bends to the right and passes to the opposite side of the case, where it immediately is bent upon itself at a point marked 6^b, and is thence bent back and forth, as described above, forming a plurality of sections, superimposed one above the other, the retroversions forming each section disposed at approximately right angles to each other until these sections occupy approximately one-half of the vertical height of the casing 10, comprising the series of section 7 in the diagrammatical Fig. 1. The last retroversion of the upper section 7 then passes through the tube 7^a to a point directly beneath the first two sections of the retroverted tube described above, where it is bent upon itself, as described below, each succeeding section being disposed directly beneath the next preceding section and at right angles thereto, the loops in this third series of sections 8 being intermediately disposed in relation to the loops of the second series of sections 7 and the preliminary series first described and so continued until the section 8 is directly superimposed upon the second section 7 with the preliminary section superimposed upon the section 8, thus filling the upper half of the casing 10, the outlet passing out through the tube 9 at a point diametrically opposite from the entrance-tube 5 and at a point approximately intermediate of the total height of the casing 10. This disposition of the sections of the steam-containing element thereby form an economizer for utilizing and preventing the waste heat of combustion, forms a continuous sequentially-disposed heating apparatus for converting water into superheated steam, and also forms traps, so that it is impossible for water in a liquid state to pass out of the boiler with the steam, and dry and practically superheated steam is the result. This form of construction allows of tubes being united by electrical welding, so as to form a continuous tube, admits of long and easy bends, presenting a minimum of resistance to the passage of water and steam through the tube and by the disposition described presents a maximum amount of heating-surface to the direct impact of heat from the burner and also a maximum amount of heating-surface in a predetermined cubical space consistent with convenience and practicability of construc-

tion, as well as affording less obstacles to the removal of the products of combustion from the outer surface of the tubes.

5 Having fully described the construction and operation of this flash-boiler, what I desire to secure, and claim in United States Letters Patent, is as follows:

10 1. A flash-boiler comprising a plurality of sections disposed one above the other, the first section receiving the feed at its top and discharging at its bottom into the bottom layer of the lowest section, said lowest section directly discharging at its top into the top layer of an intermediate section, and an
15 outlet from said intermediate section.

20 2. A flash-boiler comprising a plurality of retroverted sections disposed one above the other, the uppermost section receiving the feed at its top layer and discharging from its bottom layer into the bottom layer of the lowest section, said lowest section discharging from its top layer by a direct connection

at one side into the top layer of an intermediate section, and an outlet from the bottom layer of the intermediate section. 25

3. A flash-boiler comprising a plurality of sections disposed one above the other and composed of a tube bent back and forth upon itself, alternate retroversions being parallel, and adjacent retroversions being at an angle 30 to each other, the first of said sections receiving the feed at its top and discharging at its bottom into the bottom layer of the lowest section which discharges at its top directly into the top layer of an intermediate section, 35 and an outlet from said intermediate section.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

EDWARD S. CLARK.

Witnesses:

H. I. SMETHURST,
WM. O. WEBBER.