

No. 709,042.

Patented Sept. 16, 1902.

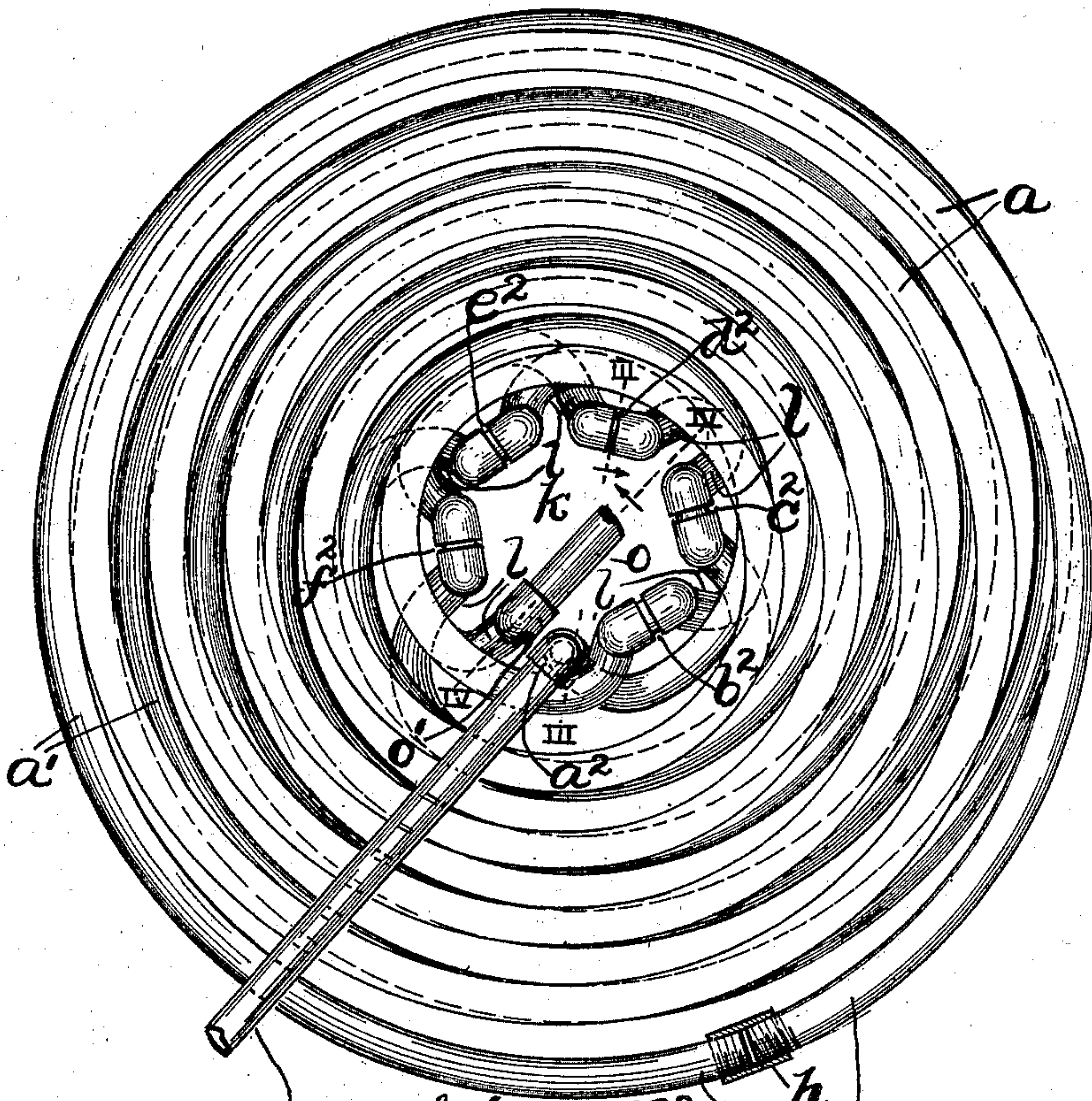
C. M. RAYMOND.  
STEAM GENERATOR OR WATER HEATER.

(Application filed Mar. 17, 1902.)

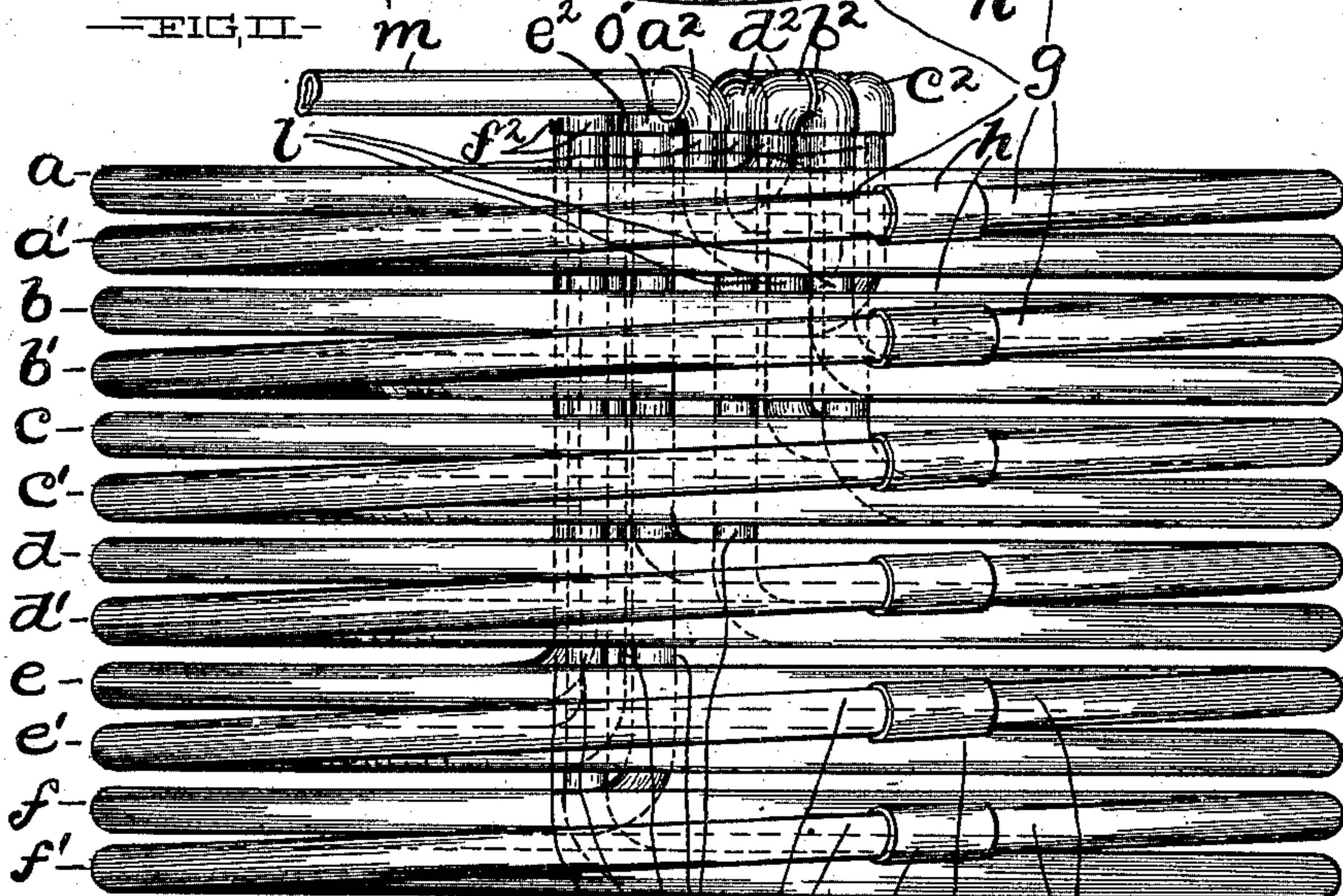
(No Model.)

2 Sheets—Sheet 1.

—FIG. I—



—FIG. II—



WITNESSES

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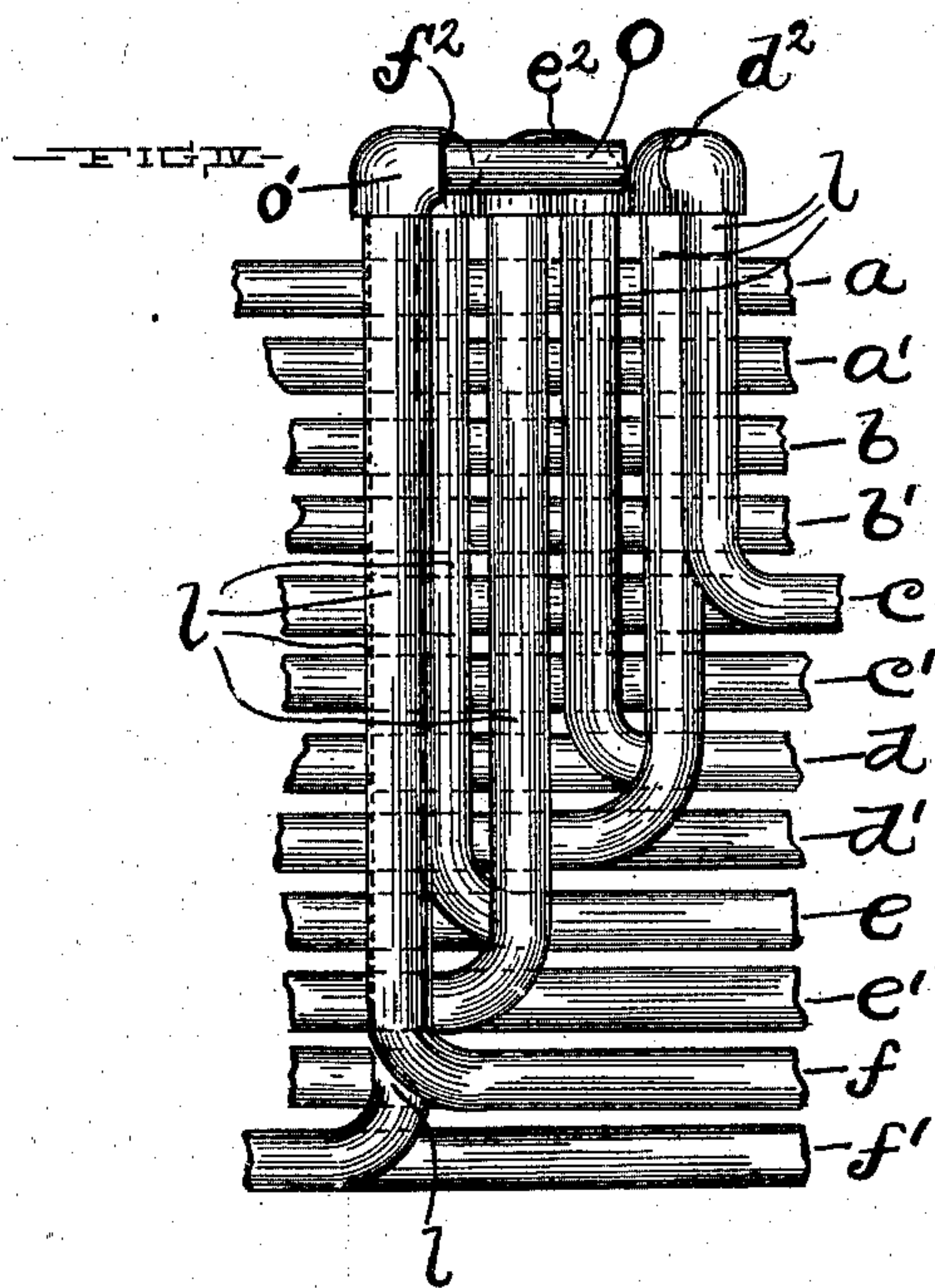
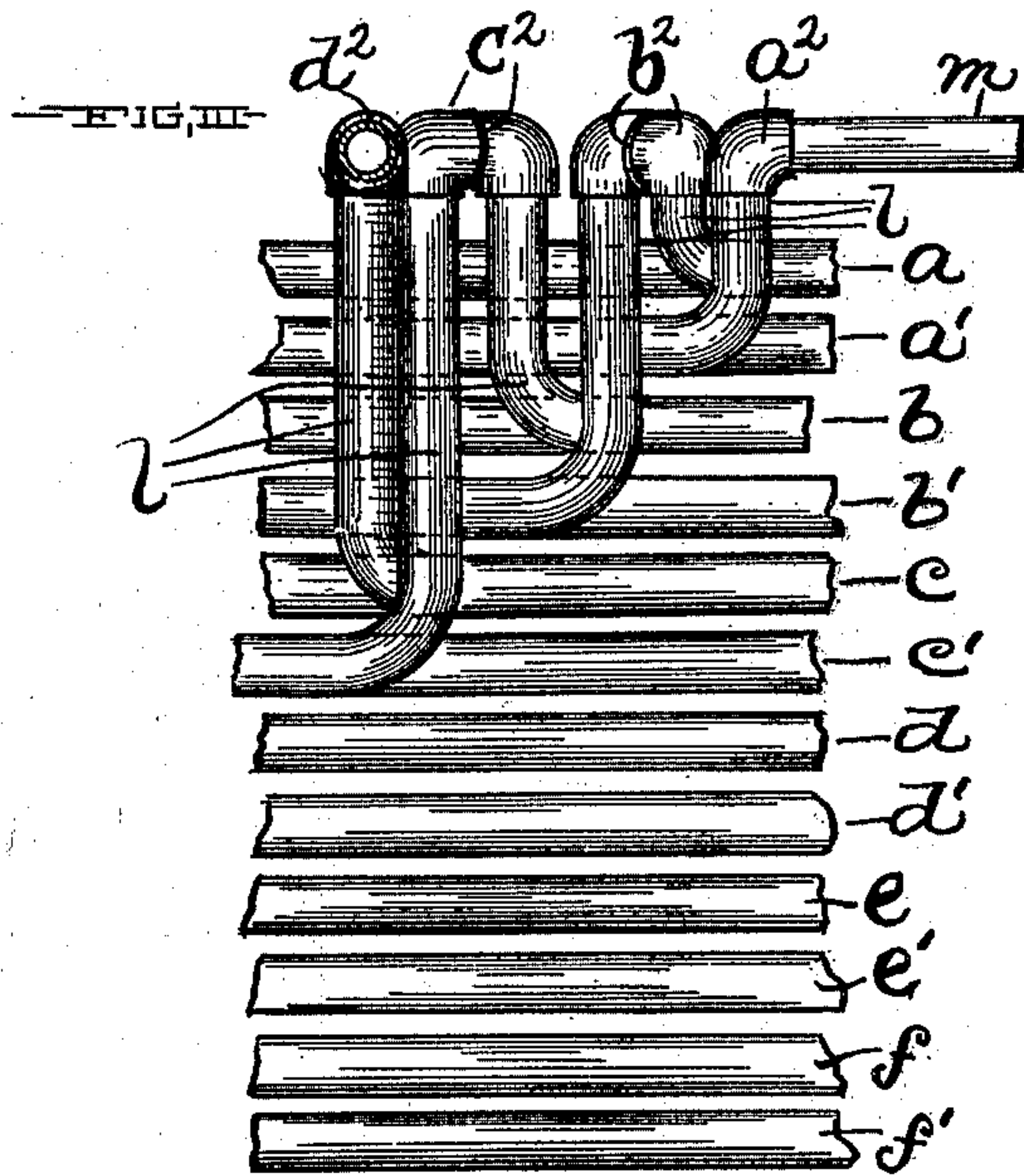
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2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

CHARLES M. RAYMOND, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO  
LOUIS E. HOFFMAN, OF CLEVELAND, OHIO.

## STEAM-GENERATOR OR WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 709,042, dated September 16, 1902.

Application filed March 17, 1902. Serial No. 98,587. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES M. RAYMOND, a citizen of the United States of America, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steam-Generators or Water-Heaters; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to improvements in steam-generators or water-heaters, and pertains more especially to fluid-circulating pipe systems for boilers, heaters, vapor-generators, and the like, comprising a plurality of pairs of helical pipe-sections made, preferably, of tubing and arranged, respectively, in a horizontal or approximately horizontal plane and a short distance apart vertically, with the outermost coils of the two sections of each pair of helical sections joined together and in open relation with each other, with the innermost coils of the helical sections having, respectively, an extension projecting upwardly to and above the uppermost helical section, with the upward extension of the inner coil of the lower section of each pair of helical sections forming the inlet of the said pair of sections, with the upward extension of the innermost coil of the upper section of each pair of helical sections constituting the outlet of the said pair of sections, with the inlet-forming upward extension of the innermost coil of the lower section of the uppermost pair of helical sections connected and in open relation with the fluid-supply pipe, and with the inlet-forming upward extension of the innermost coil of the lower section of each remaining pair of helical sections connected and in open relation with the outlet-forming upward extension of the innermost coil of the upper section of the pair of helical sections next above, and with the outlet-forming extension of the upper section of the lowermost pair of helical sections connecting and in open relation with the pipe employed to conduct the fluid from the pipe system.

The object of this invention is to join the outer ends of the sections of each pair of helical pipe-sections as great a distance as

practicable from the central portions of the said sections, so as to render the joint conveniently accessible for cleaning and repairs, to have the inlet-forming end and the outlet-forming end of each pair of helical sections arranged centrally of the said sections and extending upwardly to and above the uppermost helical section, so as to cause the water or fluid supplied to each pair of helical sections to pass to the said pair of sections from a point above the uppermost helical section, and to render each pipe connection which joins the inlet-forming end of a pair of sections with the outlet-forming end of another pair of sections readily and conveniently accessible for repairs and cleaning.

Another object is to advantageously utilize the opening formed centrally of the helical pipe-sections and extending from the top of the uppermost helical pipe-section to the bottom of the lowermost helical pipe-section.

With these objects in view the invention consists in certain features of construction and combinations of parts, hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure I is a top plan, partly in section, of a fluid-circulating pipe system embodying my invention. Fig. II is a side elevation of the same. Fig. III is an elevation, partly in section, on line III III, Fig. I, of a portion of the pipe system looking in the direction indicated by the arrow. Fig. IV is an elevation, partly in section, on line IV IV, Fig. I, of a portion of the pipe system looking in the direction indicated by the arrow.

The illustrated pipe system comprises six pairs of helical pipe-sections composed, preferably, of tubing and has the said sections arranged, respectively, in a horizontal or approximately horizontal plane and a short distance apart vertically.

*a* and *a'* designate the upper section and lower section, respectively, of the first or uppermost pair of helical pipe-sections; *b* and *b'*, the upper section and lower section, respectively, of the second or next-uppermost pair of helical pipe-sections; *c* and *c'*, and *d* and *d'*, the sections, respectively, of the two central or third or fourth pairs of helical pipe-sections; *e* and *e'*, the upper section and



lower section, respectively, of the fifth or second-lowest pair of helical pipe-sections, and  $f$  and  $f'$  the upper section and lower section, respectively, of the sixth or lowest helical pipe-section. The two sections of each pair of helical pipe-sections are arranged one above the other and are preferably uniform or approximately uniform in dimensions and number of coils, and the outer ends  $g$  of the said sections—that is, the outer ends of the outermost coils of the said sections—have the inclination required to place the said ends in line and to conveniently accommodate the application of a union  $h$ , employed in coupling or joining the said ends together, and establishing open relation between the said sections. Obviously the space within which the tubing or pipe can be coiled is limited, and an opening at and centrally of the innermost coil of a helical tube or pipe-section cannot be avoided, and consequently in the pipe system illustrated an opening  $k$  is formed centrally of and extends from top to bottom of the pipe system, and to utilize the said opening or space  $k$  to advantage the innermost coils of the helical pipe-sections are extended upwardly, as at  $l$ , through the said space or opening  $k$  preferably to and above the uppermost section  $a$ , and the upward extension  $l$  of the innermost coil of the lower section of each pair of helical pipe-sections constitutes the inlet of the said pair of sections, whereas the upward extension  $l$  of the innermost coil of the upper section of the said pair of sections forms the outlet of the said pair of sections.

The inlet-forming upward extension  $l$  of the first or upper pair of helical pipe-sections is connected by an elbow  $a^2$  with the fluid-supply pipe  $m$  above the upper section of the said pair of sections, and the inlet-forming upward extension  $l$  of the lower section of each remaining pair of helical pipe-sections is connected by a pipe connection with the outlet-forming upward extension  $l$  of the upper section of the pair of helical pipe-sections next above. As shown, the outlet-forming upward extension  $l$  of the upper section  $a$  of the first or uppermost pair of pipe-sections  $a$  and  $a'$  is connected by a pipe connection  $b^2$  above the uppermost helical section  $a$  with the inlet-forming upward extension  $l$  of the lower section  $b'$  of the second or next-uppermost pair of pipe-sections  $b$  and  $b'$ , and pipe connections  $c^2$ ,  $d^2$ ,  $e^2$ , and  $f^2$  connect the outlet-forming upward extension  $l$  of the pipe-sections  $b$ ,  $c$ ,  $d$ , and  $e$  above the uppermost helical section  $a$  with the inlet-forming upward extension  $l$  of the pipe-sections  $c'$ ,  $d'$ ,  $e'$ , and  $f'$ , respectively, and the outlet-forming upward extension  $l$  of the upper section of the lowest pair of sections  $f$  and  $f'$  is connected above the uppermost section  $a'$ , by an elbow  $f^2$ , with the pipe  $o$ , employed to conduct the fluid from the pipe system to the engine or place where the fluid is utilized.

Obviously my improved pipe system is especially well adapted for use in vapor-generators, steam-boilers, and water-heaters; but the application of fluid-circulating pipe systems relative to the burner or furnace employed in heating the same and the manner of incasing the same are too well known to require illustration and description in this application.

What I claim is—

1. A steam generator or heater of the character indicated, comprising pairs of helical pipe-sections arranged, respectively, in a horizontal or approximately horizontal plane and at short intervals vertically, which pipe system has the two sections of each pair of helical sections arranged one above the other and corresponding or approximately corresponding with each other in dimensions and number of coils and communicating with each other at their outermost coils and having their innermost coils provided, respectively, with an upward extension  $l$  projecting upwardly; a pipe arranged to conduct fluid from the pipe system and connected and communicating with the innermost coil of the upper section of the lowest pair of helical pipe-sections, a fluid-supply pipe connected and communicating with the upward extension of the innermost coil of the lower section of the uppermost pair of helical pipe-sections, and a connection between the upward extension of the innermost coil of the lower section of each remaining pair of helical pipe-sections and the upward extension of the innermost coil of the upper section of the pair of helical pipe-sections next above, substantially as and for the purpose set forth.

2. A steam generator or heater of the character indicated, comprising pairs of helical pipe-sections arranged, respectively, in a horizontal or approximately horizontal plane and at short intervals vertically and constituting a partial inclosure for a space or opening  $k$  arranged centrally of and extending from top to bottom of the said pipe system, which pipe system has the two sections of each pair of helical sections arranged one above the other and communicating with each other at their outermost coils and having their innermost coils provided, respectively, with an upward extension  $l$  projecting upwardly through the aforesaid opening or space; a pipe arranged to conduct fluid from the pipe system and connected and communicating with the innermost coil of the upward extension of the upper section of the lowest pair of helical pipe-sections; a fluid-supply pipe connected and communicating with the upward extension of the innermost coil of the lower section of the uppermost pair of helical pipe-sections, and a connection between the upward extension of the innermost coil of the lowest pair of helical pipe-section and the upward extension of the innermost coil of the upper section



of the pair of helical pipe-sections next above, substantially as and for the purpose set forth.

3. A steam generator or heater of the character indicated, comprising pairs of helical pipe-sections arranged, respectively, in a horizontal or approximately horizontal plane and at short intervals vertically, which pipe system has the two sections of each pair of helical sections arranged one above the other and communicating with each other at their outermost coils and having their innermost coils provided, respectively, with an upward extension *l* projecting upwardly to and above the uppermost helical section; a pipe arranged to conduct fluid from the pipe system at the top of the pipe system and connected and communicating with the upward extension of the innermost coil of the upper section of the lowermost pair of helical pipe-sections; a fluid-supply pipe arranged to supply fluid to the pipe system at the top of the pipe system and connected and communicating with the upward extension of the innermost coil of the lower section of the uppermost pair of helical pipe-sections; and a pipe connection, above the uppermost helical pipe-section, between the upward extension of the innermost coil of the lowermost section of each remaining pair of helical pipe-sections and the upward extension of the innermost coil of the upper section of the pair of helical pipe-sections next above.

4. A steam generator or heater of the character indicated, comprising pairs of helical pipe-sections arranged, respectively, in a horizontal or approximately horizontal plane and at short intervals vertically and constituting a partial inclosure for a space or opening *k* formed centrally of and extending from top to bottom of the said pipe system, which pipe system has the two sections of each pair of helical sections arranged one above the other and communicating with each other at their outermost coils and having their innermost coils provided, respectively, with an upward extension *l* projecting upwardly within the

aforesaid space or opening; a pipe arranged to conduct fluid from the pipe system and connected and communicating with the innermost coil of the upper section of the lowermost pair of helical pipe-sections; a fluid-supply pipe connected and communicating with the upward extension of the innermost coil of the lower section of the uppermost pair of helical pipe-sections, and a connection between the upward extension of the innermost coil of the lowermost section of each pair of helical pipe-sections, except the lower section of the uppermost pair of helical sections, and the upward extension of the innermost coil of the upper section of the pair of helical pipe-sections next above.

5. A steam generator or heater of the character indicated, comprising pairs of helical pipe-sections arranged, respectively, in a horizontal or approximately plane and at short intervals vertically, which pipe system has the outermost coils of the two sections of each pair of helical sections joined together by a union; a pipe arranged to conduct fluid from the pipe system and connected and communicating with the innermost coil of the upper section of the lowermost pair of helical pipe-sections; a fluid-supply pipe connected and communicating with the innermost coil of the lower section of the uppermost pair of helical pipe-sections, and a connection between the innermost coil of the lowermost section of each pair of helical pipe-sections, except the lower section of the uppermost pair of sections, and the innermost coil of the upper section of the pair of helical pipe-sections next above.

In testimony whereof I sign the foregoing specification, in the presence of two witnesses, this 11th day of March, 1902, at Cleveland, Ohio.

CHARLES M. RAYMOND.

Witnesses:

TELSA SCHWARTZ,  
VICTOR C. LYNCH.