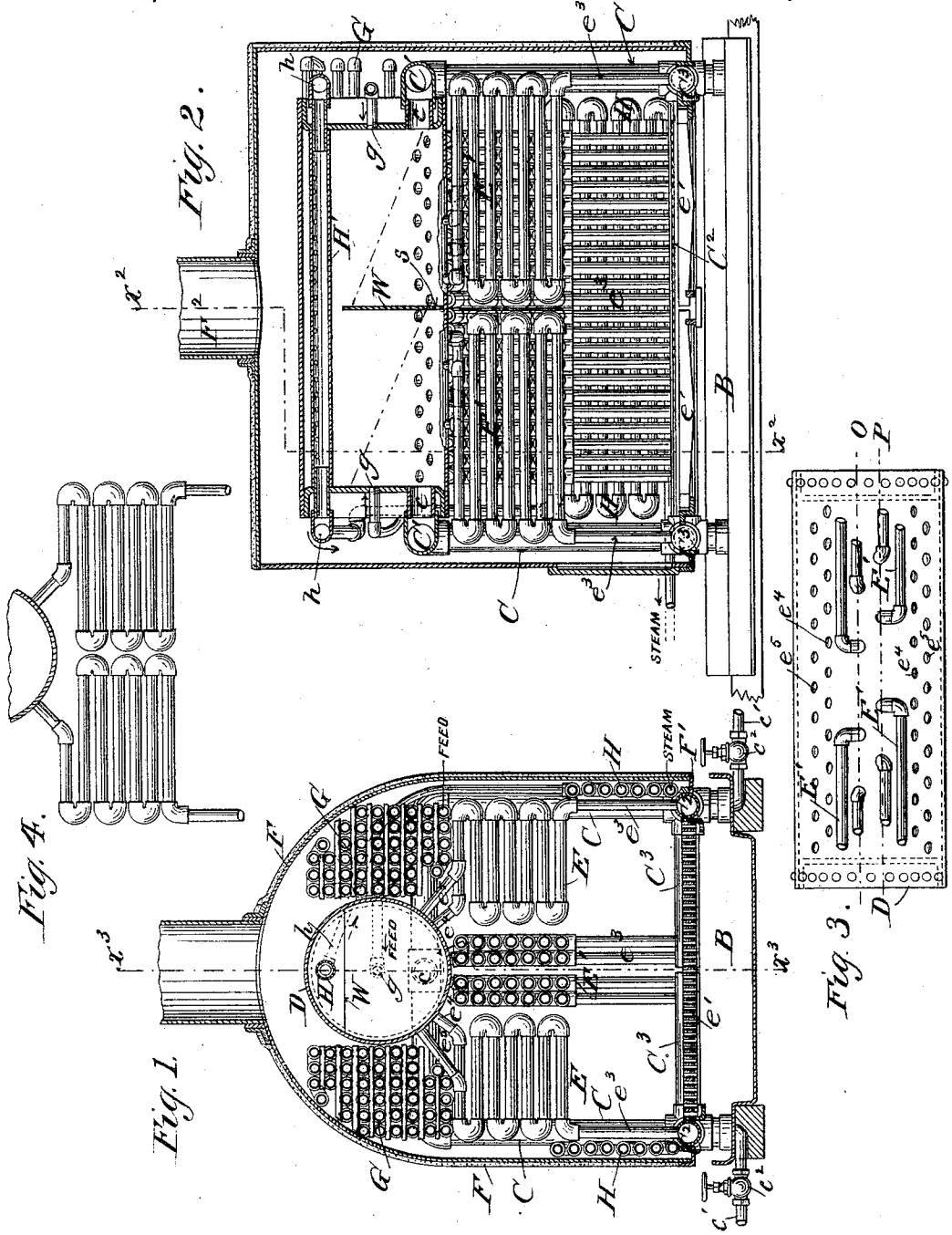
(No Model.) 2 Sheets—Sheet 1.

E. E. ROBERTS.

STEAM GENERATOR.

No. 415,397. Patented Nov. 19, 1889.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

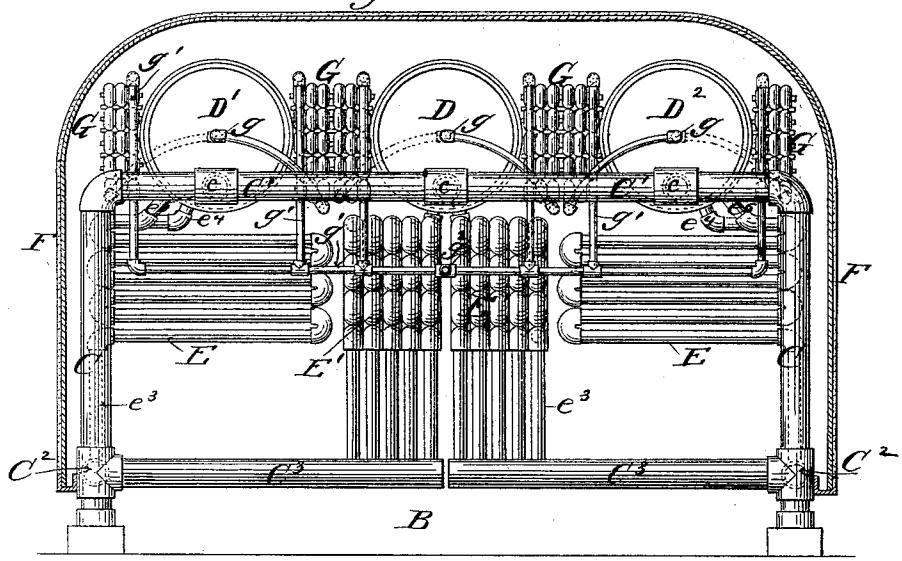


Fig. 6.

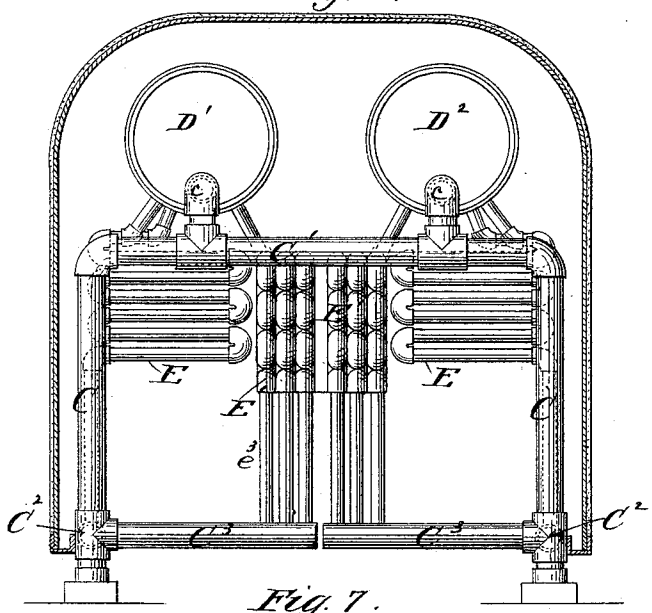
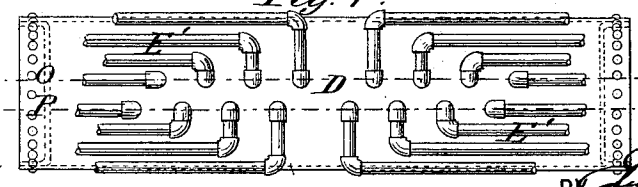


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWARD E. ROBERTS, OF RED BANK, NEW JERSEY.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 415,397, dated November 19, 1889.

Application filed May 31, 1889. Serial No. 312,720. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. ROBERTS, a citizen of the United States, residing at Red Bank, county of Monmouth, State of New Jersey, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

My present improvement relates to generators of the class described by me in Letters Patent No. 371,710, dated October 18, 1887; and it comprises certain modifications of the arrangement and manner of connecting the various pipes therein with relation to the steam and water drum, without, however, departing essentially from the original principle of operation.

It is an important object to promote rapidity of circulation, and thereby equalize the temperature of different parts of the boiler. This is accomplished herein by shortening the circuit of the generating-coils, reducing the size of the units of the structure, and multiplying their number. By the latter expedient an increased heating-surface is obtained as well as the easier replacement of such reduced parts should repairs become necessary.

My invention consists in certain novel features of construction of the distributing-pipes, wherein they are located transversely as well as longitudinally to the boiler, being arranged about the lower margins of the structure.

My invention also consists in the use of longitudinal coils connecting independently between the transverse distributers aforesaid and the drum.

Referring to the accompanying drawings, forming a part of this specification, and in which similar letters of reference indicate corresponding parts, Figure 1 is a transverse section on the line x^2 x^2, Fig. 2, showing the feature of shortening the course of circulation by reducing the unit-coils of the structure; Fig. 2, a longitudinal section on the line x^3 x^3, Fig. 1; and Fig. 3, an inverted plan view of the drum, showing details of pipe-connection. Fig. 4 illustrates a modification of Fig. 2. Fig. 5 is a front elevation with the outside casing in section, showing the adaptation of the structure for multiple drums; Fig. 6, a modification of Fig. 5, and Fig. 7 an inverted plan view of the center drum of Fig. 5.

Referring to Figs. 1 to 4, inclusive, in lieu of employing transverse coils extending the entire width of the boiler, springing alternately from opposite distributers, as illustrated in Fig. 3 of the aforesaid patent, I here employ ranges of short transverse coils E, extending half or less than half the width of the boiler, the units of each range springing successively from the same distributer. I also employ cross-pipes C^3 or distributers, and likewise connect longitudinal ranges of generating-coils E′ to such cross-pipes C^3, connecting said longitudinal coils with the drum at suitable intervals. In this case I prefer to extend each transverse distributer C^3 but half the width of the structure, as seen in Figs. 1, 5, and 6, permitting the currents from the downflow-pipes C (in this instance four in number) to circulate independently on opposite sides of the generator.

The fire-doors are employed in duplicate, so as to clear the upflow-pipes c^3 of the coils E′.

The connections of the generating-coils with the drum are so arranged as to avoid too close proximity of the holes drilled in the shell, in order not to weaken the same. This arrangement of connection will be understood by an inspection of Fig. 3, the connecting branches e^1 e^5 of the transverse coils connecting with the respective holes similarly designated, and the longitudinal coils being connected in any desired number in two lines O P, the holes in each case being staggered.

The mode of connection of the longitudinal coils will be better understood by observation of Fig. 7.

The coils E E and E′ E′ combine to form the crown of the furnace, and the units of the coils being thus subdivided and placed in different directions will expose all parts of the circulating system more equally to the center of heat than by the former arrangement of coils, hereinbefore referred to. Furthermore, should rupture occur in any one part, the cutting out of a given coil and plugging of the same would have less diminishing effect on the steaming capacity of the boiler.

Again, the removal of a section of coil can be the more easily accomplished, due to the decreased size herein employed.

The longitudinal coils may be omitted altogether, the transverse coils extending the full half-width of the furnace, as illustrated in Fig. 4. The shortening of the coils thereby effected promotes rapidity of circulation and is a desirable feature, especially in boilers of large size, wherein the half-length of coil will afford ample opportunity for a sufficient absorption of heat during the upward passage of the current.

Referring now to Figs. 5, 6, and 7, in generators of large size it is found advantageous in many instances to employ a plurality of steam and water drums. The construction of lengthwise and cross series of short coils is especially applicable to multiple drums. The series of drums D D′ D^2 are connected by means of the cross-pipes C″, located at front and rear of the structure. The downflow-pipes C, located at the four corners of the structure, connect the cross-pipes C′ with the junction of the longitudinal distributers C^2 and the transverse distributers C^3. The central drum D receives the upward circulation of the longitudinal generating-coils E′ from the front and rear transverse distributers C^3, the circulation being drawn equally from opposite sides of the boiler. The side drums D′ D^2 receive the upward circulation of the transverse generating-coils E from the longitudinal distributers C^2 at the respective sides of the boiler. The manner of connecting the branches e^4 e^5 of the coils to the drums remains substantially the same in the instances of both Figs. 5 and 6, as in the instance of Figs. 1, 2, and 3. In Fig. 6 the respective lateral divisions of the longitudinal ranges of coils are connected each to one corresponding side of a drum D′ or D^2, in a similar manner to that by which they are both connected to a common drum D, in Figs. 5 and 7. Otherwise the general characteristics of Fig. 5 also apply to Fig. 6.

In practice the generating-coils employed in connection with the plurality of drums may be built up to a much greater extent vertically in proportion to the grate-surface than indicated in Fig. 5. The feed-coils G are located between the drums as well as exterior to them, as illustrated, and the superheating coils or other accessories to the boiler may be similarly applied, as in the instances hereinbefore referred to.

I claim as my invention—

1. The combination, with the steam and water drum, the downflow-pipes, and the longitudinal and transverse distributers, of generating-coils springing from the distributers composed of both transverse and longitudinal return-bends forming the crown of the fire-box and communicating at their upper ends with the drum.

2. The combination of a steam and water drum or drums, cross-pipes connecting the drum or drums with downflow-pipes, longitudinal and transverse distributing-pipes, longitudinal generating-coils springing from the transverse distributers at front and rear of the boiler, meeting end to end at or near the center of the fire-box, transverse generating-coils springing from the longitudinal distributers at each side of the boiler, extending to the body of longitudinal coils, all of said coils forming the crown of the fire-box and communicating at their upper ends with the said drum or drums.

EDWARD E. ROBERTS.

Witnesses:
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