(Model.)

2 Sheets—Sheet 1.

F. E. HOSMER.

Steam Generator.

No. 234,872. Patented Nov. 30, 1880.

FIG. I.

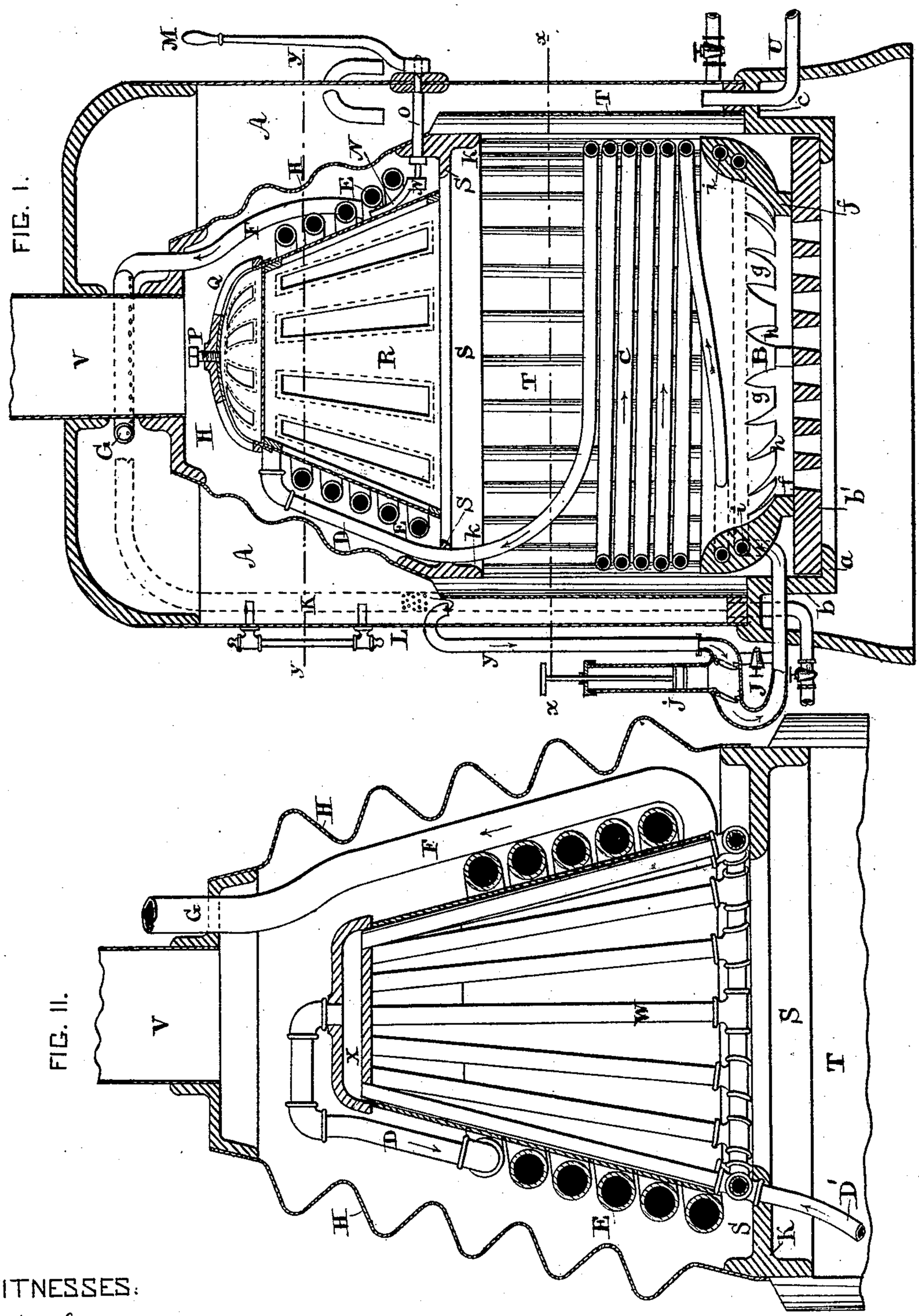

FIG. II.

WITNESSES:

Wm. S. Brown.

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INVENTOR

Francis Edwin Hosmer.

(Model.)

2 Sheets—Sheet 2.

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FIG. III.

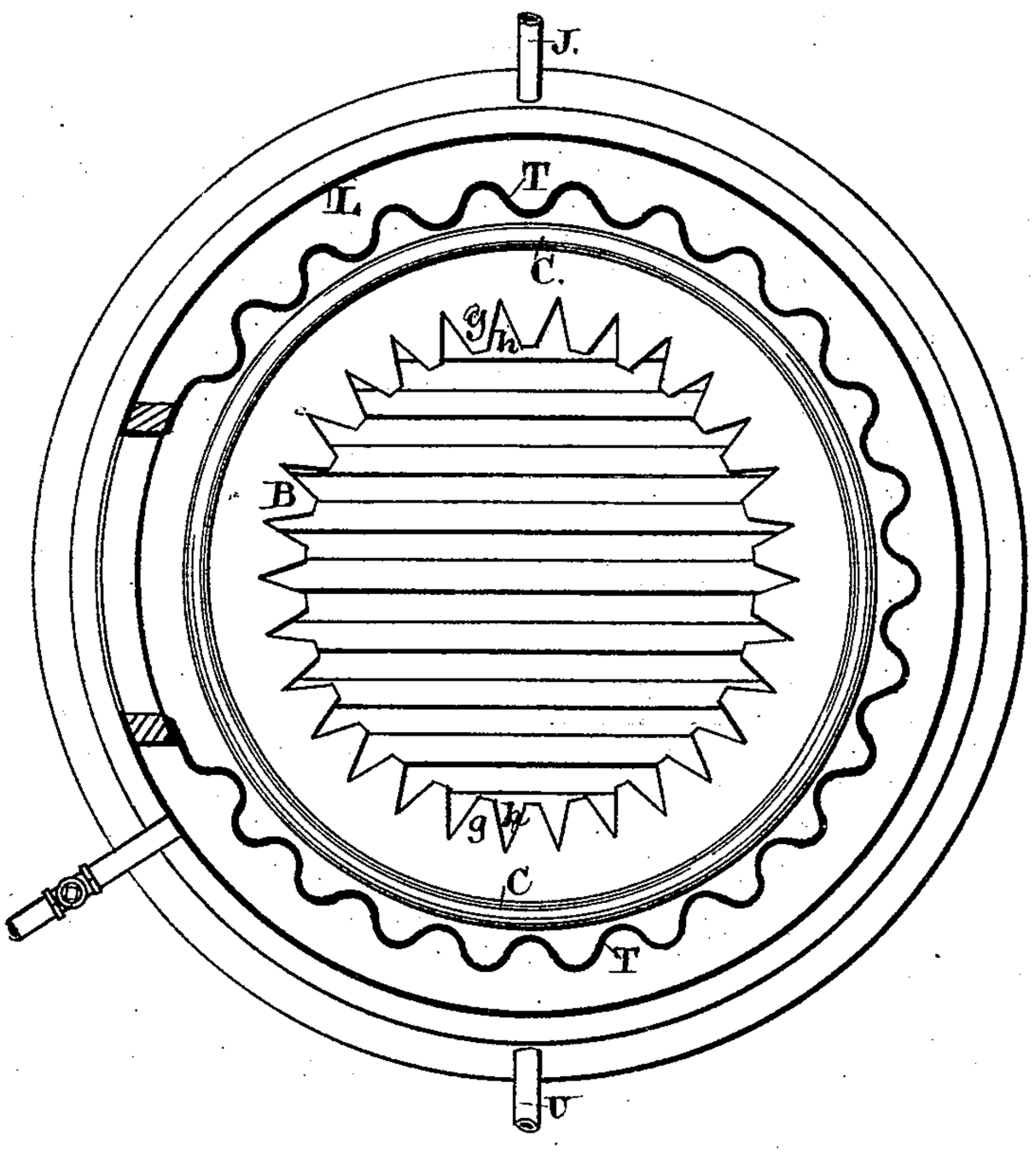
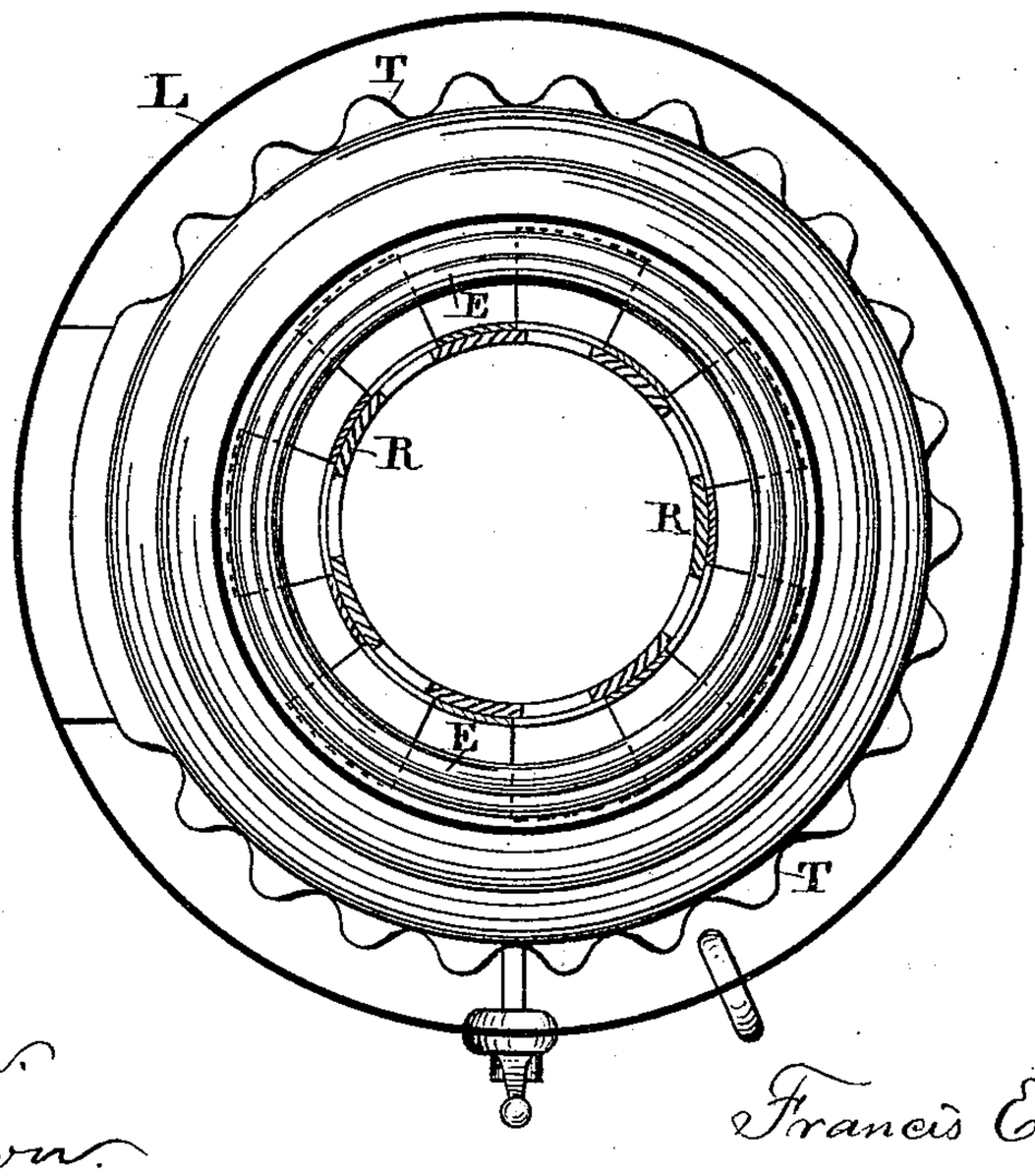


FIG. IV.



WITNESSES.

Wm. S. Brown.

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INVENTOR.

Francis Edwin Hosmer.

UNITED STATES PATENT OFFICE.

FRANCIS E. HOSMER, OF BOSTON, MASSACHUSETTS.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 234,872, dated November 30, 1880.

Application filed April 19, 1880. (Model.)

To all whom it may concern:

Be it known that I, FRANCIS EDWIN HOSMER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Generators; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the use of steam, to which it appertains, to make and use the same.

Heretofore it has been the practice to construct steam-generators so that the cold water or water partially heated is immediately brought in contact with the generating-surfaces of the boiler, thus chilling the said surfaces, causing violent contraction and expansion of the same as well as cooling the boiling water, and in a measure preventing the liberation of steam therefrom. To avoid these and other well-known defects, and to cause a rapid evaporation and circulation of the water in the boiler, to prevent sedimentary deposits, to separate the steam from the water, to induce a more perfect combustion of fuel, and to afford a better and nearer absolute control of the heat, are the objects of my invention.

Referring to the accompanying drawings, which form part of this specification, Figure I represents a vertical longitudinal section; Fig. II, a partial vertical section of a portion of the apparatus, showing a slight modification; Fig. III, a horizontal section taken on the line *x x*, Fig. I; and Fig. IV, a similar section on the line *y y*, Fig. I.

The nature of my invention consists—

First, in the construction and arrangement of a vertical grate, in which its base or bearing portion is provided with scallops or serrations, through which atmospheric air freely passes to the fire. The walls of this grate are provided with tube-spaces, through which the water is forced, and in its passage takes up much of the surcharged heat, performing the double function of imparting to the water an additional heat and preserving the grate from extreme heat, thus preventing its disintegration.

Second, the combination and arrangement of the circulating and heating pipes, by which the water, after being primarily heated, is made to circulate through the body of the grate, thence through a coil surrounding the fire, and continuing through a gradually-enlarging pipe to an upper skeleton frame-work of heating-tubes, and thence downward through an enlarged coil of pipe to the steam-chamber.

Third, in the combination, with the steam and water circulating pipes, of the steam and sediment separating coil, located within the steam-space of the boiler, and arranged in such a manner that while the steam passes out through perforations in the lower half of the circumference of said pipe the solid matter passes through its open end, water drops onto the corrugated sheet, and mud or sediment passes to another pipe, arranged for the purpose, and by which it is carried off.

Fourth, it consists in the construction and arrangement of the sediment-collecting pipe, by which the sediment from the separating-coil is trapped. By perforating the same pipe at about the water-line the floating scumn d extraneous matter is collected and drawn off by and through said pipe, by which means the boiler is kept comparatively clean.

Fifth, in the combination and arrangement of the heat-contracting dampers, by which the heat is distributed and directed to where it may be most desired.

Sixth, in the combination, with the evaporating-coils of the generator, the vertical corrugated side walls of the fire-box, by which flues are formed for the flame to pass between the said coil and sides, and the horizontally-corrugated upper portion of the flame-chamber, by which expansion and contraction are provided for and additional heating or evaporating surface is presented, by which any water passing from the perforated pipes is instantly converted into steam, as will hereinafter more fully appear.

The invention further consists in details of construction, as hereinafter described, and pointed out in the claims.

In the drawings, A shows the main water-chamber and steam-chamber, formed between the outer shell and the inner corrugated shell. The top and bottom of these shells are preferably made of cast-iron.

The lower portion of the outer shell is provided with an annulus, on which an ordinary

grate, b', is supported. This annulus a is suspended by a cylindrical ring, b, joining it to another and upper annulus, c, on which the upper portion of the outer shell rests. A flange, d, projects upward from annulus c, which surrounds and keeps in place the said outer shell. The usual mud-ring c is provided for securing the parts together.

B shows the vertical cup-shaped grate, provided with four or more legs or bearings, f, resting upon the rim of the ordinary grate.

Scallops or fringes g project down from the sides of the vertical grate, forming between them serrations h, which serve the double purpose of supplying air to the fuel and for the insertion of a sluicing bar or poker, by which the burning fuel may be stirred up, the clinkers broken, &c.

Within the upper portion of the vertical grate B is located one or more coils of pipe, i, which at one end are connected with a circulating-pump, j, and at the other end with a coil of pipe, C, located within the fire-box and resting on said vertical grate, though the pipe in the grate may be connected directly with the water-space A of the boiler, by which circulation is maintained without the intervening coil C when the pump is at rest.

The end of the pipe forming the coil C is continued up, and gradually enlarging (see D,) to a point near the crown of the flame-chamber, where it is, in turn, connected with another pipe, E, which coils downward to near the middle of said flame-chamber and forms the frustum of a cone. The lower end of coil E connects with a pipe, F, which terminates in a coil of pipe, G. The lower half of the latter is perforated for the purpose of allowing the escape of steam, as before stated.

The furnace-wall T is made of fluted or corrugated iron, arranged vertically and extending to about midway of the flame-chamber. The upper portion of the flame-chamber is fluted or corrugated horizontally, and also forms the frustum of a cone corresponding with the coil E, extending down and secured to a casting, K. The upper end of the vertical corrugated portion of the furnace is also secured to the other end of said casting. Thus the inner wall of the furnace is formed.

An annular ring or annulus, S, projects inwardly from about the middle of its vertical side. This ring S forms the base of the frame-work, upon which rest the dampers R and Q, which regulate and direct the products of combustion.

In Fig. II the ring S forms the support of the frame-work composed of pipes W, and performs the same function as the skeleton frame-work shown by Fig. I.

This controlling and regulating damper is one of the essential features of my invention, and may be adapted to other forms of boilers and operated by any well-known means; but I prefer the form shown.

The hollow frame heat-regulator, as shown by Fig. II, is constructed of pipes forming the frustum of a cone, the base forming a circle, which is connected to straight pipes that form the sides of the frame. These straight pipes terminate at the top in a circular chamber, the diameter of which at the top is less than at the base. These straight pipes are arranged at nearly equal distances apart, to allow one-half of the openings between them to be closed to within a few inches of the top in such a manner as to leave the outside surface of the closing-pieces flush with the outside surface of the straight pipes, so as to allow a movable cone-shaped slotted damper that conforms to the form of the outside frame-work, moving freely around it and making a close joint. The openings in the movable cone correspond to the openings between the pipes which form the frame-work of the damper-regulator.

In operation the damper is moved around the frame-work by the lever M, shaft o, and crank N, which is connected to the damper and lever M. Of course the openings between the pipes extend from top to bottom, every other one being closed, the said closed spaces being shut from the bottom to within a few inches of the top. By this arrangement when the outer cone or damper is moved around to close the larger openings in the frame-work the small openings near the top remain open, allowing the gases from the furnace to pass freely up the flue, thus preventing the heat from the furnace from impinging on the steam-generating coils.

The solid heat-regulator frame R, as shown on Fig. I, has independent side and top openings, so arranged that when the side openings are closed the top openings are open, both being operated by the same mechanism.

The top damper, Q, turns on screw P, by which its friction is greatly reduced. By this arrangement the flame and gases are made to impinge directly on the surface of the generating-coils, or they may escape directly through the uptake or chimney V, as the operator may think desirable.

The office of the sediment and blow-off pipe has been heretofore described, only that at its lower end I locate a blow-off cock. This pipe need not be used except when sea-water is used in the boiler or the feed-water is very muddy. A blow-off cock may also be attached to the bottom of the main chamber A.

A water-gage and other well-known attachments may be applied to show the different levels of the water; also a catch-basin connected with the gage to discern the water-supply.

Operation: The boiler is fed through pipe U, filling the main water-chamber A to the water-level T. The pump is then put in operation, either by steam or hand power. The water is then pumped out of chamber A, forced through the hollow grate-rim, thence through pipe or coil C, thence through connecting-pipe D, down through coil E, and up through pipe F

into perforated coil G, and into steam-space of the boiler. The same function is performed by hollow pipe-frame W, Fig. II, only pipe D′ connects with the circular pipe, thence through the straight pipes into a small chamber, X, thence downward through coil E and off through pipe F to perforated coil G, as in the former case.

Thus it may be said that while the water is passing through the various pipes and coils, it being previously heated, it is completely converted into steam before its exit from the perforated pipe G; but should any water be emitted from pipe G it falls in drops or fine spray on the upper corrugated surface and is instantly flashed into steam; and by opening the large damper an additional force of flame and heat is made to impinge directly against the corrugated surface, by which quicker action and greater heat are imparted to the water and steam in the steam-space.

Independent of the coil and pipe apparatus the upper corrugated surface and the damper or heat regulating mechanism will form a rapid-generating surface, and may be so constructed and operated with good results. The same may be said of the coils and pipes independent of the heat-regulating device.

Should the upper sections of coils be used for a superheater the steam would be taken from the steam-space, passed down through the coil E and escape into the steam-space again, to mix with the saturated steam therein; or it may be conveyed directly to the engine or into a separate reservoir.

It is evident that many modifications and changes in the arrangement of parts may be made without departing from the principles of my invention, and I do not therefore desire to confine myself to the exact arrangement shown.

Having described my invention, I will now state that what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a steam-generator, of the inner and outer shells, the inner shell consisting of the vertical corrugated wall forming the fire-box, the upper horizontal corrugated wall forming the flame-chamber, said walls being united and secured together by the casting *k* in the manner shown and described.

2. In a steam-generator, the combination of the outer casing, the inner shell composed of the upper and lower corrugated sections, and the heat-distributing device R and its operating mechanism, all arranged in the manner and for the purpose shown and described.

3. In a steam-generator, the combination of the inner and outer shells or casings, the heat-regulating device having an upper and lower section, whereby the heat may be thrown against the tubes or escape through the upper openings to the uptake, and the steam and water coil E, all combined and arranged to operate as shown and described.

4. In a steam-generator, the combination of the outer and inner shells, constructed as described, the vertical cup-shaped grate-incasing water-coils, by which the extreme heat from the grate is imparted to the water in the coils, thereby preserving said grate from disintegration, substantially as shown and set forth.

5. In a steam-generator, the combination of the outer and inner shells, the heat-regulating mechanism, the circulating-coils C and E, and the connecting-pipe J, all arranged to operate as set forth and described.

6. The combination, in a water-circulating steam-generator, of the inner and outer shells, the hollow-rimmed grate B, coil C, the gradually-enlarging connecting-pipe D, the coil E, and perforated coil G, all arranged for joint operation in the manner and for the purpose set forth and described.

7. The combination of the hollow-rimmed grate B, incasing water-coil, the bearers or legs *f*, scallops *g*, and serrations *h* of the lower grate, and annulus *a*, all arranged to operate in the manner and for the purpose shown and described.

8. A steam-generator consisting of the inner and outer shells, the heat-regulating framework composed of water-circulating pipes and the inclosing damper-casing, in combination with the superheating-coils and their connecting-chamber X, in the manner and for the purpose set forth.

9. The combination, in a steam-generator, of the inner and outer shells, constructed as shown, the heating-coils C, tapering pipe D, and enlarged heating-coil E, perforated coil G, and circulating-pump *j*, all arranged for circulating the water through said coils, substantially as shown.

10. In a steam-generator, the combination of the outer and inner shells, the hollow-rimmed grate B, the lower grate, *b′*, resting on annulus *a*, the shells resting on annulus *c*, and the upright cylindrical frame supporting the whole structure, all arranged in the manner shown and set forth.

FRANCIS EDWIN HOSMER.

Witnesses:
WM. H. WARD,
ROLAND E. WOODWARD.