No. 669,280. Patented Mar. 5, 1901.

# J. W. JONES.

## STEAM GENERATOR.

(Application filed May 25, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

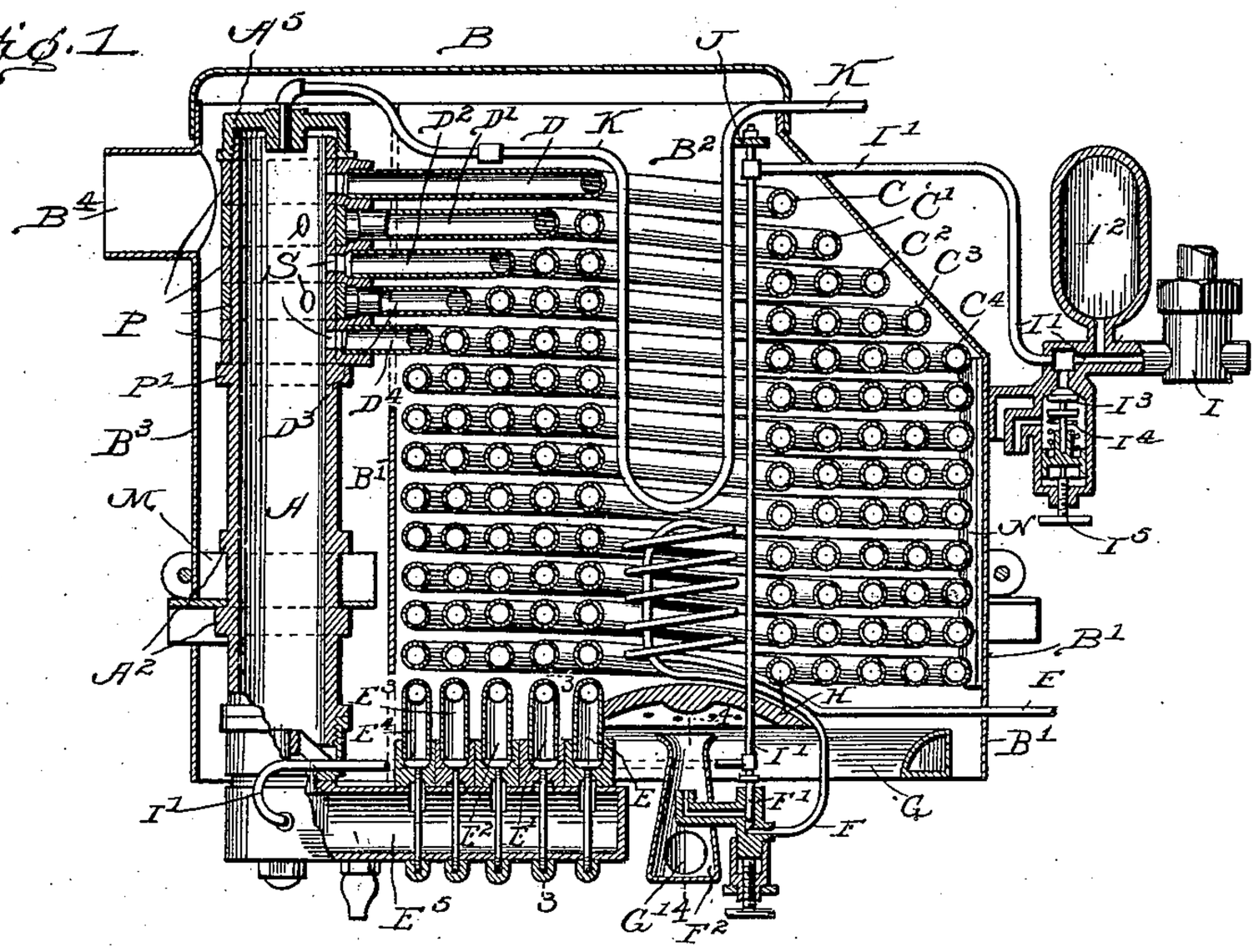



Fig. 2.

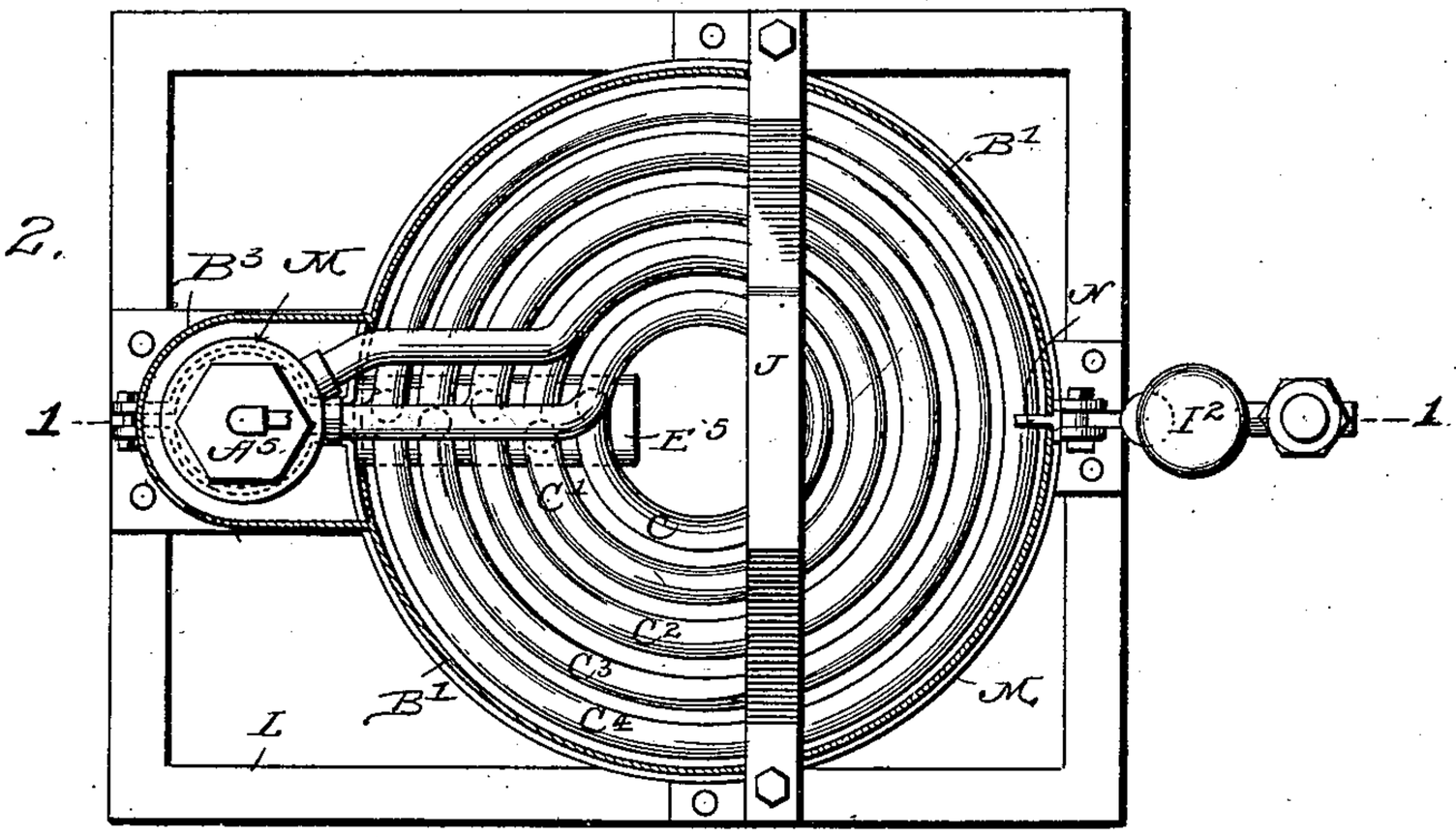
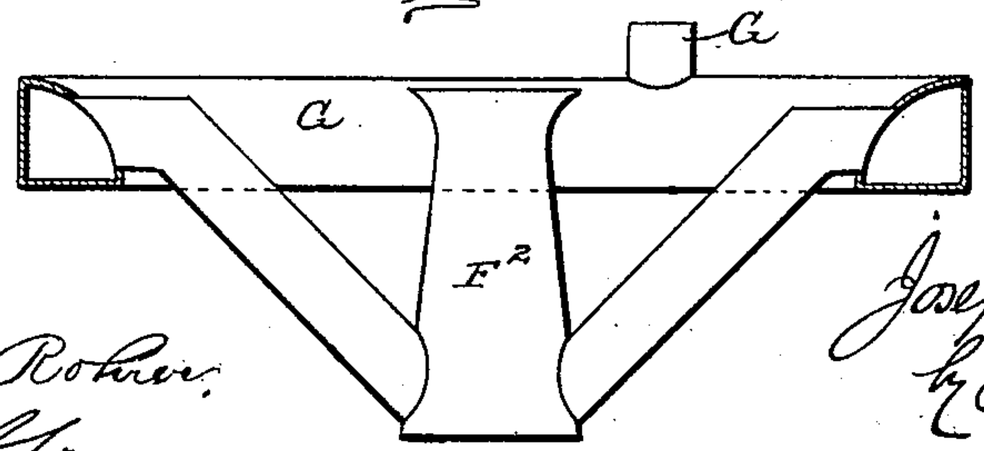



Fig. 4.

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## STEAM GENERATOR.

(Application filed May 25, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

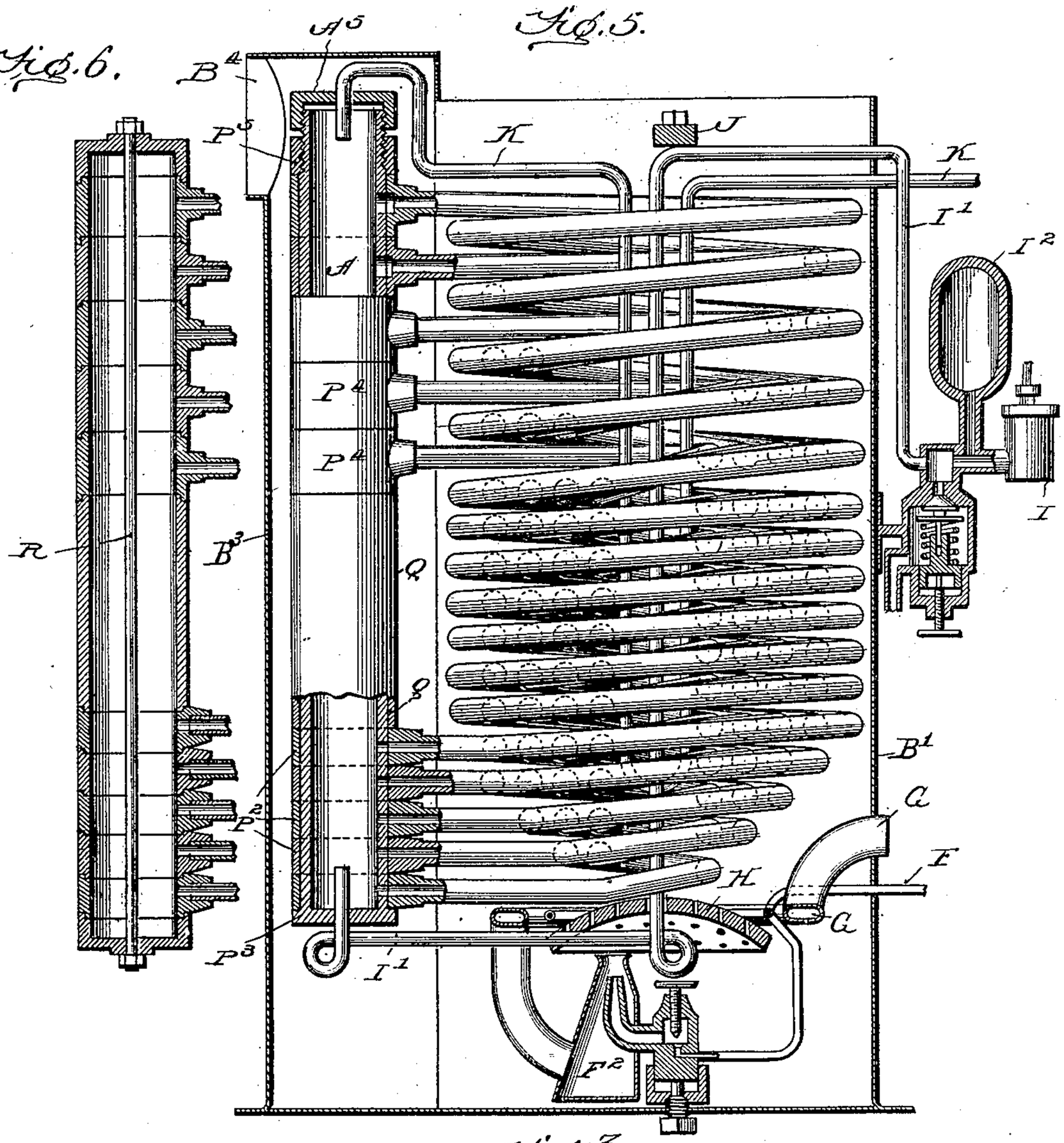
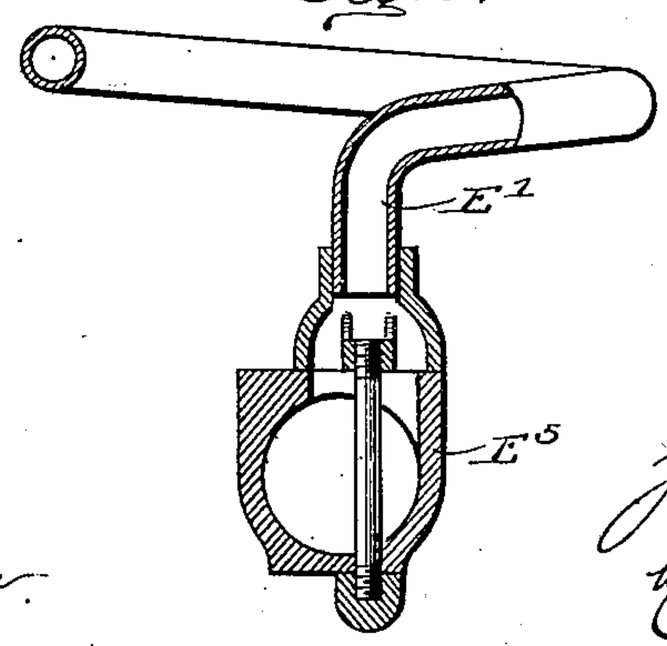



Fig. 5.

Fig. 3.

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# UNITED STATES PATENT OFFICE.

JOSEPH W. JONES, OF NEW YORK, N. Y.

## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 669,280, dated March 5, 1901.

Application filed May 25, 1900. Serial No. 17,933. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH W. JONES, a citizen of the United States, residing at New York, in the borough of Manhattan, State of New York, have invented a new and useful Steam-Generator, of which the following is a specification.

The general object of this invention is to provide a steam-generator capable of quickly producing a large amount of steam without heating in advance any considerable body of water. In seeking this general result the devices are made to occupy an unusually small space, a rapid and perfect circulation in the generator is provided for, and steam is superheated before delivery.

In the drawings, Figure 1 is a section on the line 1 1, Fig. 2. Fig. 2 is a plan view of the same apparatus, parts being omitted. Fig. 3 is a section on the line 3 3, Fig. 1. Fig. 4 is a section on the line 4 4, Fig. 1, showing only a certain air-supplying tube. Fig. 5 is a view similar to Fig. 1, showing the apparatus slightly modified. Fig. 6 shows a modified construction of a certain steam and water column seen in Figs. 1 and 5.

In general terms the apparatus consists of a large vertical pipe or steam and water column inclosed in a suitable jacket, a series of concentric helical coils of pipe inclosed in a jacket forming a heating-chamber alongside the column and each having its ends communicating with the upper and lower parts, respectively, of the column, and means whereby the steam taken from the upper part of the column is superheated before delivery.

In the various figures where the letters occur, A represents the steam and water column inclosed in a jacket B, and C C′ $C^2$ $C^3$ $C^4$ designate slightly-separated concentric helical coils of pipe, preferably parallel to the column and all having their upper ends D D′ $D^2$, &c., communicating with the upper part and their lower ends E E′ $E^2$, &c., communicating with the lower part of the same column. The connections at each end of each coil are detachable, and in the form shown in Fig. 1 a lateral extension drum or pipe $E^5$ of the column extends out beneath the coils, so that each being detachably connected to this drum may communicate with the column without projecting to the cylinder elements of the next coil. Thus when they are detached each coil may pass bodily upward and be wholly withdrawn from the apparatus without disturbing the coils without it. Below the coils, which all have their lower ends in approximately the same plane, is a burner supplied with fuel, preferably gaseous. In the apparatus chosen for illustration a pipe F brings liquid hydrocarbon from any suitable source of supply, passes around in the space just above the burner, so that the fuel may be volatilized by heat, and finally discharges the gas through a needle-valve F′ into a mixing-chamber $F^2$, where it is mixed with air brought through a pipe G, curved around in the heated zone below the plane of the burner and opening into the mixing-chamber at G′.

The mixed air and gas passing from this chamber strikes an upwardly-convex perforated distributing-plate H, where it is still further mixed and escapes upward through the perforations and is burned above the plate in direct contact with the entire surface of the lower turns of each coil, giving, as usual, a nearly colorless flame and intense heat. Water is supplied to the steam and water column by injecting devices, in this instance shown as a pump I, whose delivery-pipe I′ passes above the coils and descends vertically within all the coils to a point just above the needle-valve, where it turns abruptly and passes to the column A. The pipe I′ is provided with an air-chamber $I^2$ to insure steady flow, and also with a valve $I^3$, held closed by a spring $I^4$ with a force which may be varied by means of a screw $I^5$. The pump or other injecting device may act constantly, and when the resistance to the delivery of water in the column exceeds the limit fixed in adjusting the screw $I^5$ the valve opens and the water escapes, but only so long as this limit is exceeded, and flows back to the source from which it was drawn by the pump or elsewhere, as may desired. This feed-water in passing down within the coils is heated, yet not to a high degree, so long as a constant flow is maintained; but as soon as the flow ceases—that is, when the pressure opens the valve $I^3$—this vertical part of the pipe quickly heats, and of course expands; but such expansion is prevented from extending the pipe upward by means of a rigid stop J,

and hence the whole expansion acts to press down the needle-valve F′ and shut off the supply of fuel.

Now if the lower part of the column, and of course the lower part of each coil, contain water and if the burner be lighted steam is quickly generated and steam and water are discharged into the upper part of the column, which is protected from the direct heat of the fuel and which consequently is and remains at a somewhat lower temperature than the coils. There is thus a rapid circulation, and whatever the pressure the lower part of the cylinder will contain water, superheated, perhaps, but still liquid. The valve $I^3$ acts, however, as a safety-valve and indirectly shuts off the heat before the limit of safety is passed. Steam for use is taken from the upper part of the column through a pipe K, which passes down through the space within the inner pipe-coil and returns, thereby securing superheating of the steam by taking it through the intensely hot space directly above the burner. Some portion of this steam may control the action of the pump, or the latter may be put into operation by the attendant after steam begins to be delivered and then allowed to work without cessation until the generator is to be put out of action.

The jacket B consists of two parts, an upwardly-closed cylinder B′, inclosing the coils in a heating-chamber $B^2$, and a part $B^3$, inclosing the steam and water column, and the products of combustion escape through a flue $B^4$. The entire apparatus may be supported in any suitable manner; but as shown it is supported by a simple rectangular frame L, upon which rests a clamping-ring M, embracing the steam and water column between flanges $A^2$ and extending around the generating-coils and upon the side diametrically opposite the column, bearing a rack N, which aids in holding the coils, although the latter, being small and light, may be supported entirely by the column itself.

In Fig. 1 the column A is shown as formed with a flange P′, supporting superposed rings P, provided with perforations to register, respectively, with perforations S in the column and with the passages in the coil ends D D′, &c., which are screwed into nipples on the rings. The rings are held rigidly in place by a nut $A^5$, screwing upon the upper end of the column.

In Fig. 5 the lower ends of the coils as well as the upper ones communicate directly with the column, being provided with rings $P^2$, supported by a flange $P^3$. Upon these rings rests a sleeve Q, and upon the sleeves are superposed rings $P^4$, like those below, and both sets of rings and the sleeve are rigidly clamped by a nut $P^5$. The column may be built up as shown in Fig. 6.

It is evident that a great heating-surface is obtained within a very small space, that practically no joints are subjected to direct action of the fuel, that a very small body of water is heated at any one time, and that the action once fully started the control is purely automatic.

What I claim is—

1. In a steam-generator, the combination with an L-shaped steam and water column of a series of coils alongside the column, all having the same axis, and each having its ends communicating with the vertical and horizontal portions, respectively, of said column.

2. In a steam-generator, the combination with an L-shaped steam and water column, of a heating-chamber, a series of pipes coiled to form concentric helices within the chamber and each leading from the horizontal portion of the column and returning to its vertical portion, a heating device below said coils, means for supplying water to the column and means for discharging steam from the vertical portion of the column.

3. In a steam-generator, the combination with an L-shaped steam and water column and a series of concentric coils each leading from the horizontal to the vertical portion of the column, means for heating the coils, and a steam-pipe leading from the vertical portion of the column through the highly-heated space within the coils.

4. The combination with an L-shaped steam and water column of a series of concentric helical coils parallel to said column and each having its ends communicating with the vertical and horizontal portions of the column, respectively, heating devices for the coils, and means for shielding the column from the direct action of said devices.

5. The combination with a jacket, of an L-shaped steam and water column outside the jacket, a series of coils within the jacket each having its ends extended through the jacket and communicating with the vertical and horizontal portions of the column, respectively, and means for heating said coils.

6. The combination with an L-shaped steam and water column provided with a water-inlet below and a steam-outlet above, of a series of concentric helical coils each having its ends detachably connected with the vertical and horizontal portions of the column, respectively, means for heating said coils, and automatic devices governing the degree of such heating.

7. The combination with an L-shaped steam and water column of a series of concentric helical coils each having its ends detachably connected with the vertical and horizontal portions of said column, respectively, and each arranged for ready separation from the other concentric coils.

8. The combination with the steam and water column, of the concentric coils alongside the column and each having its ends detachably connected with the upper and lower portions, respectively, of the column, of the valved water-supply pipe leading through the axial space within the coils to said column, the steam-pipe leading through said axial

space from the column, and heating devices below said coils.

9. The combination with a vertical steam and water column, of the pipe projecting horizontally from one end thereof, the concentric coils alongside the column and each having one end detachably connected directly to the corresponding end of the column and the other end detachably connected to said pipe without passing to the cylinder elements of adjacent coils.

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Witnesses:
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