

Steam-Generator 2 Sheets Sheet 1

PATENTED JUL 25 1871

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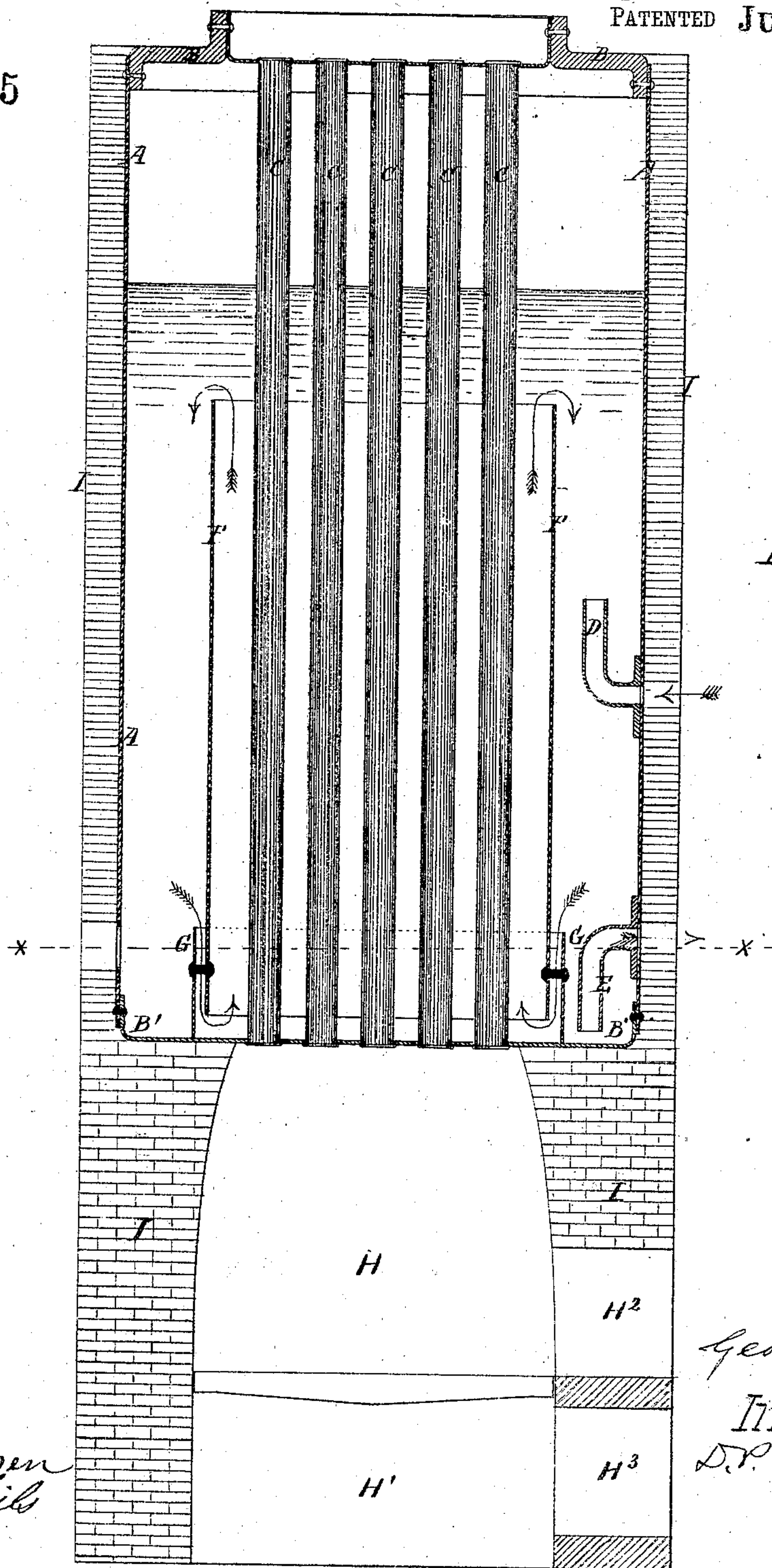


Fig. 1.

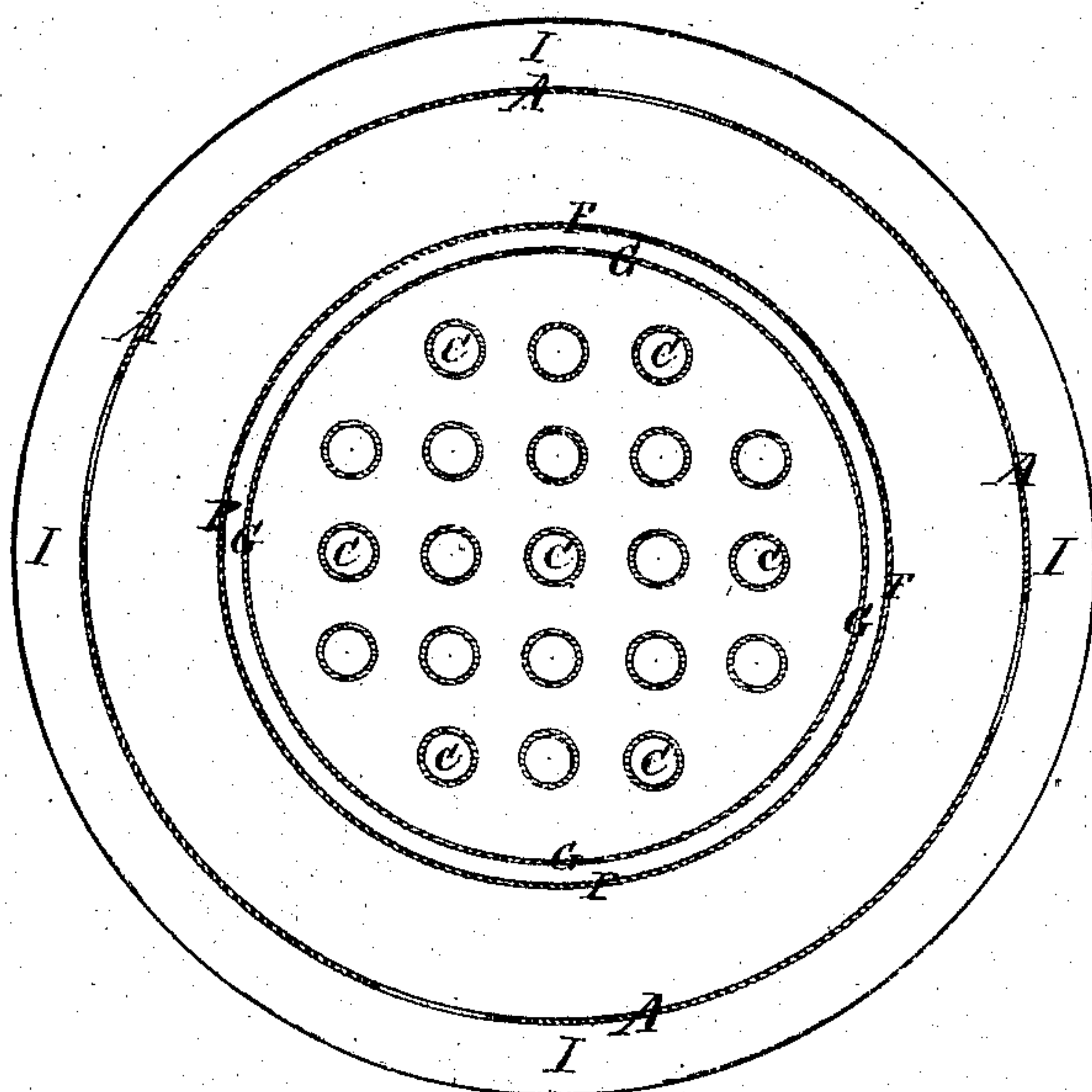
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Fig. 2



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UNITED STATES PATENT OFFICE.

GEORGE H. CORLISS, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. 117,385, dated July 25, 1871.

To all whom it may concern:

Be it known that I, GEORGE H. CORLISS, of Providence, in the county of Providence and State of Rhode Island, have invented certain Improvements in Steam-Generators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawing making part of this specification, in which—

Figure 1 is a vertical sectional elevation of my improved generator, showing the shell thereof, the tubes or flues through which the gaseous products of combustion pass, the circulating plates, the induction-pipe for water, the pipe for blowing it from the generator, and the manner of setting the same in the masonry which supports and surrounds it, together with the furnace and ash-pit. Fig. 2 is a transverse section on line *x x* of Fig. 1.

Corresponding letters refer to corresponding parts in both figures.

This invention relates to that type of devices known as vertical tubular steam-generators, its objects and results being fully explained in the following specification:

In generators of this character as heretofore constructed great difficulty has been experienced from the fact that the fire has been allowed to act directly upon the whole or nearly the whole of the lower tube-sheet, the effect of which has been to cause a deposit of earthy or mineral substance upon such sheet, the result of which has been to cause them to be burned out by the action of the fire, the heat from which has come directly in contact with their outer surfaces long before the other portions of the generator were so worn as to require renewing.

One of the objects of this invention is to provide a remedy for the above-recited difficulty by so constructing and arranging the generator that a portion of its lower tube-sheet shall be preserved at a temperature below that to which the other portion is subjected. Another object to be attained is to provide for such a distribution and circulation of the water that any earthy or mineral matter which it may contain or hold in suspension shall be caused to settle upon the cooler portion of the tube-sheet, the temperature of which portion it is intended to retain at so low a point that no injury will be done to the metal notwithstanding such deposition upon it.

To enable those skilled in the art to make and use my improved generator, I will proceed to more particularly describe it.

A in the drawing refers to the cylinder or shell of the generator, which may be of any required diameter, its length being such as best to economize the heat which passes through the tubes—say, from six to sixteen feet—it being provided with apertures in which to insert hand-hole plates near its lower end. B refers to the upper tube-sheet, which may be made of a single sheet of wrought-iron with a suitable flange turned upon it to enable it to receive the shell A; or it may be constructed, as shown in Fig. 1, of a ring of cast metal, to which the shell is riveted, and from which point it extends inward to a point near where the flues commence to occupy the space, where there is a flange formed which extends outward a distance sufficient to admit of there being a wrought tube-plate riveted to it, which plate is a continuation of the tube-sheet, it being perforated to receive the upper ends of the tubes, as shown in Fig. 1. This latter form of construction presents some advantages, inasmuch as it provides the means of securing the up-take upon the generator. B' refers to the lower tube-sheet, which is to be of wrought-iron, and of a diameter to correspond with that of the shell to which it is riveted. C C refer to the tubes or flues, which are arranged vertically within the generator by being secured in apertures formed in the heads thereof by being corked in the usual manner. D refers to a pipe which is secured to the interior or exterior surface of the generator at a point about midway between the lower tube-sheet and the water-line thereof, its inner end being made to point upward, so that the water which passes through it into the generator shall have an upward direction given to it as it enters the water-space. E refers to a pipe, which is also attached to the interior or exterior surface of the shell of the generator at a point some few inches above the lower tube-sheet, in order that when a cock or valve which may be connected with it is opened while there is a suitable pressure of steam within the generator any sediment which may have collected upon the tube-sheet shall be drawn off, its inner end being bent down to near said sheet for the purpose of facilitating the operation of removing such deposit. F refers to a cylinder

of sheet or other metal, which may be, say, one-fourth of an inch in thickness, its diameter being such as to leave between its interior surface and the outer circle of tubes a sufficient space for the upward current of water or such portion of it as shall pass up outside of such tubes. This cylinder does not extend to the bottom or top of the water-space of the generator, its lower end being held at a short distance from the lower tube-sheet by being attached to another and larger cylinder, soon to be described, its upper end being some distance below the water-line. G refers to a short cylinder, of sheet or other metal, the lower end of which rests upon the lower tube-sheet, its diameter being some three or four inches greater than that of the cylinder F, so as to leave a space between them for the water to circulate through. Upon bolts or rivets passed through this cylinder rests the cylinder F, said bolts or rivets being supplied with thimbles for the purpose of maintaining them at the proper distance from each other at all points. The arrangement of the two cylinders is such that the upward current of water, caused by the heat imparted to the center of the body thereof by the fire acting upon the exposed portion of the lower tube-sheet and that portion of the tubes which is below the upper end of the cylinder F, shall cause an upward current within the cylinder, which will induce a downward flow outside of such cylinder to and through the smaller space between the two cylinders. As the space last referred to is much smaller than that between the cylinder F and the shell of the generator, it follows that the downward current will be less rapid than the upward one, which will give time for the heavier portions of the earthy or mineral substance which are held in suspension in the water to settle upon the cooler portions of the tube-sheet, which are outside the outer cylinder G, while the lighter portions will be carried through the space between it and the inner cylinder and up again, and so on until nearly or quite all has been deposited upon such cooler

portion of the tube-sheet, so that very little if any will be deposited upon the central or hotter portion thereof. H refers to the furnace upon which the generator rests, it being constructed as shown in Fig. 1, or so that a portion of the lower surface of the tube-sheet only is exposed directly to the heat of the burning fuel, which portion is about equal to that occupied by the tubes in the generator, while the outer portion is protected from such heat by being projected over and beyond the aperture through which the heat passes from the furnace. This furnace may be round or of any other desired form, it being built with fire-brick in the usual manner, and supplied with an ash-pit, H¹, doors H² and H³, for the supply of fuel and the removal of ashes, and with any preferred kind of grate upon which to burn the fuel.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The within-described construction of the furnace for the purpose of protecting the outer portion of the tube-sheet from the heat thereof, substantially as set forth.
2. The combination of the cylinders F and G with the protected portion of the lower tube-sheet, the cylinder being so arranged as to deposit the earthy matter held in suspension in the water upon said protected portion, substantially in the manner shown and described.
3. The combination of a vertical steam-generator, having within it the cylinders F and G arranged as described, and a furnace constructed to protect the outer portion of the lower tube-sheet of such generator, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEO. H. CORLISS.

Witnesses:

R. MASON,
B. EDW. J. EILS.