

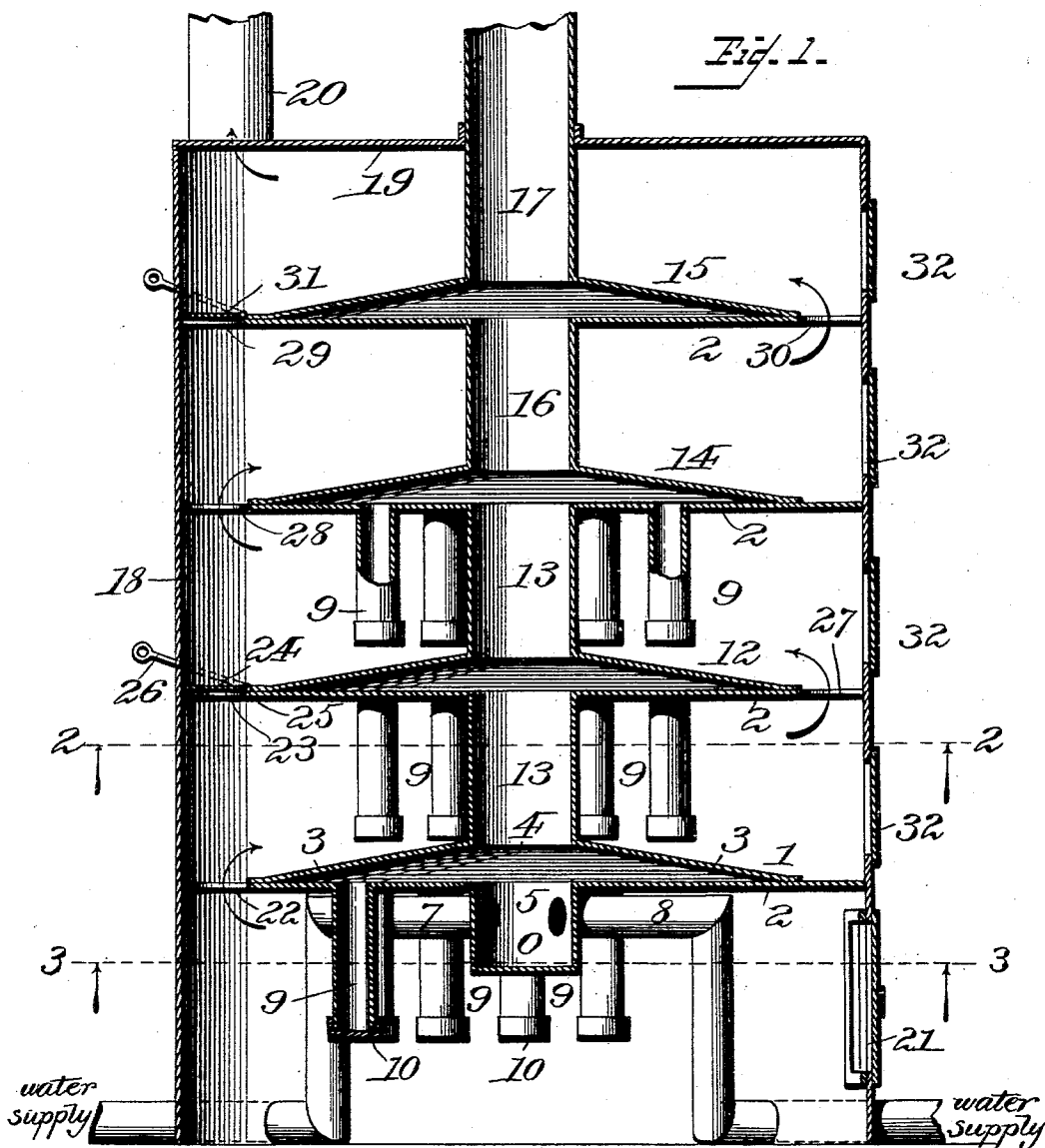
(No Model.)

2 Sheets—Sheet 1.

J. CUNNINGHAM.
STEAM GENERATOR.

No. 476,611.

Patented June 7, 1892.



Witnesses
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his Atty.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

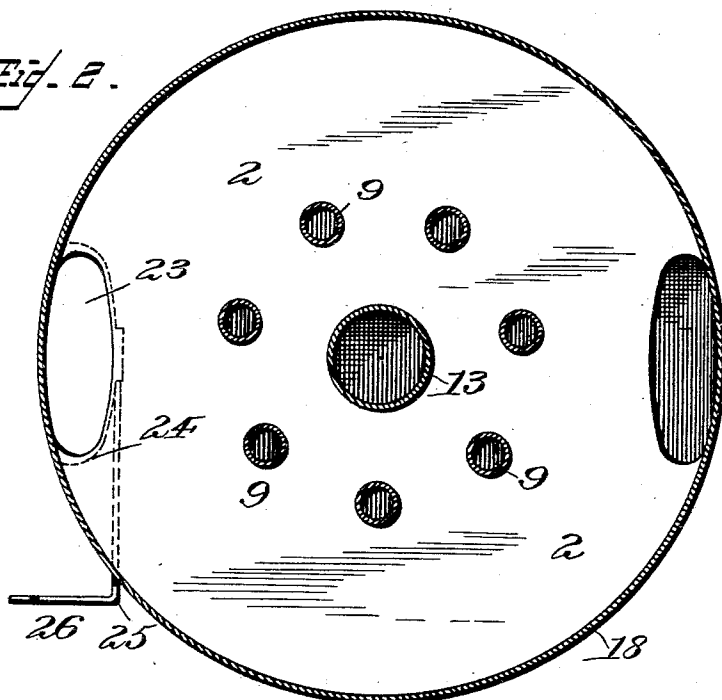
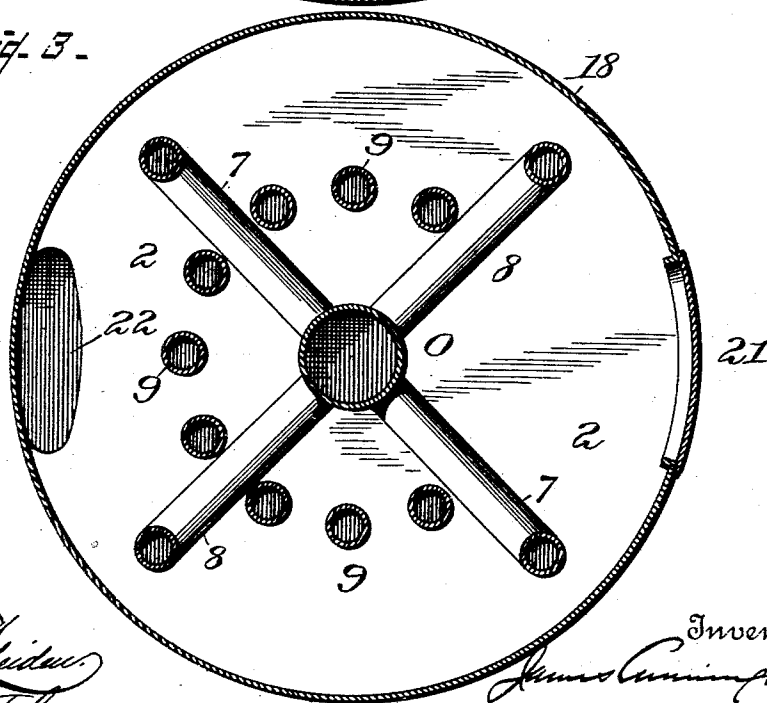


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES CUNNINGHAM, OF DUSHORE, PENNSYLVANIA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 476,611, dated June 7, 1892.

Application filed January 9, 1892. Serial No. 417,557. (No model.)

To all whom it may concern:

Be it known that I, JAMES CUNNINGHAM, a citizen of the United States, residing at Dushore, in the county of Sullivan and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Generators; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

It is the purpose of my invention to provide a steam-generator manufactured from cast or wrought iron or other suitable material and having a plurality of water domes or chambers suitably arranged within a fire-chamber and provided with a series of pendent extensions and connected by a common passage traversing the several water-domes, whereby the available fire-surface or heating-surface is materially increased, while a simple and advantageous construction is provided with a view to permitting the expansion and contraction of the parts without danger of racking the structure and loosening the joints, whereby leakage is produced.

It is my further purpose to combine with a structure of the class indicated, having a series of communicating domes, each having the form of a frustum of a cone of low altitude, a fire-jacket inclosing the whole and having such construction that the course of the heated gases of combustion may be controlled, so as to bring them into contact with the entire heating-surface of each dome and its extensions, or, on the other hand, be caused to substantially pass by any one or more of the same with but little heating effect.

It is my purpose, also, to simplify or improve the general construction of steam-generators; and to these ends my invention consists in the several novel features of construction and new combinations of parts hereinafter fully described, and then more particularly pointed out and defined in the claims which conclude this specification.

To enable others skilled in the art to make and use my said invention, I will proceed to describe the same in detail, reference being had

for such purpose to the accompanying drawings, in which—

Figure 1 is a central vertical section of a steam-generator in which my invention is embodied. Fig. 2 is a horizontal section taken on the line 2 2, Fig. 1. Fig. 3 is a similar section taken in the plane indicated by the line 3 3, Fig. 1.

In the said drawings the reference-numeral 1 indicates the lower water-dome, which may be formed of cast or sheet iron, as preferred. It consists of a flat bottom-piece 2, usually, though not necessarily, of circular form and having a diameter greater than that of the water-dome. From this bottom plate rises a top 3 of similar form to the bottom portion, with which it forms a comparatively small angle. This top plate is centrally arranged and at its center rises some inches above the bottom, terminating in an opening 4, concentric with both, and with a similar opening 5 in the bottom plate 2. The opening 5 communicates with a depending cylindrical chamber O of any suitable depth, closed at its lower end. The circular vertical wall of this chamber is entered at opposite points by pipes 7, of proper size, and between these opposite points I may, and preferably do, insert two similar pipes 8, arranged at right angles with the pipes 7. All four of these pipes extend radially from the pendent chamber O to points equally distant from the outer edge of the bottom plate 2 and somewhat within the same. At these points they are turned downward and extend to the bottom of the fire-chamber, or nearly so, and are then curved or turned at right angles and extend horizontally outward, their ends being in communication with any suitable source of supply whereby water may flow to the generator.

From the bottom plate 2 of the water-dome hang water-chambers or pendent extensions 9, usually having a depth greater than that of the water-chamber O. The lower ends of these pendent extensions are closed by caps 10, but at their upper ends they open through the bottom plate 2 and have communication with the interior of the dome.

The number of the pendent extensions may be varied; but I have shown nine, three thereof being arranged in each of the spaces between the water-supply pipes 7, one of said

spaces being left vacant, however, for reasons which will appear hereinafter. I prefer to arrange these pendent extensions at substantially equal intervals and at the same distance from the axial center of the dome 1, locating them between the circular wall of the water-chamber O and the outer edge of the bottom plate.

The reference-numeral 12 indicates the second dome in the ascending series, its construction being similar to that of the lower dome. Instead, however, of the water-chamber O, pendent from the bottom plate, it is connected with the lower dome 1 by a pipe 13, the diameter of which is about the same as that of the said water-chamber. This pipe is concentric with both domes and affords free communication between them.

The dome 12 is provided, like the dome 1, with a series of pendent extensions 9, the number of which, however, is less than the number used below. In the second dome, moreover, these pendent extensions are placed somewhat nearer the axial center of the structure, and they are arranged at regular intervals entirely around the central pipe 13. The number of these parts, however, as well as their relative position, is susceptible of variation, as preference or circumstances may dictate.

The third dome 14 in the ascending series is of the same construction as the second, and it has communication with the domes beneath it by means of a central pipe 13. It is provided with pendent extensions 9, substantially the same in construction and arrangement with those upon the second dome. In both the domes last referred to the pendent extensions are of such depth that their closed ends terminate a little above the inclined top plate of the adjacent dome beneath.

The fourth dome 15 does not differ in any essential particular from the third, with which it has communication by a central pipe 16. It may be provided with the pendent extensions 9, or these may be omitted, as preferred. From its top rises the pipe 17, which is practically a continuation of the pipes by which the four domes intercommunicate. This pipe is the avenue by which steam generated within the structure is conveyed to the point where it is used.

Surrounding the entire structure described is a fire-jacket 18, conforming in its outer shape to the circular form of the domes, its upper end rising above the fourth or upper dome to a suitable distance and its lower edge being usually on a level with the lower sides of the water-supply pipes, or thereabout. At the upper end the fire-chamber inclosed by the jacket is closed by a top or head 19, which closely surrounds the pipe 17, and upon one side and adjacent or near to the point where it unites with the vertical wall or jacket 18 is a smoke-flue 20.

The bottom plates 2 of the several domes

are connected in any suitable manner with the fire-jacket, in the lower end of which, upon the side adjacent to the vacant space between the water-supply pipes formed by the omission of the pendent extensions 9 of the lower dome, is a door 21, by which access may be had to the chamber. Upon the side diametrically opposite this door a draft-passage 22 is formed in the edge of the bottom plate 2 of the lower water-dome, by which the products of combustion may pass from the space beneath the lower dome to that intermediate the first and second domes. Directly above the draft-passage 22 a similar passage 23 is formed in the bottom plate of the second dome and has a damper 24 hinged upon the bottom plate and provided with an extended pintle 25, which passes through the fire-jacket and is formed or provided with a handle 26, by which it may be operated. Diametrically opposite the draft-passage 23 a second and similar passage 27 is formed in the same bottom plate. A draft-passage 28, is also provided in the bottom plate of the third dome, immediately over the passage 23, and in the corresponding parts of the fourth and last dome I provide two openings 29 and 30, the former being closed, if desired, by a damper 31, similar to the damper 24. The chimney stands over the opening 29, and when the damper is closed the heated gases are compelled to flow through the space below the upper dome and pass through the opening 30, thence traversing the space above the fourth dome and entering the chimney.

If desired, I may provide the bottom plates of the first and third domes with opposite draft-openings and dampers similar to the construction of the second and fourth domes. Manholes 32 may also be provided in the fire-jacket at suitable points to give access to the several spaces between the adjacent domes.

By the described construction and arrangement I provide heating-surfaces which in the aggregate afford a very extensive contact to the gases and products of combustion. I also am enabled to apply a portion of the heat to the entering water, and by properly manipulating the dampers 24 and 31 I can control the draft very perfectly. At the same time the to-and-fro passage of the heated gases in ascending to the chimney brings them into intimate contact with every part of each dome, as well as with the pendent extensions and the central pipe by which the domes have communication, thereby effecting a rapid generation of steam and a considerable economy of fuel.

What I claim is—

1. A steam-generator consisting of a plurality of water-domes, each having a rising top portion and a bottom plate extending beyond the outer edge of the top and apertured to close the space between the periphery of the dome and the fire-jacket and cause the heated air to pursue a circuitous course through the air-space, said domes being connected by cen-

tral vertical pipes giving intercommunication and the structure being inclosed by a fire-jacket, substantially as described.

2. In a steam-generator, the combination, 5
with a plurality of water-domes, each having substantially the form of a frustum of a cone of small altitude, of a fire-jacket inclosing said domes, which have communication by means of central connecting pipes, water-supply pipes entering said jacket beneath the 10
lower dome and communicating at their inner raised ends with a pendent water-chamber hanging from the bottom plate of the lower dome, and dampers closing draft-passages in 15
the edges of said bottom plates, whereby the heated gases are compelled to flow entirely through the intermediate spaces, substantially as described.

3. In a steam-generator, the combination, 20
with a plurality of water-domes, each composed of a rising top portion and a bottom plate extending beyond its point of union with the top, of a fire-jacket at the outer edges of said bottom plates, the latter being each provided with a draft-opening in or near one 25
edge, adapted to communicate with a similar opening in the diametrically-opposite edge or part of the next bottom plate, the alternate bottom plates being provided, also, with 30
dampered openings directly over the draft-passages in the bottom plate below, substantially as described.

4. In a steam-generator, the combination, 35
with a plurality of water-domes, each composed of a top portion rising toward a central pipe communicating with the dome above and a bottom plate having a series of pendent extensions, of a fire-jacket surrounding the structure and water-supply pipes entering the

fire-jacket at its lower end upon different 40
sides, said pipes rising within the fire-chamber and then approaching a central pendent water-chamber which communicates with the lower dome and is entered by said pipes, substantially as described.

5. In a steam-generator, the combination, 45
with a plurality of water-domes arranged one above another and having communication by means of central vertical pipes, of a fire-jacket to which the bottom plates of said 50
domes approach, said bottom plates having opposite draft-passages, with dampers closing the passages on one side in the alternate bottom plates, the pintles of the dampers being prolonged and passed through the fire-jacket, 55
substantially as described.

6. A steam-generator consisting of a plurality of water-domes arranged in an ascending series, the lower dome having a series of pendent extensions around a central pendent water-chamber, water-pipes entering a fire-jacket 60
inclosing the domes and communicating with the pendent water-chamber, and a chimney entering the top of the jacket on one side, the bottom plate of the lower dome and that 65
of the third being provided with draft-passages on the same side with the chimney, the other bottom plates having two opposite draft-passages in each, one of which is closed by a damper beneath the single opening in the plate 70
next above, substantially as described, and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES CUNNINGHAM.

Witnesses:

RUSL. J. THOMSON,
F. V. THOMSON.