

N. P. BRIGHTMAN.
Steam-Generators.

No. 138,607.

Patented May 6, 1873.

Fig. 1.

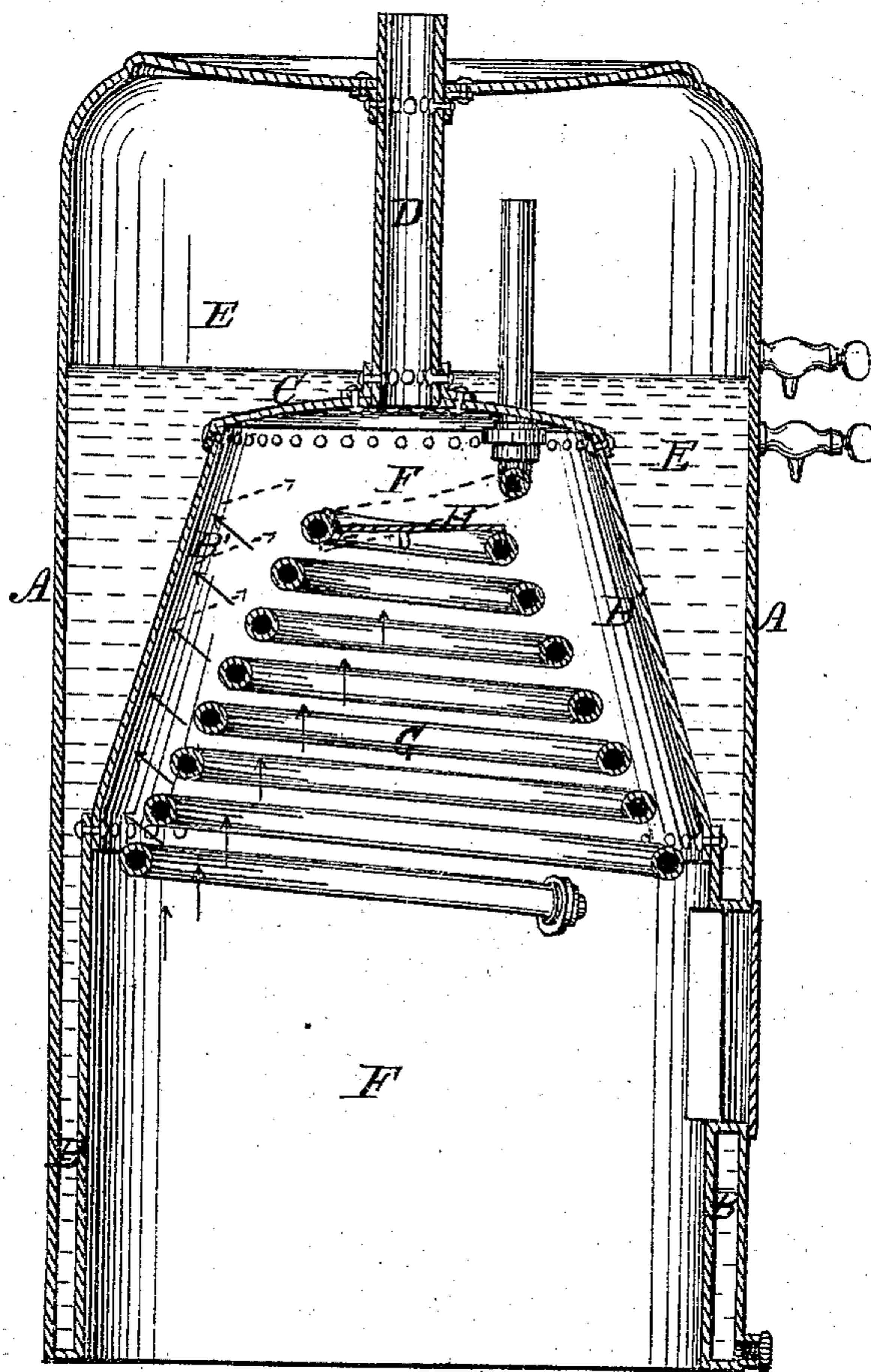


Fig. 2.



Witnesses:-
C. C. Poole
E. B. Davidson

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by his atty.
W. H. Rowe.

UNITED STATES PATENT OFFICE.

NATHAN P. BRIGHTMAN, OF NEW BEDFORD, MASSACHUSETTS.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **138,607**, dated May 6, 1873; application filed February 21, 1873.

To all whom it may concern:

Be it known that I, NATHAN P. BRIGHTMAN, of New Bedford, in the county of Bristol and State of Massachusetts, have invented an Improved Steam-Generator, of which the following is a specification:

The primary object of my invention is to provide a simple, cheap, and effective means for utilizing a greater amount of the heat generated in the furnace or combustion-chamber of a steam-boiler than has heretofore been done, by applying the heat to the apparatus in such manner that small portions only of the water in the generator is subjected to the action of the greatest amount of heat, and the water immediately converted into steam, thereby generating steam in less time and with greater economy; and, furthermore, by arranging the heating-surfaces in such manner that they will deflect the heat from one to the other, and thus keep up an active circulation of the heat to fully utilize and transmit it to the water of the boiler; and to these ends my improvement consists, first, in arranging a spiral conical coil of pipe within the furnace of a boiler, and connecting its lower end to the lower portion or water-leg of the boiler, and carrying its other extremity through the crown-sheet to a point above the water-line, or to the steam-dome of the boiler, in the manner and for the purpose hereinafter more fully set forth; second, in forming the walls of the fire-chamber that surrounds the conical coil into a frustum of a cone, the angle of its sides being more acute than the angle of the sides of the coil, so that the space between them will be enlarged proportionately to accommodate the increasing volume of the products of combustion that pass between the coils as they ascend, as hereinafter described; third, in combining the conical coil, arranged and applied to a boiler substantially as described, with a hood secured at or near its apex, that serves to deflect the heated current of gases, and thus prevent their direct exit through the smoke-stack, as hereinafter more fully described.

The accompanying drawing represents a vertical central transverse section through a boiler embracing my improvements sufficiently to illustrate the invention.

It will be readily seen that my improvements

relate particularly to vertical cylindrical boilers, the outer shell A of which is formed in the usual way. The lower portion B of the inner shell, from a point just above the furnace-door to the base or bed-plate—not shown in the drawing—is also cylindrical, and placed concentrically to the outer shell, and leaving an annular space of suitable width between them, which forms the water-leg of the boiler. The upper portion B' of the inner shell is formed of another plate of boiler-iron riveted to the lower plate, and made conical or like a frustum of a cone, the crown-plate C being riveted to its upper edge in a simple and effectual manner. The smoke-stack D is secured to the crown-plate at its center by an angle-iron ring, and passes through the center of the cap of the outer casing, thus forming a water-and-steam space, E, between the outer and inner casing, and a fire-chamber, F, communicating with the chimney within the inner casing in a well-known manner. A conical spiral coil of pipe, G, of suitable size and material, is connected at its lower end, by a screw-coupling, to the lower part or water-leg of the boiler; and is connected, in a similar manner, to a vertical tube that passes through the crown-plate and terminates in the upper part or steam-dome of the boiler. By this means the coil can be readily secured to or detached from the boiler when desired.

It will be seen, by reference to the drawing, that the taper of the coil is more or less acute than that of the conical part B' of the inner casing that surrounds it. The object of this mode of construction is to form a gradually-increasing space between the outer part of the coil and the surrounding case, in order that the heated currents, in passing through the interstices of each layer or coil of pipe, will not be obstructed or choked in their movements.

A hood, H, of peculiar form, is secured to the top of the coil in such manner as to obstruct the heated currents of the fire-chamber, and prevent their direct exit through the smoke-stack.

The deflector may be secured to the crown-plate by a bolt; but I prefer to make it in the peculiar shape shown in the detached figure of the drawing, and which permits it to be screwed in between the coils of the pipe, and readily attached or detached when desired.

The movements of the heated currents of the

products of combustion form an important function in the generation of steam with the above-described apparatus, and will require a short description: The coils of pipe being arranged, one above the other, in such manner that the outer surface of the pipe will slightly overlap the inner surface of the coil beneath it, so that the heated currents, which move in a vertical or nearly vertical direction, will not pass directly between the coils and against the inner casing of the boiler, but will first strike the bottom of the pipe, and be deflected to each side, a portion against the inner casing of the boiler, and another portion toward the center and apex of the coil, as each space between the layers of pipe conducts a certain quantity of gases to the annular space between the pipe and casing; and it will be readily seen that the gases will accumulate as each layer is added, and will require a gradual enlargement of said space to prevent the currents from being choked or retarded in their movements.

By this means the same heated currents are applied and deflected from surface to surface, and most effectually utilized. The currents deflected toward the center of the coil are concentrated at the apex of the same; and, by their increased volume and intensity, serve to heat the upper layers of the coil of pipes to a much greater degree than the lower layer, thus subjecting small quantities of water to the most intense heat, and converted almost instantly into steam; which is conveyed directly to the steam-dome or upper portion of the boiler instead of passing through the water of the boiler, and serving merely to impart to it latent heat, which would require the whole body of water to be heated to the boiling-point, or 212° , before steam is generated.

Water-gages, safety-valves, and other well-known appliances are attached to form the complete boiler, and need no description here, as they form no part of the subject-matter herein claimed.

I do not claim, broadly, the arrangement of a coil of pipe within a boiler-furnace, connected at one end to the water-leg, and at the other end to the steam-dome of the boiler, as this is well known.

I claim as my invention and desire to secure by Letters Patent—

1. The combination and arrangement of a conical spiral coil of pipe within the furnace of a steam-boiler, the lower end of the coil being connected to the lower part of boiler, and the upper end passing through the crown-sheet, and terminating in the steam-space of the boiler, substantially as and for purpose set forth.

2. The combination of said conical coil of pipe, in the manner described, with the furnace of a steam-boiler, the walls of which are coned with less taper than that of the coil of pipes, so that an annular expanding space is left between them, substantially as described, for the purpose specified.

3. The combination of the coil, arranged within the furnace of a steam-boiler, with the hood or deflector placed near the apex of the conical coil to deflect the heat and flames, and prevent their direct exit through the smoke-stack, substantially as described.

NATHAN P. BRIGHTMAN.

Witnesses:

C. C. POOLE,
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