

(No Model.)

2 Sheets—Sheet 1.

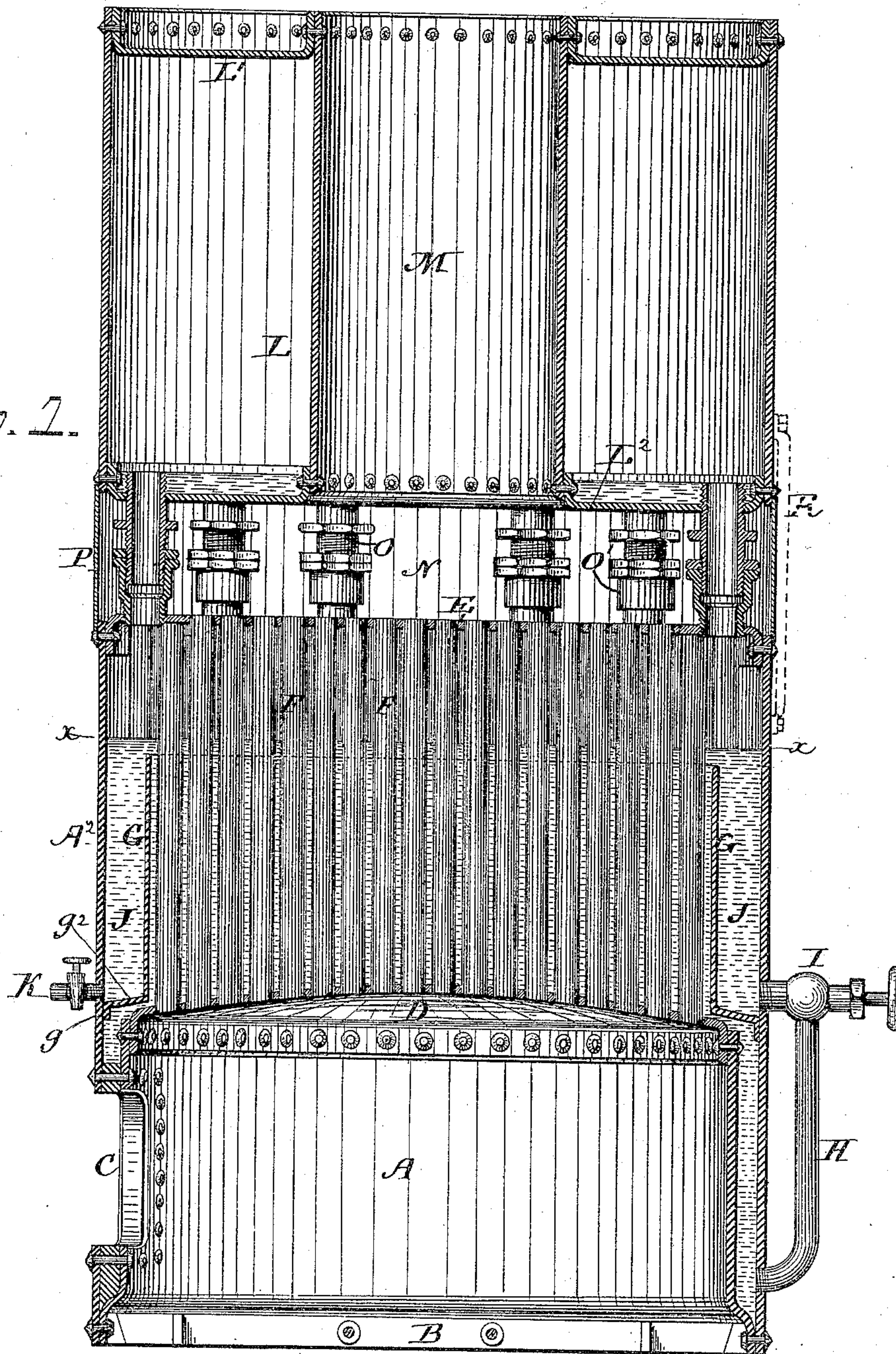
T. E. BUTTON.

STEAM BOILER.

No. 335,680.

Patented Feb. 9, 1886.

Fig. 1.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

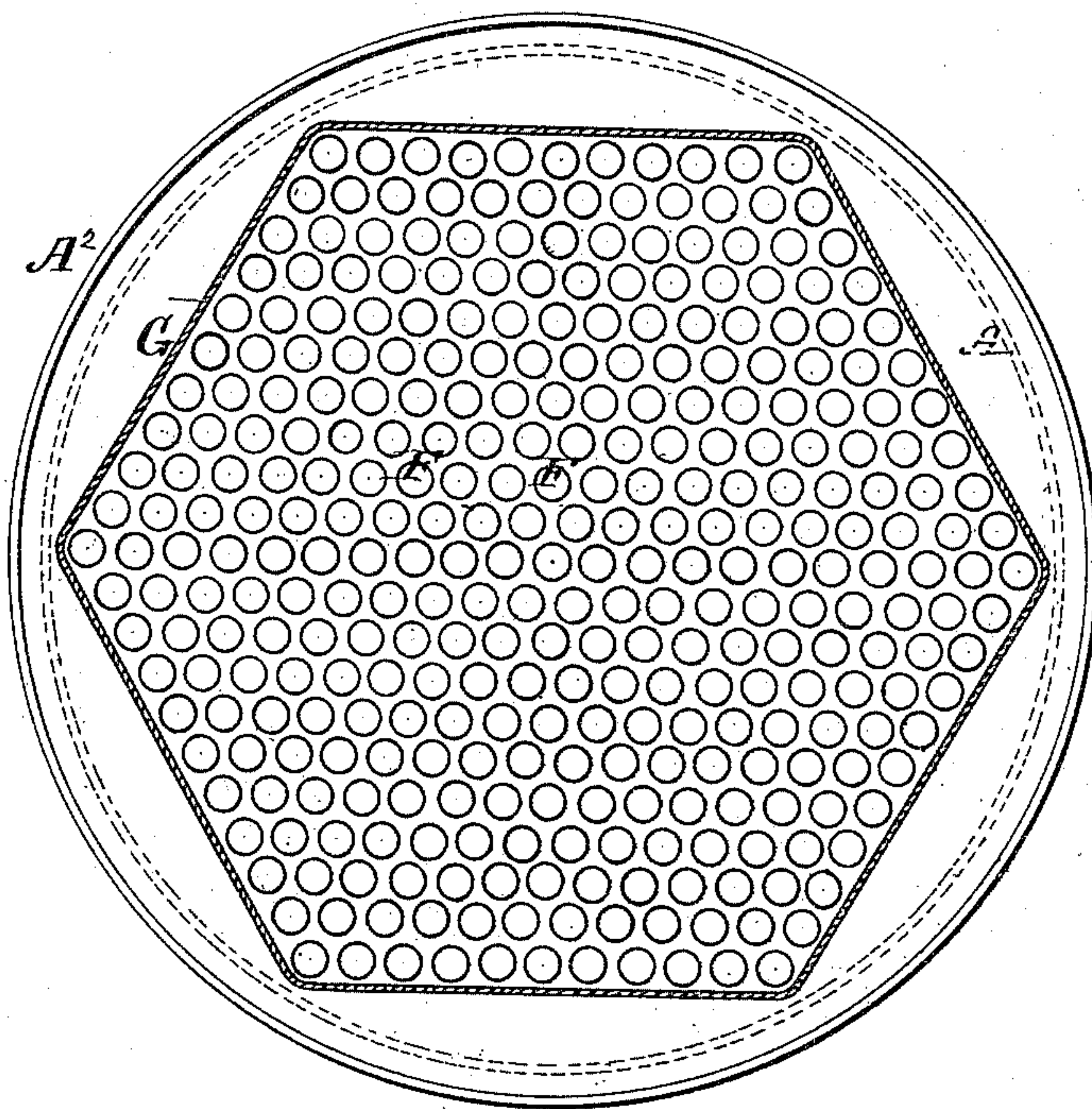
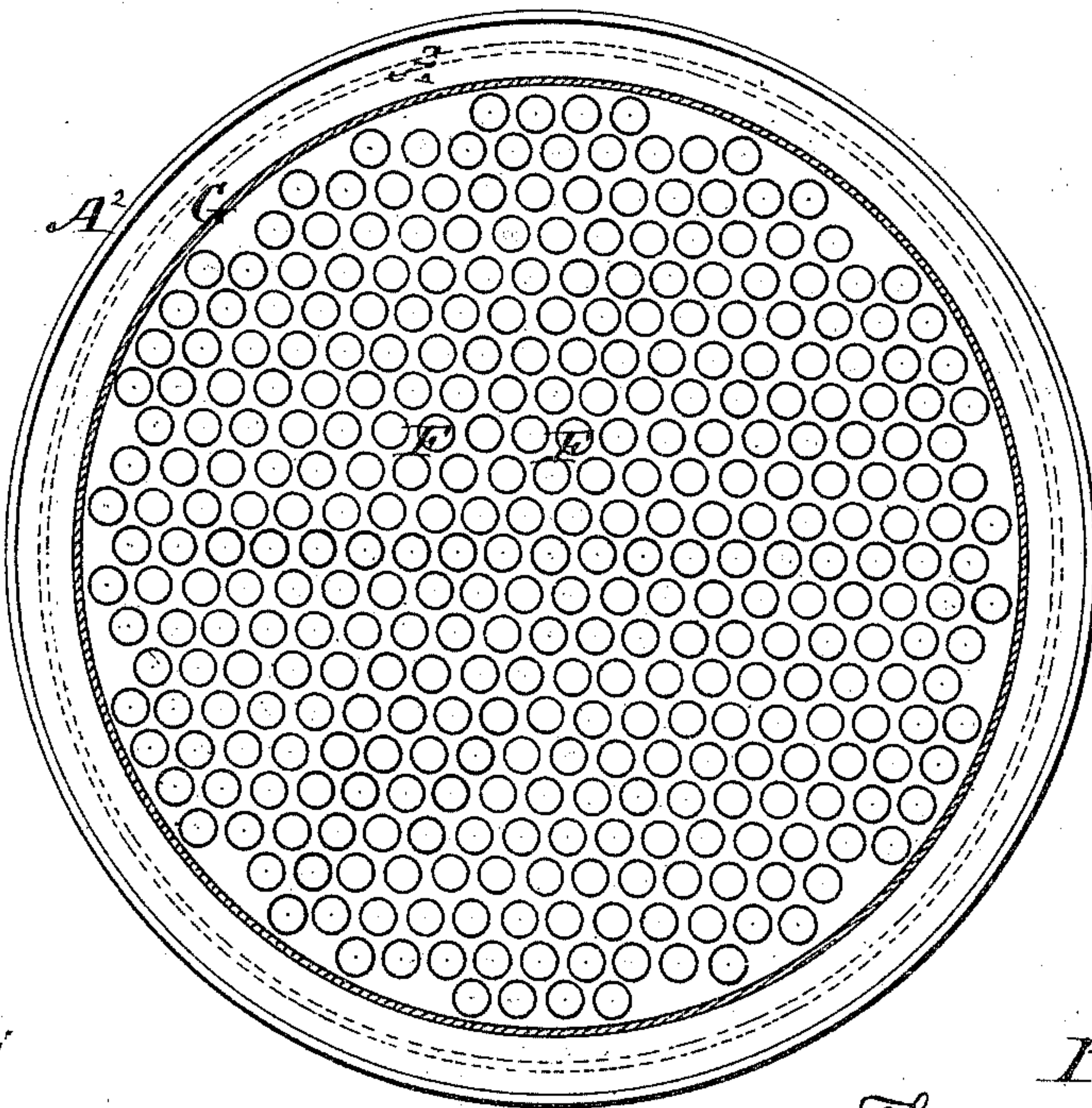


Fig. 3.



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UNITED STATES PATENT OFFICE.

THEODORE E. BUTTON, OF WATERFORD, NEW YORK.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 335,680, dated February 9, 1886.

Application filed September 27, 1884. Serial No. 144,138. (No model.)

To all whom it may concern:

Be it known that I, THEODORE E. BUTTON, a citizen of the United States, residing at Waterford, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Steam - Boilers, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in vertical steam-boilers, particularly suitable for steam fire-engines and other apparatus requiring prompt generation of steam; and the objects of my improvement are to provide means for connecting adjustably and at many points the steam-generator to the steam-receiver, to construct these connections so that water will be collected and remain upon the lower or crown-sheet of the steam-receiver, and to provide means within the boiler to reduce its water-holding capacity, and thereby increase the rapidity with which the water remaining in the boiler is transformed into steam. I attain these objects by the construction illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical central section of a boiler constructed in accordance with my invention. Fig. 2 represents a horizontal section of the same. Fig. 3 is a horizontal section of a similar boiler having the flues surrounded by a diaphragm of a cylindrical form.

The fire-box is represented at A. It is provided with a grate, B, at the bottom, and a furnace-door frame, C, in the side thereof. The lower flue-sheet, D, is made "crowning," or higher in the center than at the periphery, to facilitate the running of sediment while the water is under ebullition or the boiler is under transportation from the crown-sheet into the legs of boiler.

E represents the upper flue-sheet, and F are the flues through which the products of combustion pass upward. These flues are preferably made of copper, and are arranged as close together as possible.

The water-level maintained in the boiler while under operation is generally at the line $x x$, and covers about three-quarters of the length of the flues. To reduce the amount of

water within the boiler as much as possible at the time the fire is started, and thus have steam at a working-pressure within a very few minutes, as this feature is of great importance in steam fire-engines, and a minute of delay in forcing water on a fire may cause great damage, there is placed within the boiler what I call a "diaphragm," G. This diaphragm is either of prismatic or cylindrical or any form which will closely encompass the flues, and is secured to the inside of the shell A^2 of the boiler at g , just above the lower flue-sheet, D. It extends nearly horizontally at g^2 , or parallel to said flue-sheet D, toward the outer row of fire-flues, and then vertically close to said flues to a height of about three-fourths their length, or nearly level with the normal water-line $x x$ within the boiler. While said boiler is in full operation the said diaphragm G simply separates the highly-heated water in contact with the flues from the cooler water that is in contact with the shell of the boiler, and to facilitate the circulation of the latter back to the water-leg and the inner portion of the boiler, or among the flues F, the pipes H are provided. The pipes—any convenient number of them—have their lower end communicating with the lower portion of the water-leg, and their upper end with the lower portion of the space J, surrounding the diaphragm G. The upper portion of each pipe H is provided with a valve, I, to close all communication, when desired, between the space J and the water-leg surrounding the fire-box.

When the boiler is in full operation, the heated water between the flues F rises with the steam, and, passing over the top of the diaphragm G, descends through the pipes H into the bottom of the boiler, and up again among the flues, and thus a very rapid and thorough circulation takes place.

Although the pipes H are preferably on the outside of the boiler, they may be placed within, if desired.

Projecting from the surface of the shell opposite the bottom of the space J there is a valve, K, by means of which the water can be withdrawn from said space after closing the valves I, and yet keep the flues still surrounded by water. This is the condition in which the

boiler is left when it is desired to have steam generated very rapidly upon kindling a fire under it. No danger is experienced from this reduction of water within the boiler, but it is more liable to rapid variations in the height and temperature of water therein. After steam has been brought to working-pressure the valves I are opened, and the boiler is in its normal working condition.

Above the generator is placed the steam-receiver L, consisting of a cylinder having about the same diameter as the generator, with a head, L', at the upper end, and a plate, L², at the lower end, with a large single flue, M, between them and passing through their center. A space, N, is left between the generator and the receiver for the passage of the products of combustion from the flues F to the flue M, and a sheet of iron, or jacket, P, is fitted around said space N, to cause the products of combustion to take the flue M for an escape. The steam generator and receiver are connected by pipes arranged in a circle between the upper flue-sheet, E, and the lower plate of the steam-receiver. Each of these connections is formed of two lengths of pipe screwed together endwise with a long threaded joint. The upper length, O, of pipe is secured into the bottom plate, L², of the receiver, and its upper end projects within the latter a certain distance to retain a certain amount of water (carried with the steam) upon said plate, and thus prevent the burning thereof. The lower length, O', of the pipe has its lower end screwed into the sheet-plate E, while its upper end is screw-tapped to receive the screw-threaded lower end of the pipe O, and a lock-nut, O², is placed at the joint. The ends of the pipes O and O' have all the same number of threads cut to the inch as the lock-nut joint, and their relation to each other is as if the thread were continuous from the top of the pipe O to the bottom of the pipe O', so that whatever may be the location of the joint, whether screwed long or short, the relation of the end threads to each other remains the same. The holes in the heads E and L² are tapped in the same way, (as if the threads were continuous between them,) and the generator and receiver being held at the proper distance apart by braces R (one of which is shown by dotted lines) the pipes O O' are screwed together as short as the joints will allow and placed in position opposite the holes made to receive them, and when they are partially unscrewed from each other their outer ends enter said holes. Each end of the pipes is tapered, so that it can be screwed into the sheet until it is tight. Then the center joint is made tight with the lock-nut O².

If only one, two, or even three connecting-pipes were used, the above-described manner of providing them with equally spaced and arranged screw-threads may be immaterial; but when a larger number is used it is im-

portant that the screw-threads thereon should be cut as above described.

I am aware that boilers have been made in which the steam generator and receiver have been united by pipes immovably secured to them, and I do not claim this as my invention; but

What I claim is—

1. The combination of a steam-generator and a steam-receiver above the latter with pipes O and O', screw-threaded with threads of identical diameter at both ends and relatively continuous, and a lock-nut upon said pipes at the joint thereof, substantially as and for the purpose described.

2. A boiler consisting of a steam-generator having a series of screw-tapped holes in the top plate thereof and a steam-receiver having screw-tapped holes of the same diameter in the bottom plate thereof as in the top plate of the generator, with pipes O and O', having relatively the same continuous thread cut upon each end thereof and upon a lock-nut placed upon them at their joints, substantially as and for the purpose described.

3. The combination of an upright steam-generator having a crown-plate and a series of flues secured thereto, a steam-receiver of about the same diameter placed over it, and pipes secured to both and projecting within the receiver, with an intermediate smoke-chamber between the steam-generator and the steam-receiver, substantially as and for the purpose described.

4. The combination of an upright steam-generator having a crown-plate and a series of flues secured thereto, a steam-receiver of about the same diameter placed over it, and pipes secured to both and projecting within the receiver, with jacket P, resting upon the steam-generator and the receiver, and a smoke-chamber located between said steam-generator and the steam-receiver, substantially as and for the purpose described.

5. In combination with the shell of an upright tubular boiler and the flues thereof, the impermeable diaphragm G, surrounding said flues within the shell of the boiler and secured to the latter, whereby the water surrounding said diaphragm is, when desired, kept from communicating with the water within said diaphragm, substantially as and for the purpose described.

6. In combination with the shell of an upright tubular boiler and the series of vertical fire-flues thereof, the impermeable diaphragm G, surrounding said flues, and valve K, communicating with the space between said diaphragm and shell, substantially as and for the purpose described.

7. In combination with the shell of an upright boiler and the series of vertical fire-flues thereof, the diaphragm G, surrounding said flues, and pipe H, communicating with the space between said diaphragm and shell at one end and with the water-leg at the

other, substantially as and for the purpose described.

8. In combination with the shell of an upright boiler and the series of vertical fire-
5 flues thereof, the diaphragm G, surrounding said flues, the pipe H, and valve I thereon, substantially as and for the purpose described.

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

THEODORE E. BUTTON.

Witnesses:

WM. HOLROYD,
NELSON BATT.