(No Model.)

J. B. JOHNSTON & C. B. LITTLE.

STEAM OR HOT WATER BOILER.

No. 604,886. Patented May 31, 1898.

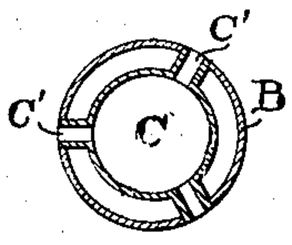

FIG. 2.

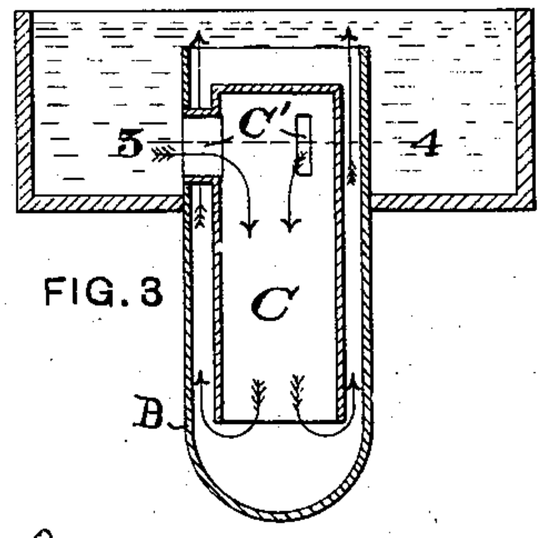

FIG. 3

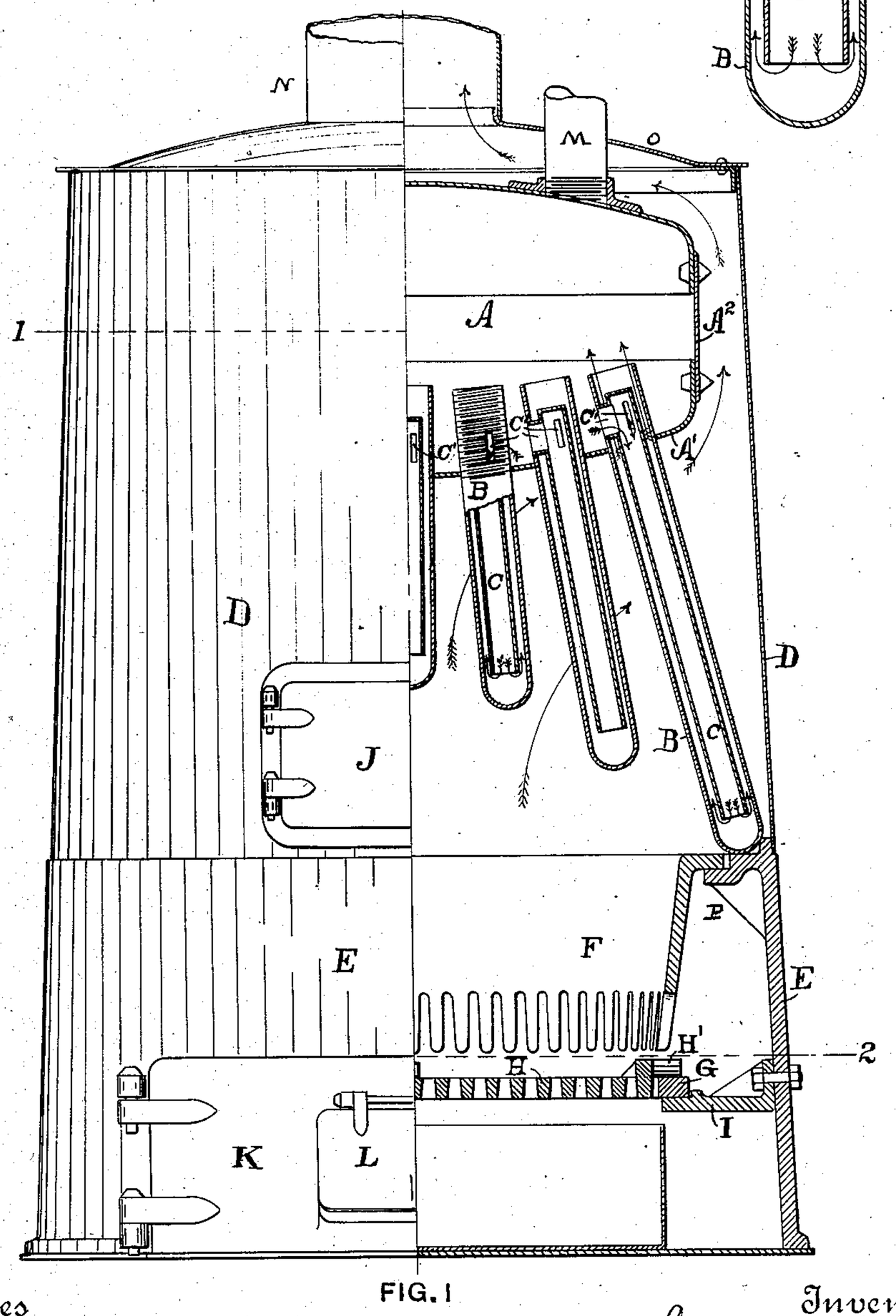

FIG. 1

Witnesses
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UNITED STATES PATENT OFFICE.

JAMES B. JOHNSTON AND CLARENCE B. LITTLE, OF DAYTON, OHIO.

STEAM OR HOT-WATER BOILER.

SPECIFICATION forming part of Letters Patent No. 604,886, dated May 31, 1898.

Application filed March 1, 1897. Serial No. 625,503. (No model.)

To all whom it may concern:

Be it known that we, JAMES B. JOHNSTON and CLARENCE B. LITTLE, citizens of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Steam or Hot-Water Boilers; and we do hereby declare that the following is a full, clear, and exact description of the invention, which 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 of reference marked thereon, which form a part of this specification.

This invention relates to improvements in steam and hot-water boilers, the several features of which will be hereinafter fullv described and claimed.

The object of the invention is to so construct and organize the outer heating-tubes and the inner circulating-tubes that a greater area of space is provided for the circulation and ascension of the hot water and that the least possible obstruction may be offered to the circulation and ascension thereof. This is accomplished by making the passages in the inner tubes through which the cold water descends narrow and deep, so that a suitable area is obtained without encroaching upon the space desired for the circulation and discharge of the hot water. This feature will be more particularly described hereinafter.

A further object of the invention is to so construct the parts that the boiler will be entirely supported by a portion of the hot-water tubes, thereby simplifying the construction and lessening the parts necessary to the mounting of the boiler.

Referring to the accompanying drawings for a part of this application, Figure 1 is an elevation of the boiler, with the right half in vertical section. Fig. 2 is a horizontal section of the heating and circulating tubes on lines 3 4 of Fig. 3. Fig. 3 is an enlarged vertical section of the upper end of one of the heating and circulating tubes.

Similar letters of reference indicate corresponding parts.

The inclosing case comprises a circular cast-iron base E, slightly inclining, the body portion D, of wrought-iron, having the same inclination, and the dome-plate O, with orifice and flange for the smoke-pipe N. The base E has a projecting rim P to support the fire-pot F and the boiler through a portion of the radiating tubes hereinafter described. Slightly below the center are attached brackets I to sustain a circular grate-frame G, which is notched on its inner surface. The door K is hung in this part to close a corresponding opening through which to remove the ashes. Within this door is suspended on hinges the supplementary door L to regulate the flow of air into the fire-pot. The grate H is provided with pivots H′, rounded on their under sides, on which it is freely suspended and on which it is rotated to effect the discharge. The upper or wrought-iron portion of the case is provided with a door J, through which to convey the fuel to the fire-pot. The boiler proper comprises a circular dome consisting of a rounded flange-plate A, the cylindrical plate A^2, and a bottom plate A′ identical in form with the top plate, and a series of heating-tubes attached radially to the bottom plate A′. To the top plate is attached a steam-pipe M, which conveys the contents to the heaters. The outer or heating tubes B are threaded at their upper ends and are screwed into the bottom plate A′ and extend into the interior slightly beneath the proper water-line. The circulating-tube C is held concentrically within the heating-tube B and has its extreme upper end closed, and connections are made between said tubes whereby side passages C′ are provided which extend through the side of the heating-tubes and provide free passages for the cold water into the inner or circulating tube C. The passages are shown in Fig. 2, and also the passages for the hot water, which are shown to have a much greater area. When heat is applied to the boiler, the water exposed to the inner surface of the heating-tubes expands and causes an upward current, and simultaneously the colder water flows in through the side passages to the inner tube and down the same, thereby producing a continuous circulation within the heating-tubes.

It is well known that the colder water lies nearest the bottom. Therefore it is essential that the passages C′ occupy positions as near the bottom of the boiler as possible in order

that the colder water will at all times enter the circulating-tubes. The ascending current of hot water in the outer tubes flows unobstructed, except at the points where the passages C′ are provided; but the obstruction at these points is reduced to a minimum by constructing said passages very narrow but with a sufficient vertical depth to give the proper area of opening for the colder water. The said passages, in other words, have a greater depth than width. As is shown in Fig. 2 of the drawings, a greater area of space is provided for the circulation and ascension of the hot water. This is essential owing to the well-known fact that cold water is more dense, therefore occupies less space than the same quantity or volume of hot water, the latter being under expansion and mixed with steam. In consideration of these facts a high degree of efficiency is only obtainable by making the combined area of the passages for the colder water much less than outlets between said passages for the hot water. Three or more of the external or heating tubes B rest on the flange P of the cast-iron base E, as shown in Fig. 1, and form the sole support for the boiler. Therefore in addition to their regular functions some of these tubes have a double function to perform.

We are aware that various constructions have been employed for securing separate channels for the passage of colder water and the circulation of hot water; but we are not aware that passages for the colder water have ever been constructed with a view to offering the least possible obstruction to the ascending current of hot water and to permit only of the desired proportionate quantity of the colder water entering the inner tube. Therefore

What we claim is—

In a steam and hot-water boiler, the combination with a slightly-inclining and circular base E having an inwardly-projecting rim P, and a circular boiler having its top and bottom plates rounded, of a plurality of heating-tubes A radially mounted in said bottom plate and a portion of which rests upon the rim P and forms the sole support for said boiler, a plurality of circulating-tubes C held concentrically within said tubes A, the said tubes C having their upper ends closed and provided with a series of side passages C′ through which the colder water passes from the boiler into said tubes, the said passages C′ being essentially deep and narrow so that a substantially less area of space is provided for the passage of the descending colder water than is provided for the ascending hot water, substantially as shown and described.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

JAMES B. JOHNSTON.
CLARENCE B. LITTLE.

Witnesses:
B. PICKERING,
E. J. FINKE.