

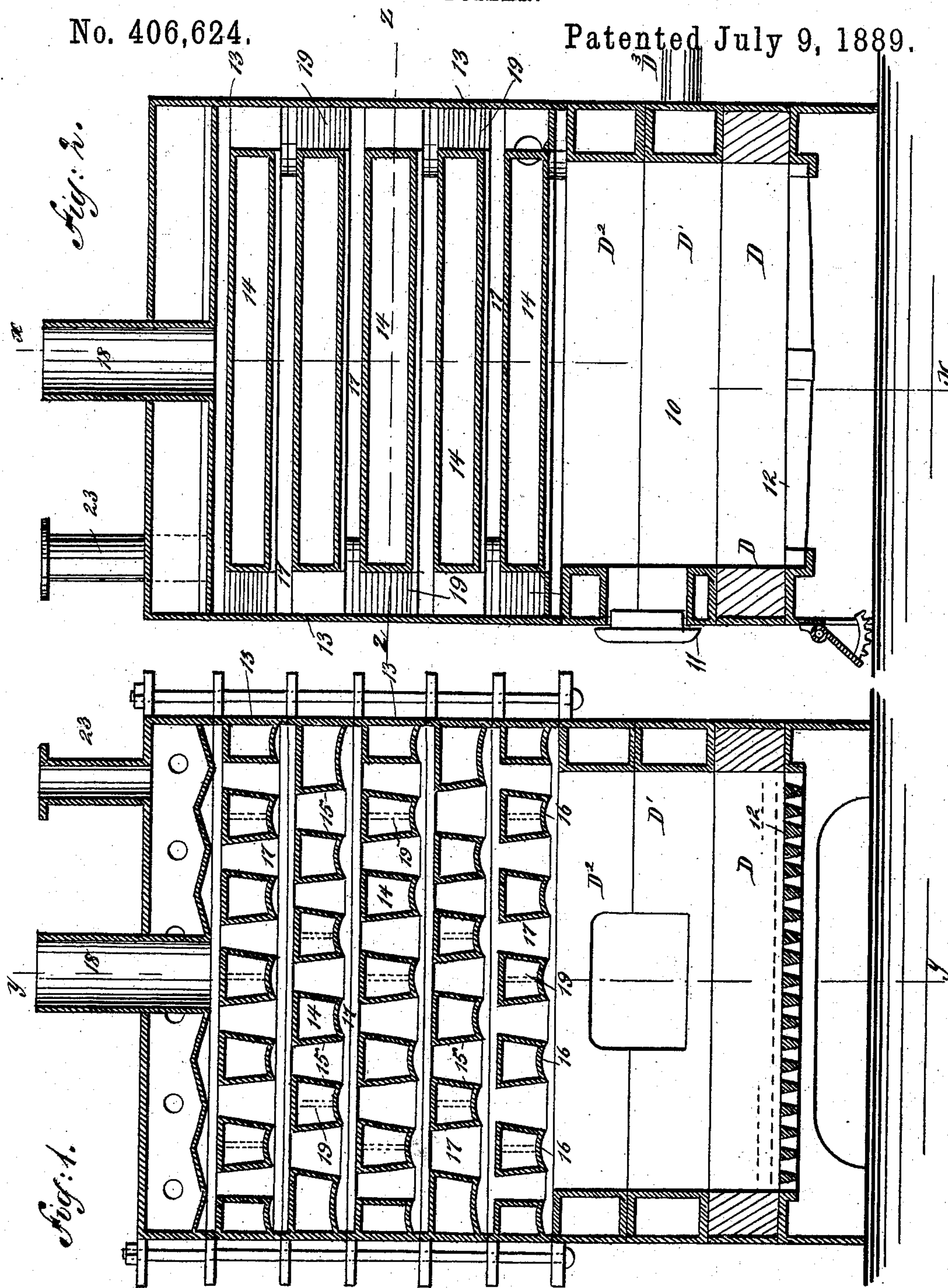
(No Model.)

2 Sheets—Sheet 1.

W. H. BYRAM & J. REDMAN.
BOILER.

No. 406,624.

Patented July 9, 1889.



WITNESSES:

Chas. N. V. A.
C. Sedgwick

INVENTOR

W. H. Byram
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ATTORNEY

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Fig. 4.

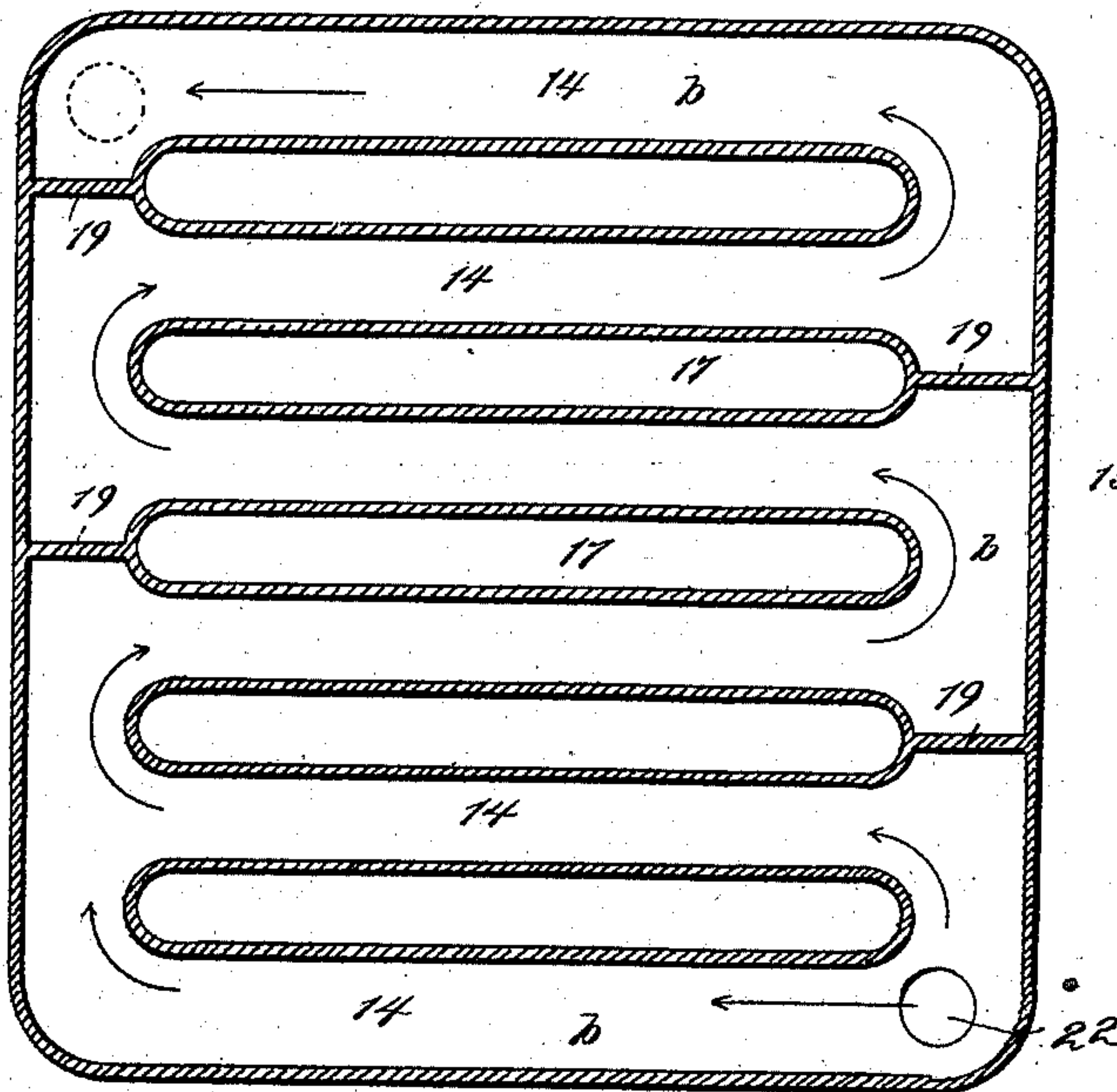
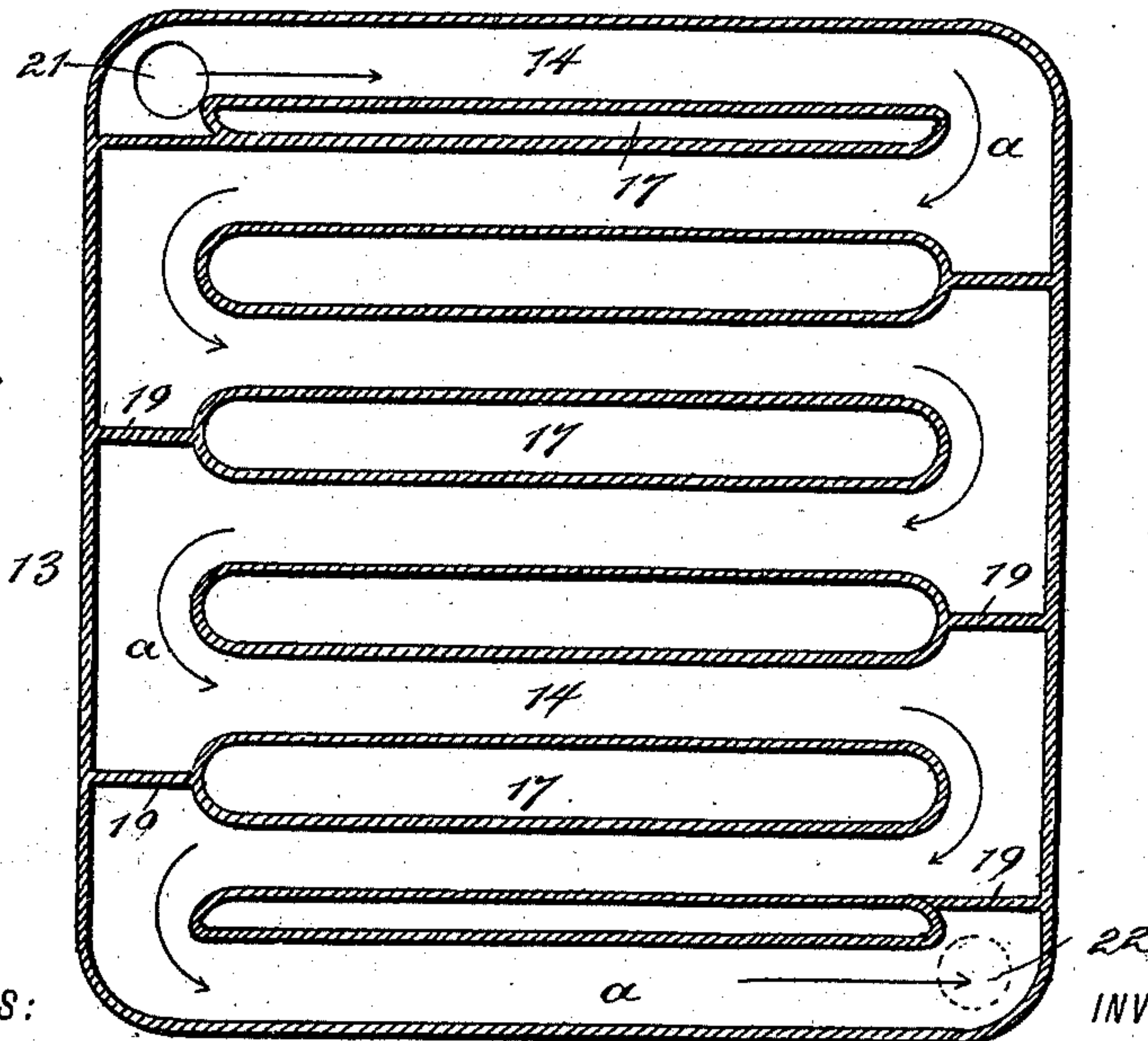


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM H. BYRAM AND JOHN REDMAN, OF FISHKILL LANDING, NEW YORK.

BOILER.

SPECIFICATION forming part of Letters Patent No. 406,624, dated July 9, 1889.

Application filed March 14, 1889. Serial No. 303,238. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. BYRAM and JOHN REDMAN, of Fishkill Landing, in the county of Dutchess and State of New York, have invented a new and Improved Boiler for Heating Buildings, of which the following is a full, clear, and exact description.

Our invention relates to boilers for heating buildings, and has for its object to so improve the construction of the boiler for which Letters Patent were granted to William H. Byram, No. 344,609, and dated September 2, 1884, that a more effective circulation will be obtained, and likewise an increase of heating-surface for the tubes.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter more fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the views.

Figure 1 is a vertical section through a boiler constructed in accordance with our improvement, taken on line xx of Fig. 2. Fig. 2 is a similar section on line yy of Fig. 1. Fig. 3 is a horizontal section on line zz of Fig. 2; and Fig. 4 is a similar section through the next upper tube-section, illustrating the course of the water.

The construction of the boiler is mainly the same as shown in the patent above referred to, consisting of a lower or fire-box section 10, provided with fire-doors 11 and a grate 12. This section, as also the several horizontal tube-sections 13, mounted thereon, is made of metal, and is preferably square or parallelogrammatic in general contour. The tube-sections are held one upon the other and upon the fire-box section in any approved manner, but preferably so that a flush finish will be imparted to the sides of the completed boiler. The lower or fire-box section of the boiler is preferably constructed in three sub-sections. The bottom sub-section is purposed to contain the fire-brick D , the other two sub-sections

being tubular, as shown at D' and D^2 in Figs. 1 and 2.

The water enters through pipes D^3 , preferably projected into the lower tubular base-section at opposite sides, and the water, after circulating in the sub-section D' , passes up at the back into the next upper sub-base section and from thence at one corner to the lower tube-section 13.

The sections 13 have each cast in or with them a series of parallel horizontal water ducts or tubes 14, of hollow bar-like construction, the sides 15 of which are made to taper downward and inward, the bottom being concaved, as best illustrated at 16 in Fig. 1. By reason of this concavity in the bottom of the tubes or ducts the fire-contacting surface is increased to a great extent, and consequently a maximum of heating-surface is presented to the water. This feature constitutes one of the improvements over the Byram boiler heretofore referred to. The tubes or ducts 14 are so located in the sections that when the said sections are built up the tubes will be arranged staggering in vertical relation to each other, whereby the ducts or tubes of either one section will be over the flue or fire-spaces 17 between the ducts or tubes of the sections immediately above or below it, thereby establishing a series of tortuous vertical courses between and under and over the ducts or tubes for the heating gaseous products of combustion from the fire-box to the offtake flue 18. The water ducts or tubes are preferably of such depth only as to provide for the free passage of the heated gases over and under as well as between them.

In the Byram boiler the water is permitted to circulate uninterruptedly through the ducts or tubes of the several sections from the point of inlet to the outlet-point. This uninterrupted circulation we seek to avoid, and our second improved feature is to provide a means whereby the water will be retained a greater length of time in the ducts or tubes than heretofore without interfering with the perfect circulation of the water from the bottom to the top of the boiler. This we accomplish by introducing vertical partitions

19 in the opposite return of each alternate duct or tube—for instance, as illustrated in Figs. 3 and 4—or in the opposite returns of every two, three, and four tubes of each tube-section, whereby the circulation will be substantially as follows:

The preferred arrangement of the partitions is such that the partitions in the lower tube-section are placed in the opposite return of each alternate duct or tube, and in the next tube-section above, at the inlet end, the first partition is placed opposite the inlet in the return of the second tube, as shown in Fig. 4.

Let Fig. 3 represent the lower section of the tube-sections and Fig. 4 the section next above. The water entering the tubes through the inlet-pipe 20 passes up into one of the vertical end tubes 21, Fig. 3, each section being connected by one such tube. From thence the water, being deflected by the several partitions 19, is made to follow a circuitous course, (indicated by the arrows *a*,) until, finding an outlet through a second vertical tube 22, (shown in dotted lines in Fig. 3, and located in the inner corner of the lower section diagonally opposite to the inlet-tube 21,) the heated water passes up through the pipe 22, (illustrated in positive lines in Fig. 4,) whereupon the partitions of the upper sections compel the water to pass to the diagonal opposite corner to the next section above in a circuitous course, the flow of the water in the upper section being opposite to that in the lower section, as indicated by the arrows *b*. Thus the water is held in the ducts or tubes of each section as long as possible consistent with the proper circulation until it passes from the boiler through the upper off-take tube 23.

We desire it to be understood that, if in

practice it is found desirable, each horizontal tube-section may be divided into sub-sections without departing from the spirit of the invention.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. The combination, with a series of sections containing parallel horizontal tubes and vertical tubes connecting the horizontal tubes of said sections, of alternately-arranged partitions rigidly secured in the returns of said horizontal tubes, substantially as shown and described, whereby a circuitous course is imparted to the water, as set forth.

2. The combination, with a series of sections containing horizontal, parallel, hollow, bar-like water-tubes having a concaved under surface, and vertical tubes connecting the horizontal water-tubes of said sections, of vertical alternately-arranged partitions located in the returns of the said horizontal tubes, substantially as shown and described.

3. In a boiler, the combination, with a series of independent sections arranged above the fire-box, one above the other, horizontal tubes carried by said sections having tapering sides and a concaved bottom surface, and vertical tubes connecting the outer tubes of each section at opposite diagonal corners, of vertical partitions alternately arranged in the opposite returns of the horizontal tubes of each of the said sections, all combined for operation substantially as shown and described, and for the purpose specified.

WILLIAM H. BYRAM.
JOHN REDMAN.

Witnesses:

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