

(No Model.)

3 Sheets—Sheet 1.

F. PROX.
STEAM BOILER.

No. 521,812.

Patented June 26, 1894.

Fig. 3.

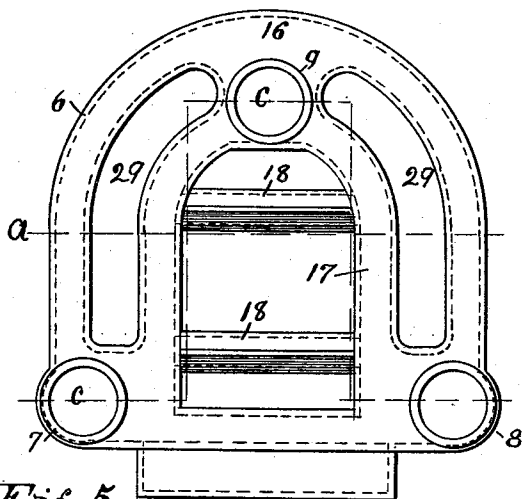


Fig. 4.

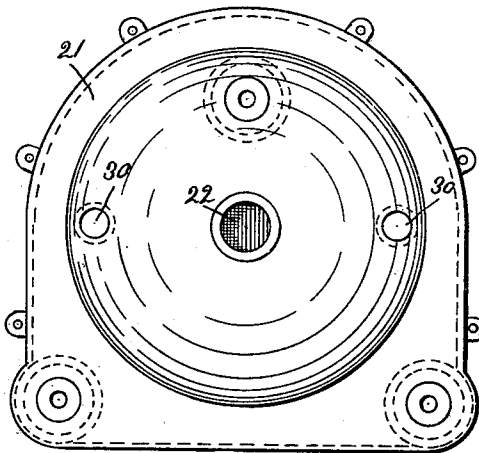
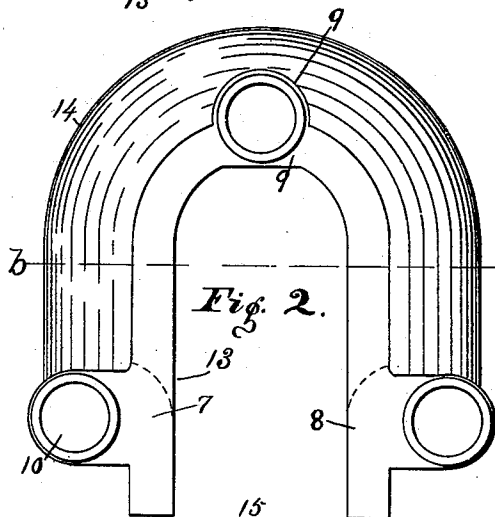
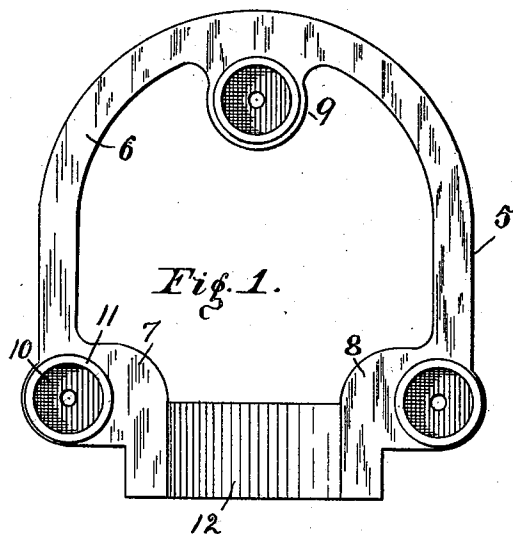
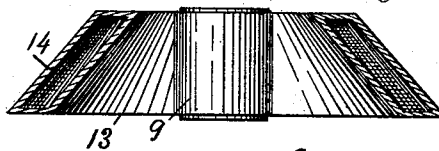


Fig. 5.



Fig. 6.



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(No Model.)

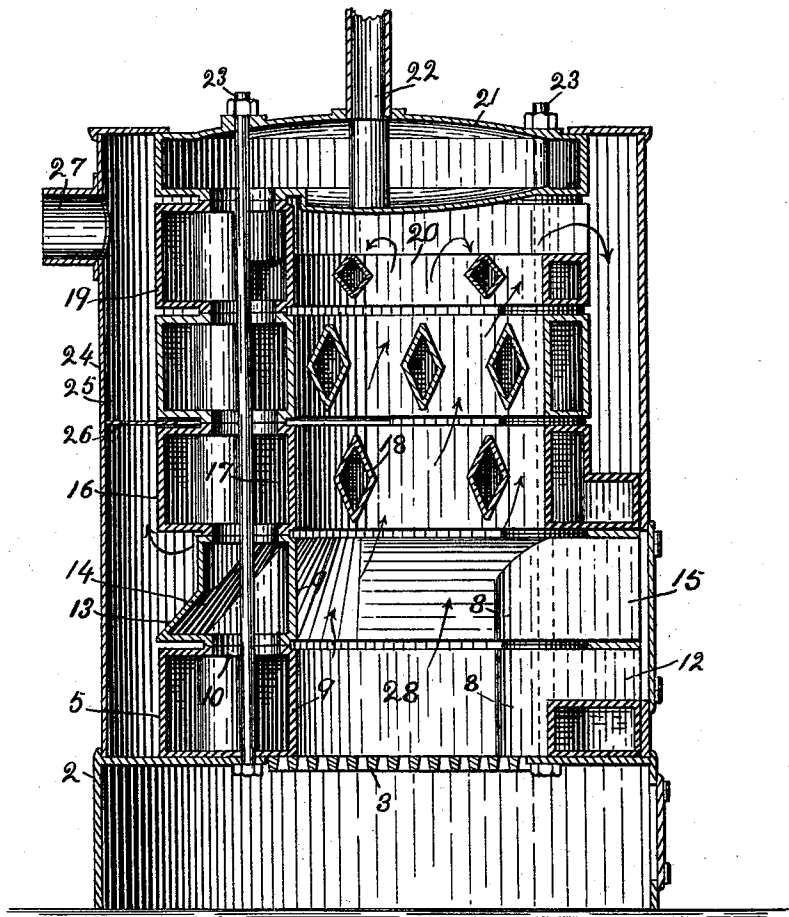
3 Sheets—Sheet 2

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Fig. 7.



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Fig. 9.

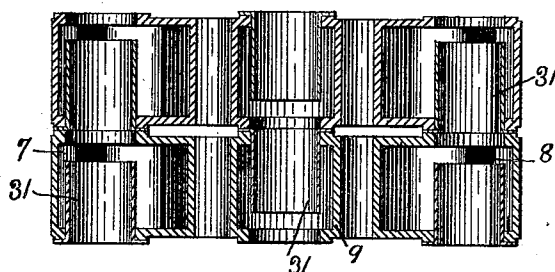
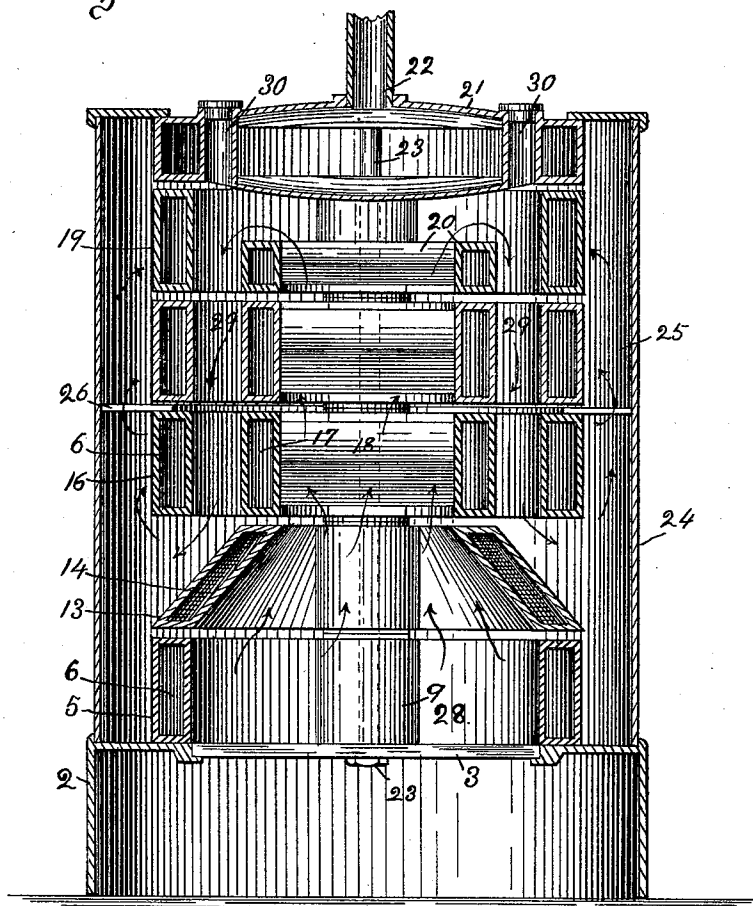


Fig. 8.



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UNITED STATES PATENT OFFICE.

FRANK PROX, OF TERRE HAUTE, INDIANA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 521,812, dated June 26, 1894.

Application filed March 23, 1894. Serial No. 504,776. (No model.)

To all whom it may concern:

Be it known that I, FRANK PROX, a citizen of the United States, residing at Terre Haute, in the county of Vigo and State of Indiana, have invented a new and useful Improvement in Steam-Boilers, of which the following is a specification.

My invention relates to that class of steam boilers which are built of a series of sections, and are designed more particularly for furnishing steam at low pressure, or hot water, for heating purposes.

The object of my improvement is, to form a boiler from a series of similar communicating hollow plates, so constructed and arranged as to present a large amount of heating surface, and produce an extended circulation of the products of combustion, all as hereinafter fully set forth.

The accompanying drawings illustrate my invention.

Figures 1, 2, 3, and 4, represent plans of the several sections composing the boiler. Fig. 5 represents a section at *a-a*—Fig. 3. Fig. 6 represents a section at *b-b*—Fig. 2. Fig. 7 represents a central vertical section of the complete boiler, on a plan extending from front to rear. Fig. 8 represents a vertical section taken at right angles to the plane of the section shown in Fig. 7, at the line *a-a*—Fig. 3. Fig. 9 represents a vertical section of a modified form of the boiler, two plates being shown, and the section being taken at the line *c-c*—Fig. 3.

In the drawings, 2, indicates a hollow base, semi-circular on one side, and straight on its other sides, and carrying in its upper surface a series of grate-bars, 3, said base forming a support for the boiler plates, and an ash-pit for the furnace.

The lowermost plate, 5, (Fig. 1) of the boiler, consists of a hollow casting forming an annular chamber, 6, of the same general outline as the base, but smaller in diameter, and having vertical walls, said annular chamber forming a passage communicating with chambers 7, and 8, formed in the angles of the straight sides of the plate, and a third chamber, 9, formed midway of the semi-circular portion of the casting. Chambers 7, 8, and 9 are closed on their under sides but are each provided on their upper sides with an opening,

10, which is surrounded by a slightly raised annular portion, 11, adapted to be finished to a true surface, and to receive the packing, or luting, between this and the next plate. An opening, 12, is formed in one of the straight sides of the casting, and extending about one half of its depth, to form a portion of the door-way leading to the furnace. Plate 5, is mounted on the base so as to include and surround the surface covered by the grate-bars 3. The second plate, 13, consists of a hollow annular casting corresponding in outline to the first plate, and having the three chambers, 7, 8, and 9, similarly arranged, and provided in both their upper and under surfaces with openings which register with the openings 10 of the lower plate. Said chambers are connected by an annular passage, 14, having vertically inclined converging walls. An opening, 15, is formed in the front side of plate 13, to form a portion of the furnace door-way. A plan of plate 13, is shown in Fig. 2, and a transverse section in Fig. 6. The next plate, 16, is identical in shape and construction with plate 5, except that there is formed in it an interior annular chamber, 17, arranged concentrically with the outer annular chamber, and communicating also with the chambers 7, 8, and 9, which are provided in both upper and under sides with openings 10, which register with the corresponding openings in plate 13. Extending across the open space included by the inner walls of chamber 17, is a series of hollow bars 18, which are tapered vertically from the center upward and downward, so as to prevent the accumulation of soot and ashes thereon.

A plan of plate 16 is shown in Fig. 3, and a transverse section in Fig. 5. Arranged above the plate 16 is a series of similar plates, each alternate plate being supplied with three cross-bars alternating in position with the two cross-bars of the other like plates, as clearly shown in Fig. 7. In the uppermost plate of this series, 19, the inner annular chamber 20, is made but about one half the height of the upper chamber, so as to permit the products of combustion to pass over the upper edges of the chamber.

The crown-plate, 21, consists of a hollow casting of the same exterior outline as the

other plates, and communicating interiorly therewith, and having in its upper side a central opening, 22, through which the steam or hot water is discharged.

5 The base, the series of boiler-plates, and the crown-plate, are firmly secured together by means of bolts, 23, which pass from top to bottom through the openings in chambers 7, 8, and 9, by means of which communication
10 is established between the interiors of the several plates.

An outer casing, 24, of the same general outline as the boiler-plates, but of larger diameter, incloses the whole series of plates, and
15 forms an annular chamber, 25, surrounding the edges of the plates on all sides. The semi-circular portion of said chamber is divided into two parts by means of a horizontal baffle-plate, 26, which is placed between two of the
20 boiler plates. The upper portion of said annular chamber is provided with a discharge pipe 27, for the escape of the products of combustion.

It will be observed that plates 5 and 13 form
25 the walls of the combustion-chamber, 28, and that the spaces, 29, (Fig. 3) between the inner and outer annular chambers of the plates like 16, form, when placed together in series, vertical flues through which the products of combustion pass downward. The crown-plate 21,
30 is provided with inclosed openings, 30, arranged immediately above the flues 29, so that access may be had to said flues for the purpose of cleaning them.

35 In operation, the several plates having been filled with water, except a small portion of the crown-plate, the products of combustion rising from the combustion chamber 28, are compelled by the inclined inner walls of plate 13
40 to pass upward through the space included by the inner annular chambers of plates 16; which products of combustion on striking the crown-plate are turned downward over the top of the annular chamber 20 and pass downward through the flues 29 until they strike
45 the outer inclined walls of plate 13, by which they are deflected outward into the annular space 25 whence they pass forward and upward over the baffle-plate 26, and out through
50 the discharge pipe, 27. A portion of the products of combustion is deflected forward over the front edge of chamber 20, and passes directly into the upper part of chamber 25, as clearly shown in Fig. 7.

55 The tapering form and the arrangement of the hollow bars 18 permit a free circulation of the products of combustion and prevent the accumulation of soot and ashes.

For the purpose of facilitating the delivery
60 of steam from the several plates, when the boiler is used more especially for generating steam, I employ the modification illustrated in Fig. 9, in which the openings connecting the plates are provided with short open tubes,
65 31, which extend nearly, but not quite, to the opposite side of the interior of the plate, those tubes in the openings in the corner chambers,

7 and 8, being turned upward, while those in chambers 9 are turned downward, the effect being to produce a free escape of steam as the
70 water circulates upward through the corner chambers, and a free circulation of the cooler water downward through the chambers 9.

I claim as my invention—

1. In a boiler, a series of sections arranged
75 one above the other, each of said sections consisting of a hollow plate forming two communicating annular chambers of different diameters arranged concentrically with an open space between them, the space between
80 the inner sides of the smaller chambers forming a flue for the products of combustion from a furnace arranged beneath said sections, said inner sides being connected by hollow bars which cross said flue and communicate with
85 the interior, and which have side walls which converge from their horizontal centers upward and downward, substantially as set forth.

2. In a boiler, the combination of the lower
90 hollow plate forming a single annular chamber which is substantially rectangular in cross section, and a second hollow plate arranged above the first and forming an annular chamber of substantially the same size and outline
95 on its under side as the annular chamber of the first plate, but having inner and outer walls which converge concentrically toward its upper side, thereby forming an annular chamber which is rhomboidal in cross section,
100 the interiors of both plates communicating through suitable registering openings, and the combined plates forming a combustion chamber having hollow walls and a contracted central opening for the escape of the pro-
105 ducts of combustion, as set forth.

3. In a boiler, the combination of a hollow plate forming an annular chamber which is substantially rectangular in cross section, a second hollow plate forming an annular chamber
110 of substantially the same size and shape as the annular chamber of the first plate, at one side, and having inclined converging walls substantially as set forth, whereby a combustion chamber inclosed by hollow walls
115 the upper part of which converge toward the axis of the chamber, is formed, a series of hollow plates arranged above said combustion chamber and forming two communicating annular chambers of different diameters
120 arranged concentrically with an open space between them, the inner sides of the smaller chamber forming an inclosed space of substantially the same diameter as the interior of the combustion chamber at its smallest
125 part, said inclosed spaces forming an upward flue for the products of combustion, and said open spaces between the annular chambers forming downward flues communicating with said upward flue, the interiors of the several
130 plates all communicating with each other through suitable registering openings, a crown-plate covering the top of the several flues, and an inclosed casing forming with

the outer edges of the boiler plates an annular chamber for the passage of the products of combustion, all arranged to co-operate substantially as set forth.

- 5 4. In a boiler, the combination with two or more hollow plates having several registering openings connecting the interior of the plates, of a series of tubes arranged in said openings

and extending partly across the interior of the plates, substantially as and for the purpose set forth.

FRANK PROX.

Witnesses:

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