(No Model.)

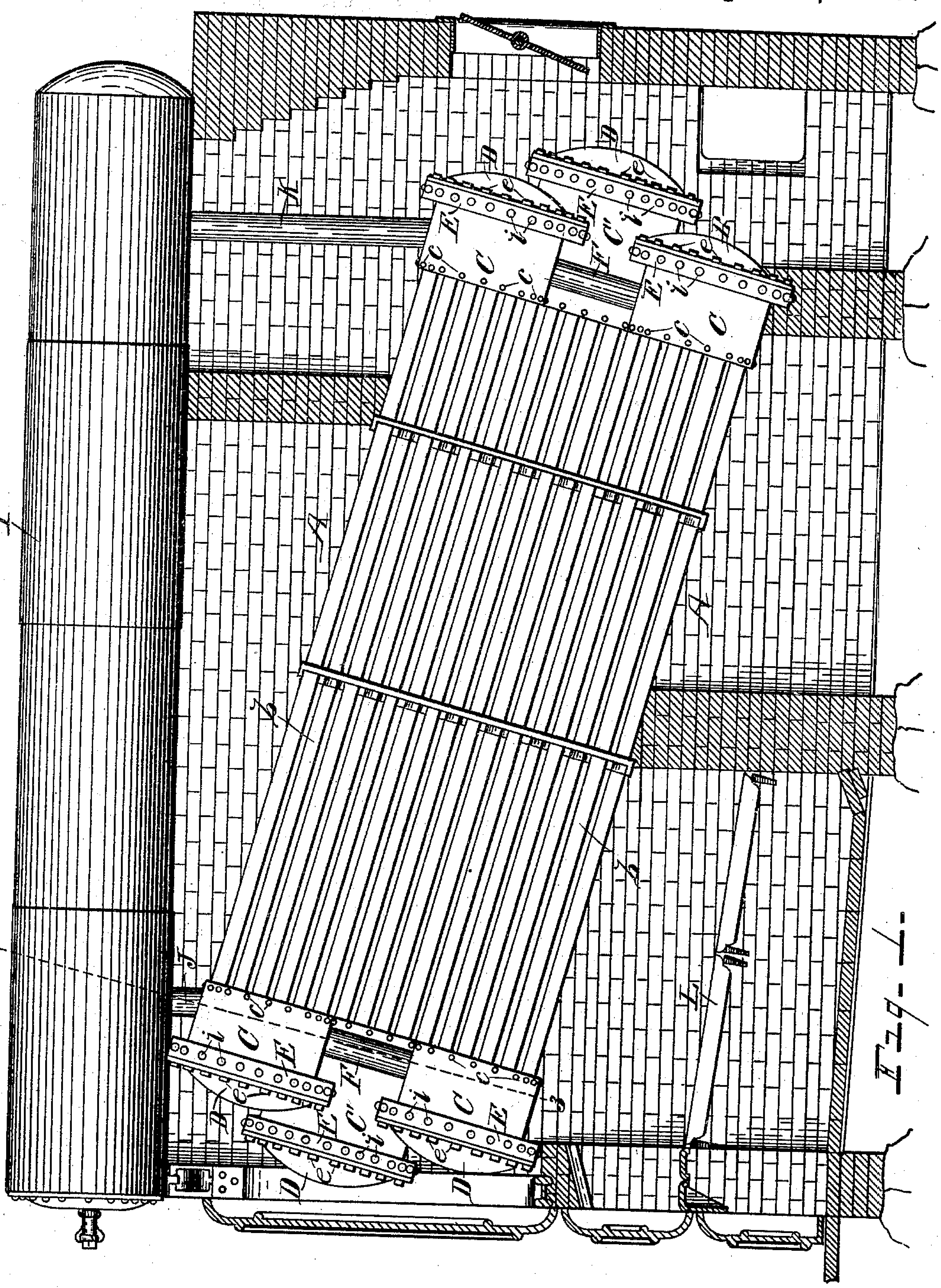
2 Sheets—Sheet 1.

S. A. PRATT.

BOILER.

No. 505,673.

Patented Sept. 26, 1893.



WITNESSES.

B. F. Wheeler

H. R. Wheeler

INVENTOR.

Stephen A. Pratt.

By Edgar S. Wheeler atty.

(No Model.)

2 Sheets—Sheet 2.

S. A. PRATT.

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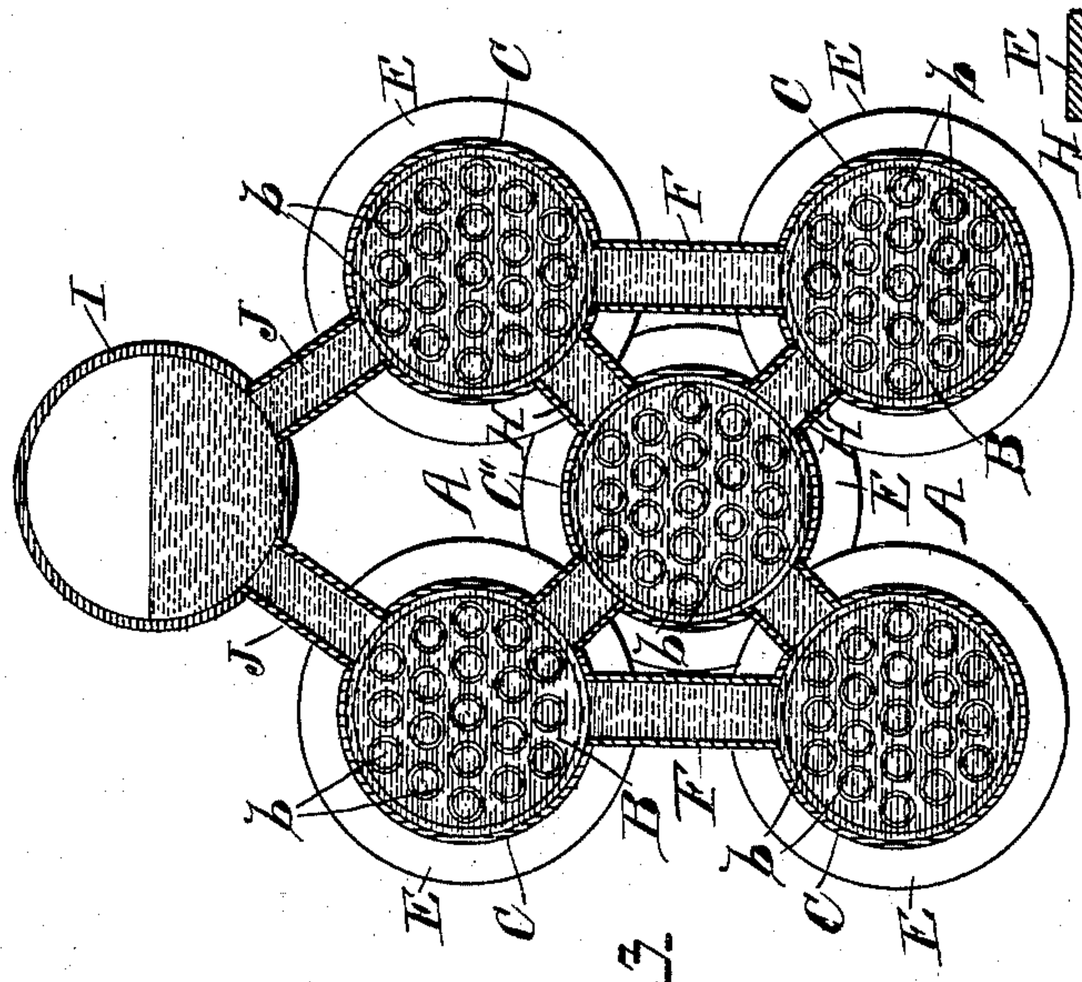

Fig. 3.

Fig. 2.

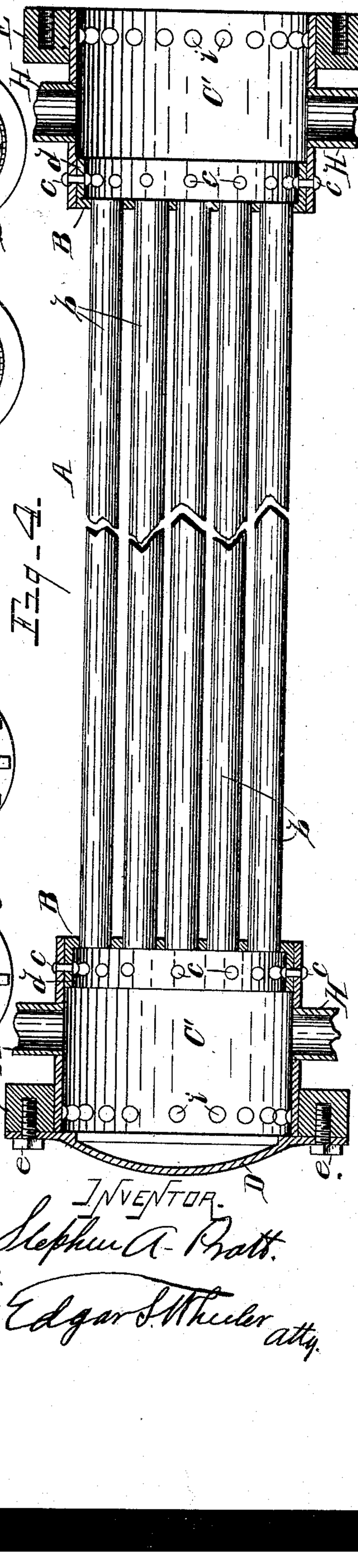

Fig. 4.

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UNITED STATES PATENT OFFICE.

STEPHEN A. PRATT, OF DETROIT, MICHIGAN.

BOILER.

SPECIFICATION forming part of Letters Patent No. 505,673, dated September 26, 1893.

Application filed March 31, 1892. Serial No. 427,296. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN A. PRATT, a citizen of the United States, residing at Detroit, in the county of Wayne, State of Michigan, have invented certain new and useful Improvements in Boilers; and I do declare the following to be a full, clear, and exact description of the invention, such as 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 new and useful improvements in water tube boilers, and consists in a certain construction and arrangement of parts, as fully hereinafter set forth, the essential features of which being pointed out particularly in the claims.

The object of the invention is to produce a safety water tube boiler, in which the tubes are divided into a plurality of independent though connected sections of uniform area, thereby effecting a corresponding reduction of pressure for each division made; and in which a free circulation of water is maintained. This object is attained by the construction illustrated in the accompanying drawings, in which—

Figure 1, is a side elevation of my improved boiler, portions of the inclosing brick-work being in section. Fig. 2, is an end elevation of the assembled tube sections comprising the boiler. Fig. 3, is a transverse section on dotted line 3—3 of Fig. 1. Fig. 4, is an enlarged detail of one of the tube-sections of the boiler, the water chambers at the ends of the tubes being in section, the head of one of said chambers being removed.

Referring to the letters of reference, A indicates the divisions into which the water tubes of the boiler are separated, of which there are five, as shown in the drawings, but the number of which may be increased or decreased for the various sizes and uses of the boiler. The ends of the tubes *b* for each of said divisions or sections of the boiler, are expanded in a circular plate B having a right angle annular flange *d* that enters the cylindrical shell C, and is secured therein by the rivets *c*, as clearly shown in Fig. 4. These shells C form a water chamber at each end of the tubes *b*, common to all of said tubes and with which they communicate, said shells being provided at their outer ends with a concavo-convex head or cover D that is removably attached thereto, by means of the screw-bolts *e*, that pass through the perimeter of said head and into a ring E that encircles the end of said shells and is riveted thereto, as shown at *i*. By attaching the heads of the shells in this manner, they may be readily removed by withdrawing the screw-bolts *e*, thus affording free access to the ends of the tubes *b*, of each section, for the purpose of cleaning or repair. If desired said rings E, may be placed within said shells instead of upon their exterior. The concavo-convex form of the heads D, better resist the pressure, and adds to the area of water-space within the shells C. These sections A of the boiler-tubes are so assembled that the four exterior sections, which are arranged in quadrilateral form, environ the fifth section which is placed centrally between them, the shells C′ of said central section being somewhat longer than the shells of the other sections or divisions, so as to extend the ring E of the heads of the central section, beyond the corresponding rings of the exterior sections, clearly shown in Figs. 1 and 2, thereby effecting a closer meshing of the tubes. The shells of the exterior sections, on each side of the boiler, and at each end of said sections, are connected by the vertical tubes F, through which the water circulates between said shells, and the shells of the central sections are connected, at each end, with the shells of the exterior sections, through the radial tubes H, shown in Fig. 3, whereby all of the tube-sections of the boiler are placed in communication. The steam-drum I is connected with the shells of the two upper sections of the boiler, by means of the oblique tubes J, at the front, shown in Figs. 2 and 3, and at the rear, by like tubes K, shown in Fig. 1, by which means a circulation of water is afforded through all the tubes of the boiler, and through the steam drum, thereby insuring a uniform heating of all parts of the boiler. This boiler so formed, is mounted in suitable brick-work, as shown in Fig. 1, in which is located the grate L, and which is so constructed as to cause the caloric-current to repeatedly cross the line of

tubes, before passing out of the stack, as is common. It will be seen, that by separating the tubes of the boiler, into a number of small independent divisions, the pressure in each of said divisions is correspondingly reduced, thereby producing a safety boiler; and it will also be seen, that, by the employment of the removable head for the outer ends of the shells of said sections, the removal of said head, affords access at once to all the tubes of the section, thus facilitating the cleaning and repair thereof.

Having thus fully set forth my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a section for water-tube boilers, the combination of a series of tubes, a cylindrical shell at each end of said tubes, the circular plates in which the ends of said tubes are secured, said plates having annular right angle flanges that enter the ends of said shells and are riveted therein, the ring encircling the outer ends of said shells and riveted thereto, the concavo-convex heads covering the entire outer ends of said shells and having an annular flange that extends onto the face of said ring, and the screw-bolts passing through said flange and into said ring, affording ready access to the ends of all of said tubes, and forming water chambers with which said tubes communicate, said shell having an induct and an educt port, independent of their connecting tubes, substantially as set forth.

2. In a boiler, the combination of a plurality of tube-sections having water-chambers at their ends, a number of said sections arranged about a central section of like construction whose water-chambers, at each end, are provided with radial pipes that communicate with the water chambers of the encompassing sections and the water chambers of said encompassing sections, on each side being connected by pipes, substantially as specified.

3. In a boiler, the combination of a plurality of tube-sections having water-chambers at their ends and so arranged that a central section is inclosed within surrounding sections, the water chambers of the central section having radial pipes that communicate with the water chambers of the outer sections and the chambers of said outer sections being connected by vertical pipes, and the steam drum connected by pipes with the chambers of the upper sections.

4. In a boiler, the combination of the exterior tube-sections arranged quadrilaterally, each section provided with a water-chamber at each end with which said tubes communicate, the central tube-section environed by said exterior sections, and having a water-chamber at each end which communicates through the interposed tubes with the chambers of the exterior sections the vertical tubes connecting the water chambers of said exterior sections, and the steam-drum connected through tubes with the upper sections, substantially as set forth.

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

STEPHEN A. PRATT.

Witnesses:
E. S. WHEELER,
H. R. WHEELER.