No. 620,872. Patented Mar. 7, 1899.

K. PARK.

BOILER.

(Application filed July 30, 1896.)

(No Model.) 3 Sheets—Sheet 1.

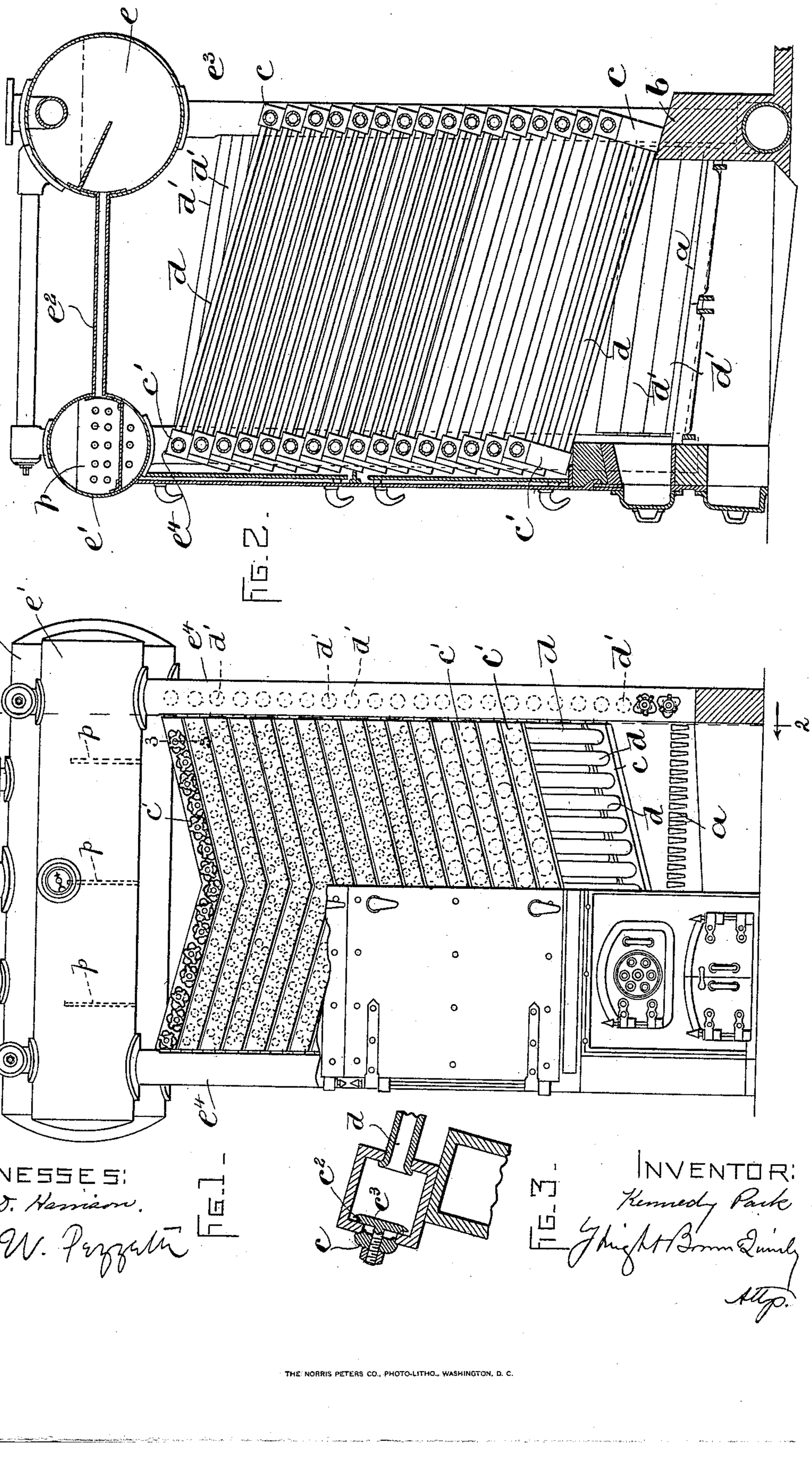

FIG. 1.

FIG. 3.

WITNESSES:

A. D. Harrison.

P. W. Pezzetti

INVENTOR:

Kennedy Park

by Wright Brown Quinby & Otis

Attys.

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3 Sheets—Sheet 2.

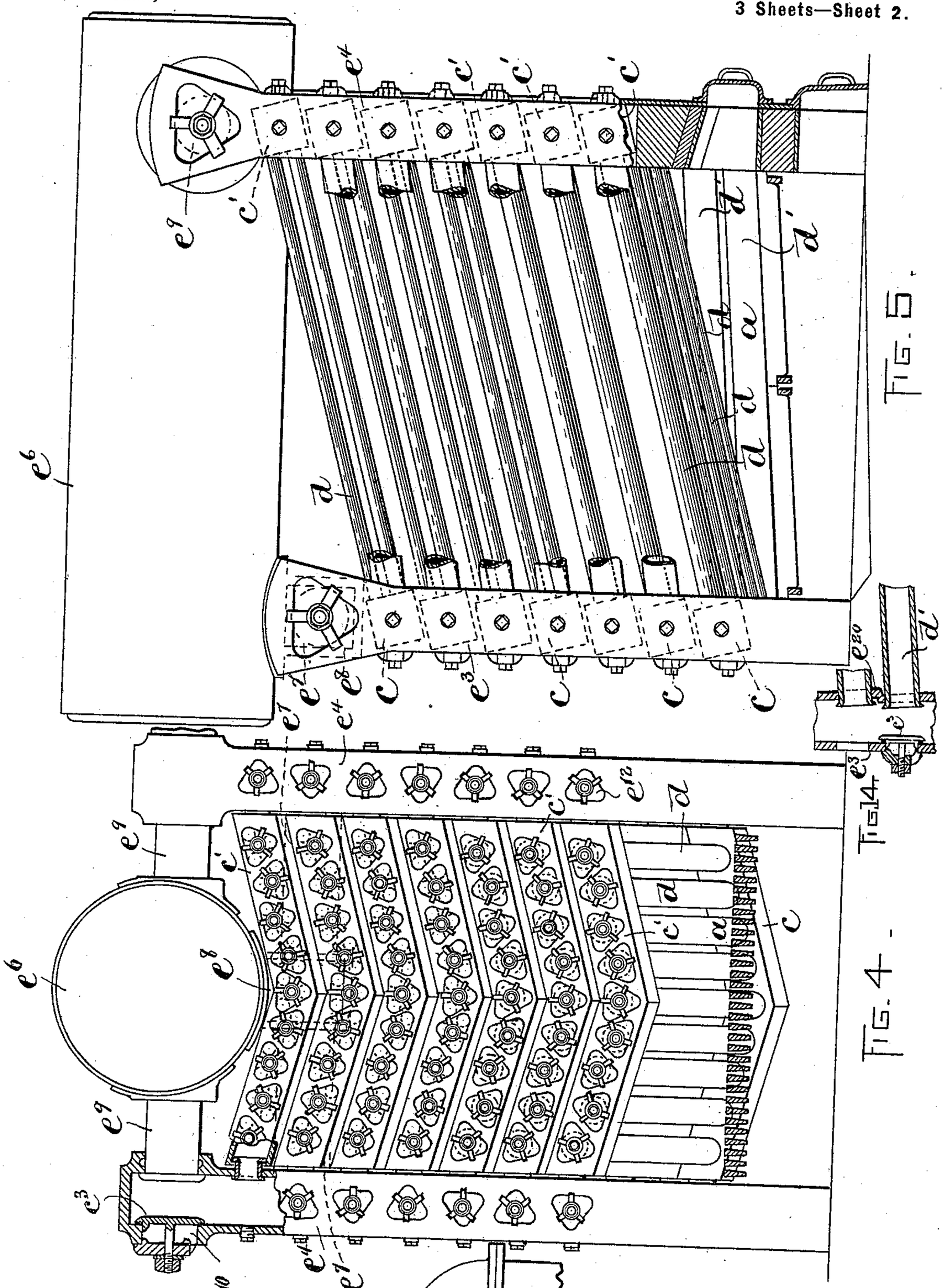

FIG. 5.

FIG. 4.

FIG. 6.

WITNESSES:

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(No Model.) 3 Sheets—Sheet 3.

Fig. 13.

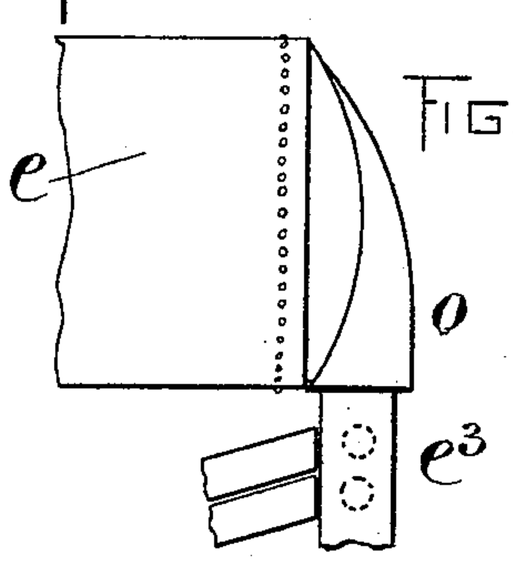


Fig. 9.

Fig. 11.

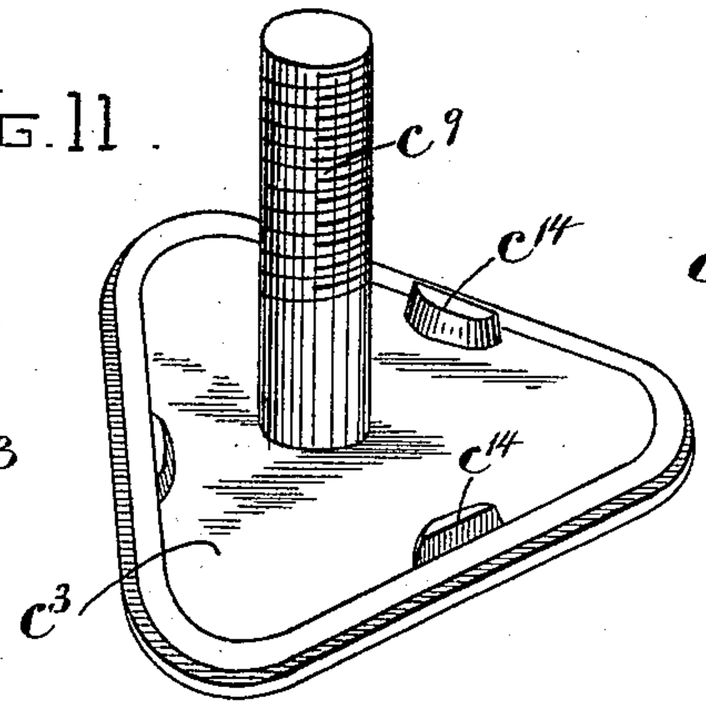


Fig. 10.

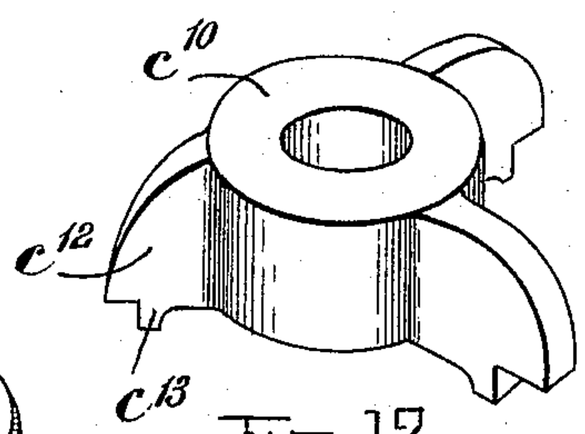
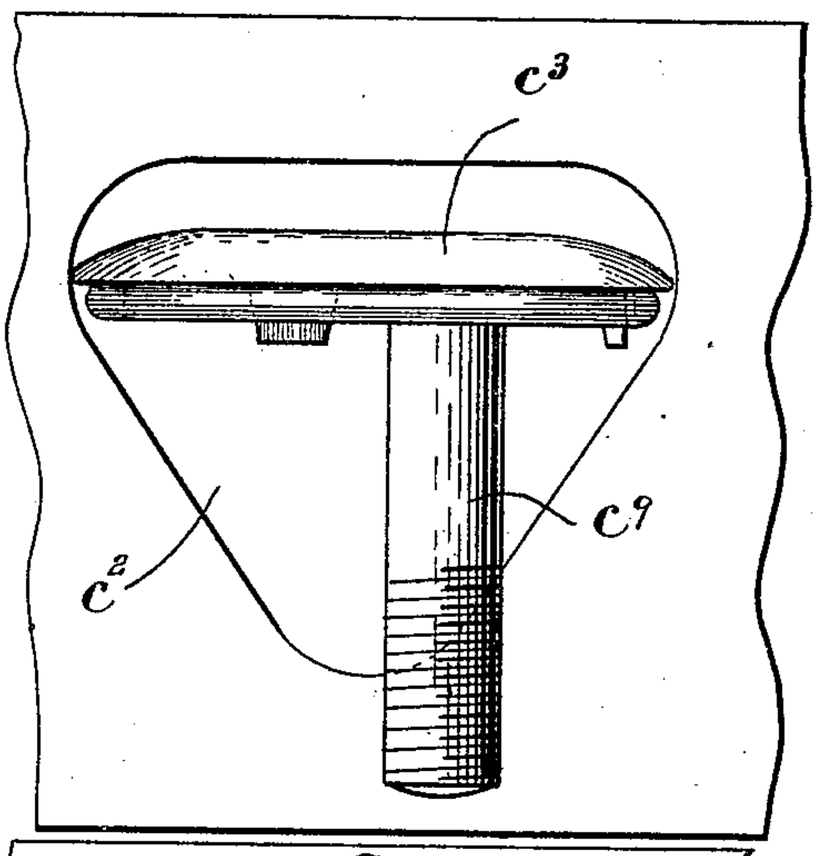
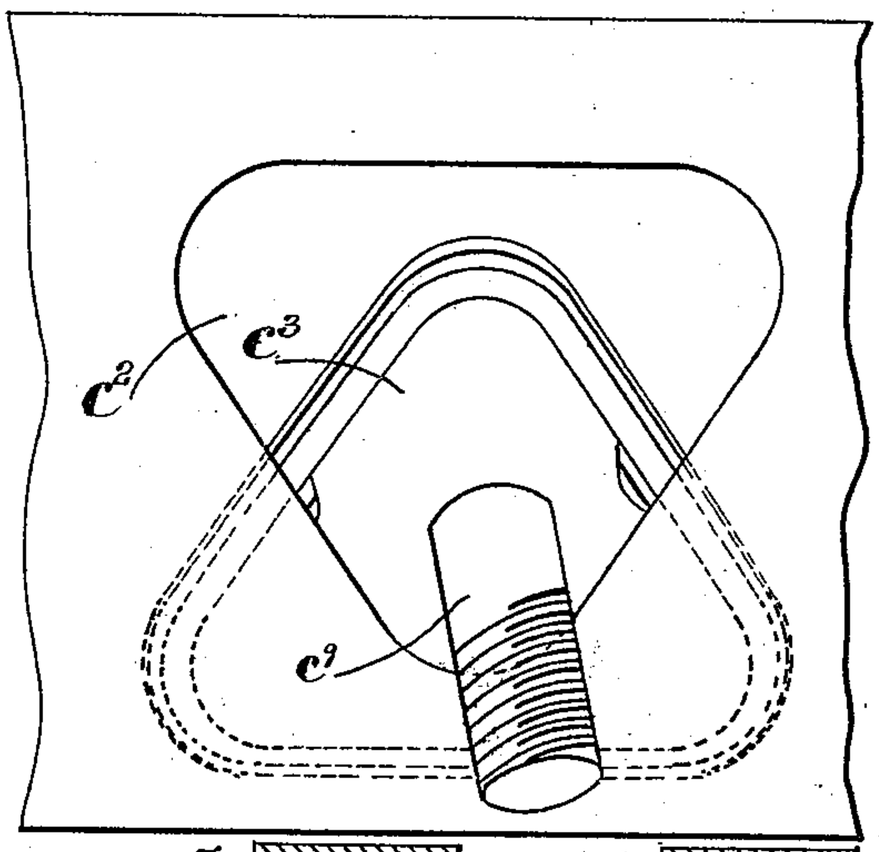


Fig. 12.





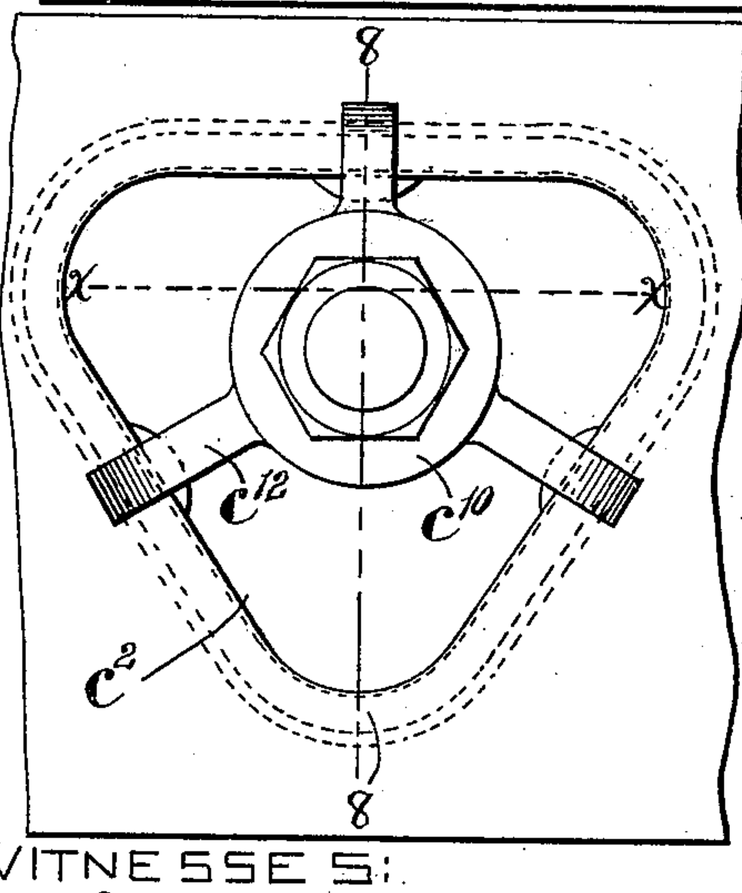


Fig. 7.

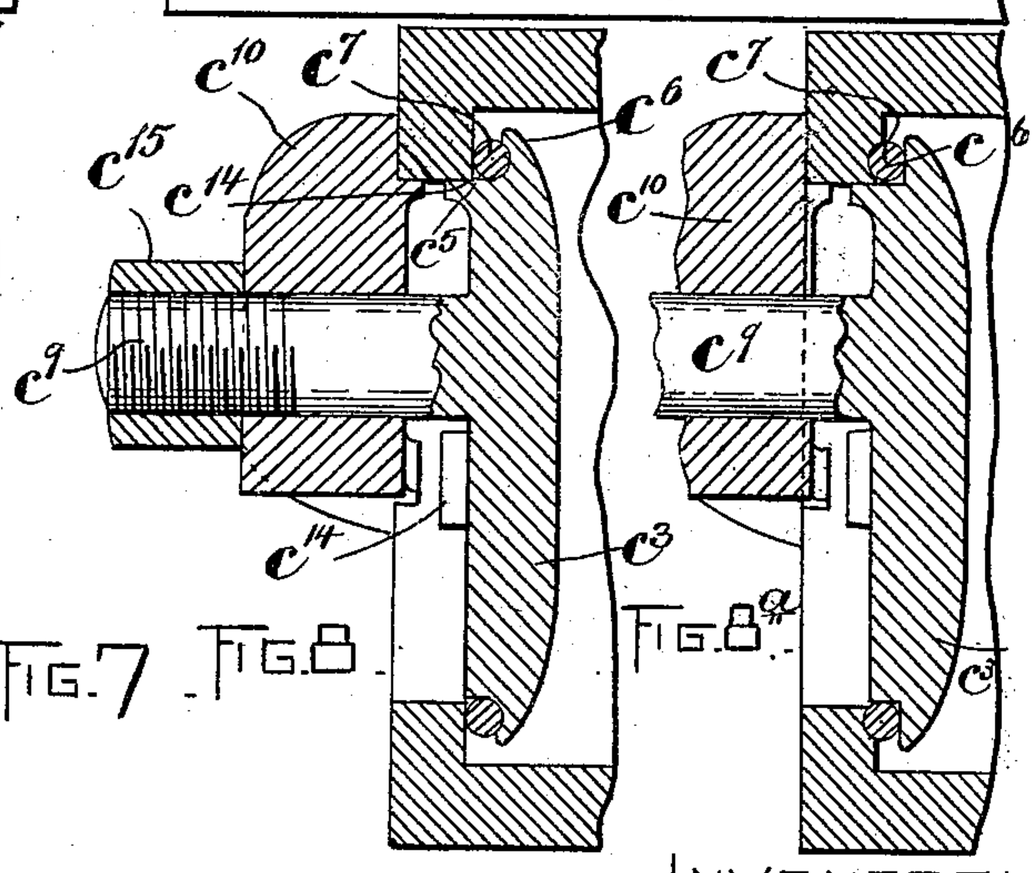


Fig. 8.

Fig. 8a.

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UNITED STATES PATENT OFFICE.

KENNEDY PARK, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO WINTHROP THAYER, OF NEWTON, MASSACHUSETTS.

BOILER.

SPECIFICATION forming part of Letters Patent No. 620,872, dated March 7, 1899.

Application filed July 30, 1896. Serial No. 601,089. (No model.)

To all whom it may concern:

Be it known that I, KENNEDY PARK, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

This invention relates particularly to boilers for the generation of steam, and has for its object to provide a simple and efficient construction whereby a rapid circulation of water may be maintained and a large area of heat-absorbing surface is presented to the circulating water.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a front elevation of a boiler embodying my invention, a portion of the casing being broken away. Fig. 2 represents a section on line 2 2 of Fig. 1, looking toward the left. Fig. 3 represents an enlarged section on line 3 3 of Fig. 1. Fig. 4 represents a partial side elevation and partial section of another form of boiler embodying my invention. Fig. 5 represents a partial side elevation and partial section of the construction shown in Fig. 4. Fig. 6 represents a modification. Fig. 7 represents an enlarged front view of a portion of one of the headers. Fig. 8 represents a section on line 8 8 of Fig. 7. Fig. 8^a represents a view similar to Fig. 8, showing a modification. Figs. 9 and 10 represent views illustrating the manner of inserting the hand-hole cover shown in Figs. 7 and 8. Figs. 11 and 12 represent perspective views of the hand-hole cover and the spider that supports the bolt of said cover. Figs. 13 and 14 represent views of details hereinafter described.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents a suitable fire-grate, above which is a fire-space inclosed by suitable walls, portions of which are formed by the usual or any suitable casing or setting, and a bridge-wall *b*. Above the grate and forming front and back walls at opposite ends of the fire-space are two series of headers *c c c' c'* of peculiar form, the peculiarity consisting in the depression of the central portion of each header, so that the ends are considerably higher than the central portion, each header having a gradual upward inclination from its central portion to its ends. The preferred form of header is that shown in the drawings, the header comprising two oppositely-inclined portions which meet and form an obtuse angle at the longitudinal center of the header. The headers are assembled or nested in the manner shown in the drawings, each being rectangular in cross-section and preferably in close contact with the one above it, so that they form practically close sectional walls, as above stated. Each header *c* is connected with the corresponding header *c'* by means of a plurality of tubes *d*, said tubes being attached to the inner walls of the headers by any suitable means, preferably by being inserted in holes formed in said walls and expanded in said holes in a manner well understood, the headers being preferably provided with hand-holes c^2 in their outer walls, said hand-holes being covered by removable plates or covers c^3, as shown in Fig. 3. The headers *c c* are located at a lower level than the headers *c' c'*, so that the connecting-tubes *d* are inclined upwardly from the headers *c* to the headers *c'*, as shown in Figs. 2 and 5.

The headers are connected at their ends with substantially vertical pipes e^3 e^3 and e^4 e^4, which constitute parts of a circulating system, whereby water is permitted to flow into the ends of the headers *c* and to flow from the ends of the headers *c'*, the water flowing downwardly through the pipes e^3 into the headers *c* and from the headers *c* upwardly through the tubes *d* into the headers *c'* and out from the raised ends of the latter into the pipes e^4, through which the water flows upwardly. Said pipes are in the construction shown in Figs. 1 and 2 connected with elevated transverse drums *e* and *e'*, said drums being horizontally arranged, the drum *e* being over the headers *c* and connected with the pipes e^3 e^3, while the drum *e'* is over the headers *c'* and is connected with the pipes

e^4 e^4, said drums being connected with each other by horizontal pipes e^2. The drum e is preferably larger than the drum e', its lower portion being below the lower portion of the drum e', so that when water is present in the two drums the tendency will be for the water to flow downwardly through the pipes e^3.

In Figs. 4 and 5 I show the pipes e^3 e^4 connected with a single drum e^6, extending lengthwise of the boiler. The pipes e^3 e^3 are connected by horizontal pipes e^7 e^7 (shown in dotted lines in Fig. 4) with a downwardly-projecting branch e^8 of the drum e^6, while the pipes e^4 e^4 are connected directly with the drum e^6 by horizontal pipes e^9 e^9, which are located at a higher level than the pipes e^7 e^7, so that water tends to flow downwardly from the drum through the pipes e^3, as in the construction shown in Figs. 1 and 2. The upper ends of the pipes e^3 e^4 are enlarged in the construction shown in Figs. 4 and 5, the inner sides of the enlarged portions having orifices which receive the outer ends of the horizontal pipes e^7 e^9, while their outer sides have orifices e^{10} to permit the insertion of a tool to expand the ends of said horizontal pipes, said orifices being closed by plates or covers c^3.

Each of the pipes e^3 may be connected with the pipe e^4 on the same side by inclined tubes d', preferably arranged close together to form tubulous walls at opposite sides of the fire-box, hand-holes being provided in the outer sides of the pipes e^3 e^4 for the reception of expanding-tools to expand the ends of said inclined tubes.

I have provided an improved form of hand-hole and an improved construction of cover or plate for use in connection therewith, the same being shown clearly in Figs. 7 to 12, inclusive.

The hand-hole c^2, which may be either of the various hand-holes shown in the drawings, is of approximately triangular form and has its greatest width along the line x x. The cover c^3 is of similar form and has a marginal shoulder c^5 of about the same size as the hand-hole and a flange c^6, projecting outwardly from said shoulder, said flange and shoulder forming a groove in which is seated a gasket c^7, of lead. On the cover is formed a bolt c^9, which passes through an orifice in a spider c^{10}, said spider having legs c^{12}, which bear on the outer surface of the wall or face in which the hand-hole is formed. Shoulders c^{13}, formed on said legs, bear on the margin of the hand-hole and keep the spider in place laterally. Similar shoulders c^{14} on the cover c^3 bear against the margin of the hand-hole to prevent lateral displacement of the cover. A nut c^{15}, engaged with the bolt c^9, coöperates with the spider, bolt, and cover in compressing the gasket c^7 between the flange of the cover and the inner surface of the wall in which the hand-hole is formed.

The described form of the hand-hole and cover enables the cover to be inserted edgewise in the widest part of the hole, as indicated in Fig. 9, and then swung inwardly, as indicated in Fig. 10, the cover being then turned to its proper position and secured as above described.

In Fig. 8 I show the flange c^6 slightly grooved for the reception of the gasket, while in Fig. 8^a the groove is formed in the inner face of the wall in which the hand-hole is formed.

It will be seen that by the described construction and arrangement of the headers, connecting-pipes, and drums I insure a ready and natural circulation of water and large areas of heating-surface to which the water is exposed. The peculiar form of the headers facilitates the circulation of the water, the downwardly-flowing water through the pipes e^3 entering the raised ends of the headers c and flowing downwardly therein and then upwardly through the tubes d and through the headers c' upwardly in both directions from the center thereof to the pipes e^4.

It is obvious that the headers and their connecting-tubes, arranged as shown, may be used in connection with any other suitable means for circulating water and steam, my invention not being limited to the employment of the drums e and e' or to the drum e^6.

The receiving-headers c may be conveniently termed "return-headers" and the corresponding pipes e^8 "return-pipes" to distinguish these parts from the headers c' and pipes e^4, which may be termed, respectively, "flow-headers" and "flow-pipes."

The upper and lower walls of the headers have no openings—that is, they are continuous and unbroken by holes—and therefore serve as partitions, which prevent the passage of water from one header to another and restrict the circulation to the passages formed by the pipes e^3 e^4.

It will be seen that in consequence of the inclination of the headers (shown in Figs. 2 and 5) the inner faces of the headers, which receive the ends of the inclined tubes d, are arranged at right angles with said tubes, so that the headers require only to be tapped or perforated for the reception of the tubes d and do not require special adaptation to the inclined tubes, such as would be required if the tube-receiving faces of the headers were vertical.

The drums are preferably provided with baffle-plates p, each extending from the bottom partly to the top of the drum. These baffle-plates are perforated to permit water to flow through them at a comparatively slow rate, the plates being intended to prevent rapid bodily movement of the water from end to end of the drum, such as would be caused by the motion of a yacht or vessel.

In Fig. 13 I show one of the vertical pipes e^3 connected with the convex head of the drum e instead of to the body of said drum, said head being provided with an offset or pro-

jection *o*, adapted to be bolted or otherwise secured to the upper end of the pipe e^3.

In Fig. 14 I show a portion of one of the vertical pipes e^3 provided with a series of inclined faces e^{20} to receive the ends of the pipes *d'*, said faces being arranged at right angles with the pipes *d'*, which, as already stated, are inclined. By providing the inclined faces e^{20} I am enabled to secure the inclined pipes *d'* to the vertical pipes e^3 by simply expanding the ends of the pipes *d'* in orifices formed in the pipe e^3, no other adaptation of the vertical pipe e^3 to the inclination of the pipes *d'* being required. The pipes e^4 may have similar inclined faces e^{20} to receive the opposite ends of the pipes *d'*.

It will be observed that the central depression of the headers and the continuous upward inclines from the depressed center to the ends of each header prevent the formation of steam-pockets in the headers and that the provision of holes in the raised ends of the headers enables said ends to be connected with vertical circulating-pipes which are located at the sides of the fire-space and are therefore kept cooler than would be the case if they were arranged at or near the center of the fire-space. This is a feature of importance so far as the pipes which conduct water downwardly from the boiler to the return-headers are concerned, the downward flow of water through said pipes being retarded in proportion to the degree of heat to which they are subjected.

I claim—

1. A boiler comprising two sectional hollow walls located at different heights at opposite ends of a fire-space, each wall being composed of a plurality of headers which are depressed at their central portions and inclined upwardly from their depressed portions to their ends, inclined tubes connecting the headers of the lower wall with the headers of the higher wall, and connections between the ends of the headers of one wall and the ends of the headers of the other wall, whereby a circulation of water is maintained through said headers and tubes, the water flowing into the raised ends of the headers of the lower wall, through the inclined tubes to the headers of the higher wall, and out of the raised ends of the headers of the higher wall.

2. A boiler comprising a series of centrally-depressed return-headers constituting a wall located at one end of a fire-space, a series of centrally-depressed flow-headers constituting a higher wall at the opposite end of said space, inclined tubes extending from the return-headers to the flow-headers across said space, substantially vertical flow and return pipes connected with the raised ends of said headers, and one or more elevated drums connected with said pipes.

3. A boiler comprising a series of centrally-depressed return-headers constituting a wall located at one end of a fire-space, a series of centrally-depressed flow-headers constituting a higher wall at the opposite end of said space, inclined tubes extending from the return-headers to the flow-headers across said space, substantially vertical flow and return pipes connected with the raised ends of said headers, and a drum connected with the said flow and return pipes, the flow-pipes being connected with the drum at points lower than the connection between the return-pipes and the drum.

4. A boiler comprising a series of centrally-depressed return-headers constituting a wall located at one end of a fire-space, a series of centrally-depressed flow-headers constituting a higher wall at the opposite end of said space, inclined tubes extending from the return-headers to the flow-headers across said space, substantially vertical flow and return pipes connected with the raised ends of said headers, the upper ends of said flow and return pipes having hand-holes in their outer portions and detachable covers for said hand-holes, a drum adjacent to the upper ends of said flow and return pipes, and horizontal pipes connecting said drum with the flow and return pipes, said pipes coinciding with the said hand-holes.

5. As an article of manufacture, a header composed of two oppositely-inclined portions and provided at one side with holes to receive a series of tubes and at its ends with holes through which said ends may be connected with vertical circulating-pipes, the header being centrally depressed.

6. In a sectional boiler, the combination of vertical pipes or chambers, rectangular headers the ends of each of which are in substantially the same horizontal plane and connected to and securing together the front vertical pipes, rectangular headers the ends of each of which are in substantially the same horizontal plane and connected to and securing together the rear vertical pipes, said headers being angularly set so that the inner faces of the front headers are opposite and parallel to the inner faces of the rear headers in lower planes, and a series of tubes longitudinally and angularly arranged, and connected at their ends to each opposite pair of headers, each series of tubes and their connected headers constituting a section of the boiler.

7. A boiler or steam-generator comprising an elevated drum, two rear vertical pipes communicating with the rear portion of the drum, two front vertical pipes communicating with the front portion of the drum, two series of headers arranged to form substantially vertical sectional walls, one series being between and connected with the rear vertical pipes and the other series being between and connected with the front vertical pipes, each header being inclined to present inclined tube-receiving faces, and inclined tubes connecting the headers of the two series in pairs,

said tubes being arranged substantially at right angles to the said faces, each pair of headers and the tubes connecting them constituting a section of the boiler which is independent of the other sections.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 25th day of July, A. D. 1896.

KENNEDY PARK.

Witnesses:
A. D. HARRISON,
P. W. PEZZETTI.