

No. 736,451.

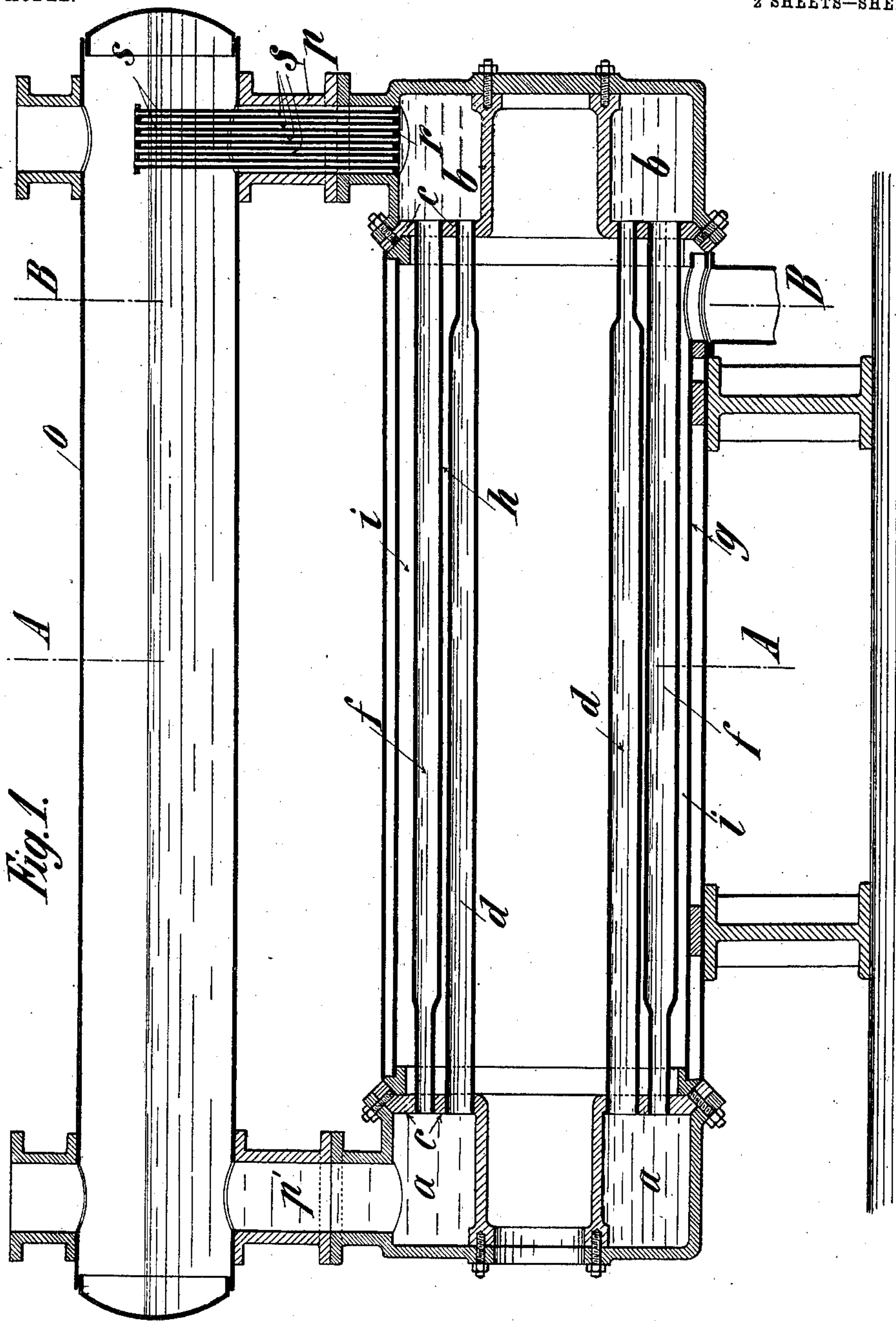
PATENTED AUG. 18, 1903.

G. SILVESTRI.
WATER TUBE BOILER.

APPLICATION FILED DEC. 23, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

W. K. Baker

[Signature]

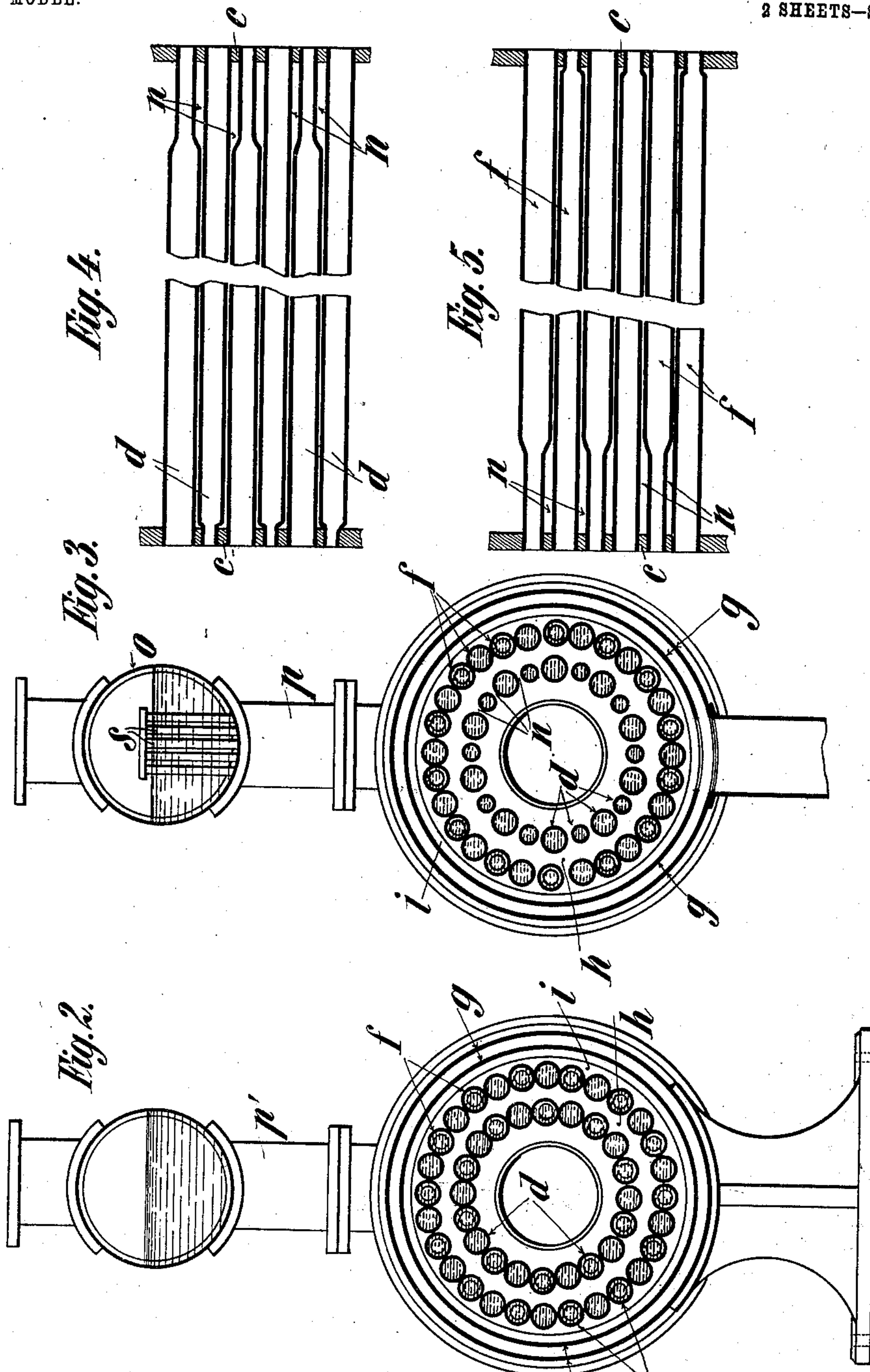
Inventor
Gudio Silvestri,
by *[Signature]* Doulter
Attorney.

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Witnesses:

H. K. Boulton

J. M. Boulton

Inventor
Giulio Silvestri
by J. M. Boulton
Attorney:

UNITED STATES PATENT OFFICE.

GIULIO SILVESTRI, OF VIENNA, AUSTRIA-HUNGARY.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 736,451, dated August 18, 1903.

Application filed December 23, 1902. Serial No. 136,344. (No model.)

To all whom it may concern:

Be it known that I, GIULIO SILVESTRI, a citizen of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, Empire of Austria-Hungary, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a full, clear, and exact specification.

This invention relates to a new or improved water-tube boiler, and has special reference to that class of water-tube boiler in which a flue suitable for the employment of an internal furnace or fireplace is created by providing water-tubes in close contact to one another; and it consists in particular in arranging concentrically two or more rows of such water-tubes in such manner that they form flues and annular tubes, respectively, arranged within one another, the most central one of such flues being intended for the reception of the fireplace, while the annular spaces between the individual rows of water-tubes and between the outer row of tubes and the external jacket, respectively, serve as flues for the hot products of combustion, provision being made for the communication of the said flues with one another, so that the products of combustion may pass from one flue into the other, which is effected by alternately reducing the diameter of the tube ends to any required extent in such manner that only one end of each tube is subjected to such reduction, also for suitably embedding the tubes by fitting the respective walls with corresponding brackets or recesses.

The new or improved water-tube boiler is represented in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal sectional view; Figs. 2 and 3, cross-sections on the lines A A and B B, respectively, of Fig. 1, while Figs. 4 and 5 show in a folded-up state a section of the inner and outer tube jackets, respectively, as formed by the respective rows of tubes.

With reference to the above drawings the boiler consists of two water drums, chambers, or tanks *a* and *b*, preferably ring or annular shaped, the two walls *c* of which drums or chambers facing one another are adapted as tube-walls—that is to say, they serve as bed-frames for the rows of tubes *d* and *f*—while

the outer front walls of said water drums, chambers, or tanks are made so as to be removed for the purpose of providing easy access to the tubes

According to the invention the boiler is fitted with two or more concentric rows of water-tubes arranged in close contact to each other, the innermost or most central one of such rows *d* forming a flue and serving as such to receive an internal fireplace of any desired construction, but preferably of such construction as is used in combination with liquid and vaporous or gaseous fuel, respectively, while the annular spaces *h* and *i* left between the concentric rows of tubes *d* and *f* and between the outer row of tubes and the boiler-jacket *g*, respectively, form and serve as flues for the hot products of combustion. In order to enable such hot products of combustion to pass from the grate or fire-chamber into the first annular flue *h* and from the latter into the next annular flue *i*, the ends of the tubes are alternately to a corresponding extent or length reduced in diameter—that is to say, the innermost or most central tubes *d* are reduced in the manner indicated at the ends abutting against the backward or rear water chamber or tank *b*, the tubes forming the next row *f* at the ends abutting against the front water chamber or tank *a*, the next series of tubes, if any, again at the ends abutting against the backward or rear water chamber or tank *b*, &c., the consequence of such arrangement being that slits or passages *n n* are formed between the ends of the tubes, which serve to allow the gases of combustion to pass. Since, on the one hand, brackets or recesses must be provided between the individual tubes for the purpose of embedding the latter in the abutment-walls and since, on the other, such tubes can only be reduced in diameter at one end in order to insert and exchange them, such reductions are only applied to every other tube, the length or extent to which they are effected corresponding to the thickness of the abutment-wall and to the cross-section of the passage to be obtained, respectively. The result of this arrangement is that the one series or group of tubes can be withdrawn or removed in the one direction and the second series or group of tubes in the other.

The manner in which the ends of the tubes are reduced in diameter is evident from the diagrammatical representation in Figs. 4 and 5 of the unfolding of the cylinders or rings formed by the ends of the tubes. A water-tube boiler is thereby provided which contains a flue without the employment of masonry, and thereby allows of an internal furnace or fireplace being made use of.

- 10 It is not absolutely necessary to arrange the water-tubes in the concentric circular order as illustrated; but the arrangement thereof may also be effected in other closed curves or in a polygonal fashion. As regards the
15 water drums, chambers, or tanks, they may be connected by two or more of such series or groups of tubes instead of by one such series or group, in which case boilers are created with two or more furnaces or fireplaces.
20 In order that an active circulation in the boiler may be brought about, the latter may, as is usual, be slightly inclined, or, as shown in the right-hand part of Fig. 1, it may be preferable to fit a suitable contrivance for that
25 purpose into the short pipe or socket *p*, connecting the chamber or tank *b* with the steam-collector *o*. The said contrivance consists of a plate *r*, adapted to completely close the short pipe or socket *p*, and into said plate is inserted a series of narrow tubes *s*, the upper
30 ends of which reach into the steam chamber or collector *o*. Said system of tubes *s* forms with the short pipe or socket *p* a communicating vessel for chamber or tank *a*. As the
35 mixture of steam and water particles ascending in the tubes *s* is of lower specific gravity than the liquid in the short tube or socket *p*, which is free from steam, the difference in the hydrostatic pressure will result in bringing
40 about an active circulation in the boiler.

What I claim is—

1. A steam-boiler comprising in combination water-chambers, and tubes arranged intermediate said chambers and seated at their
45 ends in the opposing heads of the chambers, said tubes being arranged in series, one within the other, the tubes in each series being in

close contact with each other and a space being left between the tubes in one series and the tubes in the other series, each alternate
50 tube in the different series having one end reduced in diameter for the purpose specified.

2. A steam-boiler comprising in combination water-chambers and tubes arranged intermediate said chambers and seated at their
55 ends in the opposing heads of the chambers, said tubes being arranged in concentric series, the tubes in each series being in close contact with each other and a space being left between the tubes in one series and the tubes
60 in the other series, each alternate tube in the different series having one end reduced in diameter, for the purpose specified.

3. A steam-boiler comprising in combination water-chambers and tubes arranged intermediate said chambers and seated at their
65 ends in the opposing heads of the chambers, said tubes being arranged in series, one within the other, the tubes in each series being in close contact with each other and a space being left between the tubes in one series and
70 the tubes in the other series, each alternate tube in the different series having one end reduced in diameter, and a jacket surrounding the outermost series of tubes with a space intermediate said latter tubes and said jacket.
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4. A steam-boiler comprising in combination water-chambers, and tubes arranged intermediate said chambers and seated at their
80 ends in the opposing heads of the chambers, said tubes being arranged in series one within the other the tubes in each series being in close contact with each other and a space being left between the tubes in one series and
85 the tubes in the other series, the tubes in the different series having their alternate ends reduced in diameter, for the purpose specified.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

GIULIO SILVESTRI.

Witnesses:

WILHELM BERGER,
ALVESTO S. HOGUE.