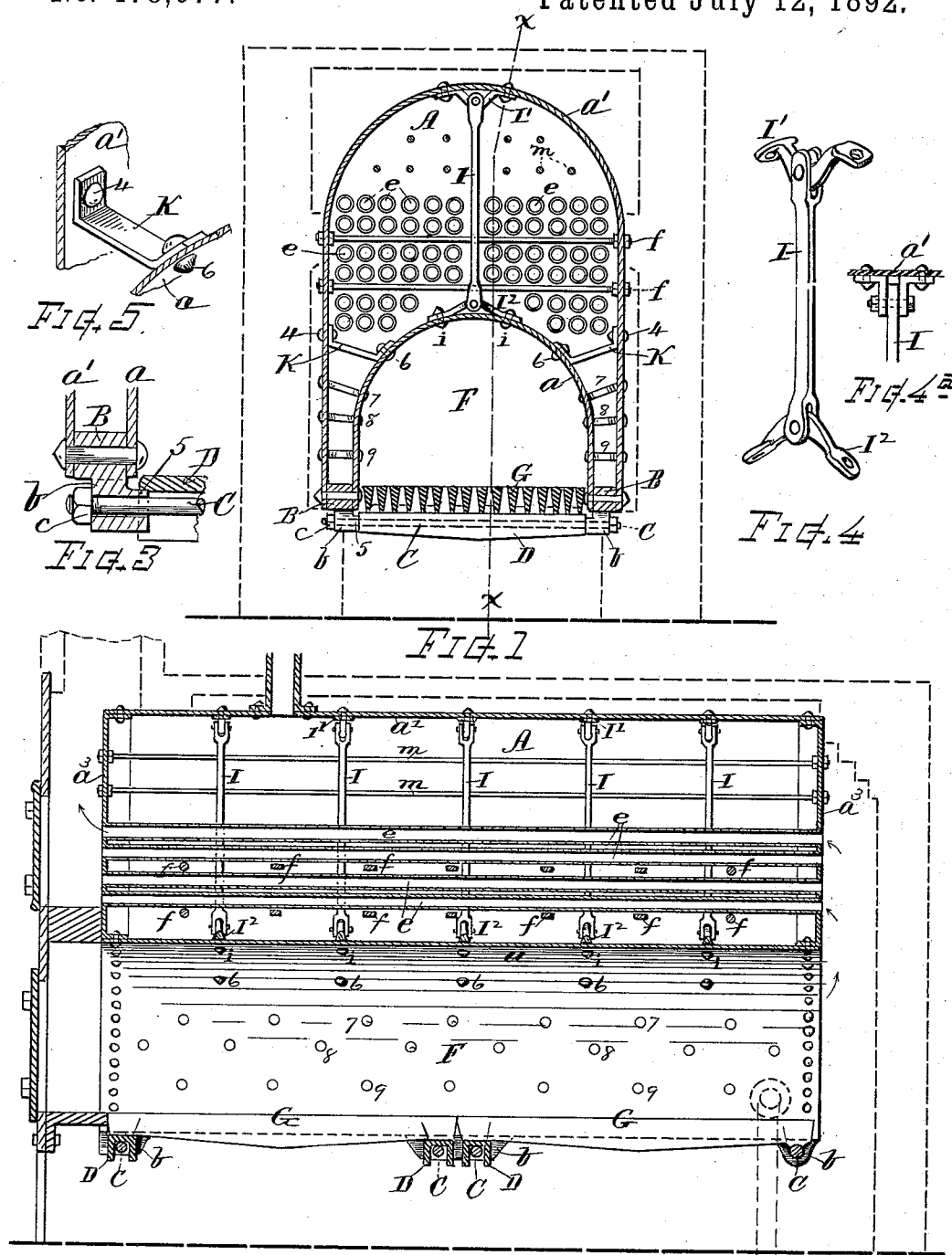


(No Model.)

G. L. ALLEN.
STEAM BOILER.

No. 478,677.

Patented July 12, 1892.



Witnesses

W. B. Barton
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Fig. 2

Inventor

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UNITED STATES PATENT OFFICE.

GEORGE L. ALLEN, OF WORCESTER, MASSACHUSETTS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 478,677, dated July 12, 1892.

Application filed February 17, 1892. Serial No. 421,887. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. ALLEN, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Steam-Boiler, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

My present invention relates to that class of steam-boilers in which the upper and under parts of the shell are both upwardly arched, of horizontal semi-cylindrical form, one within the other, and having downwardly-extending sides that are joined along their lower edges to form water-legs along the sides of the fire-chamber, which is within the upwardly-arched under portion of the boiler.

The objects of my invention are to improve the structure of the boiler and to adapt the same for practical and economical use for high-pressure heating and steaming purposes, to increase the efficiency and durability of boilers of the class named, to provide a practical and efficient means for connecting and retaining the upwardly-arched sheets in proper relation to each other, and to provide means for retaining the foot of the arched boiler from spreading, and means for preventing the inner arched sheet from collapsing at the haunches of its arch. These objects I attain by the boiler constructed and having its parts combined in the manner set forth in the following detailed description, the particular features of invention and subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a transverse section of my improved steam-boiler. Fig. 2 is a vertical longitudinal section of the same at line *x x*, Fig. 1. Fig. 3 is a section through one of the connecting-bar joints at the bottom part of the boiler. Fig. 4 shows the detail of the arch-crown connector. Fig. 4^a shows a modification in the attachment of the arch-crown connector to the boiler-shell, and Fig. 5 is a perspective view of one of the haunch-supporters.

Referring to parts, *a* and *a'* indicate the under and upper sheets of the boiler A, both of which are of horizontal semi-cylindrical

upwardly-arched form with downwardly-extending sides, the lesser being arranged within the greater and their lower horizontal edges joined together or riveted to the opposite sides of the longitudinal joint-bars B in the manner illustrated. At their ends the two arched sheets are riveted to suitable heads *a*³, that conform to and close the spaces included between the two arched sheets. The space within the lower arch *a* forms the fire-chamber F. At the bottom part of the boiler the opposite sides are connected at desired intervals of its length by strong tie-rods C, that extend transversely across below the fire-space and have their ends secured in suitable ears *b*, fixed on or cast integral with the joint-bars B, said tie-rods being preferably passed through perforations in the ears and strained up by nuts screwed onto the threaded ends against the outside of the ears *b*. The ears *b* are best made with an inward offset or projecting ledge 5, (see Figs. 1 and 3,) and under-channeled transom-bars D are supported in conjunction therewith, which overlie the tie-rods C and serve both as guards for said rods and as bearers for the grate-bars G, which latter can rest thereon, as shown in Figs. 1 and 3; or, if in any instance preferred, the grate-bars can be supported directly upon the tie-rods C, as indicated at the right in Fig. 2. The series of longitudinal tubes *e*, disposed above the lower arched sheet *a*, are arranged in groups with lateral horizontal spaces, and a central vertical space separates the several groups, as shown. Within the horizontal spaces I arrange a series of transversely-disposed horizontal stay-rods *f*, connecting the two opposite sides of the upper arched sheet *a'* at or near the springing of its arch and also at one or more intervals below the same. (See Fig. 1.) Said horizontal transverse rods are preferably disposed at intervals of from eight inches to twelve inches (more or less) apart through the length of the boiler. (See Fig. 2.)

Within the vertical space between the groups of tubes I provide the central hangers or crown-connectors I, whereby the under and upper arched sheets *a* and *a'* are connected to each other at intervals of, say, one foot (more or less) along the center or crown of their arches. These connectors each consist of a

bar having its upper end attached by a yoke I' or angle-plates to the inner side of the sheet a', while the lower end of said bar is coupled to a yoke I², having its respective ends riveted to the crown of the lower arched sheet a, as indicated at i, Fig. 1. Said crown-connector serves to support the two arches in proper relation to each other and prevent the internal pressure from changing the form of the boiler-chamber by forcing the arches away from each other. The ends of the bar I can be bifurcated and attached to the yoke by a pin or bolt, as indicated in Fig. 4, or in lieu thereof angles or ear-pieces can be riveted to the sheet a' and the straight perforated end of the bar secured thereto, as indicated in Fig. 4^a; or the connection may be made in other suitable manner for giving equivalent attachment of the parts.

K K indicate the supporters whereby the haunches of the inner arch or sheet a are connected to the upright sides of the outer sheet a'. Said supporters are preferably formed as shown in Figs. 1 and 5, arranged in inclined position at intervals of eight to twelve inches apart, their outer ends riveted at 4 to the sheet a', and their inner ends riveted to the sheet a at the haunch of the arch, as at 6, so that the said arch cannot collapse by springing of the sheet at the haunch. At their upright sides the two sheets a and a' are connected by a series of stay-bolts 7, 8, and 9, disposed at suitable intervals and having their ends firmly secured in the respective sheets by the usual method of fastening.

m m indicate longitudinal stay-rods connecting the heads a³.

The grate-bars G are disposed in the space between the water-legs at the foot of the boiler and supported on the transom-bars or tie-rods, as indicated.

In lieu of extending the fire-grate the full length of the boiler, it can in any instance be made of such length as desired and a bridge-wall introduced beneath the boiler at the back of the grate in well-known manner.

By the improved construction herein shown and described I produce a boiler of the arched form, which can be successfully employed for high pressures, heating, and steam purposes, and which is capable of giving high efficiency of service.

It will be understood that I do not broadly claim a boiler formed with upwardly-arched under and upper sheets, as such general structure is old; neither do I claim in general the employment of tubes or the use of stays in other arrangement than that substantially as hereinbefore specified; but my invention relates to the improved features of construction in boilers of this class, as defined.

I claim as my invention herein, to be secured by Letters Patent—

1. The combination, with the boiler having its shell composed of the upwardly-arched sheets a and a', with downwardly-extending sides joined along their lower horizontal edges with the joint-bars B, constructed as shown, of the transversely-disposed tie-rods C, connecting the opposite sides of the boiler across the space beneath the fire-chamber, substantially as and for the purpose set forth.

2. The combination, with the boiler having its shell composed of the two upwardly-arched sheets a and a', with downwardly-extending sides joined at their lower horizontal edges, of the joint-plates B, provided with perforated ears b, having inwardly-offset ledges 5, the transverse stay-rods C, arranged through said ears and connecting the two opposite sides of the boiler, and the underchanneled transom-bars D, overlying said rods and supported in conjunction with said offset ledges for sustaining the grate-bars, all substantially as set forth.

3. A boiler constructed substantially as herein shown and described, comprising the upwardly-arched sheets a and a', the series of longitudinal tubes e above the lower arched sheet, the transverse stays f, fixed in the sheet a' below its arch and passing horizontally between groups of tubes, the crown-connectors I, passing vertically between the tubes, the haunch-supporters K, the side stays, and the transverse rods C, connecting the opposite sides of the boiler at their lower edges, all of said parts being combined in the manner and for the purpose set forth.

Witness my hand this 15th day of February, A. D. 1892.

GEORGE L. ALLEN.

Witnesses:

CHAS. H. BURLEIGH,
ELLA P. BLENUS.