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Patented Nov. 19, 1901.

W. M. ERNST.
STEAM BOILER.

(Application filed Apr. 22, 1901.)

(No Model.)

2 Sheets—Sheet 1.

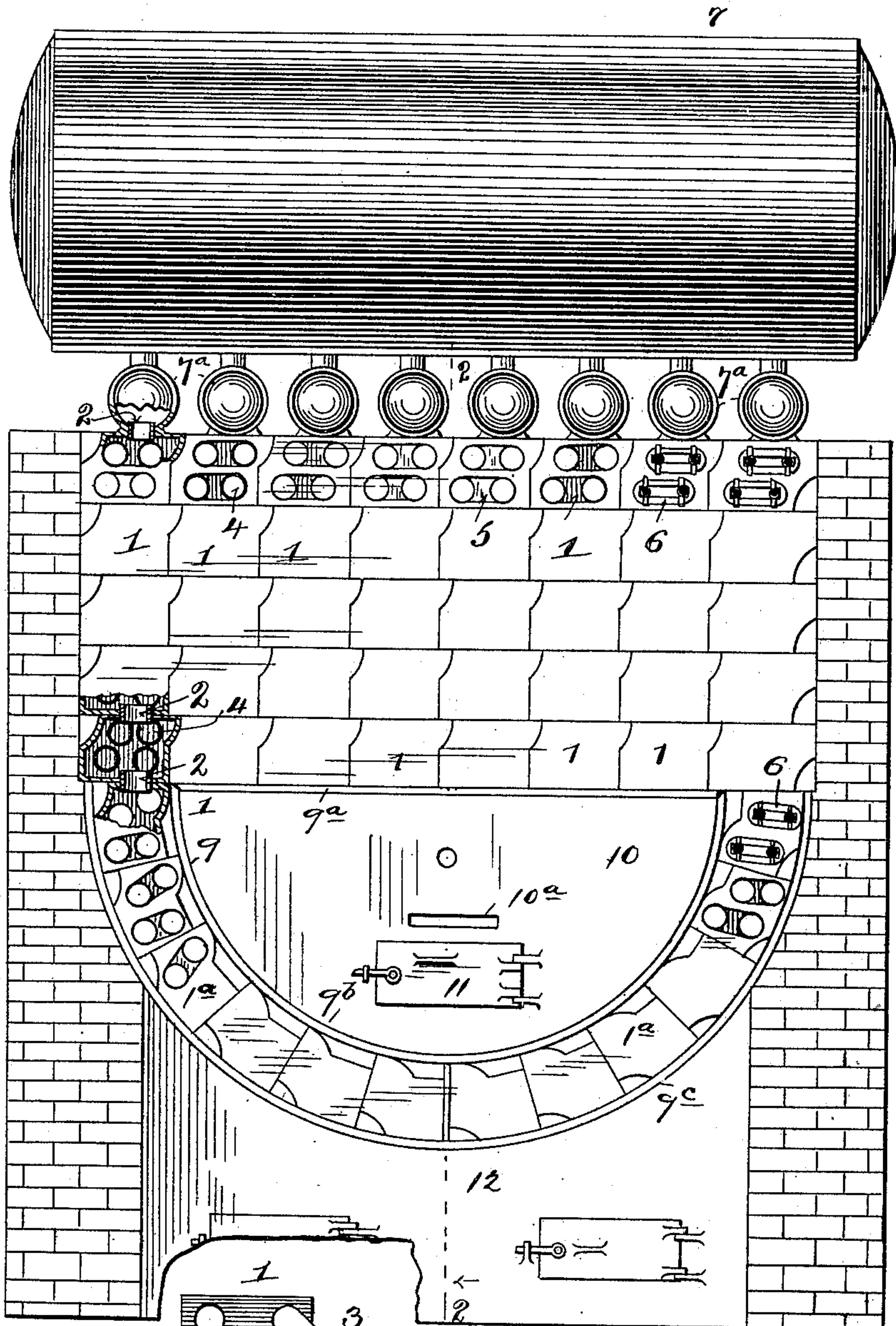


Fig. 1.

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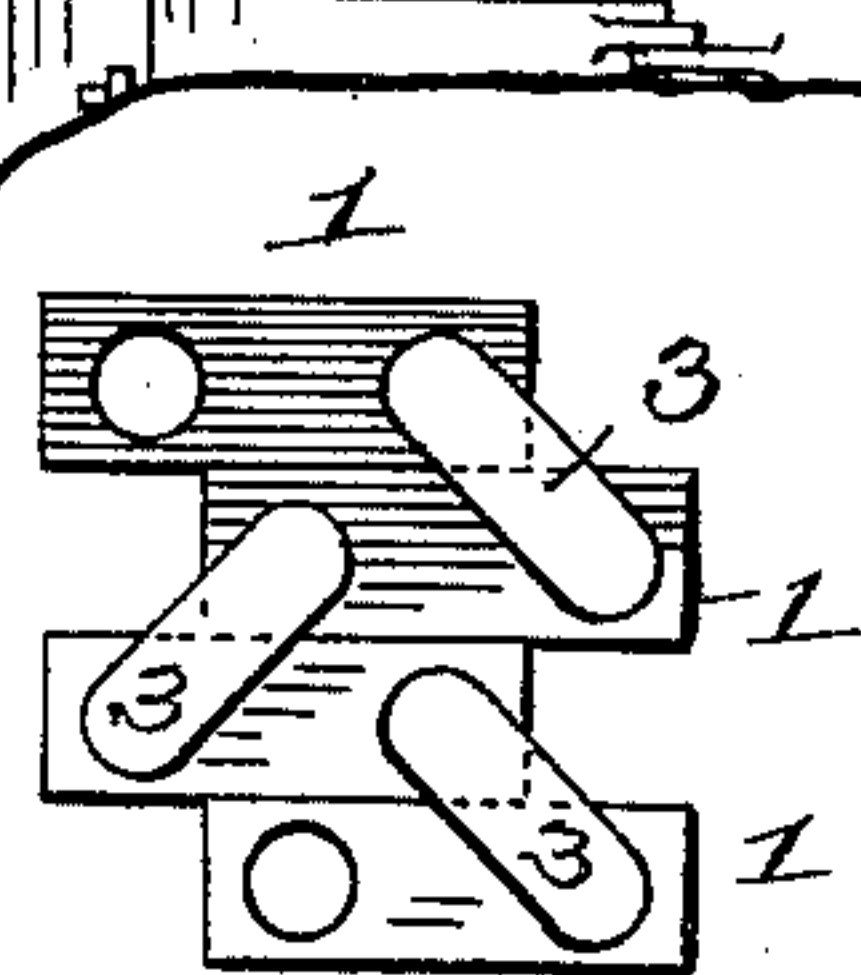


Fig. 3.

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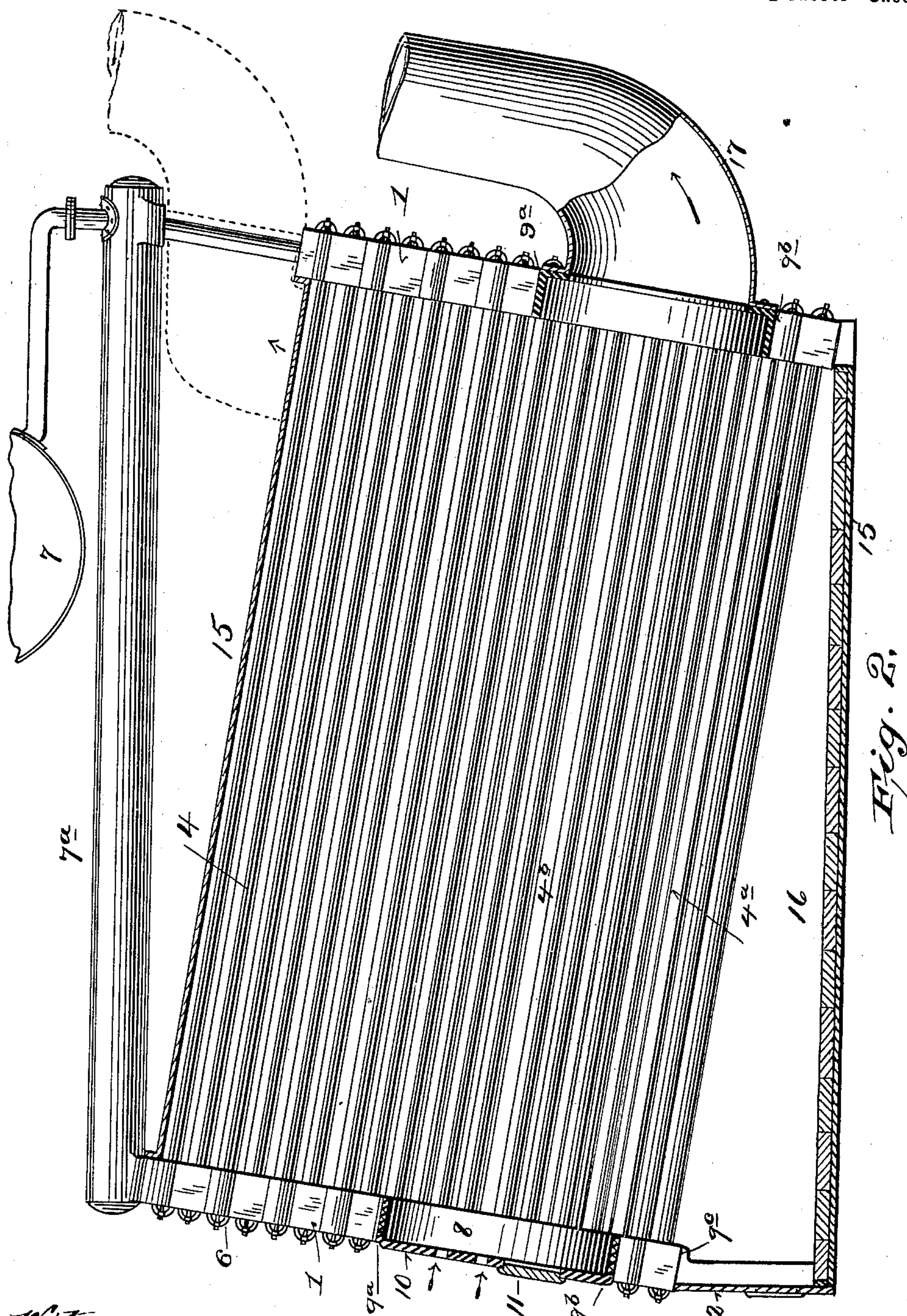
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2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

WILLIAM M. ERNST, OF NEW YORK, N. Y.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 686,721, dated November 19, 1901.

Application filed April 22, 1901. Serial No. 56,827. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. ERNST, a citizen of the United States, and a resident of New York city, borough of Manhattan, State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

My invention relates to improvements in the class of boilers that are provided with headers connected at the front and rear by water-tubes, the headers being in communication with one or more water or steam and water drums, and in the class to which my invention more particularly pertains the headers are in the form of casings or boxes placed in tiers, the headers of each tier being in communication one with the other, the tiers being in series side by side.

The object of my invention is to provide means whereby a flame may be projected longitudinally within the midst of the tubes, and in carrying out my invention I provide an opening through the front headers in line with a longitudinally-disposed space in the midst of the tubes, and to this end a row of headers are extended beneath the upper or main bank of headers forming the opening through the headers, the water-tubes being disposed around or beyond said opening forming the said longitudinally-extending space into which a flame is to be projected for heating the water in the tubes.

The invention also consists in the novel details of improvement, that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part hereof, wherein—

Figure 1 is a front elevation, partly broken and partly diagrammatic, of a boiler embodying my invention. Fig. 2 is a vertical section thereof on the plane of the line 2 in Fig. 1, and Fig. 3 is a detail of a modification.

In the accompanying drawings similar numerals of reference indicate corresponding parts in the several views.

The numeral 1 in the drawings indicates headers, which are shown in the form of boxes or casings superimposed in tiers, the several tiers being placed side by side. The headers of each tier are in communication with each

other, as by interposed tubes or ferrules 2, as in Fig. 1, in well-known manner, or, as shown in Fig. 3, the headers may be in communication one with another by means of exterior tubes 3, as in well-known manner. The headers on their inner faces are provided with openings with which water-tubes 4 are connected, and on their front faces the headers are provided with openings 5, which are kept closed by suitable covers 6 in any well-known manner to permit access to the interior of the headers and the tubes 4. Part of the headers are shown having plain fronts, although it will be understood that they are to be provided with openings and covers, as described. The tiers of headers are to be connected with one or more water or steam and water drums 7, and for this purpose I have shown the tiers of headers connected with tubes or the like 7^a, which in turn are connected with the drum 7. From the outer or side tiers of headers extend rows of headers 1^a, which pass under the central series or bank of headers, and thereby form an opening 8 through the headers. The headers 1^a of each row are in communication one with another, as described with reference to headers 1, and are also in communication with the tier of headers immediately above, (see Fig. 1,) whereby circulation upwardly through each row of headers 1^a to the row above, and thus to the tubes 7^a, is effected. The inner end of the bottom header 1^a of each row is closed. Corresponding headers are located at the front and rear, and tubes 4^a connect the headers 1^a, the tubes 4 similarly connecting headers 1, a space 4^b thus being provided in the midst of the tubes in line with opening 8 and extending longitudinally of the tubes.

The headers may be supported in any suitable manner. I have shown a frame or support 9 lining the opening 8, the upper portion 9^a of which underlies the central tiers of headers, and the lower portion 9^b overlies the headers 1^a, and outside of and beneath the headers 1^a the portion 9^c supports the headers 1^a, the latter thereby being maintained between the portions 9^b 9^c.

The opening 8, bounded by the headers, is provided at the front with a closure or plate 10, that is provided with a suitable opening

10^a, adapted to receive a nozzle, burner, or the like, from which flame is to be projected into the space 4^a in the midst of the tubes.

11 is a door in the closure 10.

5 12 is a front plate or the like beneath the frame or support 9^c and serving to sustain the same.

The boiler may be set in a brickwork or other suitable setting, and by preference the tubes will be surrounded by a jacket or casing 15, which may have a lining 16 of fire-brick or the like.

As shown in Fig. 2, the rear headers are provided with a frame similar to 9^a 9^b 9^c, 15 which provides a rear opening in line with the opening 8, and thus at the rear end of the space 4^a within the series of tubes. A stack 17 may be suitably connected in line with the opening in the rear headers to carry away 20 products of combustion, &c.

Instead of having an opening at the rear in line with the front opening 8 the rear headers may all be provided, as at the upper part of Fig. 2, to close the rear end of the space 25 4^a, and the stack 17 can communicate with the space inclosed by the casing 15, as indicated by dotted lines in Fig. 2, whereby products of combustion, &c., after passing through the space in the midst of the tubes will find 30 their way upwardly through the tubes at their rear ends, as indicated by the arrow.

With my improvements the water in the tubes that connect with the headers 1 1^a will circulate upwardly to the drum 7 independently of the other tiers of headers, and the water from the last-mentioned headers will likewise circulate through the respective tiers from the tubes to the drum 7. When the flame is projected into the space 4^a in the midst of 40 the tubes through the front opening 8, the water in the tubes 4 will be heated by the upward tendency of the heat, and the water in the tubes 4^a will be heated by the radiation of the heat sidewise and downwardly, whereby 45 waste of heat is prevented, or, in other words, as the flame is projected in the midst of the tubes they will all be subjected to the direct action of the heat. The flame may be supplied by gas or oil in well-known manner or 50 by projecting pulverized fuel into the space in the midst of the tubes by any suitable apparatus, where it will burn in the form of a flame. It will be observed that no grate-bars are needed, and no bridge-walls are necessary 55 to cause the heat to traverse the tubes in irregular lines, as is customary in water-tube boilers using grates.

I do not limit my invention to the form of headers shown, as they may be modified to suit 60 requirements, nor do I limit the invention to the particular arrangement of the various parts shown.

Having now described my invention, what I claim is—

65 1. A water-tube boiler comprising a plurality of headers arranged in tiers at the front and rear, the headers of each tier being in

communication with each other, water-tubes connecting corresponding front and rear headers, a space being provided in the midst 70 of said tubes extending longitudinally thereof and opening through the front and rear headers, whereby a flame may be projected into said space longitudinally of the tubes, and a closure for said opening provided with an 75 opening adapted to receive a nozzle or burner, substantially as described.

2. A water-tube boiler comprising a plurality of headers arranged in tiers at the front and rear, the tiers being placed side by side, 80 the headers of each tier being in communication with each other, the headers of the outer tiers being continued beneath and under the centrally-disposed upper tiers forming an opening within the series of headers, the inner 85 ends of the inner underlying headers being closed, and water-tubes connecting corresponding headers at the front and rear, providing a space in the midst of the tubes in line with said opening and extending longitudi- 90 nally of the tubes, substantially as described.

3. A water-tube boiler comprising a plurality of headers arranged in tiers, the tiers being located side by side, the headers of each tier being in communication with each 95 other, an opening being formed within the series of headers at the front and rear, water-tubes connecting corresponding headers at the front and rear and located outside of or around said openings, forming a space in line 100 therewith extending longitudinally of said tubes, and a closure for the front opening provided with an opening adapted to receive a nozzle or burner to permit a flame to be 105 projected into said space, substantially as described.

4. A water-tube boiler comprising a plurality of headers arranged in tiers, the headers of each tier being in communication with each other, certain of said tiers of headers 110 extending below and under the central tiers forming an intermediate opening within the series of tiers, a closure for said opening provided with means to permit a flame to be projected from the opening, and water-tubes con- 115 necting corresponding headers at the front and rear and located beyond said opening forming a space extending longitudinally of the tubes, substantially as described.

5. A water-tube boiler comprising a plurality of headers arranged in tiers, the tiers of headers being placed side by side, the headers of each tier being in communication with each other, certain of the headers extending beneath the central tiers of headers 125 forming an intermediate opening, a frame within said opening beneath the central tiers of headers, a support for the underlying headers, a closure for said opening provided with means to permit a flame to be projected 130 through the same, and water-tubes connected with the corresponding headers at the front and rear and located beyond said opening forming a space within the tubes extending

longitudinally thereof, substantially as described.

5 6. A water-tube boiler comprising a plurality of headers arranged in tiers at the front and rear, the tiers of headers being placed side by side, the headers of each tier being in communication with each other, a row of tiers at the front and rear extending beneath the central tiers of headers forming an opening
10 through the headers at the front and rear in line with each other, water-tubes connecting the corresponding front and rear headers and

located outside of or beyond said openings forming a space extending longitudinally through the series of tubes in line with said 15 openings, a casing surrounding said tubes forming an inclosed combustion-space, and a stack connected with the opening at the rear of the tubes, substantially as described.

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