

(No Model.)

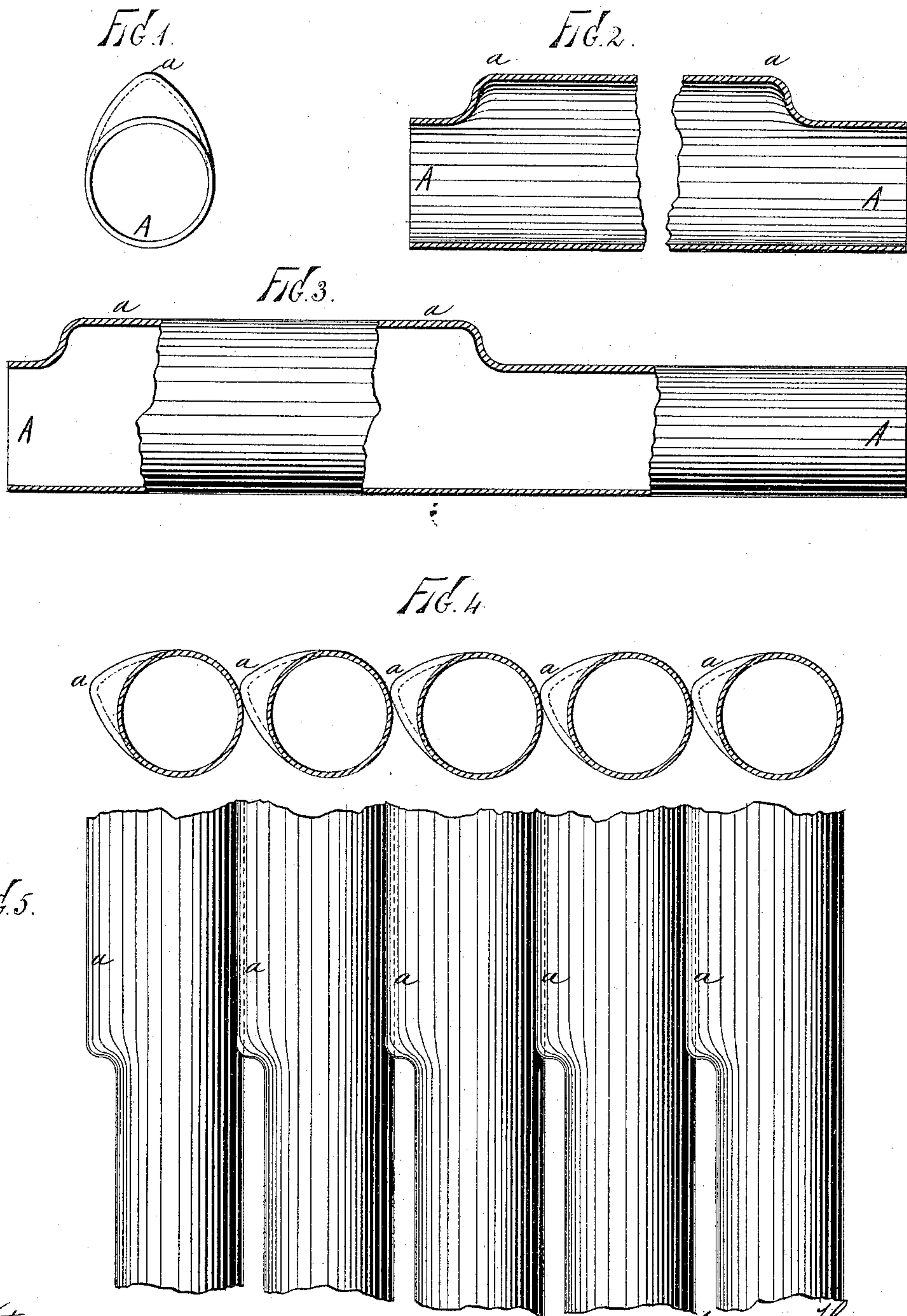
2 Sheets—Sheet 1.

J. HARTLEY.

WATER TUBE FOR BOILERS.

No. 335,695.

Patented Feb. 9, 1886.



Witnesses
John Buckler,
L. H. Osgood,

James Hartley,
Inventor:
By North Osgood,
Attorney.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 6.

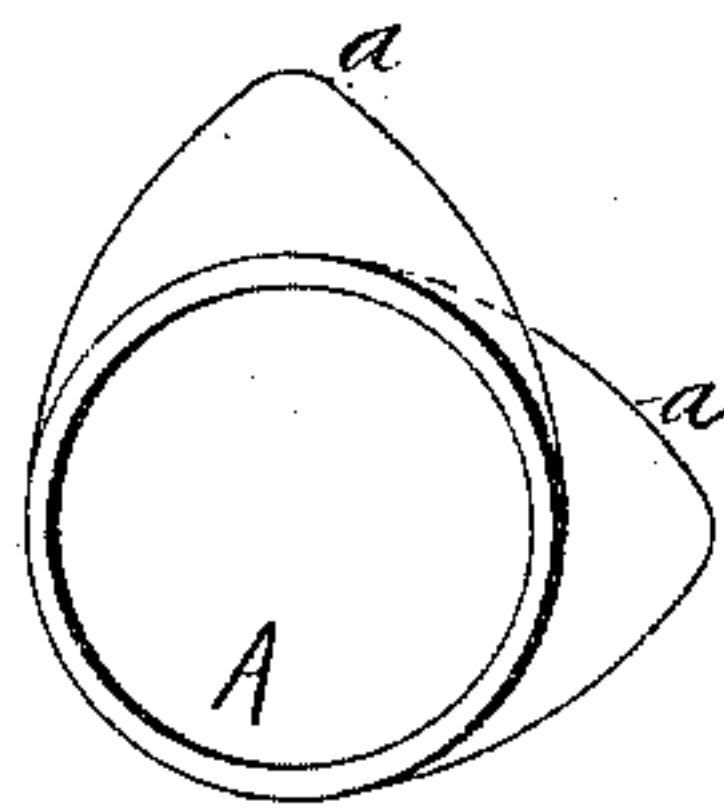


Fig. 7.

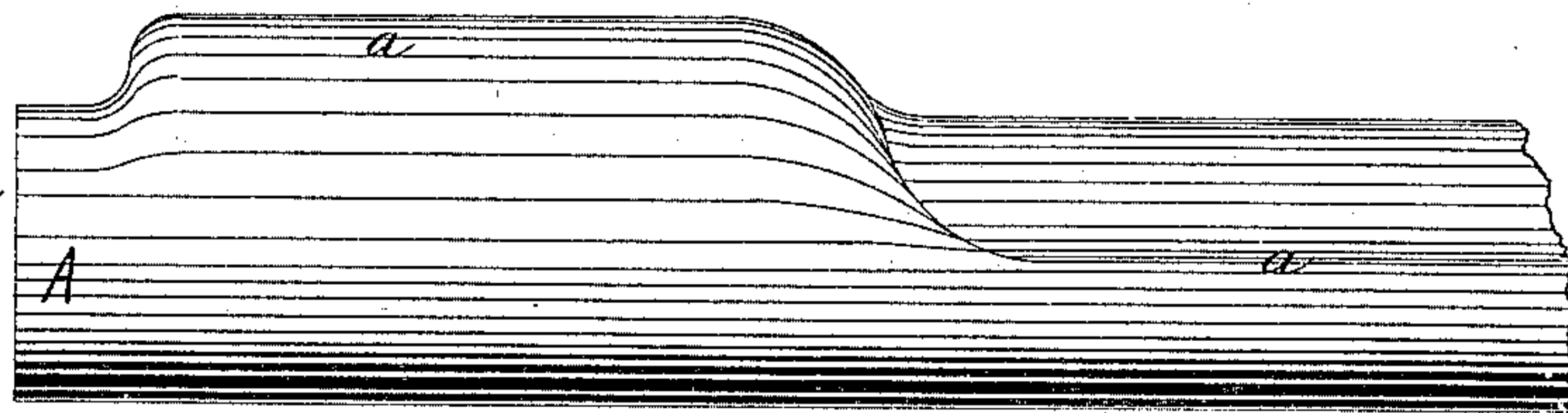


Fig. 8.

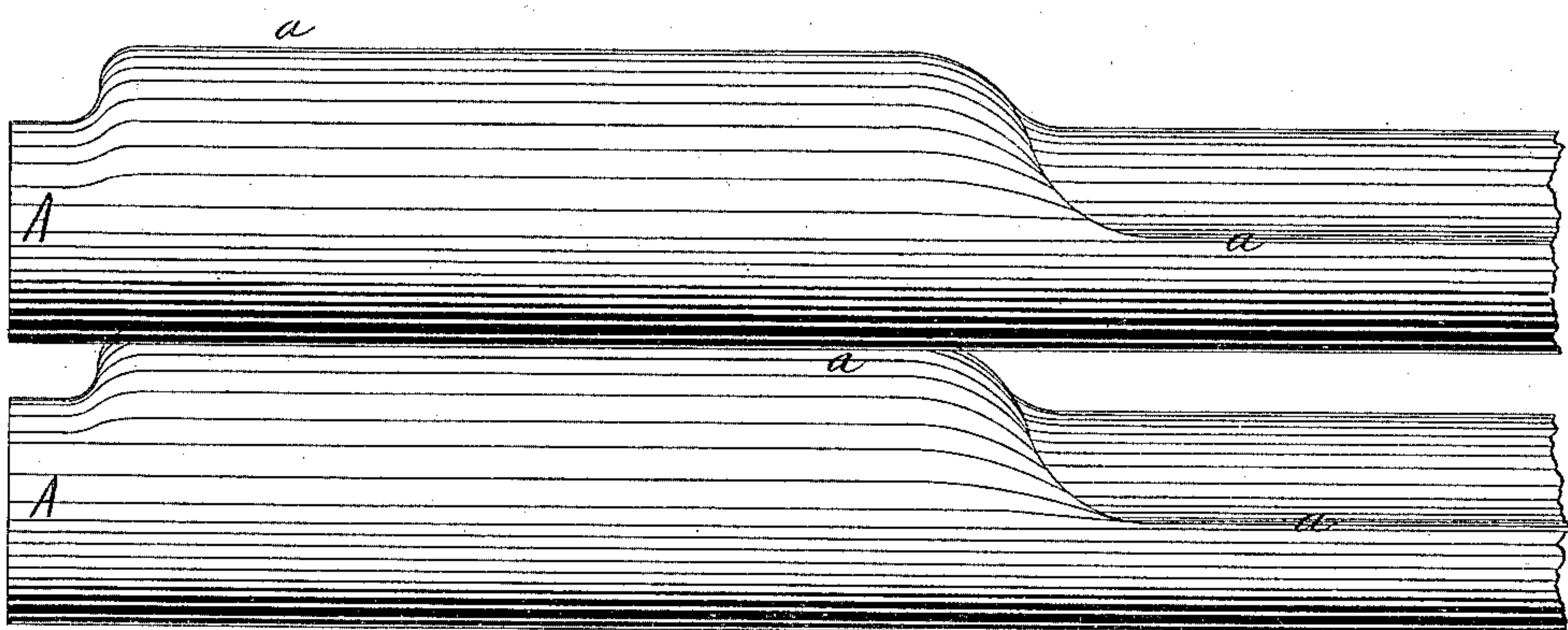


Fig. 9.

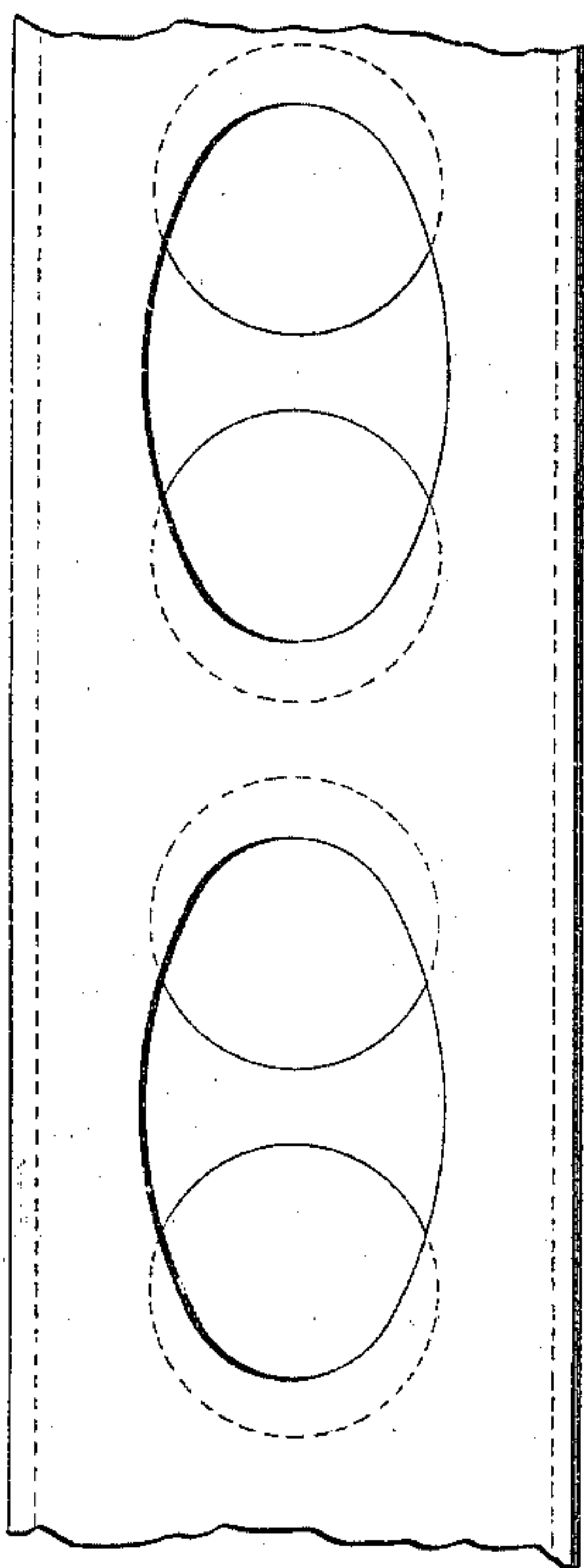
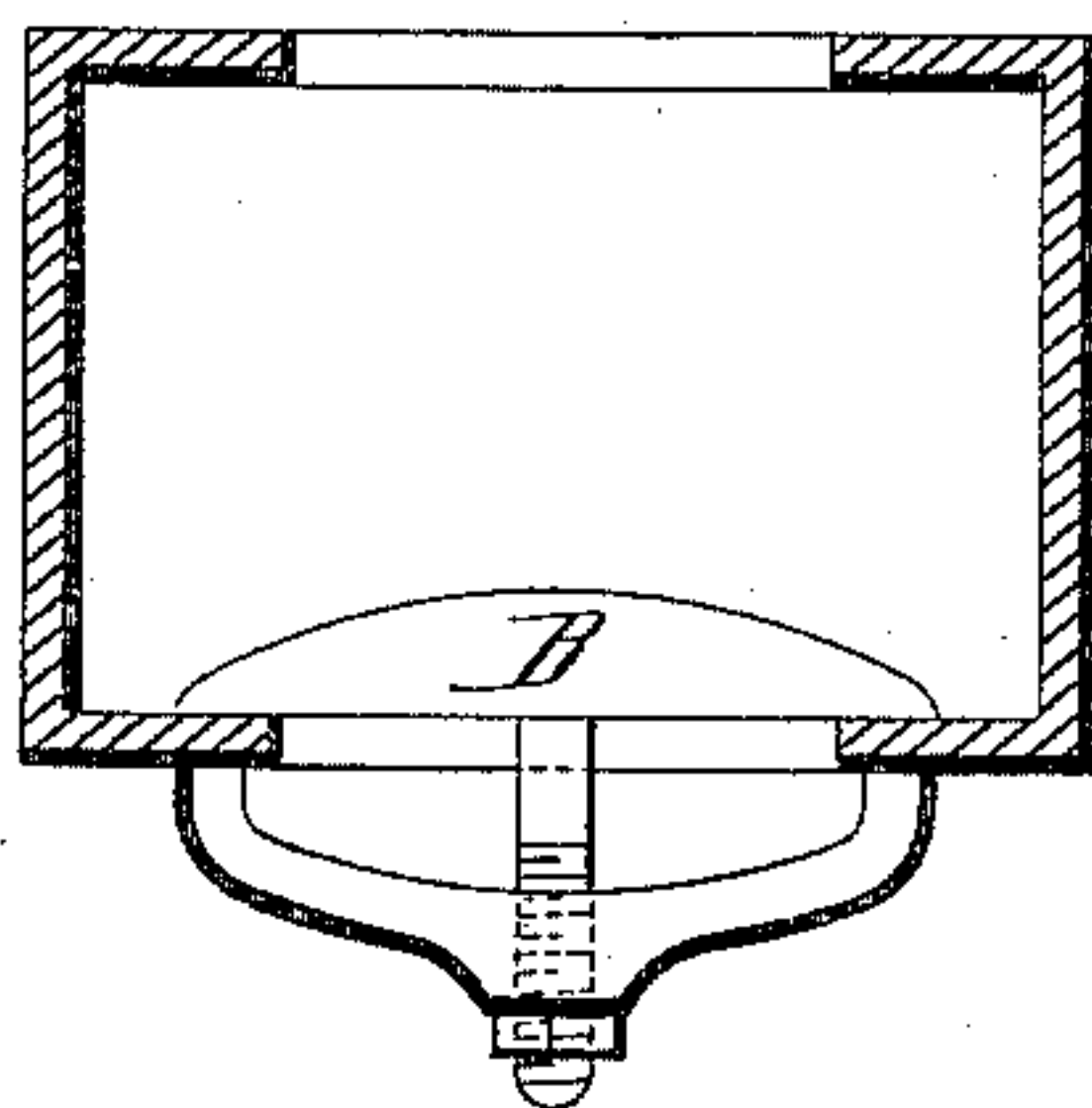


Fig. 10.



Witnesses:
John Buckler,
L. H. Osgood

James Hartley,
Inventor:
By North Osgood,
Attorney.

UNITED STATES PATENT OFFICE.

JAMES HARTLEY, OF BROOKLYN, NEW YORK.

WATER-TUBE FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 335,695, dated February 9, 1886.

Application filed April 27, 1885. Serial No. 163,548. (No model.)

To all whom it may concern:

Be it known that I, JAMES HARTLEY, of Brooklyn, county of Kings, and State of New York, have invented certain new and useful
5 Improvements in Water-Tubes for Boilers or Heaters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

10 My invention has relation to the construction and arrangement of tubes for employment in steam and other boilers and in heaters for the purpose of containing water or any liquids or fluids to be heated.

15 The object of my invention is to provide tubes of the class named which shall be extended or enlarged or offset in one or more parts, so that when located in place the spaces between adjacent tubes may be wholly or partially closed, thereby forming a side wall or
20 other barrier against the passage of heat, or leaving a portion opened and another portion closed, to provide for properly directing the heat and products of combustion, and to secure at the same time simplicity and cheap-
25 ness of construction and ease of assembling or repairing, as well as an abundance of metal between the tube-holes in the end boxes, and to secure other advantages, as will hereinafter appear.
30

To accomplish all of this my improvements involve certain new and useful peculiarities of construction and relative arrangements or combinations of parts, which will be herein
35 first fully explained, and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is an end elevation, and Fig. 2 an axial section, showing my
40 improved form of tube, having the enlarged part or the offset extending nearly to the cylindrical ends; and Fig. 3 is a partial section and elevation showing the offset and the cylindrical part of extent sufficient to afford an opening
45 between two adjacent tubes for the passage of heat and products of combustion. Fig. 4 is a cross-section representing several tubes arranged together in accordance with my invention; and Fig. 5 is a plan of the same,
50 showing the openings which may be left be-

tween the tubes when they are constructed as shown in Fig. 3. Fig. 6 is an end elevation, and Fig. 7 is a side elevation, of a tube also constructed and arranged in accordance with
55 my invention, the same being twisted or turned so as to vary the location of the offset, and thus to provide for the spaces between several tubes when arranged together; and Fig. 8 is a plan view showing two adjacent tubes and the space between them. Fig. 9 is an elevation,
60 and Fig. 10 a horizontal section, showing one manner of constructing the end box through which communication between the tubes may be established.

In all these figures like letters of reference,
65 wherever they occur, indicate corresponding parts.

A A are the circular or cylindrical ends of the tube, which may be of any length and any
70 desired diameter.

In boilers as usually constructed the heater-tubes do not touch each other, but leave free
75 open spaces between adjacent tubes, through which the heat and products of combustion from the furnace are free to pass, and in order to prevent their escape and waste it becomes
80 necessary to provide side and other walls of substantial material to confine and direct them.

I make the side walls and other barriers of the tubes themselves, and this I accomplish
85 by enlarging or providing an offset in the tubes, as shown at *a*, between the cylindrical ends, and then turning the tubes before finally securing them, so that the offset upon one shall
90 bear upon the material of the one next adjacent, substantially as indicated in Fig. 4. If the offsets be long enough to extend between the end walls or boxes, it is clear that the series
95 of tubes thus arranged will constitute an effectual barrier to the escape of products of combustion, and thus may form the side and top walls of the boiler. In a similar manner any intermediate wall or barrier may be formed. In the event that it is desired to permit the
100 products of combustion to escape through a certain part of the barrier, the offsets may be formed as indicated in Figs. 3 and 5—that is, only extending the desired length along the tubes, leaving the remaining parts cylindrical, between which cylindrical parts there

will be left the desired escape-passages, the other portion of the barrier or wall being closed, as indicated in Fig. 5.

Another manner of forming the partly-open and partly-closed barrier or wall is to extend the offset so as to leave only the cylindrical ends on the tubes for securing in the end boxes, and then twisting the tube so formed, as indicated in Figs. 6 and 7—that is, so as to bring the offset on one part of the tube to a position about at right angles to that on the other part—then, by locating the tubes as indicated in Fig. 8, a part of the wall or barrier formed thereby will be closed and the other part opened, as plainly shown. The tubes communicate with each other through end boxes of any desired extent, within which boxes they are secured by expanding, same as in the case of ordinary cylindrical tubes, but with certain important advantages peculiar to my improved form, as will appear below.

The end box represented in Figs. 9 and 10 is only one of many forms which may be employed. It will be observed that the circular openings cut in one plate thereof to receive the cylindrical ends of the tubes have their centers located at greater distances from each other than in ordinary forms, so that more metal is left remaining between the apertures, thereby insuring ample strength and solidity. These openings need not be cut with such accuracy of spacing as is usually required, for the tubes are capable of being turned a considerable distance in order to bring their offsets down to the contact position, and thus any inaccuracy of spacing the apertures may be easily compensated.

The boxes are intended to be supplied with hand-hole plates, as B, Fig. 10, upon one side, opposite the tube-apertures, and the hand-holes are arranged substantially as indicated in Fig. 9, so that the ends of two tubes can be reached through one hand-hole and expanded in place, or so that the two tubes can be easily reached for cleaning, scraping, &c.

With the end boxes and the tubes any size or form of boiler can be built up. One cylindrical end of each tube is preferably made a trifle longer than the other, as shown in Fig. 2, and the object of this is to facilitate assembling and repairs. When the tubes are all in place, to remove one it is simply cut out, and to replace it by another the longer cylindrical end is inserted in its opening and moved far enough therein to permit the adjustment of the shorter cylindrical end, when the tube is moved along to its proper place and then expanded or otherwise secured; and all this is done without disturbing or interfering with any of the other tubes. So, also, in originally mounting the boiler, the tubes may be put in place and secured in any order most desirable. Between the longer cylindrical ends short open spaces may occur, which can be readily stopped up with clay or fire-brick, or other suitable material.

If desired, the boiler may be covered with

any thin metal or non-conducting material, to prevent unnecessary radiation of heat from the exteriors of the tubes; but this covering is no essential part of the boiler, the side and other walls of which are formed by the tubes, which, when they contain liquid, are practically indestructible by the heat. Similar tubes may also be employed in making an end wall or walls of some forms of boilers, in which case the boxes will be employed as corner boxes, and a variety of combinations can be made in a similar manner.

The form of tube shown in the drawings is the preferred form, presenting no sharp angles to be affected by the heat, and affording a smooth or unbroken bottom line, by which lodgment of foreign matters is obviated, and cleaning or scraping facilitated, and the “blowing-off” process rendered effectual to clean the tubes. Of course, the mere shape of the offset may be varied without departing from my invention. The offset is easily formed by expanding the tube from its original circular or cylindrical shape, or, preferably, by drawing down the ends to a circular or cylindrical form from an original irregular or non-circular form, or in other ways which will readily suggest themselves.

In order that the tubes may be thus formed, expanded in place, twisted, cut out, and replaced, as above explained, it is necessary that they be made of wrought metal.

It has heretofore been proposed to make tubes of cast-iron with offsets and circular ends. These cast-iron tubes cannot be secured in place so that the joints will withstand the pressure to which they are subjected in a steam-boiler, and however secured all must be detached if a new one is to be inserted at any point; but by expanding the tubes in place (which can only be done with wrought metal) I am enabled to overcome this difficulty. I therefore make no claim to a cast-metal tube of the form shown herein; but,

Having now fully described my invention, what I claim as new herein, and desire to secure by Letters Patent, is—

1. The herein-described wrought-metal water-tube for boilers or heaters, the same being provided with an offset or extended part between the circular or cylindrical ends, and being twisted so as to vary the location or direction of the offset between its extremities, substantially as shown, and for the purposes set forth.

2. The combination of two or more water-tubes of the character herein set forth, each made of wrought metal and secured in place by expanding the ends, said tubes being constructed, substantially as shown, with cylindrical ends of unequal lengths and arranged so that the offset upon one shall bear against the material of the one next adjacent for a portion of its length, leaving open spaces between the tubes for the remaining portion, for the purposes and objects named.

3. In a wrought-metal water-tube of the

character herein set forth, having an offset
between the ends, the cylindrical ends made
of unequal lengths and arranged to be inserted
and secured in the end boxes by expanding
5 the ends of the tube therein, and without dis-
turbing any of the other tubes, substantially
as and for the purposes herein set forth.

In testimony that I claim the foregoing I
have hereunto set my hand in the presence of
two witnesses.

JAMES HARTLEY.

Witnesses:

HENRY FRANKE,
WORTH OSGOOD.