B. F. SAFBERG.

HEADER FOR WATER TUBE BOILERS.

APPLICATION FILED NOV. 21, 1911.

1,039,815.

Patented Oct. 1, 1912.

2 SHEETS—SHEET 1.

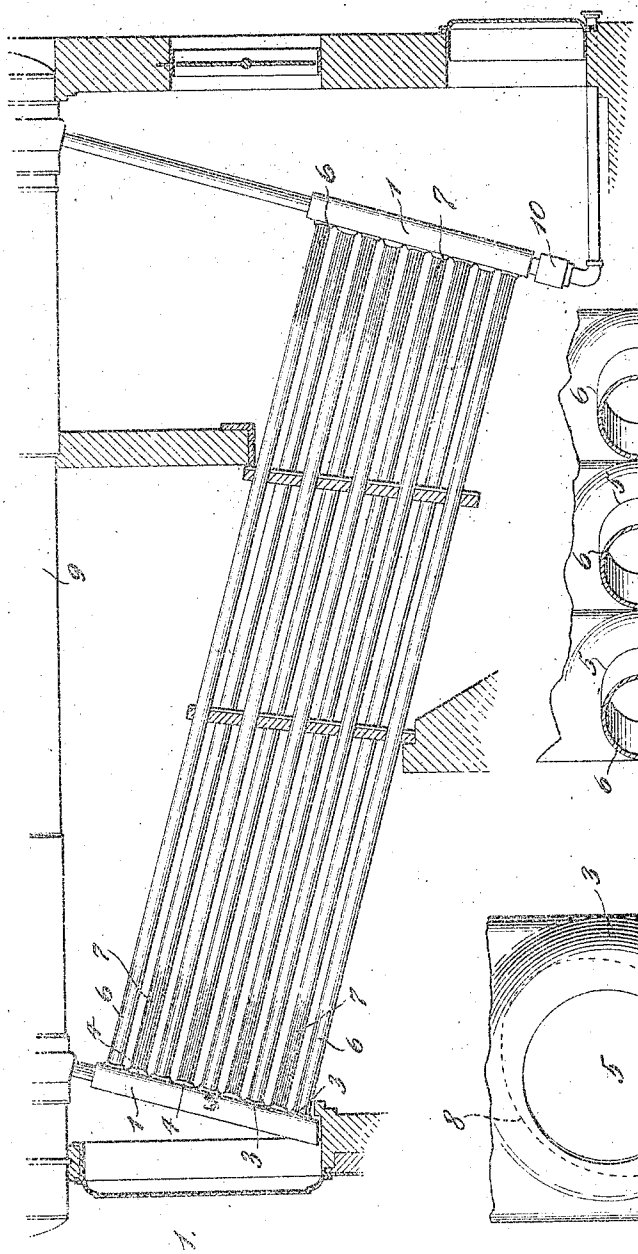

Fig. 1.

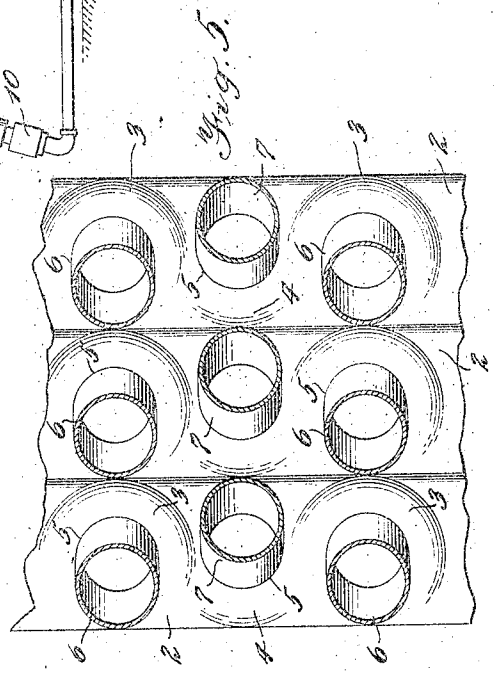

Fig. 5.

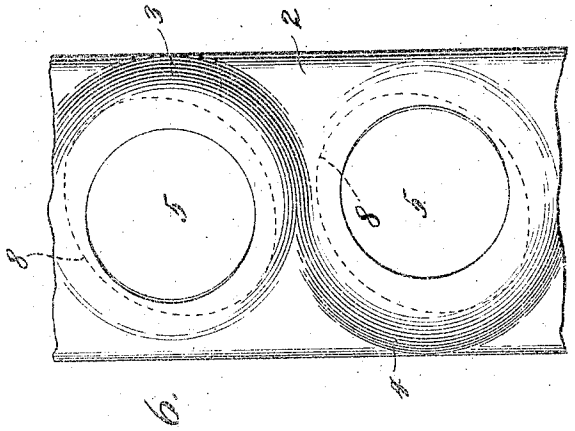

Fig. 6.

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2 SHEETS—SHEET 2.

Fig. 3.

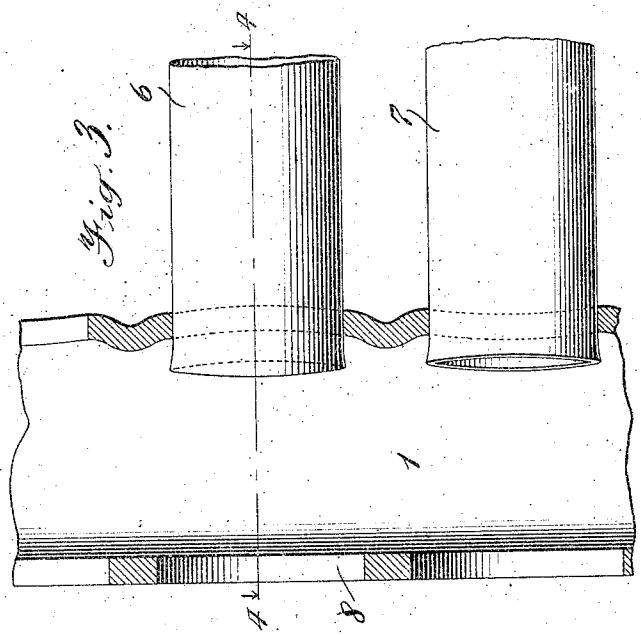
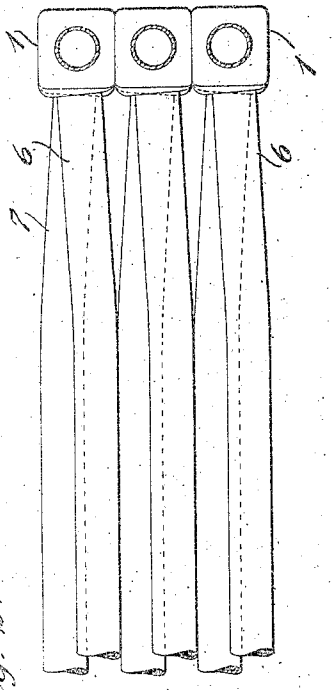


Fig. 5.



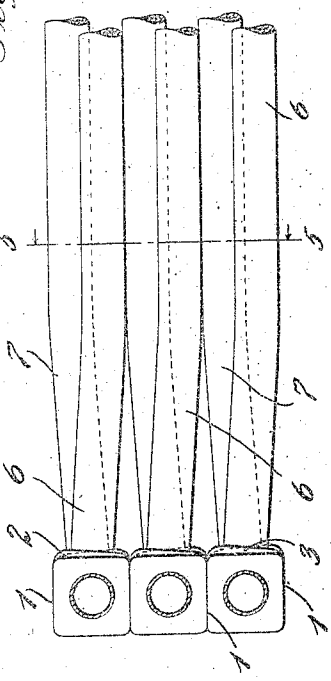
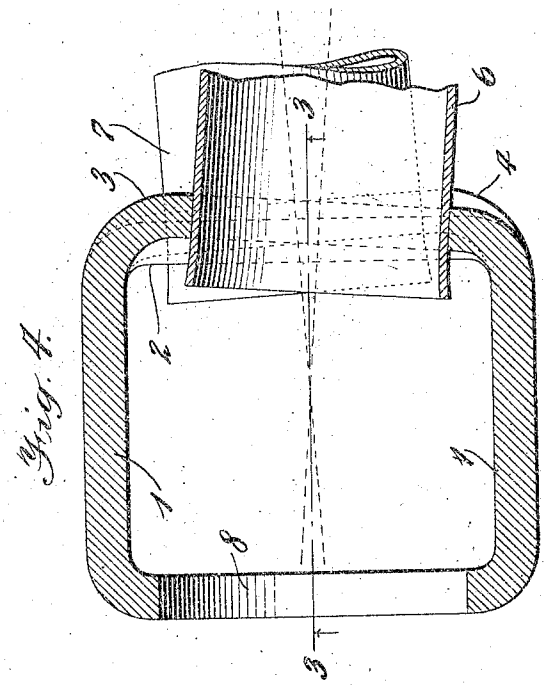


Fig. 4.



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UNITED STATES PATENT OFFICE.

BROR F. SAFBERG, OF BARBERTON, OHIO, ASSIGNOR TO THE BABCOCK & WILCOX COMPANY, OF BAYONNE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

HEADER FOR WATER-TUBE BOILERS.

1,039,815. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed November 21, 1911. Serial No. 661,462.

To all whom it may concern:

Be it known that I, BROR F. SAFBERG, a citizen of the United States, residing in the city of Barberton, county of Summit, and State of Ohio, have invented certain new and useful Improvements in Headers for Water-Tube Boilers, of which the following is a specification.

In the Babcock & Wilcox type of water tube boiler the tubes forming the heating surface are divided into vertical sections and, to insure a continuous circulation in one direction, are placed on an inclination of about 15 degrees with the horizontal. Each section is made up of a series of straight tubes expanded at their ends into corrugated boxes known as headers, the axes of the tubes being substantially at right angles to the plane of the face of the header.

Considerable expense is involved in corrugating the header and the object of the present invention is to simplify and cheapen the construction by making the sides straight and forming holes, in a particular manner, in the face of the header and bending the ends of the tubes so that when the latter are assembled, the main portion of the tubes will be staggered as heretofore.

The invention will be understood by reference to the accompanying drawings in which—

Figure 1 is a side elevation of a bank of tubes, a portion of the furnace being in section; Fig. 2 a plan view of a series of headers and the tubes connected thereto; Fig. 3 a vertical section on the plane of the line 3—3 of Fig. 4, the tubes being in side elevation; Fig. 4 a horizontal section on the plane of the line 4—4 of Fig. 3; Fig. 5, a transverse section on the plane of the line 5—5 of Fig. 2; and Fig. 6 a face view of a portion of a header before the tubes are inserted.

Similar reference numerals indicate similar parts in the several views.

In Fig. 1 I have shown a bank of inclined water tubes having their ends expanded into uptake and downtake headers the bank being divided by transverse baffles into a plurality of passes for the products of combustion. The headers are formed in the following manner. I start with a blank of proper length and section, either square or rectangular in cross section with straight parallel sides 1, and straight face and back, the sides remaining in the completed header the same as in the blank. When the header is of wrought metal the blank is placed in a suitable die and the face 2 struck up to produce a series of bosses 3 and 4 inclined to the face 2, the bosses 3 being inclined to the left and the bosses 4 to the right. Holes 5 are then punched or drilled through the bosses to receive the tubes, the plane of the openings being inclined to a plane perpendicular to the face of the header corresponding to the inclination of the bosses, that is to the left or right, and the center line of the hole perpendicular to the surface of the boss through which it passes.

To preserve the staggered relation of the tubes I bend them at a short distance from each end, as shown in Fig. 2, so that the center line of the bent portion shall be coincident with the center line of the boss, the main or body portion of each tube being straight. That is the ends of the upper row of horizontal tubes will be bent to the left or right to correspond with the inclination of the plane of the opening in the boss, and the ends of the next lower row of horizontal tubes will be bent in the direction opposite to that of the upper row. Thus as shown in Fig. 5, which may be taken as a view of a portion of the uptake header, the ends of the upper row of tubes 6 will be bent to the left; the ends of the next lower row of tubes 7 will be bent to the right; and the ends of the next lower row to the left corresponding to the first row, and so on. The ends of the tubes are expanded into the holes in the usual manner, each tube seat being at right angles to the center line of that portion of the tube which has been diverted from its straight horizontal center line. The angle of the bend of the ends of the tubes is such that the center line of the bent portions will intersect the vertical axis of the header as indicated in Fig. 4. Each end of a header is closed in a manner to form a flat surface at right angles to the parallel sides and through said end holes are punched or drilled to receive tubes or nipples for connecting the header to the boiler circulation. Opposite each tube end, in the rear wall of the header is a hand hole 8 giving access for cleaning or renewal of tubes. These hand holes will be fitted with suitable covers and clamps.

In building a steam boiler several of the

described headers are assembled side by side, as shown in Figs. 2 and 5, to form a bank of water tubes with the tubes disposed in parallel rows horizontally and the straight portions of the tubes staggered vertically, that is vertical relative to the center line of the header, the tubes in a lower row being under spaces between those of the next row above. The bank of the tubes thus formed is connected to the steam drum 9 by means of suitable nipples and connecting tubes from the upper ends of the uptake and downtake headers. The lower ends of the downtake headers are connected with short nipples to a mud drum 10, all as well understood in boiler construction.

From the foregoing description it will be seen that my invention comprises not only the header *per se* but a boiler section comprising the headers having holes in the face thereof with the center line of said holes inclined alternately right and left to a plane perpendicular to the face of the header, combined with tubes having their ends bent for a short distance to correspond with the direction of inclination of the center lines of the holes so that the tubes will enter at right angles to the tube seat, and the straight portions of the tubes connecting two header sections will be staggered vertically.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A boiler tube header having on the face thereof a series of bosses, said bosses having tube holes the center lines of which are inclined alternately to the right and left of a plane perpendicular to the face of the header.

2. A boiler tube header having on the face thereof a series of bosses, said bosses having tube holes the center lines of which are inclined alternately right and left to a plane perpendicular to the face of the header and intersecting the vertical axis of the header.

3. A boiler tube header having on the face thereof a series of bosses inclined alternately at a slight angle to right and to left of a plane perpendicular to the face of the header, said bosses having a tube hole the center line of which is perpendicular to the surface of the boss.

4. In a water tube boiler the combination of two headers, tubes connecting said headers, said tubes being bent a short distance from each end so as to stagger the straight portions of the tubes relative to the vertical center line of the header.

5. In a water tube boiler the combination of two headers each having a series of bosses in the face thereof, said bosses having tube holes the center lines of which are inclined alternately right and left to a plane perpendicular to the face of the header, tubes connecting said headers, said tubes being bent for a short distance from each end to correspond with the center line of the hole through which the tube passes, and the straight portions of the tubes staggered vertically with relation to the vertical center line of the header.

6. In a water tube boiler the combination of uptake and downtake headers consisting of sections having tube holes in the faces thereof, said holes having their center lines inclined alternately to right and left, and so disposed that center lines of holes in each horizontal row are inclined in the same direction, and tubes connecting the header sections having their ends bent to correspond to the direction of inclination of the center line of the holes so that their straight portions will be staggered vertically.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

BROR F. SAFBERG.

Witnesses:
J. C. FRANK,
R. G. BARRETT, Jr.