M. W. SEWALL & D. S. JACOBUS.

WATER TUBE BOILER.

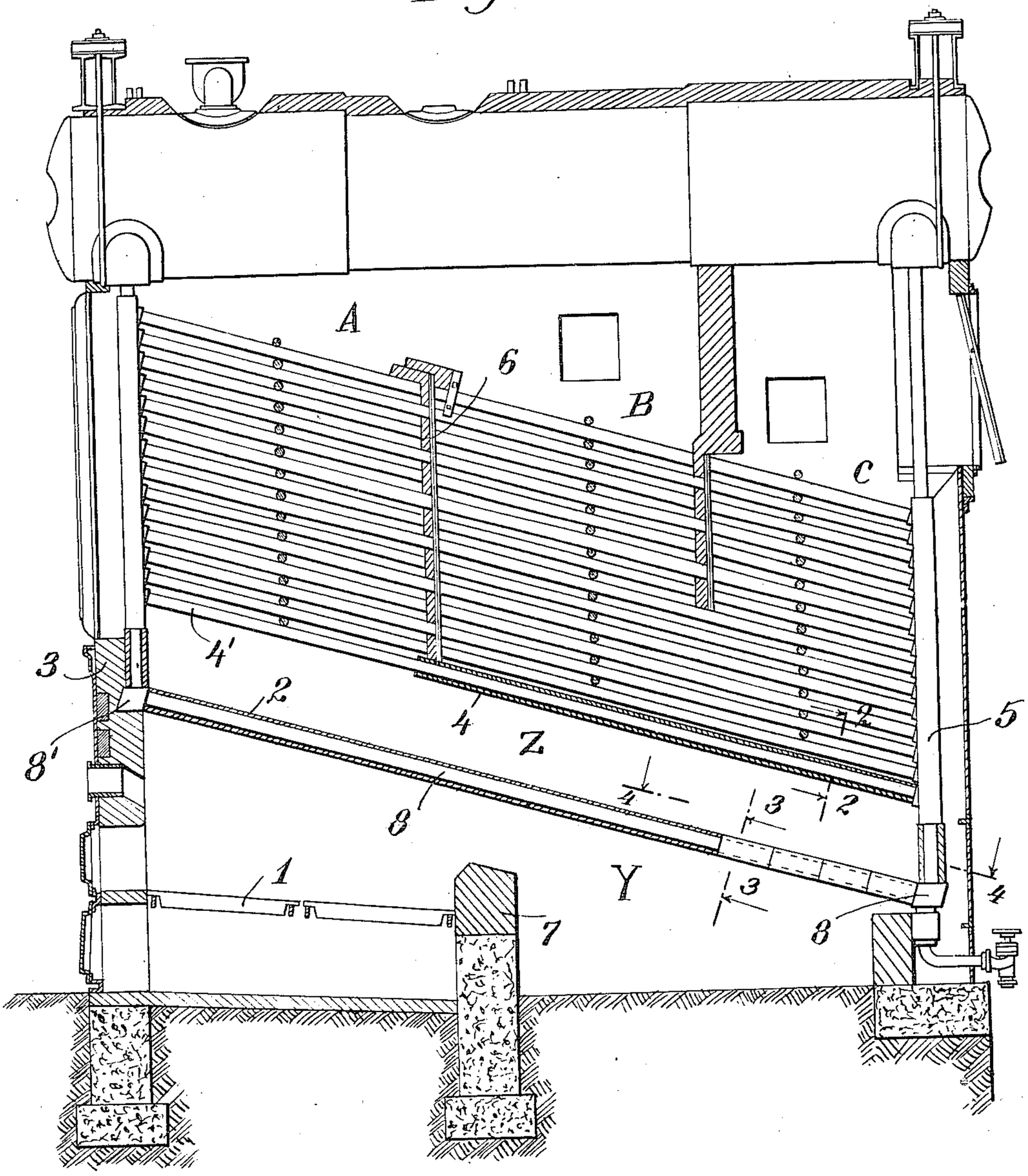
APPLICATION FILED FEB. 7, 1910.

983,171.

Patented Jan. 31, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

C. F. Keyhorn

Arthur Goat

INVENTORS

Minott W. Sewall

David S. Jacobus

BY Gifford & Bull

Their ATTORNEYS.

M. W. SEWALL & D. S. JACOBUS.

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2 SHEETS—SHEET 2.

Fig. 2,

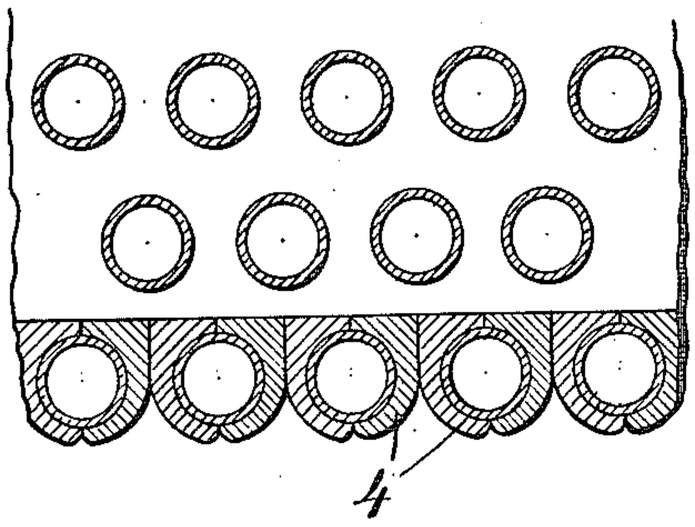


Fig. 5,

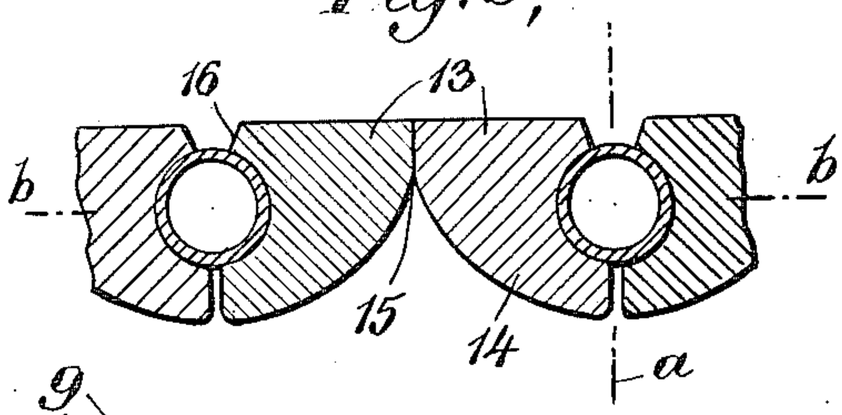


Fig. 3,

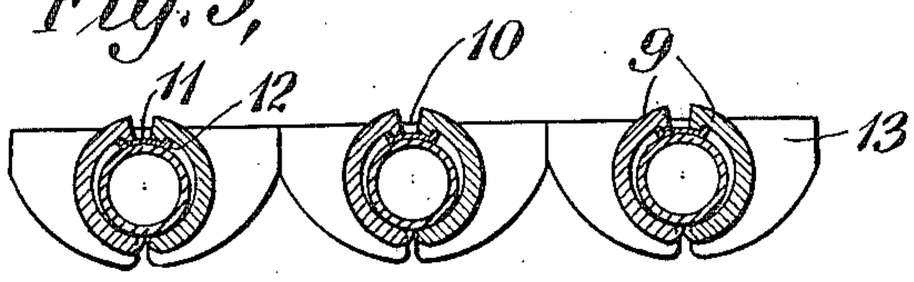


Fig. 6,

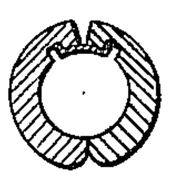
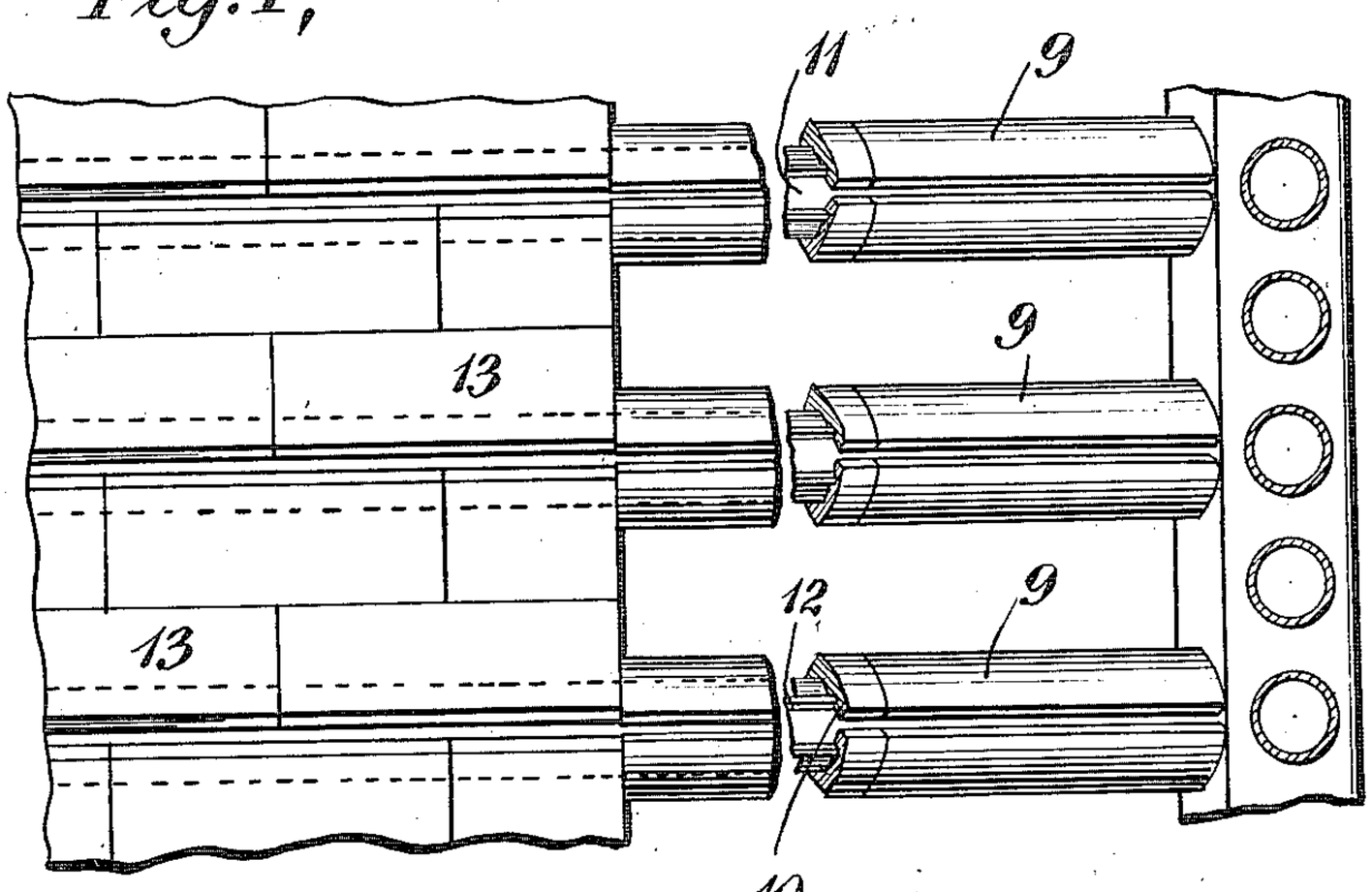


Fig. 4,



WITNESSES:

C. F. Leyhmeier

Arthur Goat

INVENTORS

Minott W. Sewall

David S. Jacobus

BY Gifford Bull

Their ATTORNEYS.

UNITED STATES PATENT OFFICE.

MINOTT W. SEWALL, OF NEW YORK, N. Y., AND DAVID S. JACOBUS, OF JERSEY CITY, NEW JERSEY, ASSIGNORS TO THE BABCOCK & WILCOX COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

WATER-TUBE BOILER.

983,171. Specification of Letters Patent. Patented Jan. 31, 1911.

Application filed February 7, 1910. Serial No. 542,417.

To all whom it may concern:

Be it known that we, MINOTT W. SEWALL and DAVID S. JACOBUS, citizens of the United States, the former a resident of New York city, borough of Manhattan, in the county of New York and State of New York, and the latter of Jersey City, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a specification.

In our application Serial No. 477,410, filed February 11, 1909, for water tube boilers, we have described a standard form of boiler construction so set that the gases, before coming into contact to a substantial extent with the water tubes, are carried below the second pass toward the rear of the boiler and thence back to the first pass before entering upon the course that they have heretofore taken through the bank of tubes. With such construction we can with highly volatile grades of bituminous coal hold the flame substantially back from the first pass and still maintain the accustomed steaming capacity and efficiency of the boiler substantially without smoking and the nuisance incident thereto.

Our object is to still further improve the conditions for boiler efficiency set forth in our said application and to that end we have selected one of the forms therein described to which the present invention is more particularly adapted; namely, that form in which the furnace roof consists of a row of water tubes extending from the front to the rear wall of the furnace, and by burying said tubes throughout their length obviate all exposure of the gases to a cooling surface in their passage from the fuel chamber to the first pass.

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

Figure 1 is a vertical longitudinal section through the boiler; Fig. 2 a vertical section on the plane of the line 2—2 of Fig. 1; Fig. 3 a section on the plane of the line 3—3 of Fig. 1; Fig. 4 a section on the plane of the line 4—4 of Fig. 1; Fig. 5 a detail section showing the form of brick used in the furnace roof, and Fig. 6 a modification of Fig. 3.

Similar reference numerals indicate similar parts in the several views.

As explained in our application Serial No. 477,410, A, B and C are the three transverse passes which have proved to impart the conditions for satisfactory steam-producing and efficiency of the standard water tube boiler herein illustrated, the gases passing first upward through A, then downward through B, then upward through C to the uptake. The grate 1, which may be hand or automatically stoked, is located substantially beneath the first pass A, but the gases, before reaching said pass, are compelled to travel through passages backward beneath the pass B, and thence forward again beneath the pass B to pass A. In the drawing we have shown a backward travel equal to the full width of the pass B, but in some cases a less distance may be sufficient.

The structure that we interpose between the fuel chamber and the inclined bank of tubes of standard construction consists of a fire brick roof or baffle 2 extending from the front wall 3 of the furnace rearwardly to a point beyond the bridge wall, and another baffle 4 extending forwardly from the downtake header 5 and approximately parallel with the baffle 2 to the foot of the baffle 6 by which the first pass A is separated from the second pass B. Baffle 2 with the parts below it produce the passage or combustion chamber Y leading from the fuel chamber through the contracted opening between said baffle and the bridge wall 7 to a point underneath the pass C, and a passage Z between baffles 2 and 4 leads from thence back to the pass A. The baffle 4 is shown as supported on the lower row of tubes 4′ of the usual bank of inclined tubes so that contact of the gases with said lower row of tubes is prevented until they reach the first pass A. The gases are also removed from contact with the water tubes below by burying the row of roof tubes 8 in the baffle 2, said tubes being connected with the boiler circulation through the boxes 8′. In our prior application the lower ends of the tubes 8 are unprotected and to obviate the exposure of the gases as they pass from the passage Y to the passage Z and to completely protect the gases from the cooling effects of the heating surface, we have, in the present construction

covered the portions of the supporting tubes between the baffle 2 and the downtake header 5 using as a covering a special form of tile shown in Fig. 3. For the baffle 2 we use the form of tile shown in Fig. 5.

In the form shown in Fig. 3 the tiles are approximately semi-circular in section and of any convenient length, each tile having a rib 10 extending longitudinally thereof on its inner surface close to one edge or a groove as shown in Fig. 6. This rib or groove is for the purpose of retaining the tile in position on the tube by contact with a loose metal lug 11 which lug conforms to the periphery of the tube and has longitudinal extensions 12 in the direction of the axis of the tube. When the metal lug is placed in proper position on the upper side of the tube and the two tiles are assembled with and supported by it, all are maintained in position for service as shown in Fig. 4. In removing it is necessary to take both tiles of a pair off at the same time and this can be readily done by grasping the tiles and separating the lower edges, a clearance between the upper edges of the tiles permitting them to move toward each other a sufficient distance to be lifted free of the tube.

In Fig. 5 we have shown the form of tile used for the baffle 2. These tiles 13 have a lower face 14 struck on an arc, the center of which is in a vertical line *a* passing through the center of the corresponding tube, the center being such that the intersection of the arcs of two adjacent tiles will be above the horizontal center line *b* of the tubes. Above the point of intersection of the two arcs 14 the abutting faces are in a vertical plane. This position of the center gives such a form to the tile that when it is rotated upwardly about the tube center the tile will immediately free itself from the adjacent tile and so permit of its rotation through a sufficient arc to remove it from its place without disturbing any other portion of the roof. These tiles of Fig. 5, when supported on the tubes 8, break joint as shown in Fig. 4 so that the removal of one tile does not permit its companion tile to fall. A clearance is provided by cutting away the upper edge of the tile at 16 to permit of the rotation of the tile a sufficient distance to effect its removal.

The inclosing tile used on the lower row of the bank of inclined water tubes to form the baffle 4 is of a form commonly used and is shown in Fig. 2. When it is required to replace one of the tiles of this baffle it is necessary to slide the tile endwise from an open space and it will be readily understood that the form shown in Fig. 5, because of the facility with which it may be put in place or removed without disturbing the adjacent tiles, offers distinct advantages.

From the foregoing description it will be seen that the baffle 2 constituting the roof of the furnace consists of abutting tiles and is continuous in both directions from the front wall to a point beyond the bridge wall. From that point to the rear wall or header, the openings between the tubes permit the passage of the gases from the passage or combustion chamber Y to the passage Z. That is, by spacing the tubes 8 farther apart than heretofore we are enabled to construct the baffle 2 with supporting water tubes extending from the front to the rear of the boiler and to embed such tubes for their full length, so that the gases are completely protected from the cooling effect of the heating surface throughout their passage from the furnace to the first pass A.

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

1. In a water tube boiler, in combination, a bank of inclined water tubes, a plurality of transverse baffles dividing said bank into transverse passes beginning at the steam uptake end, a furnace and a bridge wall therefor, a baffle extending from the front wall above and to a point beyond the bridge wall, a row of tubes embedded in said baffle and extending from the front to the rear of the boiler, a fire brick covering for said tubes beyond the baffle, and a passage above said baffle communicating with a combustion chamber and leading to the steam uptake end.

2. In a water tube boiler, in combination, a bank of inclined water tubes, transverse baffles dividing said bank into a plurality of passes beginning at the steam uptake end, a furnace and a bridge wall therefor, a combustion chamber at the rear of said bridge wall, a baffle 2 forming a roof for said furnace extending beyond the bridge wall, tubes embedded in said baffle and extending from the front to the rear of the boiler, and connected to the boiler circulation, a fire brick covering for the ends of the tubes beyond the baffle, said bricks being of less width than the space between the tubes so as to provide clear openings from said combustion chamber, and a passage above said baffle leading to the steam uptake end.

3. In a water tube boiler, in combination, a bank of inclined water tubes, transverse baffles dividing said bank into a plurality of passes beginning at the steam uptake end, a furnace and a bridge wall therefor, a combustion chamber at the rear of said bridge wall, a baffle 2 forming a continuous roof for said furnace extending beyond the bridge wall, tubes embedded in said baffle and extending from the front to the rear of the boiler, a fire brick covering for the portions of the tubes extending beyond the baffle, said bricks being of such width as to form clear openings between them, and a baffle extending forwardly from the rear to the

first pass and forming with said first-named baffle a passage which communicates with said combustion chamber.

4. In a water tube boiler, in combination, a bank of inclined water tubes, transverse baffles dividing said bank into a plurality of passes beginning at the steam uptake end, a furnace and a bridge wall therefor, a combustion chamber at the rear of said bridge wall, a baffle 2 forming a continuous roof for said furnace extending beyond the bridge wall, tubes embedded in said baffle and extending from the front to the rear of the boiler, a fire brick covering for the portions of the tubes extending beyond the baffle, said bricks being of such width as to form clear openings between them, and a baffle extending forwardly from the rear to the first pass and supported on the lower row of tubes of said bank and forming with said first-named baffle a passage which communicates with said combustion chamber.

In testimony whereof we have hereunto signed our names in the presence of two subscribing witnesses.

MINOTT W. SEWALL.
DAVID S. JACOBUS.

Witnesses:
MARY WINTER,
EDITH CAMP.