H. E. BOYRIE.

WATER TUBE BOILER.

APPLICATION FILED JAN. 18, 1912.

1,044,624. Patented Nov. 19, 1912.

Fig. 6

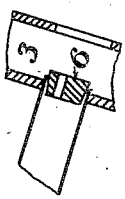


Fig. 2

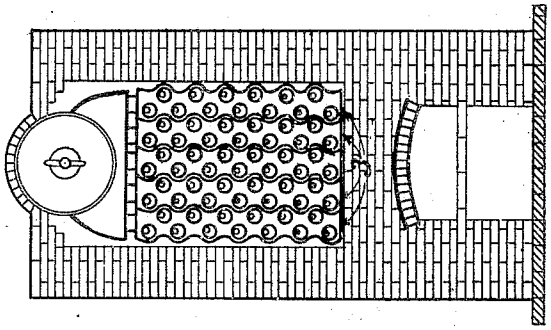


Fig. 4

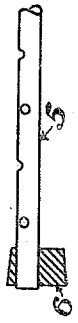


Fig. 3

Fig. 1

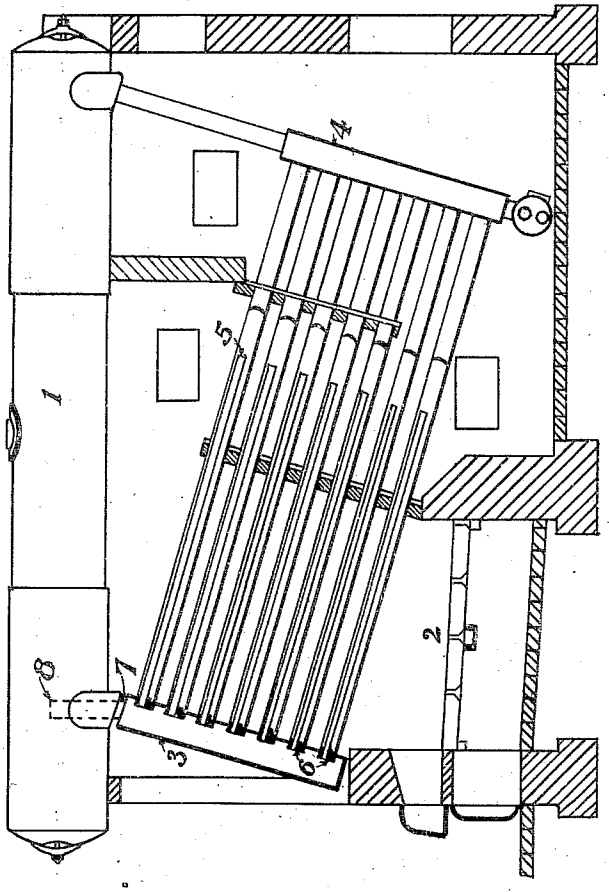
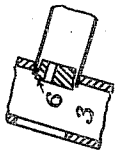


Fig. 5



WITNESSES

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WATER-TUBE BOILER.

1,044,624. Specification of Letters Patent. Patented Nov. 19, 1912.

Application filed January 18, 1912. Serial No. 672,025.

To all whom it may concern:

Be it known that I, HARRY EUGENE BOYRIE, a citizen of the United States, residing at the city of San Francisco, in the county of San Francisco and State of California, have invented a certain new and useful Improvement in Water-Tube Boilers, of which the following is a specification.

This invention relates to steam boilers of the water-tube class generally, and is more especially adapted for embodiment in the sectional-header types employing longitudinal steam and water drums or boilers disposed above pluralities or banks of inclined water tubes, either in single or double decks, such as are known commercially as Babcock and Wilcox boilers; the essential principles of the improvement, however, being also of great practical value when employed in relation to boilers of the water-leg types such as are commercially known as the Heine and Geary and other analogous constructions.

The main objects of the invention are to obtain the maximum output or extreme capacity from a boiler plant of either of the types mentioned, while occupying the minimum limit of ground space,—by permitting of forced or extreme firing either at all times or at such periods of the working day when the peak load is to be carried—say—in the late afternoon and evening in electric light and power plants of large size, and thus by minimum investment reducing the ultimate cost of power; also to obviate the serious objection and fault found to exist at present where, by reason of the slow circulation and discharge from the lowermost banks, rows, or ranges of water tubes—or those nearest to and more immediately above the furnace chamber,—the more intense heat is applied to such lower tubes with the resulting quicker generation of steam therein than in the tubes above—or more remote from the fire—and consequent liability of such lower tubes to soften, bend, and burst from the extra external heat and internal pressure at these points in the installation.

In the present known construction, the objections just noted and the comparatively low output are caused by the fact that all of the steam generated in the tubes connected to the headers must, in order to reach the elevated steam drum, pass through single nipples (one for each header-section) after finding its way through and being in consequence restricted by the volume of water occupying the header as part of the general circulation, and be also lessened in its expansive force by taking up or being mixed with this water which is necessarily of greater specific gravity. It is for the reason that the volume of steam and water so disposed is considerably greater than can readily pass upward through the limited areas afforded by such single nipple-connections to the superposed drums, that the circulation of steam and water is retarded, with the objectionable results mentioned.

To the useful ends of obviating all of these objections, and attaining the beneficial effects above alluded to, my invention consists, briefly speaking, in closing the upper end of each water tube with a removable disk, having a hole on its upper side to which is attached a perforated pipe extending down the water tube as far as experience demonstrates is necessary to collect the steam generated in the water tube. The lower end of the perforated pipe is closed but its upper side has perforations or slots so that the steam formed in the tube may rise and enter these perforations, thence travel upward and forward through the perforated pipe and the disk to the front header, thence upward to the steam space in the drum. This gives the steam formed in the water tubes a separate path to the front headers, and experience shows that the steam enters the perforated pipes in precedence to the water, and when the boiler is steaming under ordinary conditions practically no water enters the perforated pipes, so that nothing but steam reaches the front headers, excepting during those periods of light load and then it is not necessary that the steam should have precedence over the water, and it will not be objectionable if some water does enter the front headers. When steam fills the front headers it will then have a free path to the steam space in the drum by extending the nipple 7, or an equivalent extension, from within the headers as shown at 8 to prevent the water in the drum from running into the front headers. It may not be necessary to provide the lower rows of tubes with these disks and perforated pipes, as the great percentage of steam formed in the bottom tubes may require their full outlet. It is also practicable to dispense with the perforated pipes and use

only disks in the upper ends of the tubes; or disks may be used in the lower ends of the tubes only, as retarders and thus admit water to them but little faster than it is evaporated in the boiler tubes.

For a more complete comprehension of my invention reference must be had to the accompanying drawings, forming part of this specification, in which similar reference numerals indicate like parts in the several figures.

In said drawings: Figure 1 is a horizontal sectional elevation of a water-tube boiler and furnace embodying a preferred form of my invention. Fig. 2 is a front sectional elevation. Fig. 3 is an enlarged view showing the upper end of a water tube with an inserted disk to which is attached the perforated pipe. Fig. 4 shows the perforations in a steam extracting pipe. Fig. 5 is an enlarged view of a disk in the upper end of a tube but without a steam extracting pipe attached to it. Fig. 6 is an enlarged view of a disk in the lower end of a tube.

The numeral 2 indicates the furnace.

3 is a front header.

4 is a rear header and the water tubes are connected between these headers.

5 is the perforated or slotted steam extracting pipe.

6 is the removable disk at the front end of the water tube.

7 is the nipple at the top of the front header whereby the header is connected to the steam drum.

8 is an extension of the nipple or the upper part of the header to prevent water in the steam drum from sagging down into the front headers.

The front header of a water leg boiler would, in effect, be extended above the water level in the drum.

What I claim and desire to secure by Letters Patent is as follows:

1. In a water tube boiler, the combination with a suitable fire chamber; one or more steam and water drums; a plurality of banks, or rows, of inclined tubes; headers in connection with the ends of such tubes and with the drum;—of a removable perforated disk in the upper end of each or some of the water tubes.

2. In a water tube boiler, the combination with a suitable fire chamber; one or more steam and water drums; a plurality of banks or rows of inclined tubes; headers in connection with the ends of such tubes and with the drum;—of a removable perforated disk in the upper end of each or some of the water tubes; an extension to the front nipple or header to above the water level in the steam drum.

3. In a water tube boiler, the combination with a suitable fire chamber; one or more steam and water drums; a plurality of banks or rows of inclined tubes; headers in connection with the ends of such tubes and with the drum;—of a removable perforated disk in the upper end of each or some of the water tubes; a perforated pipe connected to the disk and projecting down into the water tubes.

4. In a water tube boiler, the combination with a suitable fire chamber; one or more steam and water drums; a plurality of banks or rows of inclined tubes; headers in connection with the ends of such tubes and with the drum;—of a removable perforated disk in the upper end of each or some of the water tubes; a perforated pipe connected to the disk and projecting down into the water tubes; an extension to the front nipple or header to above the water level in the steam drum.

5. In a water tube boiler, the combination with a suitable fire chamber; one or more steam and water drums; a plurality of banks or rows of inclined tubes; headers in connection with the ends of such tubes and with the drum;—of a removable perforated disk in the lower end of each or some of the water tubes.

6. In a water tube boiler, the combination with a suitable fire chamber; one or more steam and water drums; a plurality of banks or rows of inclined tubes; headers in connection with the ends of such tubes and with the drum;—of a removable perforated disk in the lower end of each or some of the water tubes; an extension to the front nipple or header to above the water level in the steam drum.

In testimony whereof, I have signed in the presence of the two subscribing witnesses.

HARRY EUGENE BOYRIE.

Witnesses:
H. H. TRACY,
A. L. MENZIN.