

No. 798,259.

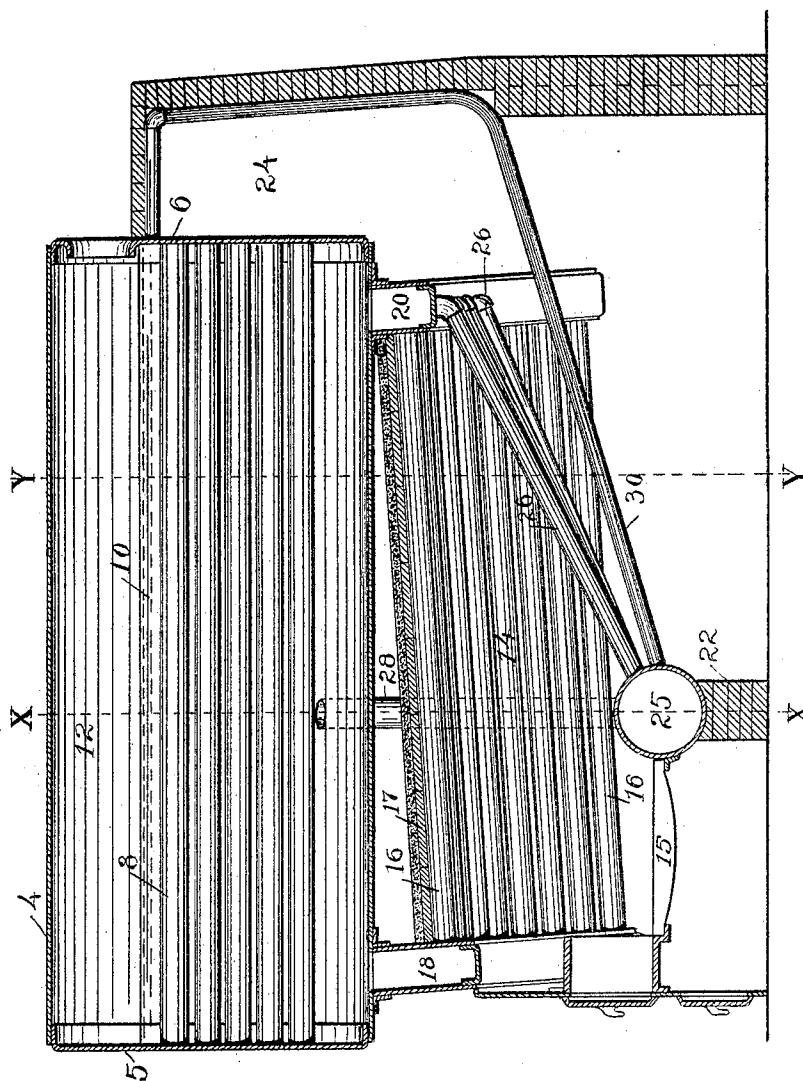
PATENTED AUG. 29, 1905.

W. W. BONSON.
BOILER.

APPLICATION FILED JUNE 2, 1903.

2 SHEETS—SHEET 1.

Fig. 1.



Witnessed

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2 SHEETS—SHEET 2.

Fig. 3

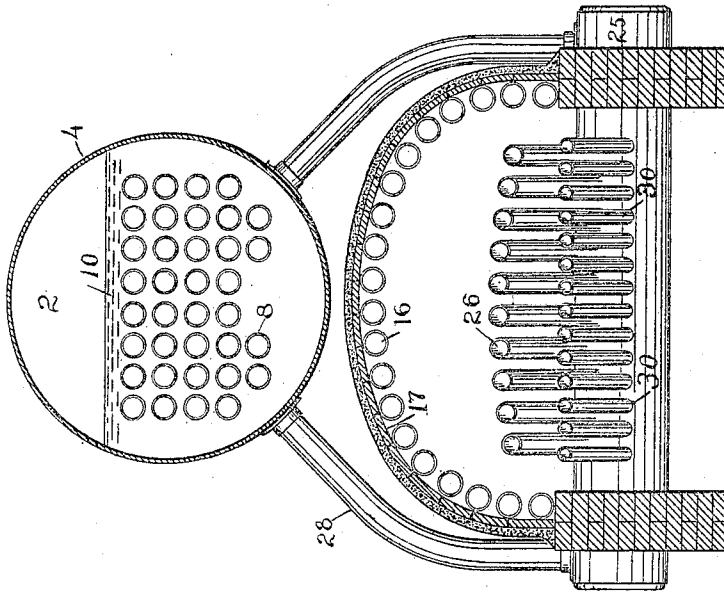
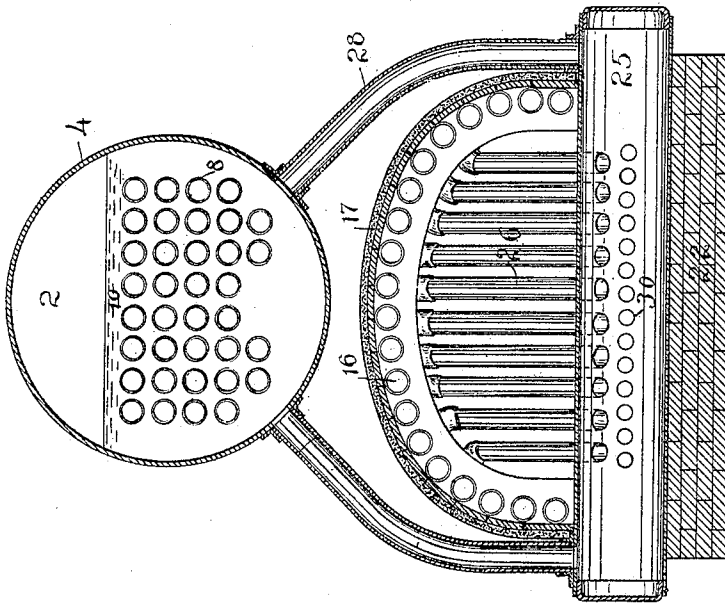


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM W. BONSON, OF DUBUQUE, IOWA.

BOILER.

No. 798,259.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed June 2, 1903. Serial No. 159,798.

To all whom it may concern:

Be it known that I, WILLIAM W. BONSON, a citizen of the United States, residing in the city and county of Dubuque and State of Iowa, have invented certain new and useful Improvements in a Combined Boiler and Furnace; and I do hereby declare the following to be a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to combined boilers and furnaces; and the leading object is to create such a free, generous, and rapid circulation of the water that the water-tubes and boiler will be kept clean, whereby the largest possible amount of heat will be conserved and effectively applied.

To this end it consists in a boiler provided with flues set over and separated from a furnace roofed with fire-brick and water-tubes and the water-tubes of the furnace connected with the water in the boiler by a front and rear water communication.

It also consists in connecting the rear water-leg by water-pipes with a drum situated in the furnace, and it further consists in means for lining the back connection which connects the boiler-flues with the furnace with a wet back connection.

The manner of construction whereby the objects are accomplished will be fully explained in the following specification when taken in connection with the drawings accompanying the same and forming a part thereof.

Figure 1 is a longitudinal section through the center of the boiler and furnace. Fig. 2 is a vertical section through line X X of Fig. 1 looking toward the rear. Fig. 3 is a vertical section through line Y Y of Fig. 1 looking toward the forward end.

Like characters of reference denote corresponding parts in each of the figures.

Referring to the drawings, 2 represents the upper member or boiler, preferably of the type known as "tubular" boiler, which consists of a shell 4, flue-sheets 5 and 6, into which the fire-flues 8 are secured, a water-space 10, and steam-chamber 12. Beneath this boiler is set a furnace 14, provided with grate-bars 15. Above the grate-bars are set water-tubes 16, reinforced with fire-brick 17 and covered over with asbestos or other non-heat-conducting material. This portion of the furnace constitutes what may be called the "fire-box proper" of the furnace. These tubes 16 are

set on an incline and extend over the fire-box and combustion-chamber and form a covering for the entire furnace and secured at their forward ends in a water-leg 18 and at the rear in a water-leg 20 in any well-known manner. These water-legs open into the boiler 2 and form a water communication between the water in the boiler and the water in the tubes 16. It will be seen as the fire-box and combustion-chamber are entirely covered by the water-tubes and brick that neither the flame of the fire-box nor products of combustion in the combustion-chamber can come in direct contact with the shell or the upper member or boiler, and hence there is little or no danger of incrustation forming in the upper boiler or undue expansion of said boiler, whereby the fire-flues are loosened or in any way injured. The life and effectiveness of the upper boiler is largely increased by this mode of construction, and also the circulation of the water between the upper and lower members is rendered much more rapid and furious.

In the base of the furnace at the rear of the grate-bars 15 and practically upon the bridge-wall 22 is set a drum 25, which extends crosswise of the furnace and projects slightly beyond the furnace on both sides and closed at both ends. Into this drum are secured water-pipes 26, which extend backward within and through the furnace and at an incline upward and are connected with the rear water-leg 20 and form a water communication between the drum 25 and the rear water-leg 20. The drum 25 is also connected to the boiler 2 by the water-pipes 28, extending on opposite sides of the furnace, and forms a direct connection between the water in the upper boiler and the drum, and by means of these pipes the water is supplied to the drum from the upper boiler.

For the purpose of utilizing the heat of the furnace there is formed what is known as a "wet" back connection to connect the furnace with the flues of the upper boiler, which is constructed as follows: There is secured in the drum 25 a series of water-tubes 30, which extend backward along in the combustion-chamber of the furnace to the wall of the back connection 24 and then upward against the wall to near the top and from there through the rear flue-sheet 6 into the upper boiler 2, forming a water connection between the drum 25 and rear of the upper boiler along in the furnace and lining the wall of the back connection. By

locating these tubes 30 so that they will form a lining to the back connection they will also serve as a rigid stay for the wall and prevent the back connection from breaking away from its fastenings.

It will be observed that since the tubes which form the roof of the furnace and are connected to the drum in the furnace are numerous and are of thin metal and exposed to the direct action of the heat of the furnace they will absorb a large part of the heat before it leaves the furnace. Then there will also be taken up considerable more of the heat by the water-tubes forming a lining for the back connection, and most of the remainder of the heat will be taken up into the water in the boiler through the fire-flues of the boiler. It will further be seen since so large a proportion of heat of the furnace is taken up by the water in the tubes which form the covering of the furnace and by the drum and other water-tubes in the furnace that there will be a rapid rushing of the water through these water-tubes which roof the furnace up through the rear water-leg into the boiler and down from the boiler through the front water-leg, and at the same time the water in the drum will rush through the water-tubes 26, up through the rear water-leg into the boiler, and down from the boiler through the pipes 28 and still further rush of the water from the drum in the furnace up the pipes, forming the lining for the back connection into the boiler. In this manner the circulation will be furious, not only at the ends of the boiler, but also in the middle, and hence the tubes will be kept clean and in the most effective condition to take up the largest number of heat units.

Having now described my invention, what I claim is—

1. In a combined boiler and furnace, a boiler provided with fire-flues, a furnace consisting of a grate, water-tubes with fire-brick above the grate forming the roof of the furnace and separating the furnace from the boiler, water communication between the boiler and the covering of the furnace, a water-drum in the furnace and water communication between the drum and boiler through the rear water-leg.

2. In a combined boiler and furnace, a boiler, a furnace consisting of a grate, water-tubes over the grate and forming with fire-brick the roof of the furnace, a water-leg at each end of the boiler to which the water-tubes are connected, a water-drum in the furnace, water-tubes connecting the drum with one of the water-legs and water communications between the drum and the boiler.

3. In a combined boiler and furnace, a boiler, a furnace consisting of a grate, water-tubes with fire-brick above the grates and forming a covering for the furnace and separating the boiler from the furnace, water communication between the boiler and covering of the fur-

nace at both ends of the boiler and furnace, and water communication between the water in the furnace and boiler along the wall of the back connection.

4. In a combined boiler and furnace, a boiler provided with fire-flues and water-space, a furnace consisting of a grate, water-tubes over the grate and forming a roof for the furnace and separating the furnace from the boiler, water communication between the boiler and water-tubes of the furnace, a back communication between the flues of the boiler and the furnace consisting of a wall and water-tubes forming a lining and a stay for the back connection, and water communication between the drum in the furnace and the boiler through the back connection.

5. In a combined boiler and furnace, a boiler provided with fire-flues, and water-space, a furnace consisting of a grate, water-tubes over the grate with fire-brick forming a covering for the furnace and separating the boiler from the furnace, water communication between the boiler and the water-tubes over the furnace through the rear water-leg, a drum in the furnace, water communication between the drum and the covering of the furnace, and a back connection between the furnace and flues of the boiler consisting of water communication between the drum in the furnace and the boiler forming a lining for the back connection, and providing a fire communication between the furnace and the flues in the boiler.

6. In a combined boiler and furnace, a boiler provided with fire-flues a water-space and steam-chamber, a water-leg at each end of the boiler opening into the boiler, a furnace consisting of a grate water-tubes connecting the water-legs at each end thereof and with brick forming a covering for the furnace, a water-drum within the furnace, water communication between the drum and the rear water-leg and between the drum and boiler, a back connection connecting the rear of the furnace with the flues of the boiler and water connection between the drum in the furnace and rear of the boiler and forming a lining for the back connection.

7. In a combined boiler and furnace, a boiler provided with fire-flues, a water-leg opening into the boiler near each end, a furnace consisting of a grate, water-tubes set in the water-legs and forming with the fire-brick a covering for the furnace, a drum set in the furnace, water-tubes connecting the drum with a water-leg, water communication between the drum and boiler, and a back connection between the boiler and flues of the furnace consisting of water-tubes forming a lining and water communication between the boiler and drum in the furnace.

8. In a combined boiler and furnace a boiler provided with fire-flues and water-space, water-legs opening into the boiler, a furnace be-

neath the boiler consisting of a grate, water-tubes set in the water-legs and providing water communication between the water-legs and forming with fire-brick a roof for the furnace, a drum set in the furnace in the rear of the fire-box, water-tubes connecting the drum with the rear water-leg, water communication between the boiler and drum in the furnace and a back connection between the flues of the boiler and furnace.

9. In a combined boiler and furnace, a boiler provided with fire-flues, a water-leg near each end of the furnace opening into the boiler, a furnace beneath the boiler consisting of a grate water-tubes attached to and opening into the water-legs, a drum in the base of the furnace, water-tubes connecting the drum with the rear water-leg, water connection between the drum and the boiler providing means for circulation in the boiler through the drum in the furnace, a back connection consisting of water-tubes uniting the drum in the furnace with the boiler and forming a lining for the back connection and a circulation of water between the boiler and drum in the furnace.

10. In a combined boiler and furnace a tubular boiler, a furnace set on an incline beneath the boiler and consisting of a grate, water-tubes over the grate, fire-brick, a drum within the furnace, connection between the drum and boiler, water communication between the drum and water-tubes in the roof of the furnace, and a back connection lined with water-tubes connecting the drum in the furnace with the rear of the boiler, thereby providing a lining for the back connection and forming a circulation of water between the drum and the boiler and water circulation in the boiler through the drum and lining for the back connection.

11. In a combined boiler and furnace, a grate, a water-drum at the inner end of the grate forming a bridge-wall for the furnace, water-tubes with fire-brick forming a covering for the grate and extending beyond the drum to the rear end of the furnace, in combination with an independent boiler provided with fire-flues steam and water space set above the water-tubes and separated from the furnace, water communication between the water-tubes over the furnace and the boiler, and water communication between the drum in

the furnace and the water in the water-tubes over the furnace through the rear water-leg.

12. In a combined boiler and furnace, a boiler member provided with fire-flues, a furnace member consisting of a fire-box and combustion-chamber, a grate in the fire-box, water-tubes over the grate and combustion-chamber and forming with fire-brick a covering for the whole furnace, water communication between the water-tubes in the covering of the furnace and boiler member, a drum in the furnace, water communication between the drum and the water-tubes in the covering of the furnace, and a back connection secured in the rear of the boiler member and the furnace member.

13. In a combined boiler and furnace, a boiler provided with fire-flues, a furnace consisting of a fire-box and combustion-chamber, water-tubes with non-heat-conducting material forming a covering for the fire-box and combustion-chamber of the furnace and interposed between the boiler and the furnace to prevent the direct action of the flame of the furnace from coming in contact with the shell of the boiler, water-legs connecting the boiler with the water-tubes, a drum in the furnace and water communication between the drum in the furnace and the rear water-leg.

14. In a combined boiler and furnace, a boiler provided with fire-flues, a furnace consisting of a fire-box provided with a grate, a combustion-chamber at the end of the fire-box, water-tubes with fire-brick covering the fire-box and combustion-chamber and interposed between the furnace and the boiler, a drum in the furnace, water communication between the boiler and the water-tubes in the covering for the furnace, a water-leg at each end of the furnace and forming water communications with the boiler, water communication between the drum and the rear water-leg, and fire communication between the furnace and the fire-flues of the independent boiler.

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

WILLIAM W. BONSON.

Witnesses:

M. M. CADY,
C. F. HANSEN.