W. W. BONSON.
COMBINED BOILER AND FURNACE.
APPLICATION FILED MAY 18, 1903.
2 SHEETS-SHEET 2.

FIG. 3.

William W. Bonson

m. m. cady
Attorney
WILLIAM W. BONSON, OF DUBUQUE, IOWA.

COMBINED BOILER AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 745,998, dated December 8, 1903.

Application filed May 18, 1903. Serial No. 157,933. (No model.)

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.

It has been found in the use of furnaces and steam-boilers that a considerable per cent. of the heat units produced by the combustion of fuel are not utilized in force, partly because the heated surfaces are not kept sufficiently clean to permit the water to quickly absorb or take up the heat generated and partly on account of the imperfect circulation of the water in the boiler as it passes along and around the heated surfaces. To obviate these difficulties constitutes the leading features of my invention.

The following specification when read in connection with the drawings accompanying the same and forming a part hereof will point out in detail the manner in which such objects are attained and the incidental advantages arising from this mode of construction and use.

Figure 1 is a side elevation with part cut away, showing the boiler and furnace with the water-tubes and a vertical section of the back connection. Fig. 2 is a vertical section through the boiler and furnace on line X X of Fig. 1. Fig. 3 is a longitudinal section of the device.

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

Referring to the drawings, A designates a tubular boiler, which consists of a shell B, smoke-flues C, secured into the front and rear flue-sheets D, providing a steam-chamber E and water-space between the shell and the flues. Directly beneath the boiler A and set upon an incline upward from the front to the rear is a cylindrical shell or drum F, which is connected to the boiler A by the front water-leg G and rear water-leg H.

At opposite sides and beneath the drum F are arranged two cylindrical drums I. These drums I are connected with the drum F by water-tubes K and are covered with fire-brick L and together form the roof or covering of the furnace, presently to be described. The drums I are also connected by water-tubes L with the main boiler A. In this manner there is a complete water communication between the water-space of the boiler A and the drum F through the water-legs G and H, and also a communication between the boiler A and the drums I through the water-tubes L, and a further water communication between the drums I and drum F through the water-tubes K.

The furnace M is formed with the drums I at its sides and roofed or covered over by the water-tubes K, the drum F, and the fire-brick L and is provided with a grate-bar O, extending back to the bridge-wall N. Over the bridge-wall N to the rear of the furnace is a flue P opening out into the back connection H and up the back connection in communication with the flues C of the boiler A, being the space between the tubes.

The operation of my device is substantially as follows: Sufficient water is introduced into the boiler A to fill the drums I and F and the tubes K and L and the boiler A to a short space above the smoke-flues C. The fire is then started in the furnace on the grate-bars, and the heat immediately comes in contact with the tubes K and the drums I and F, and a portion of it is absorbed therein. The heat then passes beyond the bridge-wall into the flue P, and as the drums I and F and the pipes K surround this flue considerable more of the heat will be taken up by them as it passes along their surfaces. The heat then passes into the back connection and immediately into the smoke-flues C, where most of the remaining heat will be taken up into the boiler A, and only a small portion will pass out of the chimney or smoke-stack, and in this manner most of the heat will be conserved. When the water in the tubes K and drum F has become heated, it will pass up from the drums I through the tubes K into the drum F, along the upper portion of the drum F, through the rear water-leg H into the boiler and alongside of the rear flue-sheet D, where the steam is released and passes into the steam-chamber E. The water taken up from the drums I will be supplied by the tubes L, coming down from the boiler, and
the water in the drum F will be supplied by the water coming down from the boiler A through the front water-leg G and also from the drums I through the tubes K. It will be observed that the intense heat coming in contact with the thin shell of the drums and tubes the water in them will be brought to so high a degree of temperature and such a volume of steam generated that there will be a furious circulation not only from the drum F into the boiler through the water-leg H, but also from the boiler into the drum F through the water-leg G and also from the drums I into the drum F and from the boiler into the drums I. This rapid circulation will keep the drums and tubes clean and in the best possible condition to absorb the largest amount of the heat units generated. It will also be understood that as the heated water passes up near the rear flue-sheet D there will be very little expansion or contraction of that sheet or the flues secured in the sheet, and hence there will be no danger of leakage caused by undue expansion and contraction of the flues or the flue-sheet.

The details of construction above set out may be varied by the skilled mechanic within wide limits without departing from the spirit of my invention, and certain features thereof may be employed without its adoption as an entirety.

Having now described my invention, what I claim is—

1. In a combined boiler and furnace, the combination of a furnace having water-drums and water-tubes forming a covering for the furnace, a boiler provided with fire-flues set above the drums, water communication between the boiler and drums, and fire communication from the furnace through the boiler.

2. In a combined boiler and furnace, the combination of a furnace, water-drums and water-tubes connecting the drums and forming a covering for the furnace, a boiler above the furnace provided with fire-flues, water communication between the upper drum and the boiler and connection between the furnace and fire-flues of the boiler.

3. In a combined boiler and furnace, the combination of a furnace having a fire-box and combustion-chamber, a drum in the upper part of the furnace, drums in the lower part of the furnace, water-tubes connecting the lower drums and the upper drum and all together forming a covering for the furnace, a boiler provided with fire-flues above the upper drum, water connections between the boiler and upper drum and fire communication between the furnace and the fire-flues of the boiler.

4. In a combined boiler and furnace, the combination of a furnace, a water-drum on each side of the furnace, a water-drum in the upper part of the furnace, water-tubes connecting the lower drums with the upper drum and forming a covering for the furnace, a boiler provided with fire-flues above the upper drum, water communication between the boiler and the drums, and fire connection between the furnace and the fire-flues of the boiler.

5. In a combined boiler and furnace, the combination of a furnace provided with a fire-box and combustion-flue, a water-drum set opposite on each side of the furnace, a water-tube in the upper part of the furnace, water-tubes connecting the side drums with the upper drum and forming a covering for the furnace, a boiler provided with smoke-flues, a water-leg at each end of the boiler and upper drum and providing means for a circulation of the water between the boiler and upper drum, water-tubes connecting the boiler with the lower drums and fire connection between the furnace and the boiler.

6. In a combined boiler and furnace, the combination of a furnace formed of grate water-drums, water-tubes connecting the drums and together forming a covering for the furnace, a boiler above the furnace provided with fire-flues, means of communication between the water in the boiler and water in the covering of the furnace, and a back connection for connecting the furnace with the boiler.

7. In a device of the character described, a furnace consisting of a grate, water-drums, water connection between the drums and forming a covering for the furnace, and a fire-flue within the covering of the furnace, fire communication between the fire-flues of the furnace and fire-flues of the boiler set over the upper drum.

8. In a device of the character described, a boiler provided with fire-flues, a furnace consisting of a fire-box having a grate and providing a longitudinal drum on opposite sides of the grate, a drum above the grate, fire-brick with water-tubes connecting the drums said drums tubes and fire-brick forming a covering for the furnace, and a flue opening into the fire-box, said flue having fire communication with the fire-flues in the boiler.

9. In a device of the character described, the combination of a furnace set at an inclined and consisting of water-drums and water connections between the drums forming a covering for the furnace and flue, a boiler provided with fire-flues above the furnace, a water-leg at the forward end of said boiler and connected with the upper drum, a shorter water-leg connecting the upper drum and the boiler near the rear flue-sheet of the boiler, and back connection between the flue of the furnace and the flues of the 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,
K. W. KEMLER.