(No Model.)

J. CAHALL.

BOILER.

No. 485,087. Patented Oct. 25, 1892.

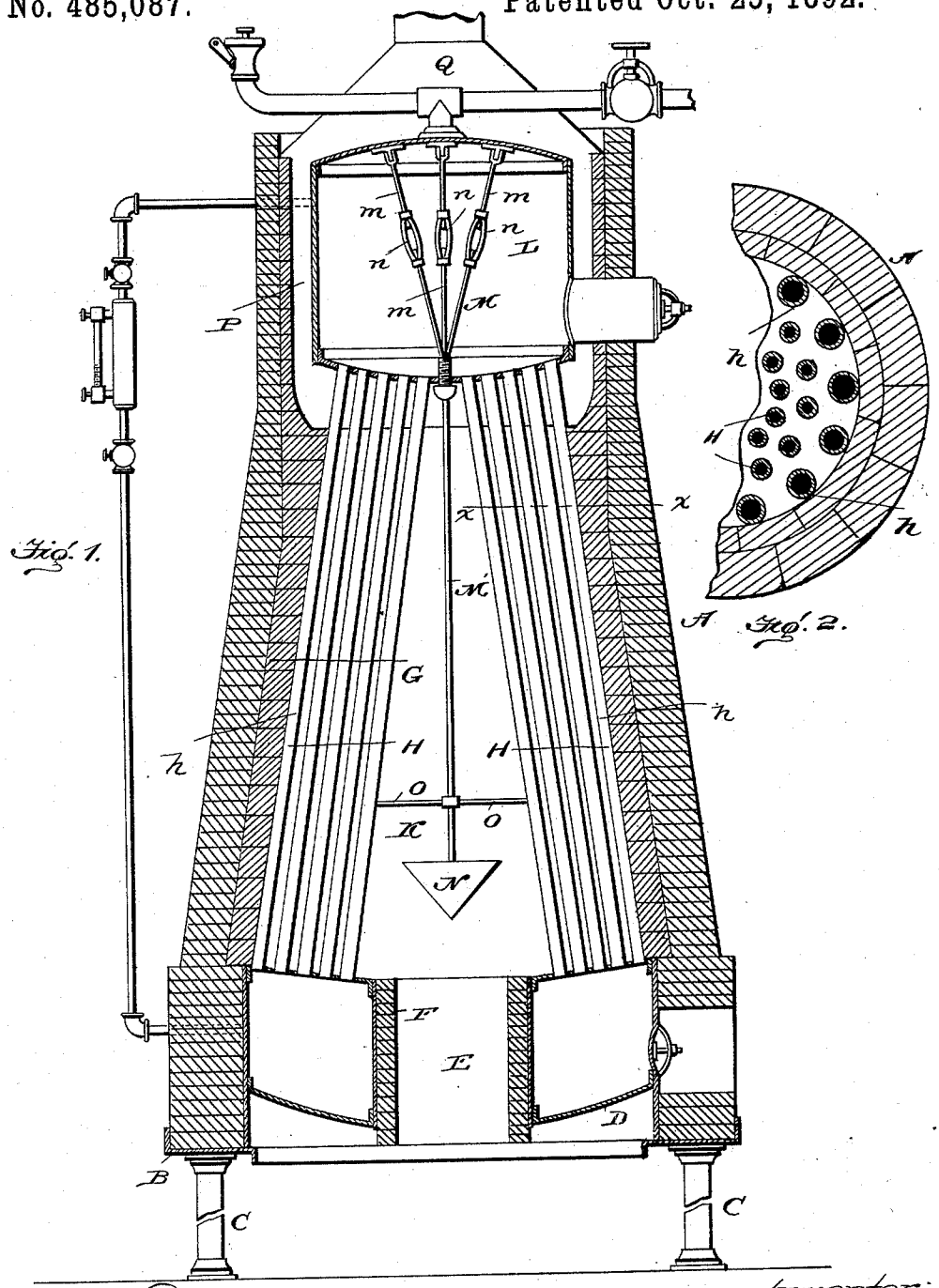

Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHN CAHALL, OF MANSFIELD, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO H. E. CAHALL AND W. H. CAHALL, OF SAME PLACE.

BOILER.

SPECIFICATION forming part of Letters Patent No. 485,087, dated October 25, 1892.

Application filed August 3, 1892. Serial No. 442,031. (No model.)

To all whom it may concern:

Be it known that I, JOHN CAHALL, a citizen of the United States, and a resident of Mansfield, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in steam-boilers designed to utilize the waste or superfluous heat generated in a puddling or heating furnace; and the objects of the invention are, first, to provide for uniformly heating all of the water tubes or pipes and effectually consuming all of the products of combustion escaping from the furnace, and, secondly, to provide for superheating the steam in the steam-drum and to so arrange the water-tubes that any sediment forming in any of them will pass into a mud-drum, from which it can be easily and readily removed.

With these and other ends in view my invention consists of an exterior shell, a mud-drum arranged in the bottom of said shell and provided with a central vertical flue or passage through which the superfluous heat, &c., generated in a suitable furnace are adapted to pass, a steam-drum situated within the shell near the upper end thereof, but out of contact therewith, to form a passage around said drum, which passage communicates with the smoke-stack and with the interior of the boiler, and a series of water-tubes connecting the mud and steam drums, said pipes being inclined inwardly or toward the center of the boiler from their lower to their upper ends to provide a central conical combustion-chamber, which communicates at its lower end or base with the central vertical flue in the mud-drum.

My invention further consists in the peculiar construction and arrangement of parts, as will be hereinafter more fully pointed out and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional view of a boiler constructed in accordance with my invention. Fig. 2 is a sectional plan view on the line *x x* of Fig. 1.

Like letters of reference denote corresponding parts in both figures of the drawings, referring to which—

A designates the outer wall or shell of my improved boiler, which is shown as supported on a base-plate B, mounted on short upright standards or posts C.

Within the shell A, at the lower end thereof, is securely mounted a mud-drum D, which is provided with a central vertical flue or passage E. The vertical passage E in the mud-drum is lined with a lining F of fire-brick or similar material, and said passage communicates at its lower end with the stack of a puddling or heating furnace. (Not shown.) The interior of the shell A above the mud-drum D is provided with a lining of fire-brick G.

Within the shell A are arranged a series of water tubes or pipes H, which pipes are arranged in concentric rows around the upper end or mouth of the central vertical passage E in the mud-drum, and said tubes are inclined inwardly from their lower to their upper ends to form a central conical or tapering combustion-chamber K. The diameter of the widest part of the central combustion-chamber K is slightly greater than the interior diameter of the vertical passage in the mud-drum, and all of the products of combustion and heat escaping from the furnace are conducted into said conical combustion-chamber through the passage in the mud-drum. The upper ends of the tubes H communicate with a steam-drum L, supported thereby, and said drum is strengthened by means of a series of internal braces M. These braces are preferably made in the manner shown in the drawings, in which the adjacent ends of rods M, attached, respectively, to the top and bottom of the steam-drum, are connected by means of turnbuckles *n*. As shown, the braces, preferably four in number, have their lower members *m* diverg-

ing from a common point or center, and from such central point a short rod extends through the bottom of the steam-drum and is provided in its lower end with a suitable internally-threaded socket adapted to receive the upper threaded end of a depending rod M, or any other suitable means may be employed for rigidly supporting said central vertical rod from the steam-drum or the braces therein.

The lower end of the rod M is rigidly attached to a deflector N, arranged centrally above the passage in the mud-drum and adapted to deflect the products of combustion, &c., escaping through said passage, through and between the water-tubes H. The deflector N is preferably made triangular in cross-section, as shown, and said deflector is held firmly in place within the central conical combustion-chamber by means of transverse braces O, attached to the depending rod M and to certain of the inner row or circle of water-tubes.

The external wall or shell A of the boiler is of uniform thickness from its bottom to a point slightly below the steam-drum, and from that point to its upper end the thickness of said shell is reduced to provide a draft-passage P around the steam-drum L, which passage communicates with the stack Q of the boiler centrally above said drum.

The advantages of a boiler constructed as hereinbefore described will be readily appreciated by those skilled in the art, and among them may be mentioned the following: As the products of combustion and heat generated in the furnace pass through the vertical passage in the mud-drum and strike the inclined sides of the deflector suspended in the central conical combustion-chamber they are deflected and pass among the water-tubes. As the draft-passage around the steam-drum opens into the body of the boiler beyond the water-tubes therein, the heat and products of combustion pass around and among the different tubes and uniformly heat the same. The steam generated in the steam-drum is superheated by the passage of the flame, &c., around said drum on its way to the stack Q. As the water-tubes are nearly perpendicular, any sediment which may form therein will fall to the bottom of the mud-drum, from whence it can be removed through a suitable manhole or door in one side thereof. As the central flue or passage in the mud-drum is lined with fire-brick, there is no danger of said drum being damaged by heat of the flame passing through said chamber.

As shown in the drawings, the outer circle of water-tubes bear against or are in contact with the inner face of the lining of the shell A, so that there is no possibility of the heat passing up along the inner wall of the boiler without circulating among the various tubes.

The outer circle *h* of the water-tubes H are of greater diameter than the other tubes, by means of which a free and proper circulation of water is maintained upwardly through the smallest tubes and downwardly through the larger tubes.

I am aware that changes in the form and proportion of parts and details of construction of the devices herein shown and described as an embodiment of my invention can be made without departing from the spirit or sacrificing the advantages thereof, and I therefore reserve the right to make such changes and alterations as fairly fall within the scope of the same.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a boiler of the class described, the combination of an external shell, a mud-drum arranged in the lower portion of the shell and provided with a central vertical flue or passage, a series of concentric water-tubes communicating with the mud-drum, and a steam-drum supported on the upper ends of the water-tubes within and out of contact with the external shell, substantially as described.

2. In a boiler of the class described, the combination of an external shell, a mud-drum arranged within the shell at the bottom thereof and provided with a central vertical passage, a steam-drum arranged within and out of contact with the external shell, and a series of water-tubes connecting the mud and steam drums, said tubes being inclined inwardly from their lower to their upper ends, substantially as described.

3. In a boiler of the class described, the combination of an external shell, a mud-drum arranged within the lower portion of the external shell and provided with a central vertical passage, a steam-drum arranged in the upper portion of and out of contact with the external shell, a series of tubes connecting the mud and steam drums, said tubes being inclined inwardly from their lower to their upper ends to form a central conical combustion-chamber, and a deflector arranged in said combustion-chamber a short distance above the upper end of the central vertical passage in the mud-drum, substantially as described, for the purpose specified.

4. In a boiler of the class described, the combination of an external shell, a mud-drum arranged in the lower end of said shell and provided with a central vertical passage, a steam-drum arranged within and separated from the external shell, a series of tubes connecting the mud and steam drums, said tubes being inclined inwardly from their lower to their upper ends to form a central conical combustion-chamber, a vertical rod arranged in said combustion-chamber and attached at its upper end to the steam-drum, a deflector attached to the lower end of said rod, and a series of transverse braces con-

necting said central depending rod with the inner circle of tubes, substantially as described.

5. In a boiler of the class described, the combination of an external shell, a mud-drum arranged in the lower part of said shell and provided with a central vertical passage, a steam-drum arranged within the main shell, and a series of tubes of different diameters or sizes connecting the mud and steam drums, said tubes being inclined inwardly from their lower to their upper ends, substantially as described, for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN CAHALL.

Witnesses:
WILLIAM DOW,
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