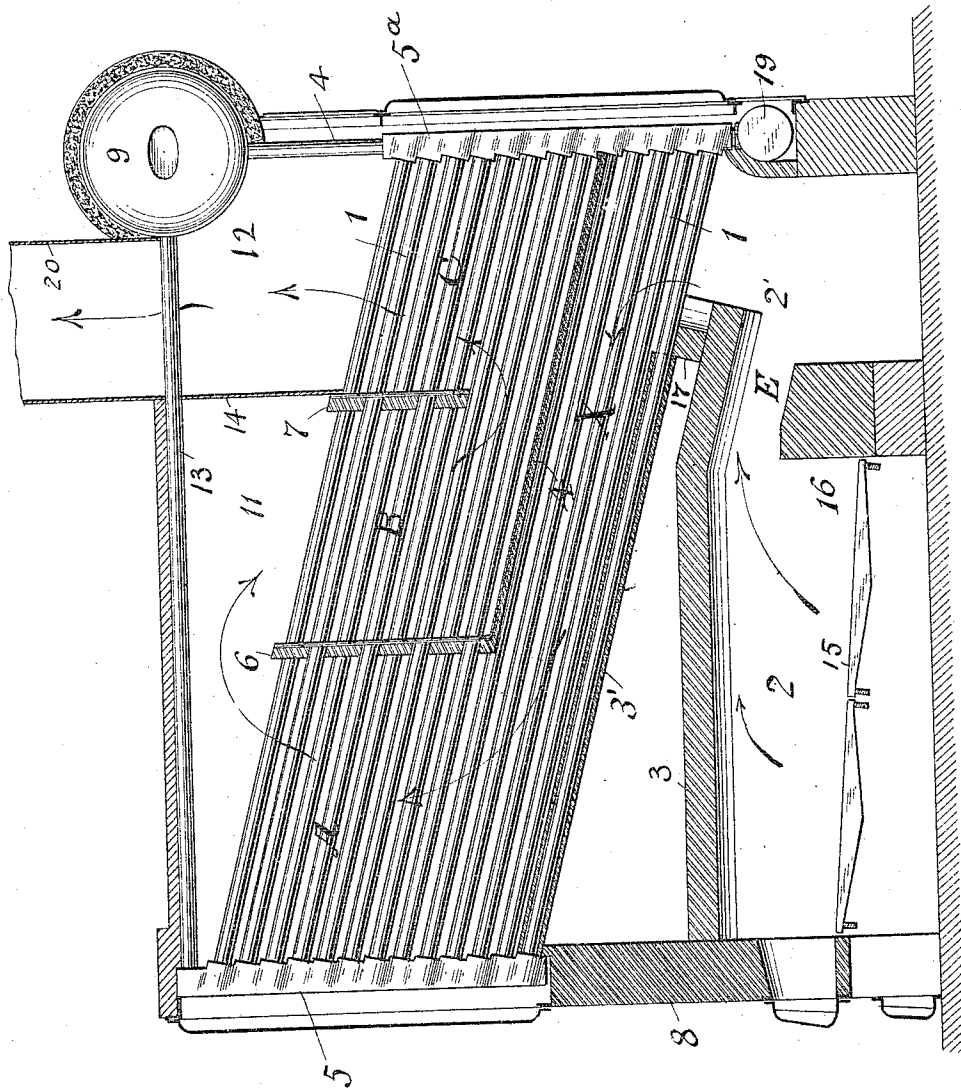


M. W. SEWALL.
STEAM BOILER.
APPLICATION FILED MAR. 4, 1907.

Patented Jan. 31, 1911.

983,170.



Witnesses:
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UNITED STATES PATENT OFFICE.

MINOTT W. SEWALL, OF ROSELLE, NEW JERSEY, ASSIGNOR TO THE BABCOCK & WILCOX COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

STEAM-BOILER.

983,170.

Specification of Letters Patent.

Patented Jan. 31, 1911.

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To all whom it may concern:

Be it known that I, MINOTT W. SEWALL, a citizen of the United States, residing at Roselle, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to steam boilers wherein a group of inclined water tubes are employed, and the primary object of my present invention is to increase the efficiency of such type of boiler.

The problem of high efficiency in a water tube boiler involves not merely economy of space and convenience of operating, but also (1) the proper circulation of the water and separation of steam therefrom; (2) the proper combustion of the fuel, and (3) the proper circulation of the hot gases, and there is a complete interdependence of efficiency between these several factors. In the boilers of the type referred to at present in use, the circulation of the water and the separation of the steam therefrom is similar to my construction and one object of my invention is to attain a higher efficiency by an arrangement for the circulation of the hot gases and the combustion of the fuel.

In the accompanying drawing, I have shown a side elevation partly in section of a boiler containing my invention in the best form in which I contemplate embodying it at the present time and which may be described as follows:

1 is a group of inclined water tubes connecting the headers 5, 5^a, at opposite ends. 9 is the steam and water drum, and is connected with header 5^a by the series of tubes 4 and with the header 5 by the series of tubes 13. 19 is the mud-drum. The circulation of the water, therefore, is upwardly inclined through the tubes 1 into the header 5; thence through the tubes 13 into the steam and water drum 9 where the final separation takes place; thence downward through the series of tubes 4 into the header 5^a, whence the circulation is repeated over and over again. The heated gases of combustion make three transverse passes A—B—C among the tubes and preliminary there- to they make a longitudinal pass X underlying the transverse passes B and C and emptying into the transverse pass A. As

shown, the longitudinal pass X is of substantially less cross area (it is shown as less than one-third) than the transverse pass A so that the current of gases which is comparatively rapid through the pass X is retarded in the pass A. The presence of the preliminary longitudinal pass X as well as in position and size relatively to the other passes enables the hot circulating gases from the combustion to coöperate more efficiently with the circulation of water within the tubes. The group of tubes may be divided into the passes above referred to by the transverse baffles 6 and 7, and the longitudinal baffle 4 which runs parallel with the tubes and connects the header 5^a with the foot of the transverse baffle 6. I prefer, also, to use a longitudinal baffle 3' extending at the foot of the group of tubes and parallel therewith from the header 5 underneath the passes A and X.

11 is the space above the tubes through which the gases proceed from the pass A to the pass B. 12 is the space through which they proceed from the pass C to the up-take. The spaces 11 and 12 are separated by the partition 14.

2 is the furnace chamber underlying the passes A, X and B, which is connected near its roof by the longitudinal throat E with the space 2' from which the gases proceed upward to the pass X. The furnace chamber 2 is formed by the grate surface 15, the bridge wall 16 and the reverberating roof 3 of arched firebrick extending from the front wall 18 over the furnace chamber 2 and preferably over and beyond the throat E and forming the front boundary of the up-take passage into the pass X. If the baffle 3' be employed, the rearward ends of it and the roof 3 meet, as shown. This junction may be formed by an arch 17 supporting the rear end of the baffle 3'. The presence of the roof 3 or baffle 3', or of both, separates the tubes nearest the fire (i. e. the lower row of tubes) from the fire and thus decreases the efficiency of that lower row of tubes, but the efficiency of the tubes above the lower row is increased by the presence of the baffles and the increased perfection of combustion due thereto and to the reverberatory roof of the furnace.

In the preferable form above described, my construction may exteriorly occupy a space horizontally and vertically similar to

that occupied by horizontal water tube boilers of the most approved type heretofore in use. Moreover, before the gases are permitted to pass between the tubes their combustion is stimulated by the roof 3 confining them and compelling them to flow longitudinally over the fuel to the rear of the tubes. After entering between the tubes they are compelled to travel a long distance among the tubes and are brought in contact with the various parts of the group of tubes and the order of their passage with respect to the circulation of the water is such as to obtain the greatest efficiency. The course of the gases from the furnace chamber to the up-take is indicated by arrows.

The structure represented is especially adapted for the burning of bituminous or low grade anthracite coal (1) by the reverberatory action within the furnace chamber, and (2) by reason of the increased distance traveled by the gases and consequent retention among the tubes. The gases have opportunity to absorb such an amount of oxygen from the air as to produce very complete combustion and prevent excessive smoke while they produce in the water at the proper points the desired circulation and generation of steam.

In the use of this invention in different situations and with different kinds of fuel either the arched roof 3 or the baffle 3' may be dispensed with. The location of the firing door of the furnace chamber may be placed at the opposite end of the structure from that shown, in which such instance, of course, the baffles 3' and 4 will be transposed or re-arranged accordingly without changing their relationship to the furnace.

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

1. In a water-tube boiler, in combination, the group of inclined water tubes, the fur-

nace, a roof extending from the front of the boiler toward the rear thereof and separating the fuel chamber from the lower row of tubes, a longitudinal baffle located in said group above a plurality of rows of tubes and extending from the rear toward the front and a plurality of transverse baffles dividing the space above said longitudinal baffle in said group into a plurality of transverse passes.

2. In a water-tube boiler, in combination, the group of inclined water tubes, the furnace, a roof extending from the front of the boiler more than two-thirds the distance toward the rear thereof and separating the fuel chamber from the lower row of tubes, a longitudinal baffle located in said group above a plurality of rows of tubes and extending from the rear more than half the distance toward the front and a plurality of transverse baffles dividing the space in the upper portion of said group into a plurality of transverse passes.

3. In a water-tube boiler, in combination, the group of inclined water-tubes, the furnace, a roof extending from the front of the boiler approximately five-sixths the distance toward the rear thereof and separating the fuel chamber from the lower row of tubes, a longitudinal baffle located in said group above approximately one-third the rows of tubes and extending from the rear approximately two-thirds the distance toward the front and a plurality of transverse baffles dividing the space in the upper portion of said group into a plurality of transverse passes.

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

MINOTT W. SEWALL.

Witnesses:

WM. L. RICHARD,
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