

M. W. SEWALL.

STEAM BOILER.

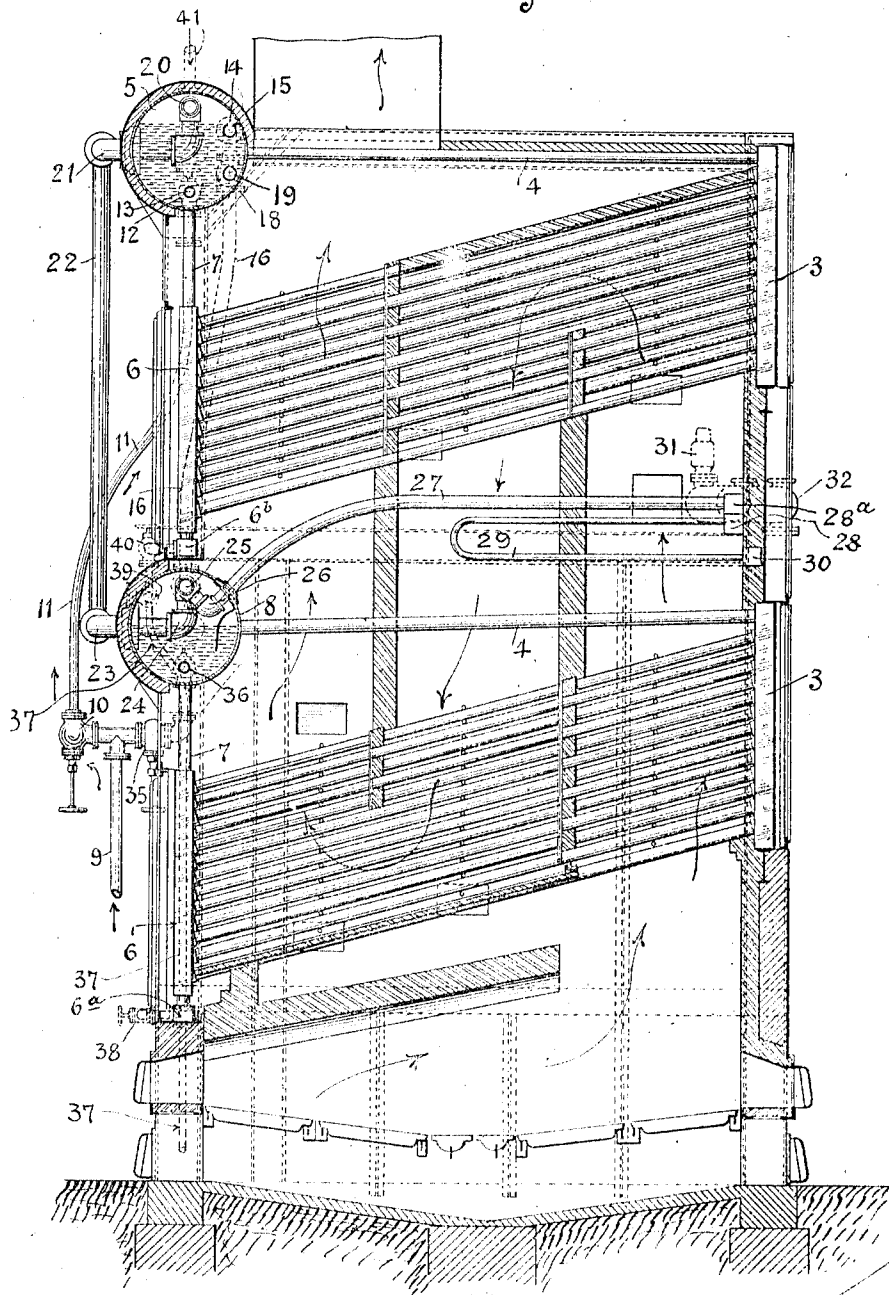
APPLICATION FILED JUNE 6, 1907.

1,064,174.

Patented June 10, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



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Minott H. Sewall, Inventor.

By L. H. H. H.
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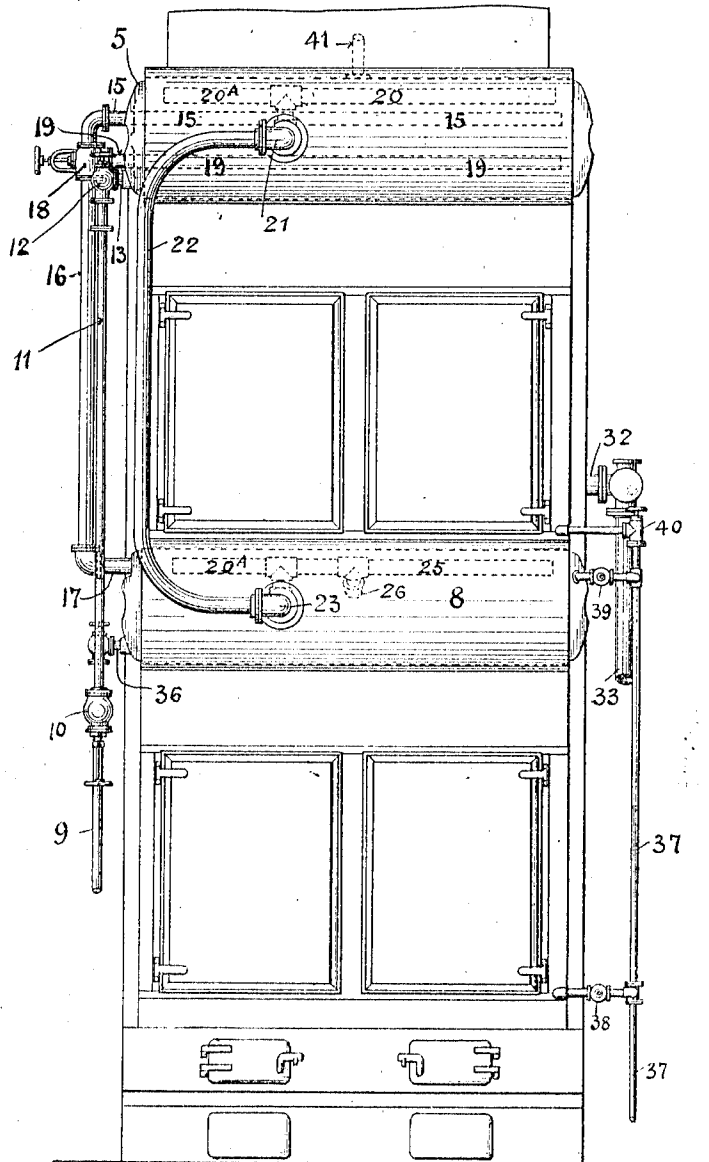
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3 SHEETS-SHEET 2.

Fig. 2.



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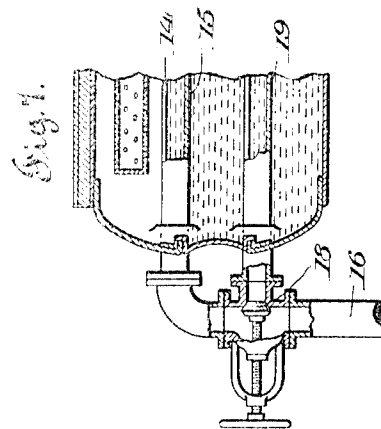
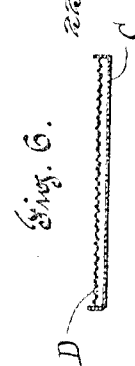
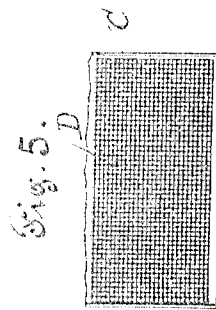
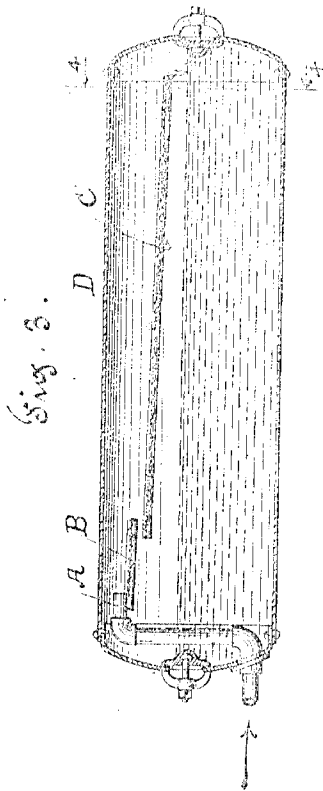
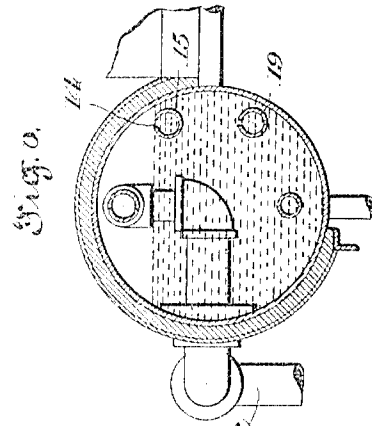
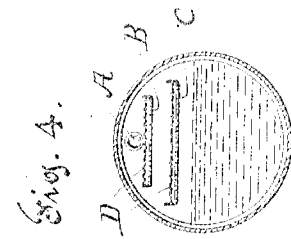
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 3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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

STEAM-BOILER.

1,064,174.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed June 6, 1907. Serial No. 377,503.

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 drawings.

This invention relates to steam boiler plants wherein a plurality of steam boilers are arranged at different elevations with a feed water supply connected to the boiler most remote from the furnace and therefrom with the other boilers. An example is referred to in U. S. Letters Patent No. 772,435, granted to me October 18, 1904, in which a plurality of steam boilers are superposed and include steam boilers of a water tube type. In the patent referred to the steam and water circulation of the boiler elements are in communication and the feed water supply connection is made directly with the drum of the upper groups of tubes, and the drums of the lower groups of tubes are fed from the upper drum by gravity after the temperature of the feed water has been raised to the temperature of the steam.

In the present embodiment of my invention two separate boiler elements of a usual form are shown composed of standard parts and having independent water circulations with interdependent water supply and steam discharge and common circulation of the gases of combustion from one furnace chamber in and around both of the boiler elements, each element comprising, vertical headers 3—6 connected by inclined water tubes; tubes 4 extending from the upper ends of the uptake headers horizontally or nearly so to a steam and water cross drum 5, placed above the downtake headers 6, and which drum is also connected by short tubes 7 to the upper ends of the downtake headers 6, thus making provision for the usual water circulation. External connections are provided for the feed supply to the upper boiler element and for the conduction of water and steam from the drum of the upper boiler element to the drum of the lower boiler element. The feed enters the drum of the upper boiler element and passes through its circulating system, where it becomes heated and partially evaporated, and then passes from the drum of the upper ele-

ment to the drum of the lower element where the evaporation continues, the water entering the lower drum having the temperature of the steam. The steam from the upper drum passes to the lower drum through a balance pipe. All of the steam then passes out of the drum of the lower element to the main steam supply pipe. The external circulation or course of the gases of combustion about the tubes is represented by the arrows in the sectional view of the accompanying drawings.

As shown in my former patent referred to, the boilers in the present instance are placed above a furnace occupying, if desired, the whole length of the setting, or more, and the whole width between the boiler walls, to enable the assembling above a maximum grate area on a given floor area of sufficient heating surface to absorb the heat developed on the large grate. It also, by the segregation of the circulation into two or more parts, enables the heating and the evaporation of the water by successive stages. It is desirable in such a plant that there be but one water line for observation. This should be in the lower boiler element, from which all the steam from the boiler is conducted to the main steam supply pipe. In order to accomplish this such connection must be made as will enable the feed to be introduced directly into the drum of the upper boiler element without concern as to the water level in that element. It is preferable that a water line be maintained in the upper drum of the upper element at which level an overflow connection will be made by means of an open pipe to the steam space of the lower boiler element. A second method of transferring the water from the upper boiler element to the lower is as follows:—The upper boiler may be completely filled with water and communication be made with the lower boiler element by connecting an open pipe from the top of the upper drum to the steam space of the lower drum. In this case the steam and water will be discharged together through this connecting pipe. It is desirable, in order to keep the management of the boiler as simple as possible, that the pipe connecting the drums of the two boiler elements be free from a valve or any other obstruction, so that the whole boiler may be considered as a single unit and no manipulation be re-

quired to maintain this condition of perfect free intercommunication between the drums of the two boiler elements.

Referring to the accompanying drawings which form a part of this specification: Figure 1, Sheet 1, is a side elevation partly in section. Fig. 2, Sheet 2, an end elevation of a structure embodying my invention. Fig. 3 represents a view in side elevation partly in section of the drum of the upper boiler element and shallow vessels therein arranged to receive the water fed into the drum. Fig. 4 represents a sectional view in end elevation taken on line 4-4 of Fig. 3; Fig. 5 represents a top view of a portion of the shallow vessel C shown in Fig. 3. Fig. 6 represents an end view of shallow vessel C. Figs. 7 and 8 enlarged detail views of portions of the drum of the upper boiler.

In the preferable method of feed water supply, the water enters through the pipe 9, valve 10, pipe 11, valve 12 and pipe 13 into the drum 5 of the upper boiler element. The water level is fixed by the internal weir pipe 15, which is provided with one closed end and a slot 14 in the top, through which the water overflows into the pipe 16 and thence into the steam space of the drum 8 of the lower boiler element. The purpose of the weir pipe is three-fold: 1st—to determine the water line in the drum, 2nd—to insure a quiet and uniform outflow of water, 3rd—to expose a large surface of water to the hot steam so as to increase the temperature of water entering the lower drum, should that in the upper drum be at a temperature less than that in the lower drum. To provide for the emergency of a lack of the normal feed through the course described, an additional weir pipe 19, provided with a similar overflow slot, is placed at a lower level in the drum 5. This weir pipe is connected to the downcomer 16 through valve 18, by opening which the water between the respective levels may be utilized to maintain the feed supply to the lower drum 8. By closing the valve 18, the water level in drum 5 will return to the upper weir level 15. If the feed be again put into operation and continued with sufficient volume. Valve 18 is constructed to maintain continuous open communication with the weir pipe 15 and pipe 16 leading to the lower drum, while the valve itself is closed. With the preferable method of feed, a steam balance pipe, marked 22, is required to connect the steam spaces of both drums for the purpose of balancing the unequal pressures that may be caused by the feeding of cold water into the upper drum. Without a balance pipe, a reduction of pressure due to a reduction of temperature in the upper drum may cause an upflow of the water from the lower drum to the upper. With a steam balance

pipe of ample area, such an action is impossible. If the upper drum should be filled with water as in the second method, the balance pipe will not be needed.

In order to raise the temperature of the incoming feed water in the drum of the upper element, it may be carried to a point A, high up in the steam space and discharged into a shallow vessel B, and thence into a second broader shallow vessel C, for exposure to the steam in the drum and a consequent raise in temperature. The shallow vessels B and C may be provided with means for roughening the surface of the water as it passes through them for producing a larger surface exposure to the steam. This may be accomplished by laying a coarse wire mesh in the bottom of the inclined vessels, or by other means. The water may flow longitudinally through vessel C and be discharged in a cataract at the end.

The pipe 22, through connections 21 and 23, communicates with the steam dry pipes 20 and 20^A in the steam spaces of the upper and lower drums respectively. 20^A in the lower drum is in line with, but distinct from, dry pipe 25. The steam exit connection is from the dry pipe 25 of the lower drum and is shown at 26, from which pipe 27 leads to a superheater, through a header 28^A. The superheater is composed of two square boxes 28 and 30, and the U tubes 29, the ends of which terminate in the boxes 28 and 30. The box 28 is divided into two compartments by a partition at the middle of its length. The steam is admitted to one compartment through box 28^A, which is half the length of the box 28, the two being connected by several large nipples. Another box is placed in line with the box 28^A, and nipped to the second compartment of box 28 and forms the steam outlet of the superheater. This construction causes the steam to pass through one-half of the superheater tubes 29, then longitudinally through a portion of the length of box 30, and then through the other half of the tubes 29. To the end of the second compartment of the box 28 a fitting 32 is connected, to which one or more safety valves may be connected. From this fitting 32 steam is taken to the main line. In Fig. 1, 32 shows the fitting attached directly to the superheater outlet. This fitting has flanges for the connection of safety valves and also one for the connection of the branch to the steam main. The purpose of this fitting is two-fold: First: To permit the attachment of safety valves sufficient to comply with the requirements of the furnace and boiler. Second: This fitting is to be so designed that it may be bolted to the rigid parts of the boiler supports or of the building, for the purpose of preventing the vibrations transmitted from the steam main, being transmitted to the superheater. The

safety valves on fittings 32 will be set at the maximum steam pressure desired. Should other safety valves be required, they will be placed in direct communication with the drums of the separate elements and be set at a pressure, say, 10 lbs. higher than the valves at 31. The purpose of this is to maintain a continuous flow of steam through the superheater, should the flow of steam to the main outlet be suddenly cut off. This will prevent the overheating and the possible destruction of the superheater. Auxiliary feeds are also shown by a direct connection from the feed supply 9 to the lower drum which is normally closed by the valve 35, or, through the pipe 37 and valve 30 from an independent source and directed to the lower head 6^a through the valve 38 or the lower drum 8, through the valve 39 or to the header 6^b of the upper boiler, through the valve 40, thus supplying an independent auxiliary feed to each boiler element. These auxiliary feed connections are not an essential element of the present invention.

The superposed arrangement of the boilers upon a given floor space with a grate surface at the base practically equal to said floor area and with a combustion chamber enveloping the boilers is like that shown in my former patent referred to with the exception of the arrangement of the baffles that direct the products of combustion from the furnace chamber to the exit. In the present arrangement the hot gases are directed from the furnace chamber across the high ends of the water tubes of both boilers where the circulating water is hottest and a rapid generation of steam occurs. The gases then pass downward and recross the respective groups

of tubes and are then directed upward and recross the cooler ends of the tubes to the exit, the course of the gases through the several passes formed by the partitions, as shown, being indicated by the arrows in Fig. 1 of the drawing.

In the use of the present invention the relative arrangement of the boilers may be different so long as one of a series is located at a higher elevation. For example, the invention may be readily applied to boilers located upon floors one above the other, and fired independently as is usual in large power houses.

I claim as my invention:

1. In a steam generating plant comprising a series of superposed boilers each provided with steam and water drums, a weir inside of the steam drum of the upper boiler, having a free opening to the outlet connection, the said weir placed at the required water level, all for the purposes described.

2. In a steam generating plant comprising a series of superposed boilers, each provided with steam and water drums, a weir placed in the steam drum of the upper boiler at an upper position, a weir placed at a relatively lower position, the two weirs being connected to a water downcomer, the upper one by a free opening and the lower one by a valved connection, said water downcomer having its termination in the steam space of the drum of the lower boiler.

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

MINOTT W. SEWALL.

Witnesses:

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H. S. CHINNOCK, Jr.