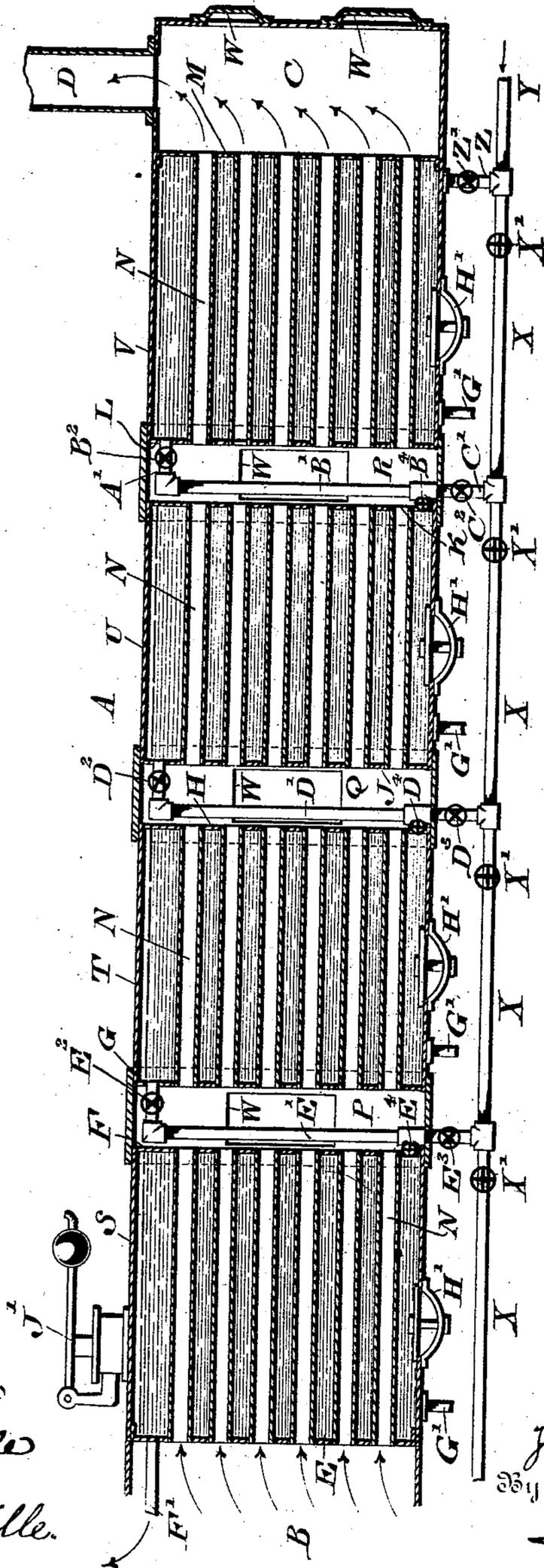


(No Model.)

H. G. KEASBEY.
FEED WATER HEATER.

No. 543,688.

Patented July 30, 1895.



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HENRY G. KEASBEY, OF AMBLER, PENNSYLVANIA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 543,688, dated July 30, 1895.

Application filed January 25, 1895. Serial No. 536,194. (No model.)

To all whom it may concern:

Be it known that I, HENRY G. KEASBEY, a citizen of the United States, residing at Ambler, in the county of Montgomery, State of Pennsylvania, have invented a new and useful Improvement in Feed-Water Heaters, which improvement is fully set forth in the following specification and accompanying drawing.

My invention consists of a novel improvement in feed-water heaters, economizers, &c., which are constructed separately from the boiler and is adapted to be so arranged relative thereto that the hot gases and products of combustion constitute the only heating medium therefor, said gases being conducted directly to the heater through a suitable flue, after having been first utilized in the boiler, said heater being formed of a series of water-chambers suitably connected together, so that a space or combustion-chamber may intervene between each, in which combustion-chamber are inclosed the connections between said water-chambers, said connections being adapted to conduct the water from the top of one chamber to the bottom of an adjacent chamber in a direction opposite to the course of the products of combustion, the water entering the heater where the temperature is lowest and leaving it where the temperature is highest, whereby the heating is gradually and effectively accomplished.

It further consists of novel means for isolating one of said water-holding chambers whenever desired.

It further consists of novel details of construction, all as will be hereinafter set forth.

The figure represents a longitudinal sectional view of a feed-water heater, economizer, &c., embodying my invention.

Referring to the drawing, A designates the inclosing shell or casing of the heater, the same having the end B open to receive the products of combustion or hot gases from any suitable source, while the other end is closed, forming a smoke-box C, to which is attached the smoke outlet or stack D.

The shell A is preferably cylindrical in shape and is provided with the transverse partitions E, F, G, H, J, K, L, and M, which serve as tube-sheets for the flues N, it being noticed that the distance between the partitions F and G, H and J, &c., is less than the

distance between the other partitions E and F, G and H, J and K, &c., whereby combustion-chambers P, Q, and R are formed intermediate the water-holding chambers S, T, U, and V, said combustion-chambers being provided with the doors W, which permit of access to the interior for the purpose of removing soot, cinders, &c., and the smoke-box C may also be provided with similar doors.

X designates a pipe which extends longitudinally of the shell A, the end Y of which serves as the inlet for the feed-water, which enters the chamber V through the nipple Z, which has the valve Z' therein.

A' designates the outlet from said chamber V, which has the valve B² therein and is removed from the inlet Z as far as possible, being at the upper portion of said chamber V, and communicates by means of the pipe B', having the valve B² therein, with the lower portion of the chamber U, said pipe B' having also communication with the pipe X by means of the nipple C', having the valve C² therein. In like manner the upper portion of the chamber U is connected by the pipe D', having the valve D² therein, with the lower portion of the chamber T, and the upper portion of the latter has a communication with the lower portion of the chamber S by means of the pipe E', having the valve E² therein, while the latter pipe, as well as the pipe D', has a valved connection E³ D³ with the pipe X.

B⁴, D⁴, and E⁴ designate suitable valves interposed between the connections B', D', and E' and the water-chambers U, T, and S, respectively, whereby the flow of water thereto may be stopped when desired.

F' designates the outlet to the boiler.

G' designates blow-off pipes for each of the water-holding sections, which are also provided with the manholes H', and the chamber S is also provided with the safety-valve J'. It will also be noticed that the connections B', D', and E' are each located within their respective combustion-chambers, so that there will be no loss of heat therefrom.

The operation is as follows: Assuming, first, that the valves Z', B², B⁴, D², D⁴, E², and E⁴ are open and the valves in the connections C', D³, and E³ are closed, the feed-water introduced in the pipe Y enters the chamber V at the point farthest from the inlet of the hot

gases and is conducted in zigzag course by the pipes B', D', and E' to the outlet F', and thence to the boiler, it being noticed that the heating is gradually and effectively accomplished, since the water enters the heater where the temperature is lowest and leaves it at F', where said temperature is highest, the flow of said water being at all times in a direction opposite to the course of the products of combustion.

If it should be desired to decrease the capacity of the heater at any time or to isolate a portion of the same, it can be readily done by properly manipulating the valves shown, as is evident. Thus the chamber U can be cut out by closing the valves B⁴, D², and E³ and opening the valves Z', B², C², D³, D⁴, E², and E⁴, and it will be understood that the other chambers may also be isolated in like manner, if desired, and that the number of water-holding chambers may be increased or diminished according to requirements, as is evident. It will also be understood that the pipe X is to be provided with suitable valves X' intermediate the connections Z, C', D³, and E³, said valves to be opened or closed according to requirements, as will be apparent.

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

1. A feed water heater consisting of a series of water holding chambers, having flues therein, said chambers being arranged in substantially longitudinal alignment, combustion chambers intermediate said water chambers, and connections between each of the latter, communicating with the upper and lower portions of the same, said connections being inclosed within said combustion chambers, said parts being combined substantially as described.

2. A feed water heater, consisting of a series of water holding chambers, having flues therein and combustion chambers therebetween, said chambers being arranged in substantially longitudinal alignment, valved connections between the upper and lower portions of the adjacent water chambers, a feed water inlet communicating with the lower portion of one terminal chamber, and a feed water outlet leading from the upper portion of the other terminal chamber, said parts being combined substantially as described.

3. A feed water heater, consisting of a series of water holding chambers, having flues therein, and combustion chambers therebetween, said chambers being arranged in substantially longitudinal alignment, valved conduits be-

tween the upper and lower portions of adjacent water chambers, a valved, longitudinally extending pipe arranged adjacent said heater, and having a valved communication directly with one of said chambers, and a valved connection between said longitudinal pipe and each of said conduits, each of the latter having a valve in its lower portion, whereby the flow of fluid to the lower portion of any water chamber may be cut off, said parts being combined substantially as described.

4. In a feed water heater, a series of water holding chambers, having combustion chambers therebetween arranged in substantially longitudinal alignment, flues in said water chambers, an inlet and outlet for the heating medium, the pipes B', D', E', having therein the valves B², D², E², B⁴, D⁴, and E⁴, the longitudinally extending pipe X, provided with the valves X', and having the valved connection Z leading to one water chamber, and the valved connections C', D³, and E³, communicating with said pipes B', D', E', said parts being combined substantially as described.

5. A feed water heater, a series of water holding chambers, having flues therein, said chambers being arranged in substantially longitudinal alignment, combustion chambers intermediate said water chambers, valved connections between the upper and lower portions of the adjacent water chambers, and a longitudinally extending valved pipe, having a valved communication with each of said connections, said parts being combined substantially as described.

6. The water chambers S, T, U, V, the combustion chambers therebetween, said chambers being arranged in substantially longitudinal alignment, the valved pipes B', D', and E' the pipe X and the valved connections from the latter, whereby communication is had with said chambers, the above parts being combined substantially as described.

7. A series of water-holding chambers having combustion chambers therebetween, said chambers being arranged in substantially longitudinal alignment, valved pipes connecting the upper and lower portions of said water chambers, a supply pipe X adjacent the latter, valved connections from said pipe X to said chambers through the pipes which join said water chambers, said pipe X having valves X' thereon between said connections, substantially as described.

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Witnesses:

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