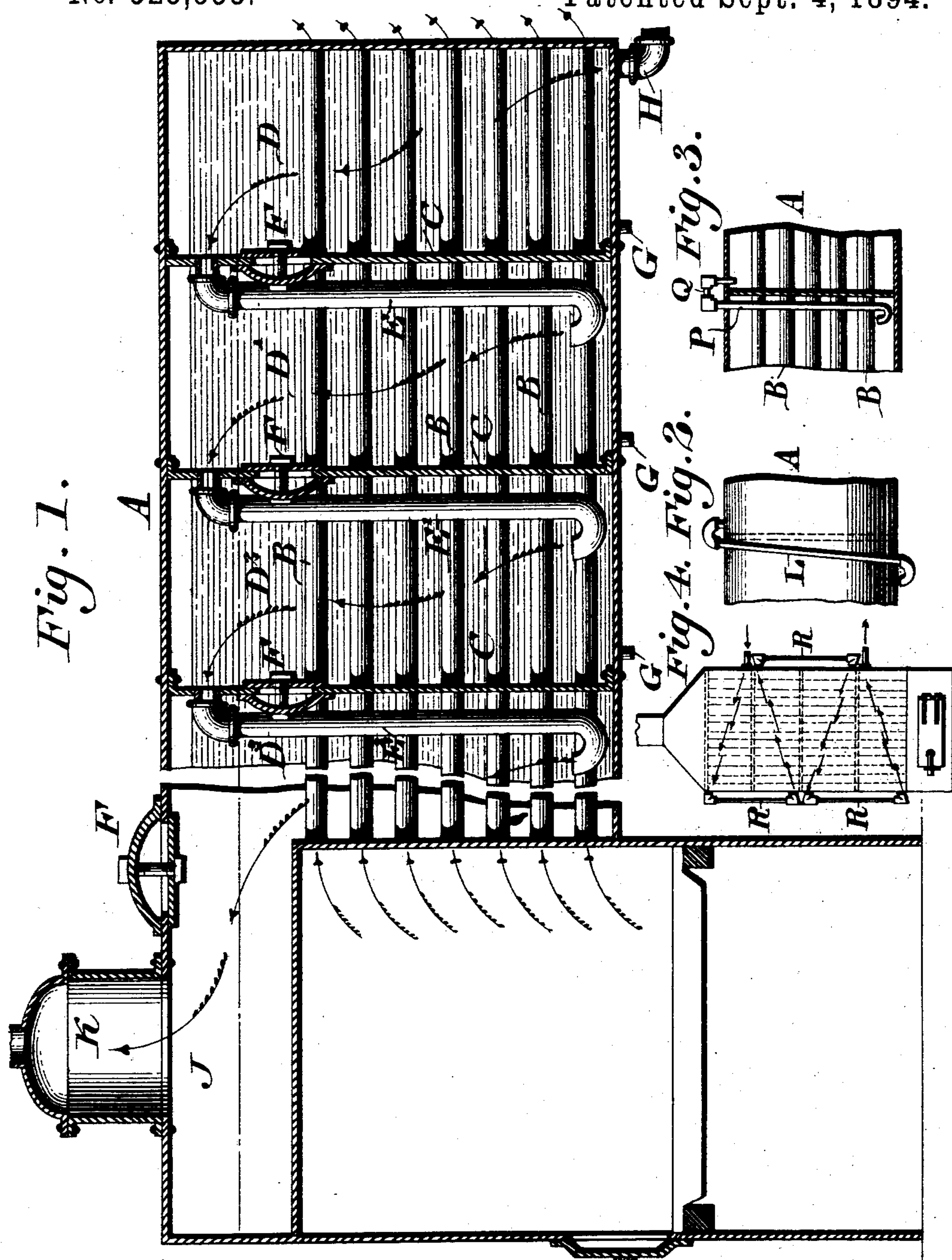


(No Model.)

H. G. KEASBEY.  
STEAM BOILER.

No. 525,553.

Patented Sept. 4, 1894.



WITNESSES:

P. H. Chagler.  
L. Douville

INVENTOR

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# UNITED STATES PATENT OFFICE.

HENRY G. KEASBEY, OF AMBLER, PENNSYLVANIA.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 525,553, dated September 4, 1894.

Application filed January 18, 1894. Serial No. 497,245. (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 Steam-Boilers, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of a steam boiler having a feed water heating device, so combined therewith that the latter serves both to assist the circulation and to gradually heat the water, while it is being converted into steam, the same being formed with separate chambers, which are in communication in such manner that the water is caused to traverse the boiler alternately from top to bottom, throughout the chambers in zig-zag order, whereby it is subjected to the action of the heating flues which extend continuously in an unbroken line from end to end of said boiler through said chambers and partitions and steam is rapidly and effectively generated at the fire box end of the boiler, all as will be hereinafter set forth.

Figure 1 represents a longitudinal section of a steam boiler embodying my invention. Fig. 2 represents a side elevation of a portion of a modification. Fig. 3 represents a longitudinal section of a portion of a modification. Fig. 4 represents a side elevation of a portion of a modification.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings: A designates a steam boiler, and B designates the flues therein for the passage of the products of combustion. Within the boiler are partitions or diaphragms C, which divide the boiler into chambers D, D', D<sup>2</sup>, D<sup>3</sup>, it being noticed that the flues B pass through said partitions and chambers.

Connected with the partitions, at or near the upper ends thereof, are pipes E, E', E<sup>2</sup>, which extend downwardly therefrom, and open into the chambers which they occupy at or near the bottoms of the same, thus forming a communication between the chambers, and a zig-zag passage for the water throughout the boiler.

The boiler and partitions C are provided with man-hole openings and plates F, for ad-

mission to the chambers for repairs, and cleansing the boiler and pipes G for blowing-out deposits or sediment, and emptying purposes.

S designates the fire box of the boiler, the steam space of which being over the crown sheet, whereby the steam is finally generated in the hottest portion of the boiler.

The operation is as follows: Water is directed by the feed pipe H into the chamber D of the boiler, and rising therein reaches the opening leading to the pipe E, so that the water enters said pipe and is directed by the same to the bottom of the chamber D', where it is discharged. It then rises in said chamber D' and reaches the pipe E', by which it is discharged at the bottom of the chamber D<sup>2</sup>, and thus the operation continues through said chamber D<sup>2</sup>, the pipe E<sup>2</sup> and chamber D<sup>3</sup>, it being noticed that while the water may be admitted into the boiler in a cold or cool condition, it is subjected to increased heat as it approaches the furnace, and as it traverses the boiler in a zig-zag course, or alternately from bottom to top and top to bottom, it is subjected to increased heating surfaces presented by the flues which it passes, so that steam will be effectively and rapidly generated, the same entering the steam space J and steam dome K.

In Fig. 2, I show pipes L, which are located on the outside of the boiler, and communicate with the top of one chamber and bottom of the adjacent chamber, as at M and N.

In Fig. 3, I show a pipe P, which is located within one of the chambers of the boiler, and passed through the shell of the boiler, where it is connected outside of the same by a pipe Q, with the adjacent chamber, the operation however being the same as in Fig. 1.

In Fig. 4, I show an upright boiler which is divided into horizontal chambers, and provided with pipes R, whereby the water enters the bottom of the upper chamber, discharges at the top of the same into a pipe which enters the next chamber below, at the bottom thereof, and so on throughout the other chambers, so that the course of the water is zig-zag, or alternately from bottom to top and top to bottom through the different chambers, the effect being the same as in the previous cases.

In two applications filed by me of even date



herewith, Serial Nos. 497,243, and 497,244, for feed water heating devices *per se* separate and distinct from the boiler, I have shown and claimed a construction adapted in one  
5 case to utilize hot gases and products of combustion alone, one end of the heater being open and adapted to be connected with the flue of a boiler and to receive the said hot gases therefrom, the said heater being adapted to  
10 be employed in connection with any style of boiler desired, the other parts being also arranged with this especial object in view. In the other case the feed water heater is adapted to be used in connection with a suitable source  
15 of steam heat alone, both ends of said heater having an inclosed chamber, and the location of steam inlet and outlet and drips, &c., therefor being arranged with this especial object in view. This heater being also designed to  
20 be used in connection with any suitable construction of boiler.

In the present case the heater and boiler are combined into a single structure, and the connections from the different chambers to  
25 the several adjacent chambers are made preferably exteriorly of the boiler.

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

30 1. A steam boiler having partitions therein forming separate chambers, flues extending continuously in unbroken line from end to end of said boiler, through said chambers and partitions, and pipes connecting with said

chambers, exteriorly of the boiler, forming 35 communications between the said chambers in zig-zag order, the water being introduced into a chamber remote from the fire box, and the steam chamber being over the fire box, said parts being combined substantially as 40 described.

2. A steam boiler having partitions therein, forming separate chambers, flues extending continuously in unbroken line from end to end of said boiler, through said chambers and 45 partitions, pipes connecting with said chambers exteriorly of the boiler, forming communications between the chambers, said pipes extending alternately from bottom to top and top to bottom of said chambers, a fire box and 50 a steam dome, said parts being combined substantially as described.

3. A steam boiler provided with a fire box, flues leading therefrom and extending continuously in unbroken line from end to end 55 of said boiler, partitions in said boiler forming chambers and connections between said chambers, exterior of the boiler for directing the water through the same alternately from bottom to top and top to bottom, and a steam 60 dome located at the fire box end of the boiler, said parts being combined substantially as described.

HENRY G. KEASBEY.

Witnesses:

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R. H. GRAESER.