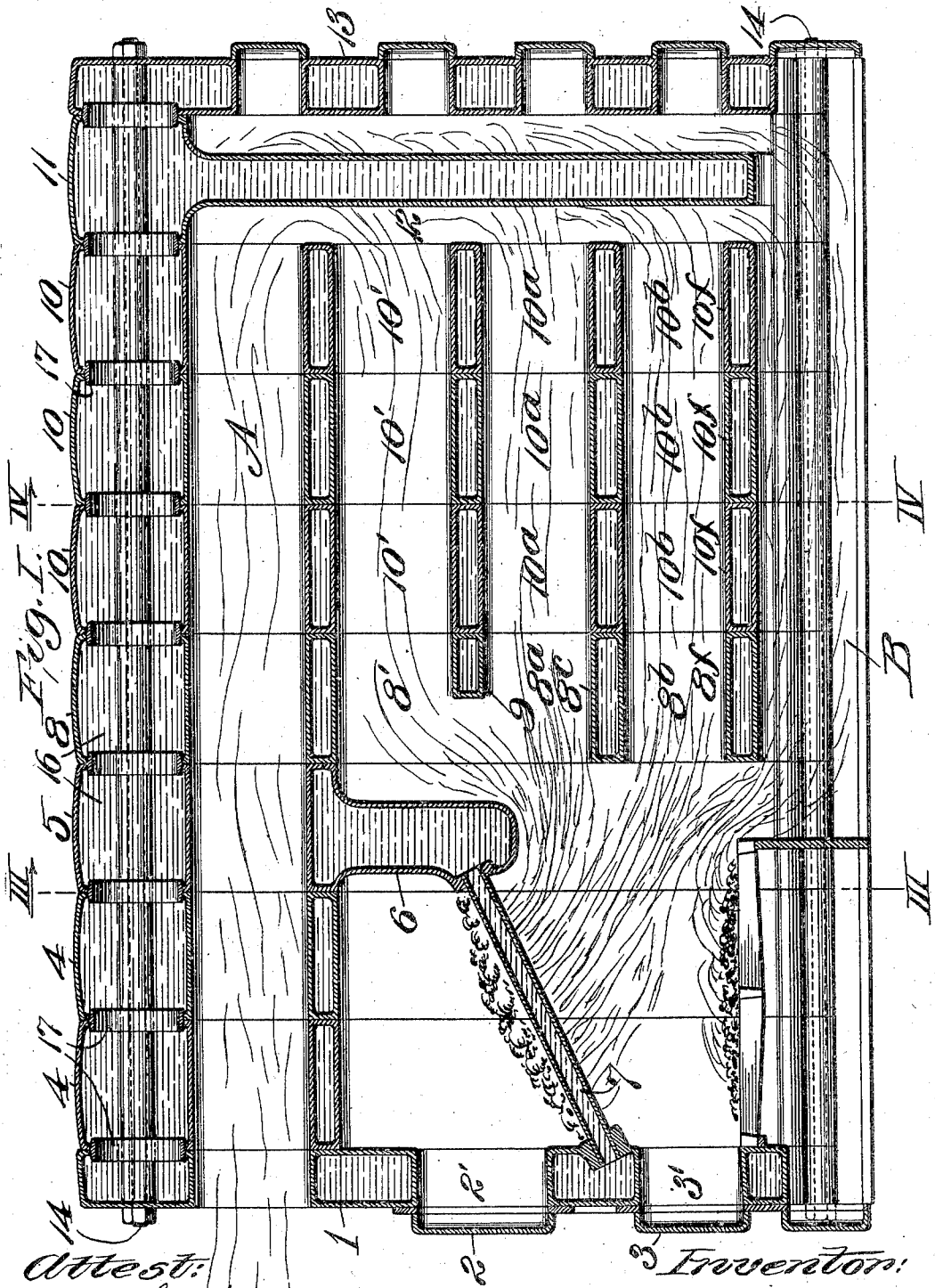


M. C. HAWLEY.
 COMBINED SECTIONAL BOILER AND FURNACE.
 APPLICATION FILED JULY 31, 1909.

950,915.

Patented Mar. 1, 1910.

3 SHEETS—SHEET 1.



Attest:
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Fig. III.

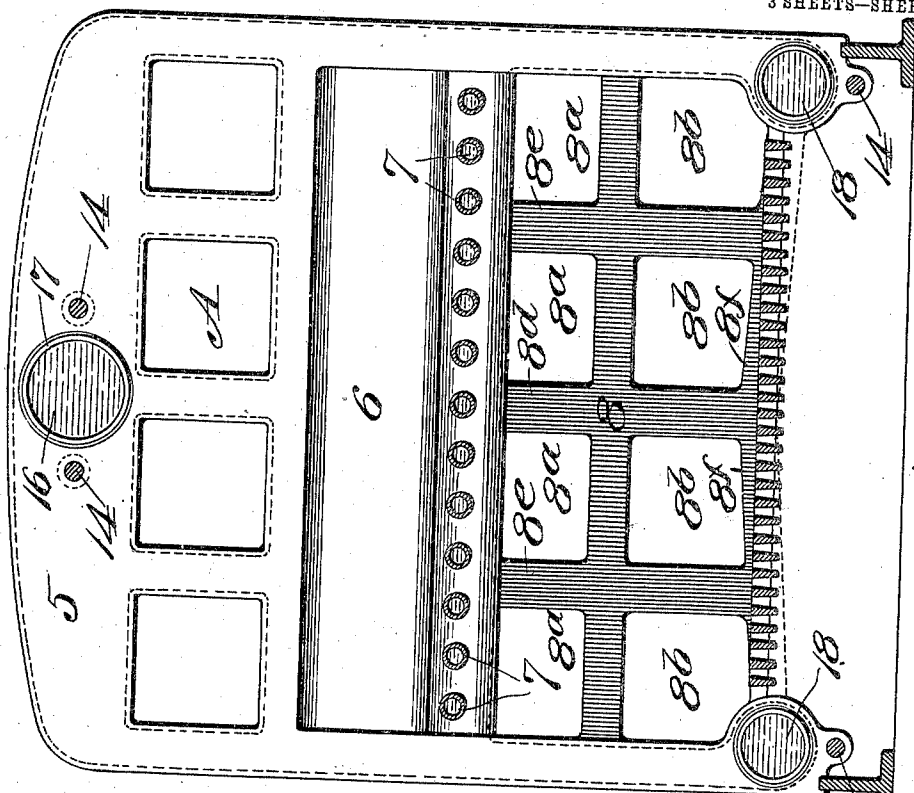
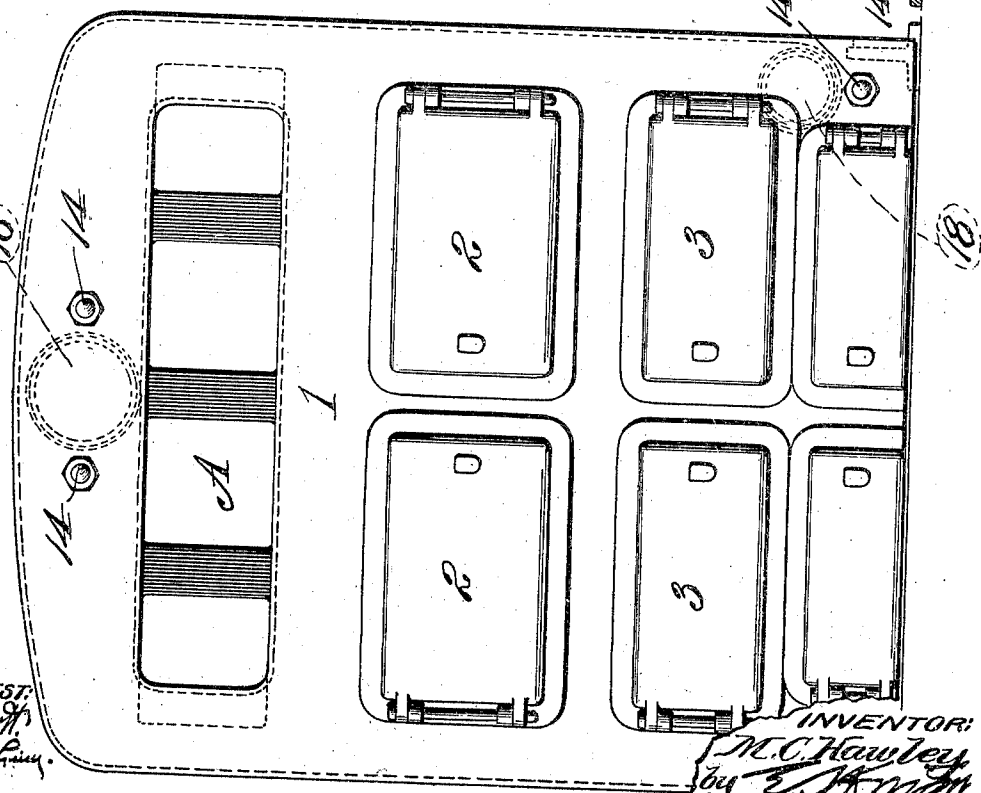


Fig. II.



ATTEST:
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UNITED STATES PATENT OFFICE.

MELVILLE C. HAWLEY, OF ST. LOUIS, MISSOURI.

COMBINED SECTIONAL BOILER AND FURNACE.

950,915.

Specification of Letters Patent.

Patented Mar. 1, 1910.

Application filed July 31, 1909. Serial No. 510,639.

To all whom it may concern:

Be it known that I, MELVILLE C. HAWLEY, a citizen of the United States of America, residing in the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Combined Sectional Boilers and Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to a combined sectional boiler and furnace and it has for its object the production of a furnace of this description whereby the products of combustion may expend their heating properties within the furnace with a high degree of heating action upon the water circulating in the sections of the furnace. This result is accomplished due to a particular construction of the furnace sections and arrangement of the flues therein, in order that the products of combustion will pass through the sections in several courses, including a down draft, a horizontal draft, and a vertical draft.

Figure I is a longitudinal section through my furnace. Fig. II is a front elevation of the furnace. Fig. III is a vertical cross section taken on line III—III, Fig. I. Fig. IV is a vertical cross section taken on line IV—IV, Fig. I. Fig. V is an enlarged vertical longitudinal section taken through one of the joints between two of the furnace sections.

In the accompanying drawings:—1 designates the front chambered section of my boiler furnace provided with an upper fire door 2 and a lower fire door 3 that respectively control the fire doorways 2' and 3'. Immediately back of the chambered front section are chambered sections 4 within which the combustion chamber of the furnace is located and adjoining the rearmost of the sections 4 is a chambered water leg section 5 that has pendent in it, back of the combustion chamber, a water leg or manifold 6 which extends transversely of the furnace at the rear of the combustion chamber and downwardly to a retracted degree from the top of said chamber.

7 are hollow grate bars, preferably arranged at an incline relative to a horizontal line drawn through the furnace and which serve to connect the water leg 6 with one of the chambers in the front section 1 beneath the fire doorway 2'. The hollow grate bars 7 which are adapted to support the main

body of the fuel that is burned in the furnace are, it will be seen, located entirely in front of the water leg 6, as a consequence of which it is necessary for the course of the draft through the body of the fuel and between the grate bars to be a downward one in order that the products of combustion from the fuel will be carried beneath the water leg.

8 designates a chambered section located immediately back of the chambered section 5 and which is provided with an upper horizontal flue 8' at the rear of the water leg 6, an intermediate horizontal flue 8^a beneath the upper flue and located partially above the lower end of the water leg and partially beneath said water leg and a lower horizontal flue 8^b. The flues 8' and 8^a through the section 8 are separated by a hollow water circulation partition 9 that is of less breadth than the breadth of said section, in order that a part of the products of combustion passing beneath the water leg 6 may circulate freely in an upward course into the flue 8' after passing beneath the water leg. The flues 8^a and 8^b are separated by a water circulation partition 8^c that is located wholly beneath the level of the lower end of the water leg 6 and the products of combustion enter these flues in a horizontal direction after passing downwardly through the bed of fuel on the hollow grate bars 7.

10 designates a series of chambered sections located back of the chambered section 8 and which are provided with horizontal flues 10', 10^a, and 10^b, registering respectively with the horizontal flues 8', 8^a, and 8^b in the chambered section 8, and through which the products of combustion pass after passing through the horizontal flues in the section 8 to impart heat to the water circulation partitions in the sections 10 through which the flues of the sections extend. The flues 10', 10^a, and 10^b in the rearmost section 10 are in open communication with a flue A extending horizontally in the furnace and which may lead to the front of the furnace, as shown in the drawings, or lead to any other point in the furnace at which it may be desired to discharge the products of combustion that escape from the furnace.

The furnace is closed at the rear end by a back section 13 and all of the sections of the furnace are united by suitable connections, such as tie rods 14 that extend longitudinally of the furnace.

The chambered section 8 is provided with a central vertical partition 8^d and vertical partitions 8^e located between said central partition and the sides of the section, thereby subdividing the section to provide the horizontal flues hereinbefore mentioned therein, (see Fig. III). The sections 10 are also provided with central vertical partitions 10^d in line with the central vertical partitions of the section 8 and with the vertical partitions 10^e in line with the partitions 8^e, (see Fig. IV).

The chambered section 8 has a bottom chamber 8^f and the sections 10 have bottom chambers 10^f in alinement with the bottom chamber of the section 8, as seen most clearly in Fig. I. All of the chambers 8^f and 10^f are arched, as illustrated in Figs. III and IV, and are in communication with the vertical partitions that surmount them, the apex of each of the bottom chambers being at a central location and immediately beneath the central vertical partition of the section.

At the bottom of the furnace portion of my combined boiler and furnace is an up-draft burning grate 7' upon which fresh fuel may be placed, but which is more particularly intended to receive the droppings from the down-draft grate above it, which includes the hollow grate bars 7. The combustion chamber of the furnace portion communicates immediately at the rear of the up-draft burning grate with the flame space B (see Fig. I) that extends horizontally beneath the boiler and communicates with the vertical flue 12 at the rear end of the furnace with which the horizontal flues extending through the series of chambered sections 10 also communicate.

I desire to draw particular attention to the arching of the bottom chambers surmounting the flue B, and which have just been referred to, inasmuch as this arching provides for the rise of the hot products of combustion to the transverse center of the furnace and immediately beneath the central vertical partitions 8^d and 10^d of the sections 8 and 10, whereby the water in the bottom of the central vertical partitions is maintained at a higher degree of heat than the water in the bottom of the intermediate vertical partitions in said sections, as a consequence of which there is much more rapid circulation through the central vertical partitions than in the other vertical partitions, and the water present in the several sections 8 and 10 rises centrally and circulates outwardly in the chambers of the sections, thereby af-

fording rapid circulation of water that is highly desirable in order that the highest degree of water heating action in the furnace may be maintained.

Intercommunication between the various sections of my furnace is furnished by a top conduit 16 extending longitudinally of the furnace and through thimbles 17 at the joints between the sections and also through bottom conduits 18 extending through the various sections.

I desire it understood that I do not claim herein any invention in a down-draft furnace and boiler having a pendent water leg and front water space, and hollow grate bars inserted in the water leg and front water space, inasmuch as these features, by themselves considered, are known to me to be very old, and the construction was embodied by me in a firebox boiler many years ago. I do claim it to be new, however, to make a construction embodying the foregoing and including the sets of horizontal flues extending through the water sections and into which the hot products of combustion passing from the combustion chamber are caused to be delivered partly to each flue, due to the presence of the pendent water leg acting as a deflector to partly direct the hot products of combustion and also permit the rise thereof back of the water leg after passing beneath it; also in combination with the foregoing, the vertical flue at the back of the boiler with which the horizontal flues communicate in common, and the flame space located wholly back of the combustion chamber leading beneath the bottom hollow water partitions communicating with the vertical flue.

I claim:—

A combined boiler and furnace having at its forward end a furnace portion and at its rear end a boiler portion; the furnace portion including a down-draft grate with a dependent water leg at the rear thereof, and a lower up-draft grate beneath the down-draft grate; and the boiler portion having a series of horizontal flues separated by water circulation partitions back of the furnace portion communicating with a rear vertical flue, and at its bottom beneath said horizontal flues a flame space providing communication between the furnace chamber at a point in proximity to the lower up-draft grate and the rear vertical flue.

MELVILLE C. HAWLEY.

In the presence of—

WM. H. SCOTT,
EDNA B. LINN.