(No Model.)

B. VAN STEENBERGH.

Sectional Steam Boiler.

No. 239,355. Patented March 29, 1881.

Fig. 1.

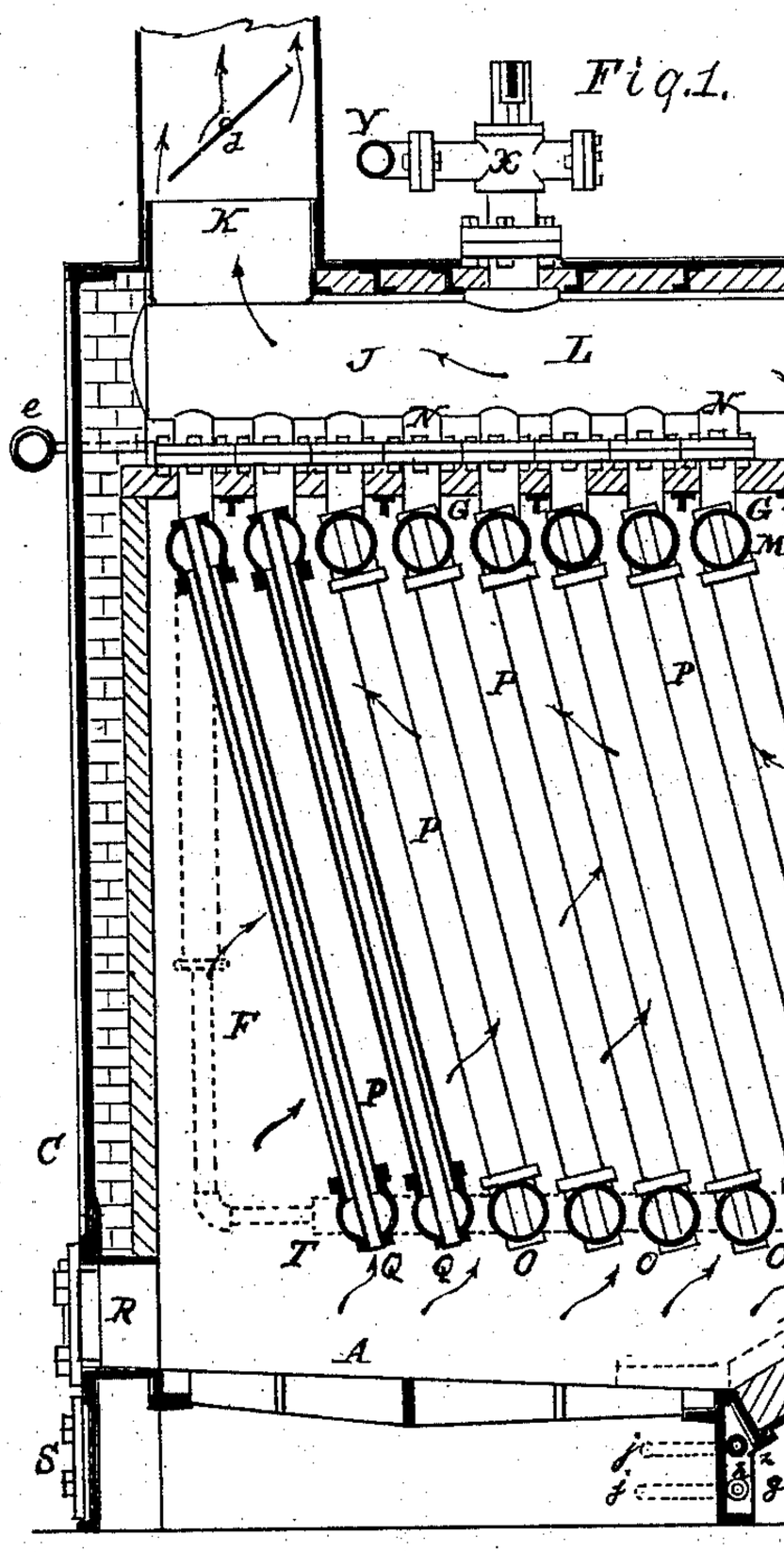
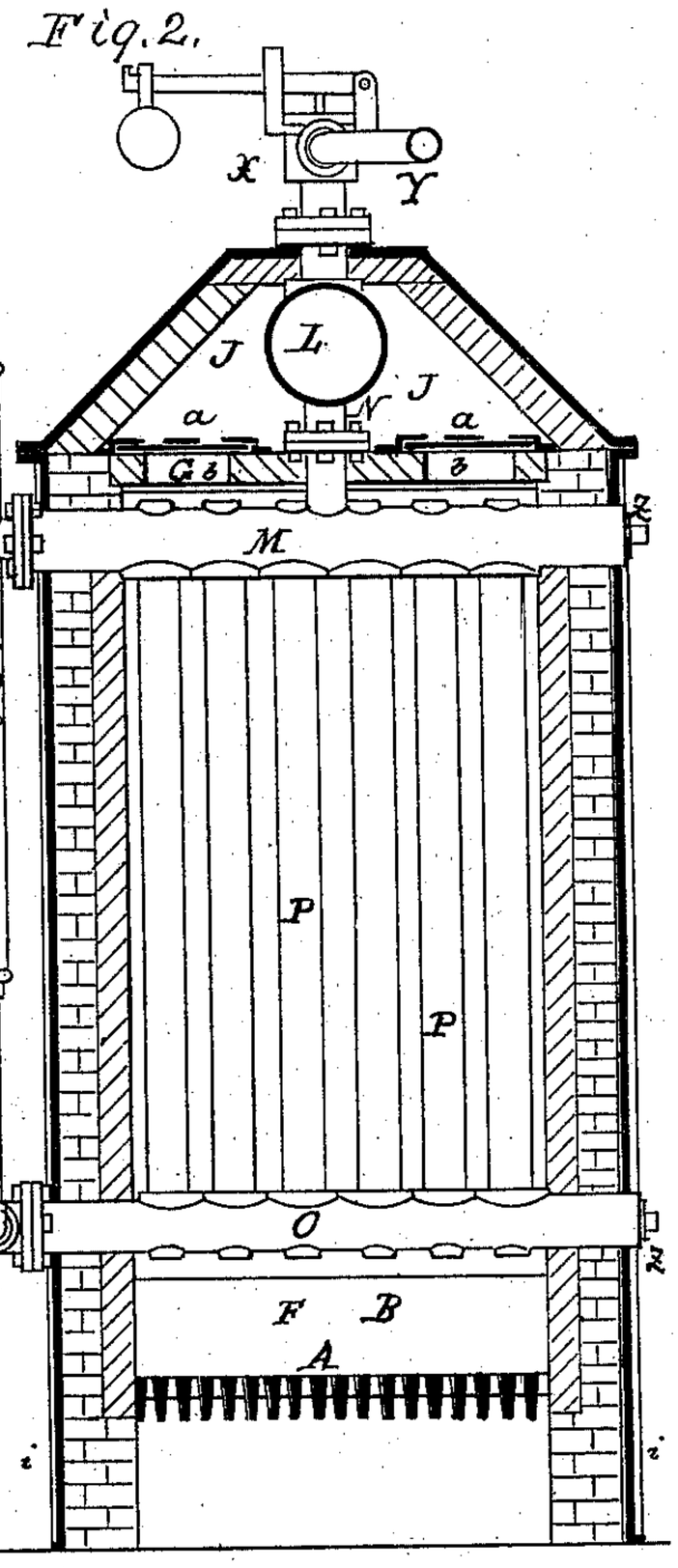


Fig. 2.



Witnesses

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BURHAUS VAN STEENBERGH, OF GOSHEN, NEW YORK.

SECTIONAL STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 239,355, dated March 29, 1881.

Application filed February 1, 1881. (No model.)

To all whom it may concern:

Be it known that I, BURHAUS VAN STEENBERGH, of the town of Goshen, in the county of Orange and State of New York, have invented new and useful Improvements in Sectional Steam-Boilers, of which the following is a specification.

This invention relates to that class of steam-generators known in the trade as "sectional boilers." Its object is to get the greatest maximum heat out of the least minimum of fuel; and it consists, essentially, in the combination of sections of a steam-generator with a reverberatory furnace constructed substantially as shown; secondly, in the construction and arrangement of the sections forming the generators with the walls of the furnace, by which the products of combustion are made to impinge with greater impact on the heating-surface of the water-tube; third, in the combination and arrangement of the fire and water tubes relative to their position with the steam-drum and the superheating-chamber, locating a horizontal diaphragm or partition between said tubes and drum, by which the intense heat is transmitted to and taken up by the water-tubes before it reaches the steam-chamber, as will be more fully hereinafter explained; fourth, the combination and arrangement in the furnace of the horizontal partition with the reverberatory deflection and the controlling-dampers in said partition; fifth, the combination and arrangement of the inclined bridge-wall, the rear wall, and the overhanging inwardly-inclined deflector and the horizontal partitions, by which the hot gases are made to take a forwardly direction through the tubes, in the manner shown and described; sixth, the combination and arrangement of the steam-generating sections and their connections relative to the horizontal partition, by which the products of combustion or a portion of them is first made to pass through the flame-tubes, and then to follow on a horizontal plane along the said partition, being compelled to take a circuitous route among and between the necks of the steam and water connections, thus imparting additional heat to the steam as it escapes from the generating-sections to the steam-drum, substantially as shown and described; seventh, the arrangement of the rearwardly-inclined bridge-wall and its adjustable vertical support, by which the grate-bar surface may be enlarged, increased, or diminished, as may be desired, according to the necessities of the quantity of steam demanded or the kind of fuel to be used.

The arrangement of parts may be as follows: A reverberatory furnace of a sectional steam-boiler with a series of lateral rows of nearly upright longitudinal-inclined water-tubes having fire-flue tubes through them, and each row having a top and bottom horizontal and lateral water-head connecting the members of the row, of which the bottom water-heads are connected severally with one common feed-pipe on the outside of the furnace, and of which the top water steam-heads are each connected by a common central steam-drum arranged in the superheating-flue which connects the furnace with the chimney, and said upright water-tubes being arranged diagonally to the grate-surface of the furnace. By the above means the flame is reverberated, and it traverses all said bottom and upright water-tubes laterally and in different directions, thereby effecting a uniform and powerful caloric action in the furnace and upon the inner and outer surfaces of these upright water-tubes, to generate the steam rapidly, and also effecting the suitable superheating of the steam in the steam-drum for use.

The invention relates also to the combination and arrangement of the reverberatory furnace with dampers for changing the draft from reverberatory to direct draft suitable for encouragement or a rapid ignition of the burning material in the furnace.

In the drawings hereto annexed, forming part of this specification, Figure 1 represents a vertical longitudinal section of the sectional boiler with my improvements. Fig. 2 is a lateral or cross section of the same.

A represents the grate of the furnace; B, the rear side, and C the front side, of the same.

D is a bridge, inclined from the grate to the rear side or wall, and E is a deflector-bridge made outward from the rear wall into the fire-box F. Both said bridge and deflector serve to reverberate the flame and equalize the heat in the furnace, which has its fire-box provided with a tile top or crown, G, supported upon

the cross-bars H. Said crown G has a large opening, I, between its junction with the rear wall, through which the products of combustion pass into a top flue, J, which turns said products forward to escape into the chimney K, provided at the top of the forward part of said top flue. In said top flue is arranged centrally and longitudinally the steam-drum L.

In the fire-box, below the crown G, are arranged the horizontal lateral water-tubes M, of which each has a central upward neck and flange, N, for each of which the steam-drum has a corresponding flanged neck, to connect the water-tubes M and steam-drum L properly solid and steam-tight. In the lower part of said fire-box are arranged a corresponding number of lateral horizontal water-tubes, O, with the number of tubes M, and from each tube O to the corresponding tube M above is arranged a row of upright water-tubes, P, which are each a proper equal distance apart for the flame to pass between, and they are expanded solidly therein steam-tight, for which purpose the tubes M and O have hubs formed on them, into which the tubes P are fitted. The longitudinal sides of the furnace are made vertical, and the tubes P are arranged parallel between them; but in longitudinal direction of the furnace said tubes are arranged inclined or diagonally with the grate, as shown. In each of said water-tubes P is furnished a flue-tube, Q, centrally and parallel to it, and each flue-tube passes through the top and bottom water-tubes M and O, and is also expanded solidly therein. Forward on the same level with the grate-bars is made the fire-door R, and below is one or more ash-doors, S, arranged. The water-tubes O have each a flange on the outside of the furnace, through the side of which they all pass; and the feed-pipe T has also corresponding flanges with those formed on the tubes O, so that said feed-tube is connected with each of the tubes O, and they are all fed from said pipe T. The most forward water-tube, M, is also provided with an outside flange, to which the vertical tube U is connected on its upper part, the lower end of the same being connected with the said feed-pipe T. To said pipe U is attached the water glass gage V, and also the gage-cocks W W, at and above the proper water-level, which is in this boiler at about the top of the tubes P.

On the top of the steam-drum L is connected the safety-valve X, from which the pipe Y passes, to conduct the steam generated and superheated to its destination for use.

The whole boiler and furnace is inclosed by cast-iron sides, which are properly lined with fire-brick and common brick, to keep the heat within and to have it of good durability, with exception of the ends of the water-tubes M and O, of which those on the right-hand side have plugs Z, to open said tubes or pipes for cleaning.

The chimney is furnished with one main damper, *d*, to regulate the draft suitably during the regular generation of the steam, and allowing the draft to reverberate in the fire-box. For the purpose of producing a rapid combustion, as in case of requiring a rapid generation of the steam, or that the fire has become too low, or that the fire requires to be made fresh, I provide the furnace with the dampers *a a*, arranged upon the crown G, which has the openings *b b* in straight direction over the grate and under the chimney, to allow a direct draft to pass into the chimney and cause the rapid combustion. Each of said dampers *a a* has a rod and handle, *e*, protruding on the outside of the furnace, to operate the damper.

The sides of the furnace are made in sections bolted together, of a dimension suitable to remove any suitable number of the sections of the boiler for repairs or to work with a less number of them.

The rear ends of the grate-bars rest upon the rear cross-piece, *g*, which is bolted with the bolts *h h* to the sides *i i* of the case of the furnace, and said sides *i i* have slots *j j*, so that said cross-piece *g* may be secured farther from or nearer to the front side of the furnace, by which means the furnace may be suited for more or less grate-surface by placing longer or shorter grate-bars therein. Said grate-surface may also be reduced by covering the rear ends of the grate-bars, suitable to obtain the grate-surface desired, to suit the consumption of fuel desired.

The grate-surface may be varied from eight to twenty-five square feet, suitable for rapid or slow generation of the steam, according to the purpose for which it is employed.

This boiler has a heating-surface of over seven hundred square feet, of which about thirty feet are used for superheating-surface, and all the remainder is nearly fire-surface, or the most valuable heating-surface in effect. It has an ample water-room of thirty cubic feet and steam-room of fourteen cubic feet. Its construction is simple, and of limited expense and of great durability, of great strength, suitable for very high pressure, and very safe. The steam therein is properly superheated and generated very economically on account of the large effective heating-surface, and its capacity and grate may be at any time diminished.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in a sectional steam-generator, of the combined water and fire or flame tubes arranged at an incline with the rearwardly-inclined deflectors and the horizontal partition, substantially as shown and described.

2. The combination, in a sectional steam-generator, of the inclined sections, the inclined bridge-wall, and the deflector E with the horizontal partition, all arranged in the manner shown and described.

3. The combination, in a sectional steam-generator, of the inclined water and flame

tubes, horizontal partition, deflector E, and superheating-chamber, constructed and arranged as shown and described.

4. The combination and arrangement, in a furnace, of the horizontal partition with the reverberatory deflector and the controlling-dampers in said partition, substantially as shown and described.

5. The combination and arrangement of the inclined bridge-wall and the overhanging rearwardly-inclined deflector and the horizontal partition, by which the hot gases are made to take a forwardly direction through the tubes, in the manner shown and described.

6. The combination and arrangement of the steam-generating sections and their connections relative to the horizontal partition, by which the products of combustion (or portion of them) are first made to pass between the flame-tubes, and then to follow on a horizontal plane along the said partition and between the necks of the steam and water connections, imparting additional heat to the steam as it escapes from the generating-section to the steam-drum, substantially as shown and described.

7. The combination of the inwardly-inclined bridge-wall and its adjustable vertical support with the grate-bars, by which the grate-surface may be increased or diminished, as may be desired, according to the quantity of steam demanded, or the kind of fuel to be used, all constructed and arranged in the manner set forth.

8. The combination and arrangement of the grate A, the bridge D and deflector E, the crown G, with the opening I, and the flue J and chimney K, with the drum L, the tubes P and flue-tubes Q, the water-tubes M and O, and feed-tube T, substantially as and for the purpose herein mentioned.

9. The combination and arrangement of the fire-box F, the grate A, with the bridge D and deflector E, the crown G, with the opening I and *b b* and dampers *a a*, the connecting or return flue J, and chimney K, and damper *d*, the water and flue tubes P and Q and M and O, substantially as and for the purpose herein stated.

In witness whereof I hereunto set my hand this 17th day of January, 1881.

BURHAUS VAN STEENBERGH.

In presence of—
W. F. TROTTER,
H. H. PAULSEN.