(No Model.) 3 Sheets—Sheet 1.

H. A. R. DIETRICH.

SECTIONAL BOILER.

No. 526,563. Patented Sept. 25, 1894.

Fig. 2

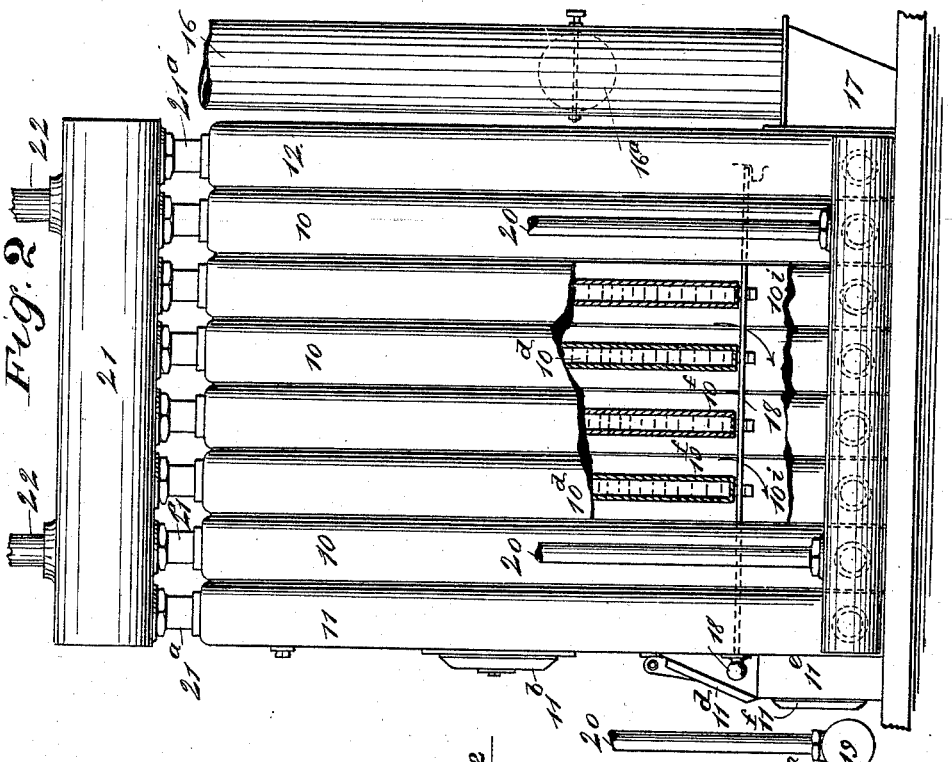

Fig. 1

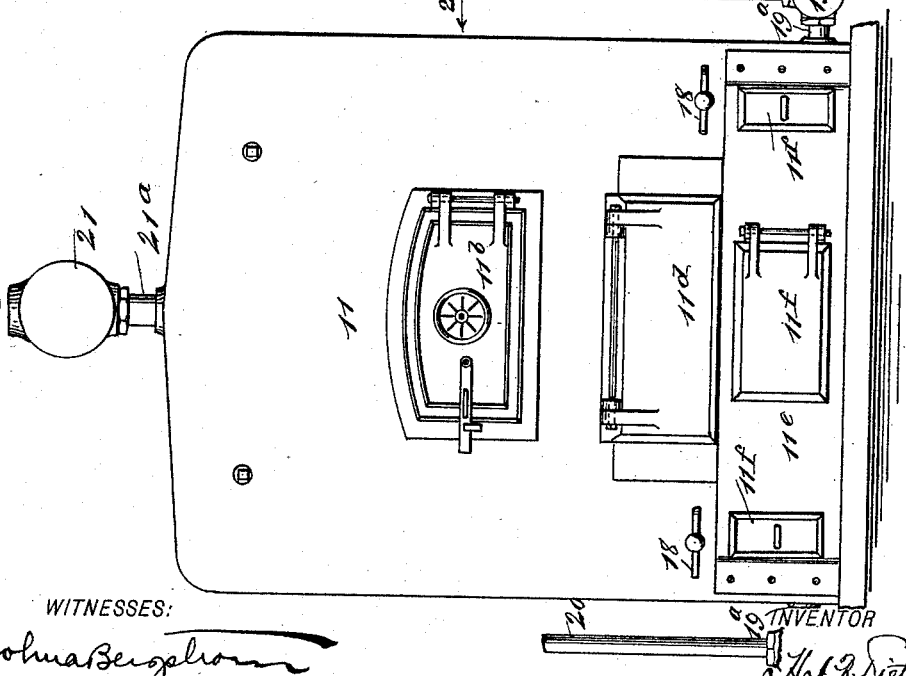

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Fig. 4

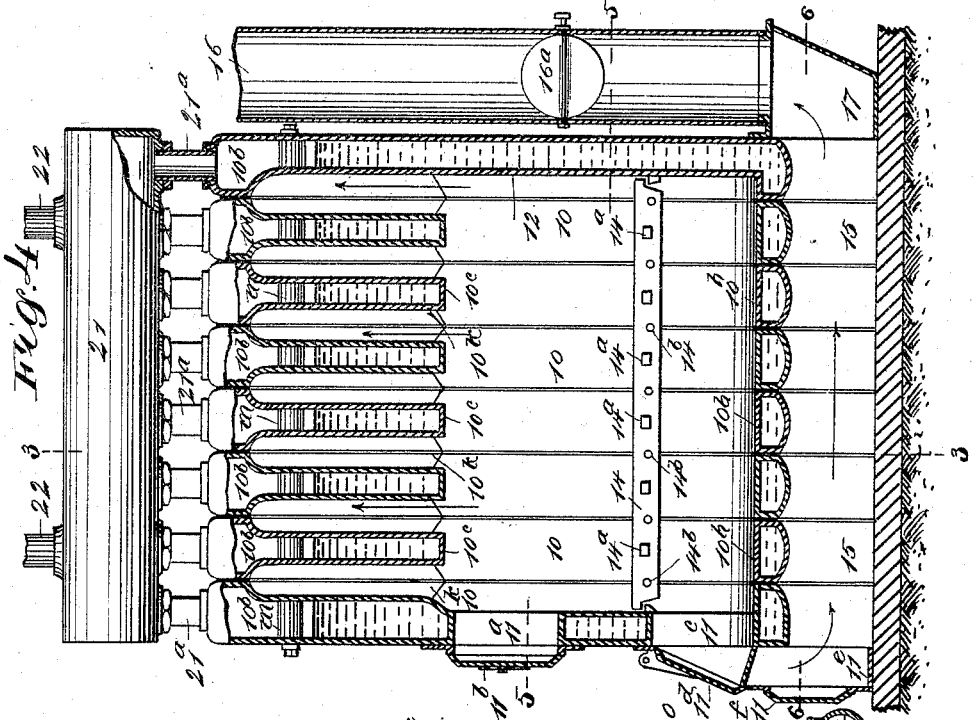
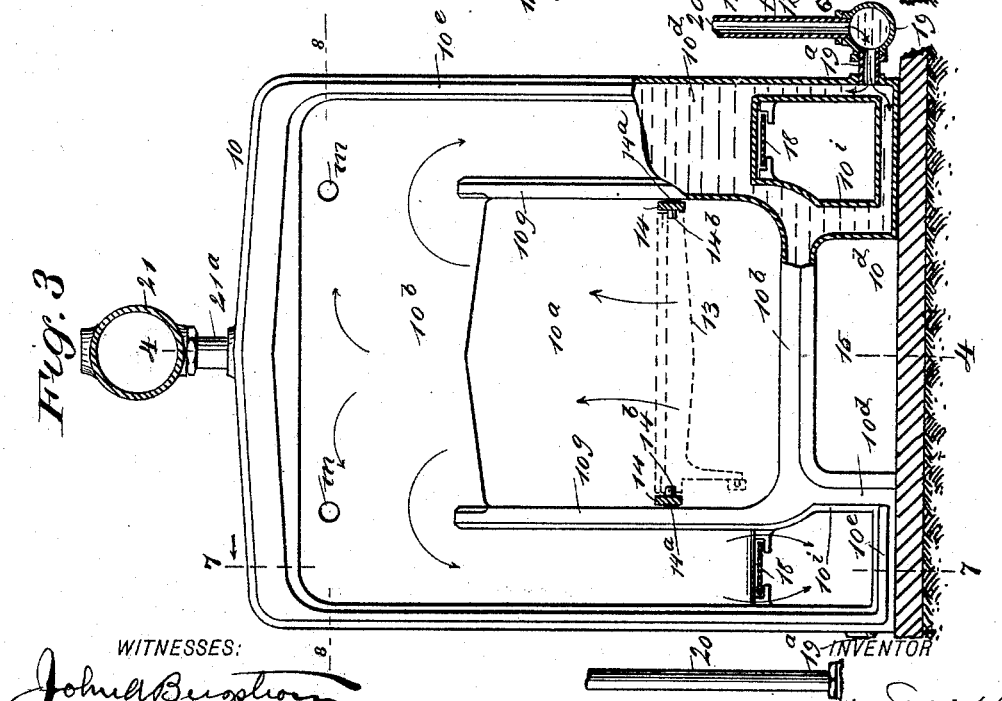


Fig. 3



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SECTIONAL BOILER.

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FIG. 5

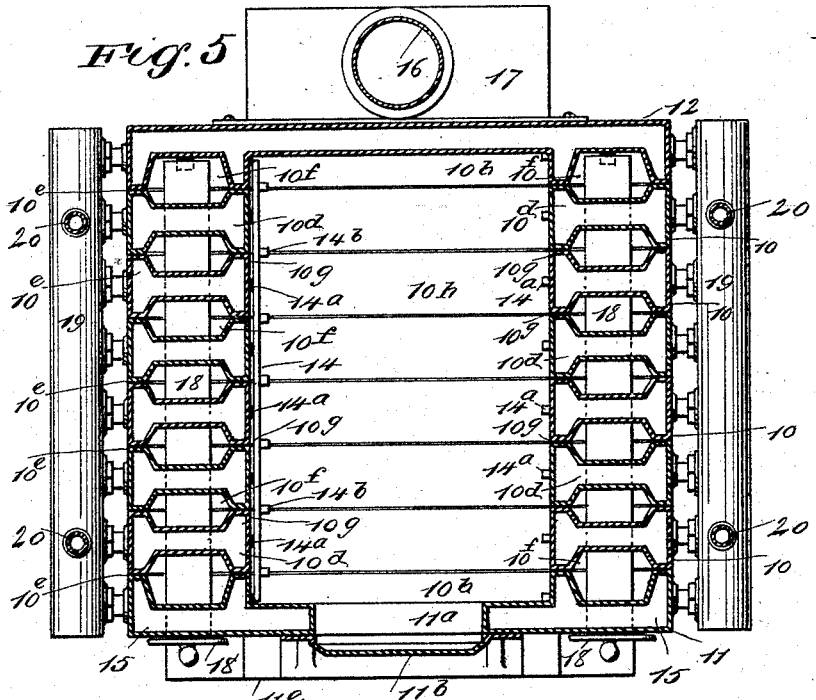

FIG. 7

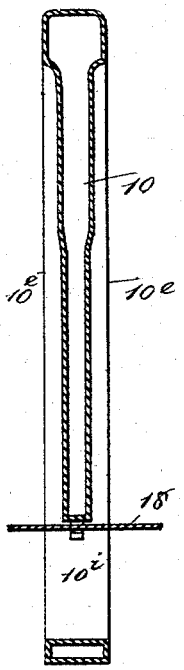

FIG. 6

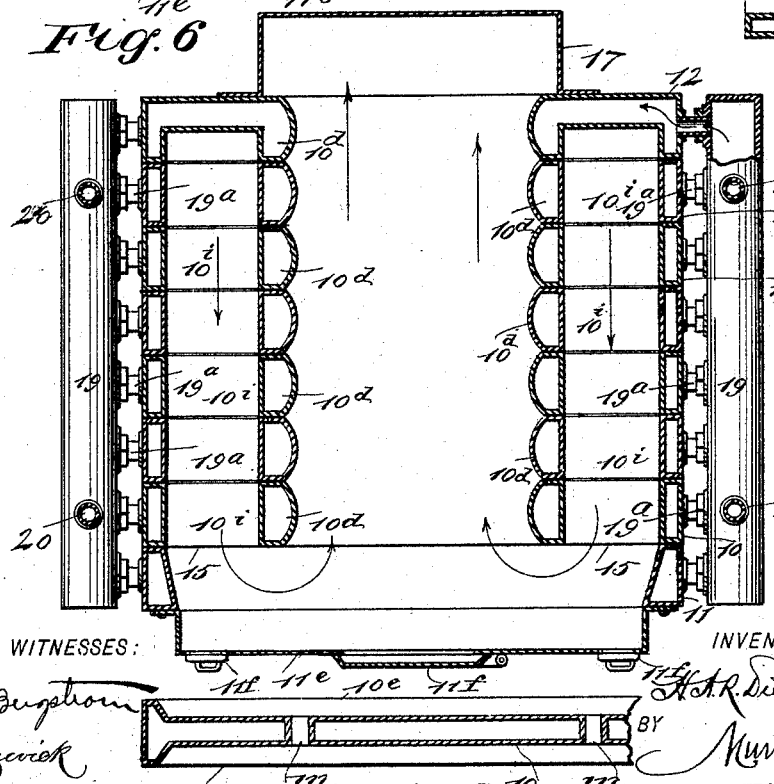

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FIG 8

UNITED STATES PATENT OFFICE.

HARRY A. R. DIETRICH, OF SOUTH BETHLEHEM, PENNSYLVANIA.

SECTIONAL BOILER.

SPECIFICATION forming part of Letters Patent No. 526,563, dated September 25, 1894.

Application filed December 21, 1893. Serial No. 494,341. (No model.)

To all whom it may concern:

Be it known that I, HARRY A. R. DIETRICH, of South Bethlehem, in the county of Northampton and State of Pennsylvania, have invented new and useful Improvements in Sectional Boilers, of which the following is a full, clear, and exact description.

My invention relates to improvements in steam producing, or water heating boilers of the sectional type, and has for its object, to provide additional features of improvement for the sectional boiler patented by me February 28, 1893, No. 492,664, whereby said patented device is rendered more efficient in service.

To this end my invention consists in the construction and combination of parts, as is hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views shown.

Figure 1 is a front view of the improved boiler. Fig. 2 is a longitudinal side view, opposite the arrow 2 in Fig. 1, broken away to expose interior parts. Fig. 3 is a transverse sectional view on the line 3—3 in Fig. 4. Fig. 4 is a partly sectional longitudinal side view, on the line 4—4 in Fig 3. Fig. 5 is a sectional plan view, on the line 5—5 in Fig. 4. Fig. 6 is a sectional plan view, on the line 6—6 in Fig. 4. Fig. 7 is a vertical sectional view of a single intermediate division of the boiler, on the line 7—7 in Fig. 3; and Fig. 8 is a sectional plan view, in part, of an intermediate division of the boiler, on the line 8—8 in Fig. 3.

The essential features of the patented boiler, which the present invention improves, briefly stated, consist of a series of upright hollow sections that have their transverse vertical faces held in close contact, the impinging sides of the boiler sections being recessed to provide heat-receiving spaces between the hollow water-holding portions of the same. A fire chamber is formed by providing two integral legs for each boiler section, which chamber is closed at the front and rear by boiler sections that have no legs. Heat flues or spaces intervene adjacent boiler sections which connect with longitudinal conduits formed in the hollow legs of the boiler sections, said conduits being connected with an upright draft flue or flues at the rear end of the boiler.

In the drawings that represent the present improvements, a series of intermediate boiler sections 10 is provided, 11 and 12, respectively representing front and rear sections of the boiler that are changed in construction from that of the intermediate sections.

As the parts 10 are similar, the description of one intermediate boiler section will serve to explain the construction of all provided for a boiler, and as clearly shown in Figs. 3, 4 and 7, each intermediate section 10 comprises a preferably cast metal receptacle that is parallel on the outer sides, is slightly arched on top, and apertured at 10^a, in substantially rectangular form, to produce a fire chamber when all the boiler sections are assembled.

The aperture 10^a is transversely formed in each boiler section 10, at a sufficient distance from its wall to afford a water chamber 10^b above the fire chamber in each section, the transverse parallel walls of said water chamber merging into the top wall of the aperture 10^a, as indicated at 10^c in Fig. 4. The parallel side walls of the fire chamber aperture 10^a are evenly spaced from the outer side walls of the boiler section 10, and the water chamber 10^b is downwardly extended through the upright hollow portions or water legs 10^d that are thus formed at each side of the aperture mentioned. A projecting hollow rib 10^e is formed on each transverse side of each intermediate boiler section 10, around its peripheral edge. These ribs which impinge each other in pairs when the boiler sections are assembled, afford heat compartments 10^k above the fire chamber between each pair of boiler sections, in direct communication therewith.

Along each side wall of the aperture 10^a, in a boiler section 10 opposite hollow ribs 10^g are formed, that project slightly above the aperture, and merge into the bottom wall 10^h of said fire chamber aperture, as indicated at

the left in Fig. 3, the hollow ribs 10^e and 10^g providing heat conducting flues 10^f between the water legs of adjoining boiler sections, as shown where broken away in Fig. 2. The water legs of the several boiler sections 10 are extended of a suitable length below the horizontal composite hollow wall 10^h that is the bottom of the boiler fire chamber, or more particularly its ash pit.

In each series of legs 10^d, at a correct distance above their lower horizontal walls, a transverse aperture is formed in each leg, which apertures provide a horizontal flue below at each side of the boiler. Specifically described, the flue apertures in the legs 10^d are integrally produced by the formation of a substantially rectangular transverse tubular wall 10^i in each leg, the location of these tubular cross walls affording water spaces in the legs that completely surround the horizontal flues, and have a free communication with the water space in the hollow wall 10^h of each boiler section 10, as clearly represented at the right in Fig. 3. The integral formation of the serially aligned cross walls 10^i, permits the upright spaces or heat flues 10^f to intersect the horizontal flues produced by said tubular cross walls, and thus transmit heat currents thereto. The space below the wall 10^h is laterally bounded by the inner upright walls of the water legs 10^d, which legs are widened below said horizontal wall, to provide space for the flue walls 10^i, and a continuous water passage around the latter, as before explained.

The section 11, which forms the front of the boiler, is provided with a water chamber 10^b, which is continuous, with the exception that an integral ring wall 11^a is produced between its front and rear side walls, at a suitable point to form a stoking hole for the fire chamber, which hole is sealed by the usual style of door 11^b. At a proper distance below the stoking hole in the front section 11, an ash-pit aperture is formed by the integrally produced ring wall 11^c, the lower side of which ring wall forms a portion of the hollow bottom wall of the fire chamber and ash pit combined, a door 11^d affording means to seal the ash pit aperture. The fire chamber previously described also affords the ash pit, these compartments being separated by a series of grate bars 13, one shown in Fig. 3. Preferably, the grate bars are supported at their ends to receive a simultaneous rocking motion. To conveniently effect this, and at the same time provide reliable means for binding the several boiler sections together intermediately of their upper and lower portions, the bearing bars 14 are provided. The two similar bars 14 each consist of a heavy metal strip, rectangular in cross section, having a toe at each end that rest on lugs formed on inner walls of the front and rear boiler sections, as shown in Fig. 4 of the drawings. At proper intervals between the ends of each bearing bar, transverse and preferably rectangular holes are formed in said bars for the reception of the neatly fitting rectangular studs 14^a which project from the side walls of the fire chamber, a pair of said studs being oppositely formed or produced on each boiler section 10. At central points between the studs 14^a, trunnion-like projections 14^b are formed on the bars 14, for the reception of the grate bars 13, the ends of which are longitudinally perforated so as to loosely engage with the trunnions and thus be supported free to rock, as shown by dotted lines in Fig. 3, each grate bar having a depending arm, which arms hang in the same vertical plane, and at their lower ends are pivoted to a single pusher bar, whereby they are adapted to receive simultaneous rocking movement.

Between the leg portions of each boiler section below the hollow horizontal wall 10^h, an opening is produced, which affords a central conduit 15, from front to rear of the boiler when the several sections are placed and held together. Below the ash pit door 11^d, a plate metal rectangular box 11^e is located and secured to the front boiler section 11, this forwardly-projecting attachment forming a connecting flue between the longitudinal flues 10^i at the sides of the boiler and the center conduit 15 therein. The flue box 11^e is apertured near its center, and also near the ends, to afford openings for cleaning dust and ashes from the flues 10^i and 15, suitable doors 11^f being provided to seal these openings.

The rear boiler section 12, is recessed on the front side so as to complete a heat compartment 10^k between it and the boiler section 10, which is in contact with its ribbed edge, a continuous water chamber extending throughout its area.

Preferably, two or more rows of thimbles *m* are formed or secured in the boiler sections 10, 11, 12, near their upper walls; these being aligned in series, and adapted, if plugs in the front and rear sections are removed, to admit air from without the boiler into the heat compartments 10^k, so as to supply oxygen to intensify the combustion of carbonaceous vapor which rises in the compartments from the fire chamber below them. At the rear of the boiler an upright draft flue 16, is erected on a smoke box extension 17, that is attached to the rear face of the boiler section 12, opposite the center conduit 15, of which it is a continuation.

Said draft flue, which is proportioned in dimensions to suit the capacity of the boiler, is provided with the usual damper valve 16^a, to control its draft.

It has been found advantageous in practice, to provide means for the restriction and equalization of escape of heat currents from the heat compartments 10^k and vertical heat conducting flues 10^f, and to this end a plate metal throttle gate 18, is introduced between the

flues 10^i at each side of the boiler, and supported to slide on ledges through a slot in the boiler section 11. The throttle gates are proportioned in width to suit the dimensions of other parts they co-act with, so that a suitable opening will be afforded at each side edge of a gate between the upright flues 10^f and horizontal flues 10^i, these openings forming effluent passages for the products of combustion that are evolved in the fire box of the boiler, so that the heat currents will be slower to escape, and a larger proportion of the heat absorbed by the water in the legs of the boiler.

At each side of the composite boiler, a water chamber 19 is located, which each consists of a cylindrical drum sealed at the ends and about equal in length with the length of the boiler from front to rear. The water chambers 19, are each connected to the boiler sections 10, 11, 12, by short nipples 19^a and proper jam nuts, a nipple extending between each side of a boiler section and the water chamber at that side of the boiler. On the water chambers 19, one or more upright pipes 20 are projected from each chamber, which will be further described.

A steam or hot water drum 21, is mounted upon the boiler, and its several sections are connected to this drum by a series of nipples 21^a, as shown in Figs. 1, 2, 3, and 4.

The boiler sections when assembled, are preferably jointed together, with a fire-proof putty applied to their impinged surfaces, or any other non-combustible sealing material may be employed, and it will be seen that by the method of attaching the drum 21, water chambers 19 and bearing bars 14, to the boiler sections, these portions of the boiler will be held in close connection at their points of juncture.

The improved boiler may be used for steam or hot water heating, and is particularly well adapted for heating buildings by hot water circulation; in which case the pipes 20, are extended to connect with the radiators in rooms of the building, serving as cooled water return pipes, other pipes 22 being extended to the radiators mentioned to furnish them with hot water. One or more of the pipes 20 may be utilized for supplying the several sections of the boiler with feed water. In case the boiler is used as a steam generator, then the receptacle 21 becomes a dry steam drum.

One of the distinguishing features of the present invention comprises the hollow bottom wall 10^h, that affords an extended heating surface for steam evolution or water heating, as it receives heat from the ash pit and also on its lower side from heat currents in the conduit 15. Another important improvement is the provision of the throttle gates 18, that may be increased or diminished in width, and which when in place, will so control the escape of the descending heat currents, that increased absorption of heat therefrom is secured for the water in the legs of the boiler sections, as before mentioned.

The provision of a central heat conduit 15, and transverse flue connections afforded between said conduit and the flues 10^i at the front of the boiler, insures a more extended contact of the heat currents with water heating surfaces of the boiler, and thus increases its efficiency as a water heater or steam generator, conducing to economy in fuel consumption, by effecting a larger percentage of heat transmission for the amount of fuel consumed.

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

1. In a boiler, the combination with vertical sections having heat compartments and upright heat flues between them, and horizontal flues intersecting said upright flues, of flat elongated throttle gates between the upright heat flues, and horizontal flues arranged to restrict and control the transmission of heat currents from the heat compartments to the horizontal flues, substantially as described.

2. In an upright sectional boiler, having a fire chamber formed by a nearly rectangular aperture in each section, and intervening heat compartments which intersect descending flues within the boiler at each side of the fire chamber, the combination with said descending flues, of a horizontal longitudinal flue at each side of the boiler, composed of tubular flue walls that are serially aligned, and a removable flat throttle gate between each horizontal flue and the descending flues which intersect it, providing reduced draft openings at the side edges of said gates between the vertical and horizontal flues substantially as described.

3. In a sectional boiler having spaced descending heat-conducting flues at each side of a fire chamber, and a horizontal flue formed in the boiler sections at each side of the fire chamber and in a lower plane intersected by the descending flues and also in connection at the front with a central draft passage, the two insertible flat throttle gates one over each horizontal flue and of less width than said flue or of the series of descending intersecting flues, substantially as described.

4. In a sectional boiler, comprising upright chambers recessed in impinging sides, thereby forming intervening heat compartments and descending flues at each side of a central fire chamber, the serially aligned horizontal flues below and at each side of the fire chamber, a central conduit below a hollow wall that separates it from the fire chamber ash pit, a transverse flue at the front of the boiler, connecting the horizontal flues with the conduit, and flat throttle gates between the descending flues and the horizontal flues that reduce

the draft passages from the descending flues into said horizontal flues, substantially as described.

5. In a sectional boiler, the elongated flat throttle gates slidable through slots in the front section of the boiler, and arranged to lie above in horizontal draft flues in the assembled sections providing reduced draft passages at their side edges and restricting the escape of heat currents from the fire chamber into said draft flues, substantially as described.

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