

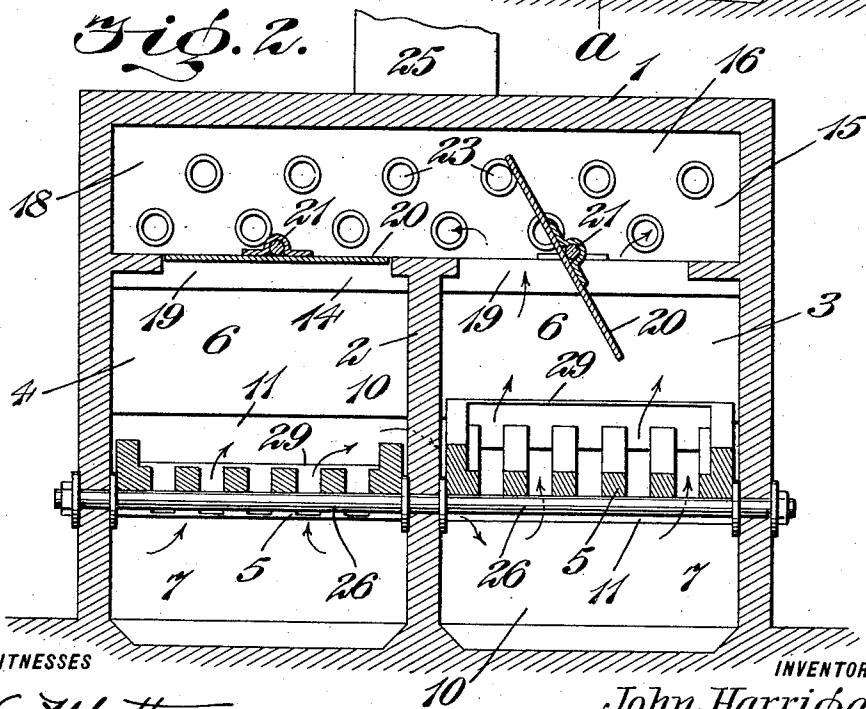
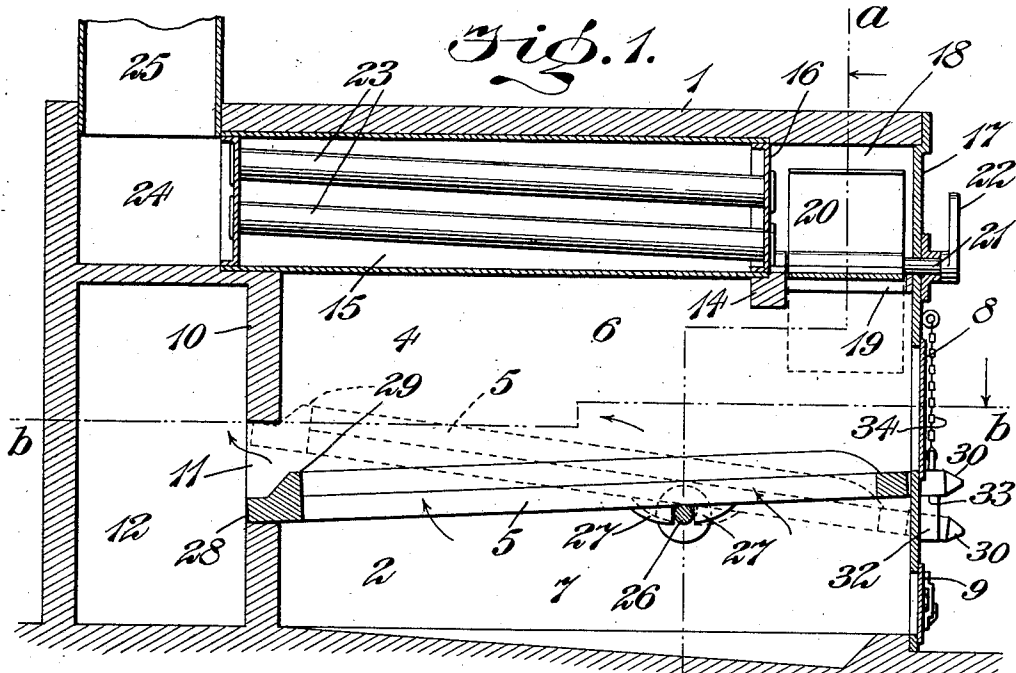
J. HARRIGAN.
FURNACE.

APPLICATION FILED JULY 27, 1910.

Patented Apr. 15, 1913.

2 SHEETS—SHEET 1.

1,059,153.



WITNESSES

A. C. Abbott

W. E. Lawson

BY

John Harrigan

INVENTOR

ATTORNEY

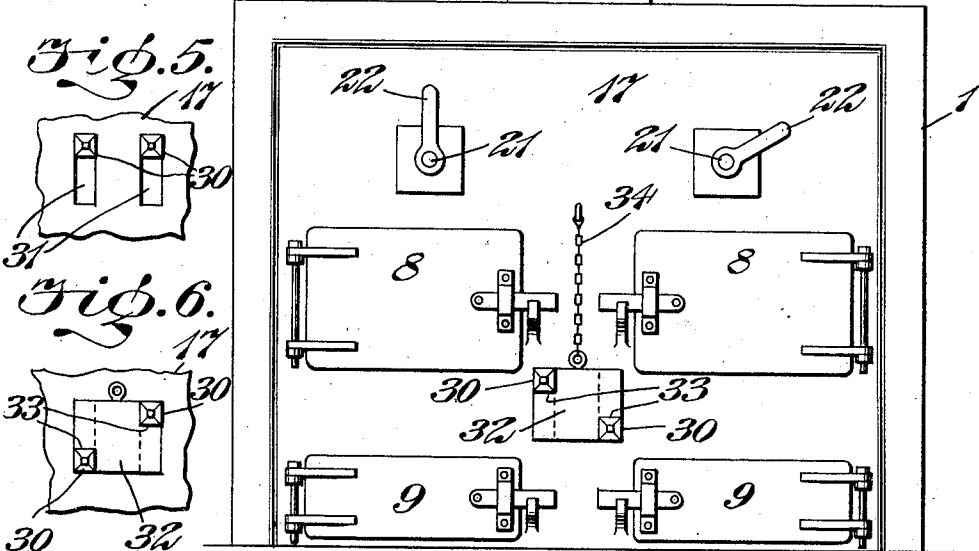
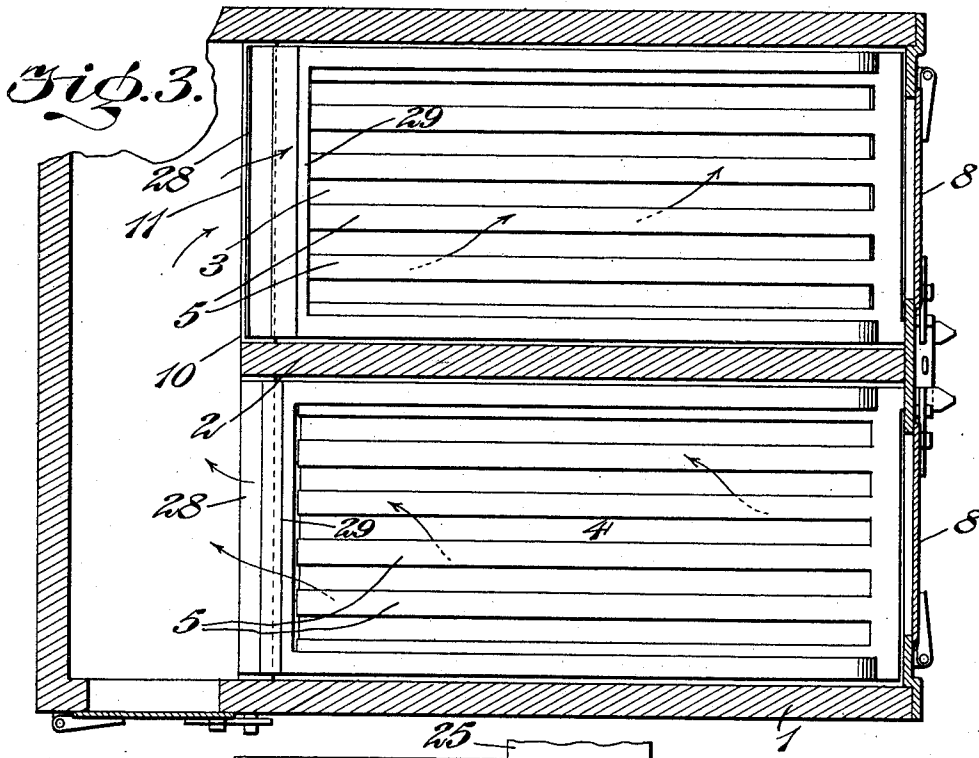
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Fig. 4.

BY

John Harrigan
[Signature]

INVENTOR

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN HARRIGAN, OF NEW YORK, N. Y.

FURNACE.

1,059,153.

Specification of Letters Patent.

Patented Apr. 15, 1913.

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To all whom it may concern:

Be it known that I, JOHN HARRIGAN, a citizen of the United States, and a resident of the city and State of New York, have invented certain Improvements in Furnaces, of which the following is a specification.

This invention relates to certain improvements in furnaces, and more particularly in that class of furnaces which are especially designed and intended to assure substantially complete combustion of the fuel, whereby to prevent or lessen the production of smoke and consequent waste of fuel due to the carrying off of minute particles of fuel and unconsumed gases with the draft, and the object of the invention is to provide a furnace of this general character of a simple and comparatively inexpensive nature, having means of a novel and improved description capable of employment for the elimination of smoke and for assuring substantially complete combustion of the fuel without requiring the exercise of any extraordinary or peculiar care or skill on the part of the attendant.

The invention consists in certain novel features of the construction, and combinations and arrangements of the several parts of the improved furnace, whereby certain important advantages are attained, and the furnace is rendered simpler, less expensive and more economical during use, and otherwise better adapted and more convenient for employment, all as will be hereinafter fully set forth.

The novel features of the invention will be carefully defined in the claims.

In order that my improvements may be the better understood, I will now proceed to describe the invention with reference to the accompanying drawings, wherein—

Figure 1 is a vertical section taken through one side of a furnace provided with my improvements in a plane alined with the general trend of the draft therethrough; Fig. 2 is a sectional view taken vertically and transversely through the forward part of the improved furnace in the plane indicated by the line *a— a* in Fig. 1; Fig. 3 is a sectional view taken horizontally through the furnace in the plane indicated by the line *b— b* in Fig. 1; Fig. 4 is a front elevation of the furnace showing certain features of the grate holding or locking means; Fig. 5 is a fragmentary view showing a portion of the furnace front for the illustration of

certain features of construction not apparent in the preceding views, and Fig. 6 is a view somewhat similar to Fig. 5, but illustrating the means for holding or locking the grates adjusted to a position different from that shown in Fig. 1.

The improved furnace is shown in these views provided with a shell or casing wall 1, and with a partition or division wall 2 extended upwardly at its central part serving to divide the interior of said shell or casing into two similar compartments or chambers 3 and 4, which are side by side adjacent to the furnace front, and wherein are extended horizontally directed grates 5, 5 which may be of any preferred structure in detail and which operate to divide the respective chambers 3 and 4 into upper fire boxes or combustion chambers 6, 6 and lower ash pits 7, 7, the furnace front 17 being provided with fire doors 8, 8 whereat access may be had to the fire boxes for charging or raking the fires upon said grates, and with lower ash doors 9, 9, affording access to the ash pits 7, 7 as is usual in furnaces.

10 represents a transversely directed vertical partition or division wall erected within the interior of the furnace casing or shell 1 at the rear of the compartments or chambers 3 and 4, and wherewith the rear end of the central division or partition wall 2 above referred to is joined, as indicated in Figs. 1 and 2, and 11, 11 represent apertures produced in this transverse partition or division wall 10 in line with the rear ends of the grates 5, 5 in the respective chambers or compartments 3 and 4, and serving for the passage of products of combustion to and from a transversely extended intermediate flue or inter-communicating passage way 12 which is produced within the shell or casing at the rear of said transverse partition or division wall 10 and is calculated to afford communication between the two chambers or compartments 3 and 4 so that the products of combustion from one of said compartments or chambers may traverse such flue or inter-communicating passage way and be conveyed into the other chamber or compartment as will be hereinafter explained.

14 represents a transverse brace or strut of any preferred kind extended across the forward part of the interior of the furnace casing in line with the upper part of the central partition or division wall 2, and affording support for the forward part of a

boiler 15 which is herein shown extended rearwardly across and along the upper parts of the fire boxes 6, 6 of the respective chambers or compartments 3 and 4 so as to close the same and to produce a heating surface exposed to the hot products of combustion arising from the fuel burning upon the grates 5, 5, the forward tube sheet 16 of such boiler being spaced from the furnace front 17, as shown in Fig. 1, to produce a transversely extended flue or passage 18 across the forward part of the furnace and above the compartments or chambers 3 and 4 at opposite sides of the division or partition wall 2, and adapted for communication with the forward ends of the fire boxes 6, 6 at the upper parts of such chambers or compartments 3 and 4 by way of ports or apertures 19, 19 at opposite sides of said central partition 2.

The ports or apertures 19, 19 are controllable by means of valves or dampers 20, 20, mounted upon rods 21, 21 extended through the furnace front and provided with manipulating handles 22, 22 whereby they may be conveniently turned in such a way as to permit each of the respective valves or dampers to be set or adjusted either into opened or closed position so that the course of the products of combustion through the furnace may be regulated as will be hereinafter explained, and 23 represent flues or tubes extended through the boiler 15 and affording communication for the passage of such products of combustion from said upper forward transverse flue or passage 18 to a similar transversely extended flue or passage 24 at the rear part of the shell or casing, above the intermediate transverse flue or inter-communicating passage way 12, and 25 represents a breeching or the like communicating with said flue or passage 24 and affording an outlet for the products of combustion to the stack or chimney.

26 represents a brace extended transversely across the lower central part of the furnace, with its extremities securely anchored in the side walls of the furnace and its central part supported in the central partition or division wall 2 in such manner that its opposite end portions are caused to project transversely across the chambers or compartments 3 and 4 at opposite sides of said wall 2, and 27 represent spaced lugs integrally produced upon the undersides of the respective grates 5, 5, which lugs are engaged at opposite sides of the brace rod 26 in such a manner as to afford a pivotal support for each such grate 5, at its central part, so that the respective grates are permitted to be rocked upon said end portions of the brace rod 26 to alternately raise and lower their rear extremities 28. Said rear end portions 28 of the respective grates 5, 5 are

extended within the ports or apertures 11, 11 which afford communication between the transverse intermediate flue or inter-communicating passage way 12 and the respective chambers or compartments 3 and 4, and the grates 5 are heaviest at their rear ends and are so supported for pivotal rocking movement upon the brace rod 26 as to be normally extended in downwardly inclined position from the fire doors 8 toward the said ports or apertures 11, as clearly shown in full lines in Fig. 1, the construction and arrangement of the parts being such that when the rear end of either of said grates 5 stands in such normally lowered position, the same is securely supported upon the bottom of the corresponding port or aperture 11, which is then in communication with the fire box or combustion chamber 6 of the corresponding chamber or compartment 3 or 4, while by reversely rocking either of said grates as, for example, to the position illustrated in dotted lines in Fig. 1, the inclination of such grate is reversed, and the rear end thereof is raised so as to contact with the top of the port or aperture 11 wherein it plays, so that such port or aperture is caused to communicate with the ash pit 7 of the corresponding chamber or compartment 3 or 4 instead of with the fire box or combustion chamber 6 thereof wherewith it communicates when the grate stands in its normal gravital position.

The forward extremity of each grate 5, 5 is provided with an integrally formed extension or actuating member 30, which is located at the side of the grate adjacent to the central partition or division wall 2, and is carried through a vertically directed slotted opening 31 produced in the furnace front 17, so as to extend outside the furnace in position to serve as a means for reversely rocking the pivotally supported grate, the location of the members 30 adjacent to said central wall 2 assuring the positioning of their protruding ends in the furnace front closely adjacent to each other, so that they may traverse parallel paths along the slotted openings 31, 31 when the respective grates 5 are rocked upon their pivotal supports as will be hereinafter explained.

In the use of the improved furnace, after the fire boxes 6, 6 of the respective chambers or compartments 3 and 4 shall have been charged with fuel, and the fires kindled therein, the fuel in said compartments will be permitted to burn for a sufficient time to attain a certain degree of incandescence. During this preliminary or initial operation, the grates 5, 5 may both stand in their normal downwardly inclined position as seen in full lines in Fig. 1, while both dampers or valves 20 may be adjusted to the opened position shown at the right hand side of Fig. 2, so that the draft may be exerted

freely to promote combustion and hasten the attainment of an incandescent condition of the fuel upon the grates.

When the fuel in one of the chambers or compartments 3 or 4 shall have attained a sufficient degree of incandescence, signifying that the gases generated in the initial stages of combustion have been given off, the grate 5 in such chamber or compartment will be rocked pivotally upon the brace bar 26 so that its rear end portion 28 shall assume the elevated position shown in Fig. 1 in dotted lines and in full lines at the right hand side of Fig. 2, and the valve or damper 20 at the opposite chamber or compartment will be adjusted into closed position as indicated in the latter figure, after which the fire door at such opposite chamber or compartment will be opened and a fresh charge of green fuel will be thrown upon the downwardly inclined grate 5 therein and spread evenly over the same so as to replenish the fire in that chamber or compartment while the fire in the other chamber or compartment, wherein the grate is elevated is permitted to retain its condition of incandescence.

The replenishment of the fire in the compartment or chamber 4 wherein the grate 5 is in its normal downwardly inclined position, will give rise to the generation of additional partly consumed gases and smoke, and since when the grate is lowered, the port or aperture 11 has communication with the fire box 6 of such chamber or compartment it will be seen that these freshly generated gases and smoke including minute particles of fuel carried along with the draft will find an outlet from the fire box 6 of chamber or compartment 4 into the transverse intermediate flue or inter-communicating passage way 12, and will be carried along the same to the opposite side of the furnace, where the products of combustion and partly consumed gases and fuel will be delivered through the oppositely arranged port or aperture 11 into the other chamber or compartment 3 at the opposite side of the central wall 2, and since the grate 5 in this chamber or compartment stands in its elevated position the products of combustion and accompanying fuel and gases will be delivered through the last-named port or aperture 11 into the ash pit 7 of such chamber or compartment 3 and will rise through the incandescent fuel supported upon the upwardly inclined grate 5 so that the partly consumed fuel and gases will be subjected to the influence of such incandescent fuel and wholly consumed thereby.

The valve or damper 20 at the forward end of the chamber or compartment 3 wherein the grate is in the upwardly inclined position remaining open during this operation, the gaseous products of combustion arising from the grate 5 will find free outlet through

the port or opening 19 controlled by such valve or damper and will circulate through the boiler flues and finally escape from the transverse flue 24 to the outlet 25. The ash doors 9 may be utilized to afford such supply of air to each chamber or compartment 3 and 4 as may be required for the proper management of the fires therein, and if desired, the fires may be choked down and controlled by the admission of air at the fire doors or at dampers therein in a well known way.

When the fresh or green fuel in the fire box of chamber or compartment 4 shall have in turn attained a condition of incandescence, the grates 5, 5 of the respective chambers or compartments 3 and 4 are reversed in position, that of chamber 3 being returned to its normal downwardly inclined position while that of chamber 4 is elevated to an upwardly inclined position as indicated by dotted lines in Fig. 1, and the dampers or valves 20, 20 are similarly reversed in position so that the valve 20 for chamber 3 closes its port 19 while the valve for chamber or compartment 4 is adjusted to open communication from said chamber or compartment to the forward transverse flue or passage 18, after which an additional charge of fresh or green fuel is thrown through the fire door upon the grate of chamber 3 to replenish the fuel thereon, thereby giving rise to generation of further partly consumed gases and finely divided fuel in the form of smoke and fumes which are carried upward from the grate of said chamber 3 through the port 11 into and along the transverse intermediate flue or inter-communicating passage way 12 to and through the opposite port 11 into the ash pit 7 of chamber 4 and are caused to ascend through the incandescent fuel on the grate 5 in such chamber or compartment 4 so as to be wholly consumed prior to their escape through the port 19 to the smoke outlet. This operation of reversing the position of the grates and valves will be repeated as often as may be necessary to maintain the desired fire within the chambers or compartments 3 and 4, and at each reversal of these parts it will be seen that the course of the products of combustion along the intermediate flue or inter-communicating passage way 12 is reversed, while the incandescent fuel on the grate of one of the other of said compartments 3 and 4 is caused to act as a filter to effectively remove and consume such fumes and partly consumed gases and minute particles of fuel as may be generated in the first stages of combustion from the fresh or green fuel so that the production of smoke and loss of fuel due thereto is wholly avoided.

The structure and arrangement of the parts herein shown with the chambers or compartments 3 and 4 side by side beneath

the boiler is well adapted for use in boiler furnaces by reason of its compactness and simplicity, and the use of the valves or dampers substantially as herein shown permits each damper to be extended partially within the forward end of the corresponding chamber or compartment when in open adjustment, so as to operate as a baffle or deflector to direct the gases passing through the port 19 toward the central part of the transverse forward flue 18 so that the heating effect may be symmetrically applied to the boiler.

I have also shown the improved furnace provided with simple and effective means for locking or holding the grates 5 in adjusted position, such means comprising a block-like member 32, notched at diagonally opposite corners as shown at 33, 33 and suspended by a chain or equivalent flexible suspender as indicated at 34 so that it may be conveniently turned about to permit its notched upper corner 33 to be engaged beneath either the extension 30 of the grate of chamber 4 as indicated in Fig. 4 while its lower notched corner is engaged above the extension 30 of the grate in chamber 3, or when said member 32 is turned with its other face outermost, to be engaged as shown in Fig. 6 with its upper notched corner 33 beneath the extension 30 of the grate in chamber 3 while its lower notched corner is above the extension 30 of the grate in chamber 4.

From the above description it will be seen that the improved furnace constructed according to my invention is of an extremely simple and comparatively inexpensive nature and is particularly well adapted for use by reason of its compact and practical construction, and of the increased efficiency, lessened production of smoke and economy in fuel consumption attained by its use, and it will also be obvious from the above description of my invention that the furnace is susceptible of considerable modification without departure from the principles and spirit of the invention, and for this reason I do not desire to be understood as limiting myself to the precise formation and arrangement of the several parts herein set forth in carrying out my invention in practice.

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

1. A furnace of the character described having an exit flue, two compartments in direct communication with each other through an inter-communicating passage way and with said exit flue for the passage of products of combustion from one compartment to pass through one chamber through the other to the exit flue, grates movable in said compartments to cause the products of combustion from the fire bed of

one compartment to pass through the fire bed of the second compartment, extensions on the grates extended exteriorly of the furnace, said furnace being provided with slots for the passage of such extensions, means common to both grates exterior of the furnace and engageable with the extensions of the grates for holding the same against movement, said means closing the slots of the furnace and means for alternating the flow of said products of combustion through said compartments.

2. A furnace of the character described having an exit flue, two compartments in direct communication with each other through an inter-communicating passage way, and with said exit flue for the passage of products of combustion from one chamber through the other to the exit flue, grates movable in said compartments to cause the products of combustion from the fire bed of one compartment to pass through the fire bed of the second compartment, extensions on the grates extending exteriorly of the furnace, such furnace being provided with openings for the passage of such extensions, a block like member capable of engagement with the extensions of the grates to hold such grates against movement, and means for alternating the flow of such products of combustion through said compartments.

3. A furnace of the character described having an exit flue, two compartments in direct communication with each other through an inter-communicating passage way and with said exit flue for the passage of products of combustion from one chamber through the other to the exit flue, grates movable in said compartments to cause the products of combustion from the fire bed of one compartment to pass through the fire bed of the second compartment, extensions on the grates extended exteriorly of the furnace, said furnace being provided with openings for the passage of such extensions, a block like member having notches at diagonal points, such notches being capable of accommodating the extensions of the grates, whereby the grates are held against movement, and means for alternating the flow of such products of combustion through said compartments.

4. A furnace of the character described, having an exit flue, two chambers adapted for direct communication with each other through an intercommunicating passageway and with said exit flue for the passage of products of combustion from one chamber to the other through the exit flue, and a grate mounted for rocking movement at points intermediate its length within each of the chambers, whereby direct communication from the spaces above the grates through the openings from these chambers into the intercommunicating passageway is altered

nately opened and closed by the grates, whereby the products of combustion are caused to pass alternately from the fuel on one grate under and through the other grate to the exit flue.

5 5. A furnace of the character described, having an exit flue, two chambers in direct communication with each other through an intercommunicating passageway, means for successively establishing communication between said exit flue and, first, one and then the other, of said respective chambers, and a grate mounted for rocking movement at points intermediate its length within each of the chambers, whereby direct communication through the openings from the spaces above the grates in these chambers into the intercommunicating passageway is alternately opened and closed by the grates, whereby the products of combustion are caused to pass alternately from the fuel on one grate under and through the other grate to the exit flue.

25 6. A furnace of the character described, having two chambers in direct communication with each other through an intercommunicating passageway, an exit flue, valve controlled means operable for successively establishing communication between said exit flue and, first one, and then the other, of said respective chambers, and a grate mounted for rocking movement at points intermediate its length within each of the chambers, whereby direct communication through the openings from the spaces above the grates in these chambers into the intercommunicating passageway is alternately opened and closed by the grates, whereby the products of combustion are caused to pass alternately from the fuel on one grate under and through the other grate to the exit flue.

7. A furnace of the character described, having an exit flue, two chambers in direct communication with each other through an intercommunicating passageway, and with said exit flue for the passage of products of combustion from one chamber to the exit flue through the other, a grate mounted for rocking movement at points intermediate its length within each of the chambers, whereby direct communication through the openings from the spaces above the grates in these chambers into the intercommunicating passageway is alternately opened and closed by the grates, whereby the products of combustion are caused to pass alternately from the fuel on one grate under and through the other grate to the exit flue, and means for locking said grates against movement.

8. A furnace of the character described, having an exit flue, two chambers in direct communication with each other through an

intercommunicating passageway for the passage of products of combustion from one chamber through the other to the exit flue, and a grate mounted for rocking movement at points intermediate its length within each of the chambers, whereby direct communication through the openings from the spaces above the grates in these chambers into the intercommunicating passageway is alternately opened and closed by the grates, whereby the products of combustion are caused to pass alternately from the fuel on one grate under and through the other grate to the exit flue, and means common to both of the grates for holding the same against movement.

9. A furnace of the character described, having an exit flue, two chambers in direct communication with each other through an intercommunicating passageway, and with said exit flue for the passage of products of combustion from one chamber to the exit flue through the other, a grate mounted for rocking movement at points intermediate its length within each of the chambers, whereby direct communication through the openings from the spaces above the grates in these chambers into the intercommunicating passageway is alternately opened and closed by the grates, whereby the products of combustion are caused to pass alternately from the fuel on one grate under and through the other grate to the exit flue, and means exterior of the furnace for holding the grates against movement.

10. A furnace of the character described, having an exit flue, two chambers in direct communication with each other through an intercommunicating passageway, and with said exit flue for the passage of products of combustion from one chamber to the exit flue through the other, a grate mounted for rocking movement at points intermediate its length within each of the chambers, whereby direct communication through the openings from the spaces above the grates in these chambers into the intercommunicating passageway is alternately opened and closed by the grates, whereby the products of combustion are caused to pass alternately from the fuel on one grate under and through the other grate to the exit flue, and means exterior of the furnace and common to both grates for holding the same against movement.

In witness whereof I have hereunto signed my name this 26th day of July 1910, in the presence of two subscribing witnesses.

JOHN HARRIGAN.

Witnesses:

J. D. CAPLINGER,

WILFRED E. LAWSON.