

P. F. DYBRO.

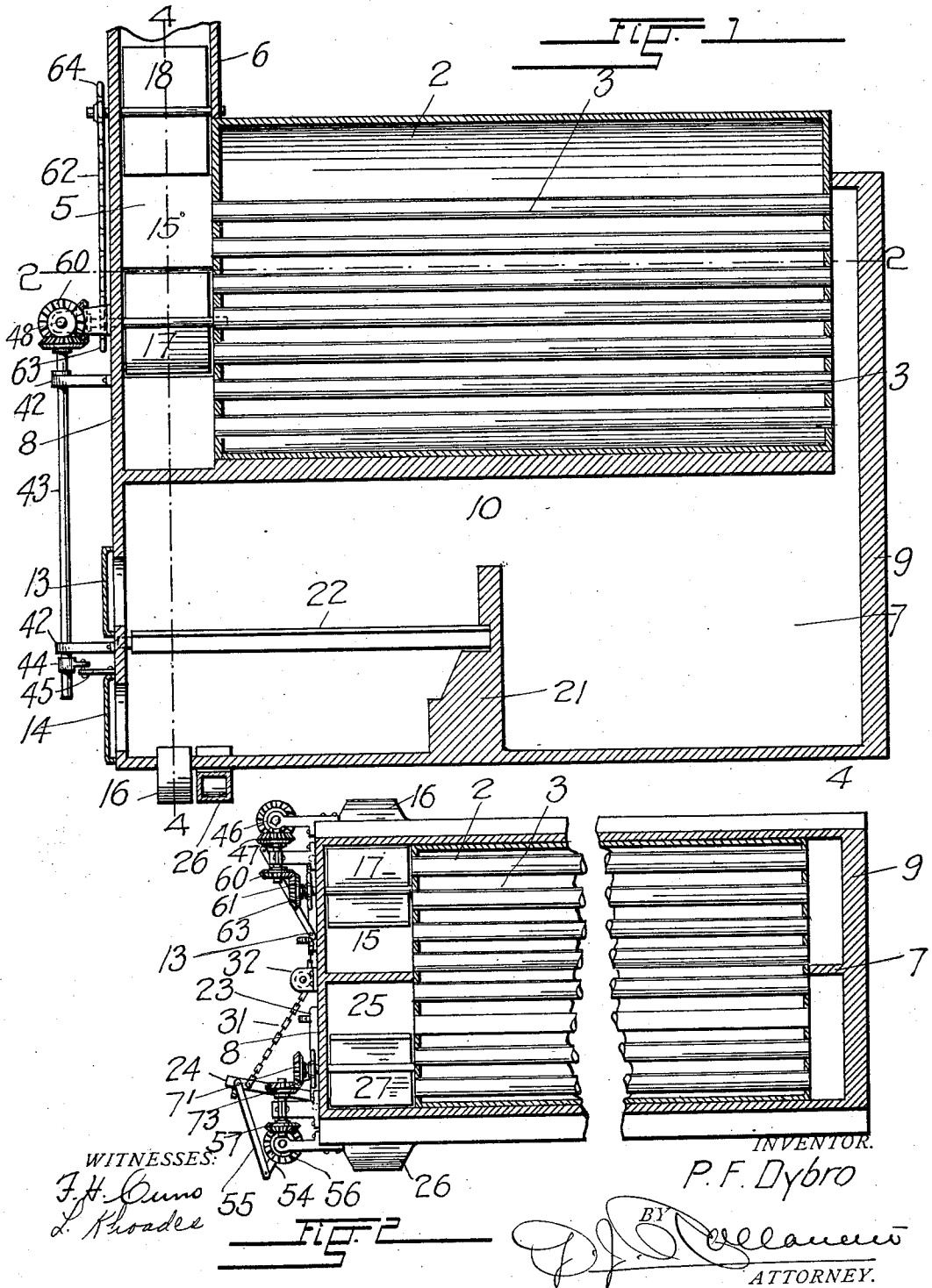
FURNACE.

APPLICATION FILED FEB. 11, 1911.

Patented Dec. 10, 1912.

2 SHEETS-SHEET 1.

1,046,745.



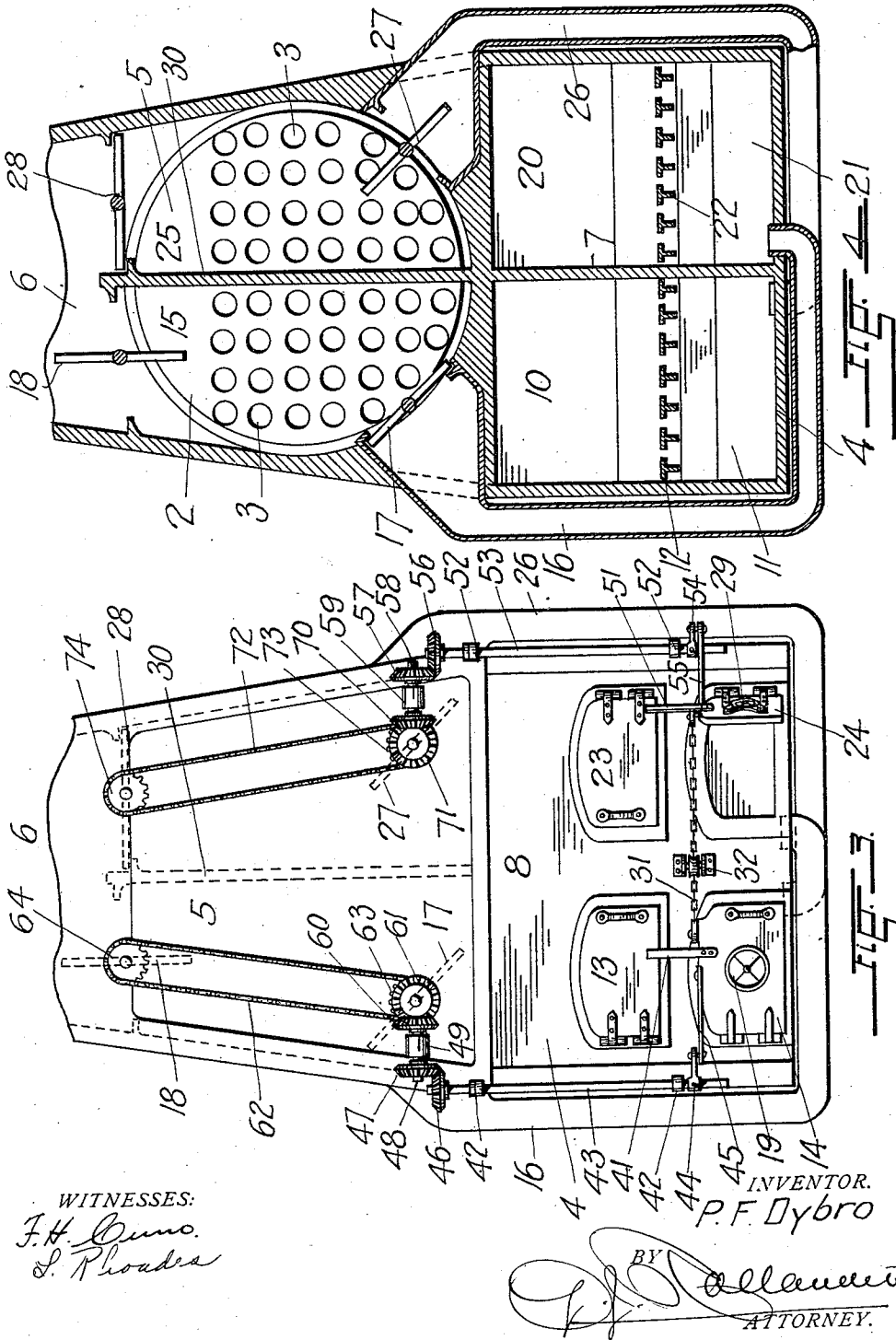
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FURNACE.

1,046,745.

Specification of Letters Patent.

Patented Dec. 10, 1912.

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To all whom it may concern:

Be it known that I, PEDER F. DYBRO, a citizen of the United States of America, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to furnaces for boilers, stoves, brick kilns and other similar contrivances which are heated by the use of carbonaceous fuel, and its object resides in the provision of a furnace in which the products of imperfect combustion which ordinarily escape through the stack in the form of smoke, are completely consumed.

In carrying out my invention, I divide the furnace into two sections separated by a dividing wall and each comprising a fire chamber and a smoke chamber operatively associated therewith, and I connect the smoke chamber of each section with the fire chamber of the other section, by means of suitable conduits.

Dampers are provided to control the flow of gases from the smoke chambers to the stack and to the respective conduits, and a simple mechanism is applied at the front of the furnace, whereby the opening movement of one or the other of the fire doors which afford access to the grates of the two fire chambers, will cause the ash or draft-door of the same chamber to open, while that of the other chamber which was open for the admission of oxygen to the fire, is simultaneously closed.

The dampers in the smoke chambers are automatically reversed by the same movement of the fire door, so that after fuel has been fed through the open door of one chamber, and the latter has been closed, the products of imperfect combustion arising through the said fuel, are compelled to pass through the incandescent mass upon the grate of the other chamber before reaching the smoke stack. Thus by supplying the two fire chambers alternately with fuel, all smoke and gases are consumed, the maximum amount of heat is derived from the fuel and nothing but a colorless vapor will escape through the stack.

No mechanical draft-inducing appliances are employed in accomplishing the above stated results, the course of the air-current due to the natural draft being automatically reversed from one chamber to the other, each time one of the fire doors is opened to replenish

the fire upon the grate to which it affords access.

In the accompanying drawings, in the various views of which like parts are similarly designated, my invention is shown as applied to a tubular steam boiler, Figure 1 representing a vertical section through the same, Fig. 2, a horizontal section taken along the line 2-2 Fig. 1, Fig. 3, a front-view of the boiler and Fig. 4, a transverse section taken along the line 4-4 Fig. 1.

Referring to the drawings by numerals, 2 designates the cylindrical boiler, the tubes 3 of which communicate at their opposite ends, with the fire box 4 and the smoke box 5 which, as usual, is connected at its upper end with the stack or chimney, by means of a flue 6. A centrally disposed, upright partition 7 which extends from the front plate 8 of the furnace to the rear wall 9 of the same divides the fire box 4 into two compartments, to provide the fire chambers 10 and 20 which are separately provided with fire bridges 11 and 21, for the support of the grate-bars 12 and 22. Fire doors 13 and 23 afford access to the grates of the respective compartments and ash or draft doors 14 and 24, to the ash pits of the same. A partition 30 extending in a plane with the dividing wall 7 between the front plate of the furnace and the adjacent end of the boiler 2, divides the smoke box 5 into two compartments which constitute the smoke chambers 15 and 25 which at their lower ends, connect with flues 16 and 26 which, extending alongside and below the furnace walls, terminate respectively within the ash pits of the fire box compartments 20 and 10 at the opposite sides of the dividing wall. Rotary dampers 17 and 27 are provided to control the flow of gases from the chambers 15 and 25 into the respective conduits 16 and 26 and similar dampers 18 and 28 are disposed to open and close the openings between the chimney flue 6 and the two compartments of the smoke box 5.

In the operation of my invention, the two dampers in each of the chambers 15 and 25 are respectively open and closed and positions of those in one chamber are reversed with respect to the corresponding dampers in the other chamber. The dampers remain in this position until one of the fire doors is opened, when they are automatically reversed through the instrumentality of a mechanism the construction of

which will now be described. Rigidly connected with the draft-doors 14 and 24, are two upwardly projecting bars 41 and 51 which when the doors are closed, extend in front of the respective fire doors 13 and 23, so that when one of the latter is opened, the draft door at the same side of the furnace, is compelled to open at the same time, and the opening movement of one of the ash doors is converted into a closing movement of the other, by means of a chain 31, the ends of which are fastened to the respective doors and which in the operation runs over a sheave 32 which is mounted to rotate about a vertical axis, upon the front plate of the furnace, in between the doors. Rotatably mounted in bearings 42 and 52 at opposite sides of the two pairs of doors, are vertical shafts 43 and 53 which carry, at their lower ends, crank-arms 44 and 54 which by means of pitmen 45 and 55, are connected with the respective draft-doors, whereby a movement of one of the latter on its hinges, will cause a partial rotation of the respective shaft. Beveled gear wheels 46 and 56 fixed upon the upper ends of the shafts 43 and 53, mesh with similar gears 47 and 57 at the end of short, horizontal shafts 48 and 58 which are rotatably mounted in bearings 49 and 59, axially in a plane with the axes of rotation of the dampers 17 and 27. The shafts 48 and 58 carry at their opposite ends, miter gears 60 and 70 which are in operative engagement with corresponding gears 61 and 71 mounted upon the portions of the gudgeons of the dampers 17 and 27 which protrude through the apertures in the front plate 8, in which they are rotatably supported. It will thus be observed that the opening movement of either one of the ash doors through an arc of determined length, will be converted into a movement of the lower one of the pair of dampers at the same side of the furnace, through an arc of about forty-five degrees, and this movement of the said lower dampers is transmitted to the respective upper dampers by means of chains 62 and 72 which are carried over corresponding sprocket wheels 63 and 73 and 64 and 74 mounted upon the gudgeons of the respective dampers. The draft doors 14 and 24, are, as usual, provided with registers 19 and 29 which provide means for admitting oxygen to the fires in the two compartments 10 and 20 when their ash doors are in the closed position.

Having thus described the mechanical construction of my invention, its operation and the advantages derived therefrom will be readily understood.

Premising that the compartment 20 of the fire box was last supplied with fuel, the corresponding draft door 24 is open to admit oxygen to the fire, as shown in Fig. 3,

and the four dampers in the smoke-box compartments 15 and 25 occupy the positions illustrated in Fig. 4, in which the smoke box compartment at the side of the furnace at which the air is admitted to the fire is in communication with the ash-pit at the opposite side of the furnace, and the smoke box compartment at the last mentioned side in communication with the stack or chimney. The smoke and gases arising from the fuel disposed upon the grate 22 of the fire-box compartment 20, passing over the respective bridge wall 21, are drawn through the tubes 3 at the same side of the dividing walls 7 and 30, into the corresponding smoke box compartment 25 whence they are drawn past the open damper 27, through the flue 26, into the ash-pit of the fire box compartment 10 at the opposite side of the dividing wall and thence through the incandescent mass upon the grate 12, by which they are consumed, the vapor arising from the said fire being drawn through the tubes 3, into the corresponding smoke box compartment 15 from where they escape past the open damper 18 into the flue 6 which connects with the stack or chimney. When the fires of the furnace again require replenishment, by reason of the fuel in the compartment 20 having been consumed, the fire door 13 of the compartment 10 at the opposite side of the furnace is opened and fuel deposited upon the grate 12. The opening movement of the door 13, results in a similar movement of the corresponding draft door 14 and a closing movement of the other draft door 24 while the positions of the various dampers are simultaneously reversed through the instrumentality of the transmission mechanisms hereinbefore described. After the fire door 13 is again closed, the corresponding ash door remains open to admit air to the newly replenished fire and the course of the current of gases arising from the said fires to the stack is reversed with respect to that above described. It will thus be observed that by feeding fuel alternately in the two fire-box compartments 10 and 20, all smoke and other products of imperfect combustion will be consumed before reaching the flue 6 which leads to the stack or chimney, that this result is accomplished by natural draft only and without the use of blowers or other draft-inducing devices, that no cold air is drawn through the tubes in the boiler, as is the case in ordinary furnaces when the supply of oxygen exceeds the requirements of the fire, and that any excess of air drawn into the furnace is employed in the consumption of the smoke and gases by the fire in the compartment opposite to that into which the air is admitted. Should the quantity of air drawn into the furnace through the open ash-door be insufficient to the last mentioned

purpose, an auxiliary quantity of air may be supplied by opening the register in the other ash-door.

I wish it understood that while I have shown and described the mechanical appliances required in the operation of my improved furnace, in the best and simplest form at present known to me, variations in their construction and arrangement may be resorted to within the spirit of my invention.

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

1. A furnace having two separate sections each comprising a fire-chamber and a smoke chamber operatively associated therewith, fire doors and draft doors affording access to the respective fire chambers, a smoke-flue in communication with the said smoke chambers, conduits connecting each smoke chamber with the fire chamber of the other section, dampers for controlling the flow of gases from the smoke chambers into the smoke flue and into the respective conduits, means for compelling the draft door of either one of the fire chambers, to open in unison with the corresponding fire door, and means for converting the movement of the said doors into an opening or closing movement of the said dampers.

2. A furnace having two separate sections each comprising a fire-chamber and a smoke chamber operatively associated therewith, fire doors and draft doors affording access to the respective fire chambers, a smoke flue in communication with the said smoke chambers, conduits connecting each smoke-chamber with the fire chamber of the other section, dampers for controlling the flow of gases from the smoke-chambers into the smoke flue and into the respective conduits, means for converting a movement of either one of the fire doors into movements of the two draft doors in opposite directions, and means for reversing the positions of the dampers in the two smoke chambers.

3. A furnace having two separate sections each comprising a fire chamber and a smoke chamber operatively associated therewith, fire doors, and draft doors affording access to the respective fire chambers, a smoke flue in communication with the said smoke chambers, conduits connecting each smoke chamber with the fire chamber of the other section, dampers for controlling the flow of gases from the smoke-chambers into the smoke-flue and into respective conduits, means for converting an opening movement of either one of the fire doors into an opening movement of the corresponding draft door and a closing movement of the draft door in the other section, and means for reversing the positions of the dampers in the smoke chambers.

4. A furnace having two separate sections each comprising a fire-chamber and a smoke chamber operatively associated therewith, fire doors and draft doors affording access to the respective fire chambers, a smoke flue in communication with the said smoke chambers, conduits connecting each smoke chamber with the fire chamber of the other section, dampers for controlling the flow of gases from the smoke-chambers into the smoke flue and into the respective conduits, means for converting a movement of either one of the fire doors into an opening movement of the corresponding draft door and a closing movement of the draft door in the other section, and a mechanism for converting the movement of the said doors into a closing or opening movement of the said dampers.

5. A furnace having two separate sections each comprising a fire chamber and a smoke chamber operatively associated therewith, fire doors and draft doors affording access to the respective fire chambers, a smoke flue in communication with the said smoke chambers, conduits connecting each smoke chamber with the fire chamber of the other section, dampers for controlling the flow of gases from the smoke chambers into the smoke flue and into the respective conduits, means for compelling the draft door of either one of the fire chambers to open in unison with the corresponding fire-door, means for converting the said movement of the said draft door into a closing movement of the draft-door of the other fire-chamber, and means for reversing the positions of the dampers in the smoke chambers.

6. A furnace having two separate sections each comprising a fire chamber and a smoke chamber operatively associated therewith, fire doors and draft doors affording access to the respective fire chambers, a smoke flue in communication with the said smoke chambers, conduits connecting each smoke chamber with the fire chamber of the other section, dampers for controlling the flow of gases from the smoke chambers into the smoke-flue and into the respective conduits, means for compelling the draft door of either one of the fire-chambers to open in unison with the corresponding fire-door, means for converting the said movement of the said draft-door into a closing movement of the draft-door of the other fire chamber, and mechanisms for converting the movements of the draft doors into a closing or opening movement of the dampers in the corresponding smoke-chambers.

7. A furnace comprising a smoke flue, two separate fire chambers, and fire doors and draft doors affording access to the same, means for conducting gases along courses leading from each one of the said chambers, through the fire in the other chamber, to

the said flue, means for compelling the draft door of each chamber to move in unison with the respective fire door, and means to simultaneously open one of said courses and close the other one by the movement of the said doors.

8. A furnace comprising a smoke flue, two separate fire chambers, and fire doors and draft doors affording access to the same, means for conducting gases along courses leading from each one of the said chambers, through the fire in the other chamber, to the said flue, means for converting an opening movement of either one of the fire doors into an opening movement of one draft-door and a closing movement of the other draft-door, and means to simultaneously open one of the said courses and close the other one by the movement of the said doors.

9. A furnace having two separate sections each comprising a fire-chamber and a smoke chamber operatively associated therewith, a smoke flue adapted to communicate with each of the said smoke-chambers, conduits

separately connecting each smoke-chamber with the fire-chamber of the other section below the grate thereof, a damper in each smoke chamber to control the flow of gases into the smoke flue, a damper in each smoke chamber to control the flow of gases into the respective conduits, the two dampers in each chamber being respectively in the open and closed position while the dampers in one chamber are arranged reversely to those in the other chamber, draft doors affording access to the respective fire-chambers, means for converting an opening movement of either draft door into a movement of the other door in the opposite direction, and means for converting the movement of the said doors into an opening or closing movement of the said dampers.

In testimony whereof I have affixed my signature in presence of two witnesses.

PEDER F. DYBRO.

Witnesses:

LELA RHOADES,
G. J. ROLLANDET.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."