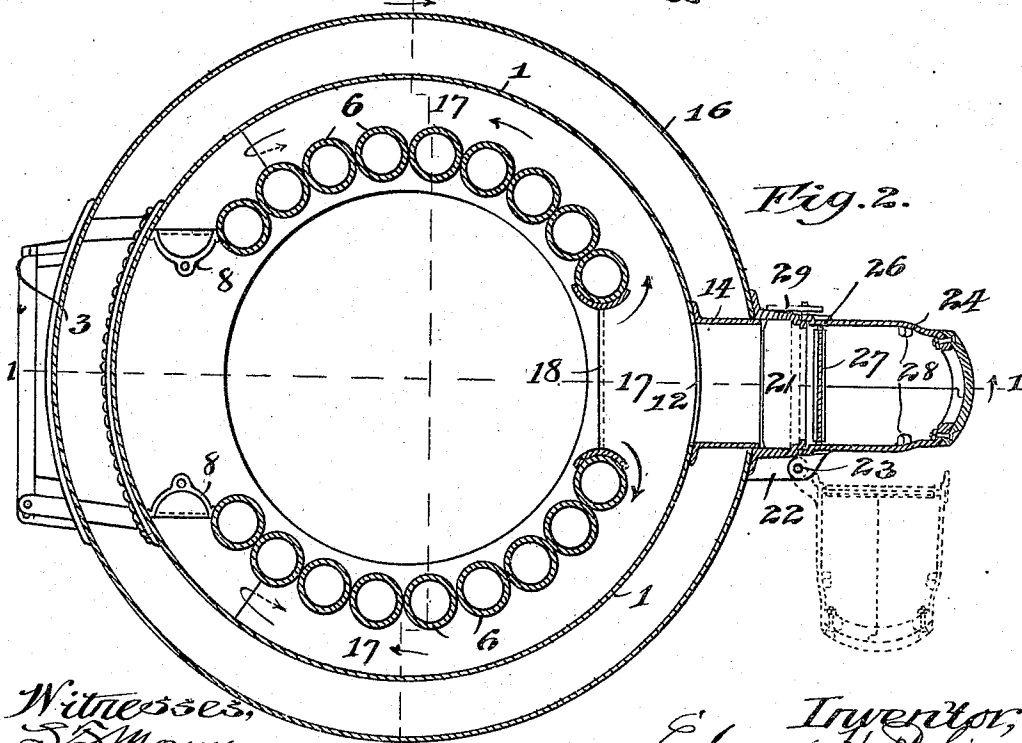
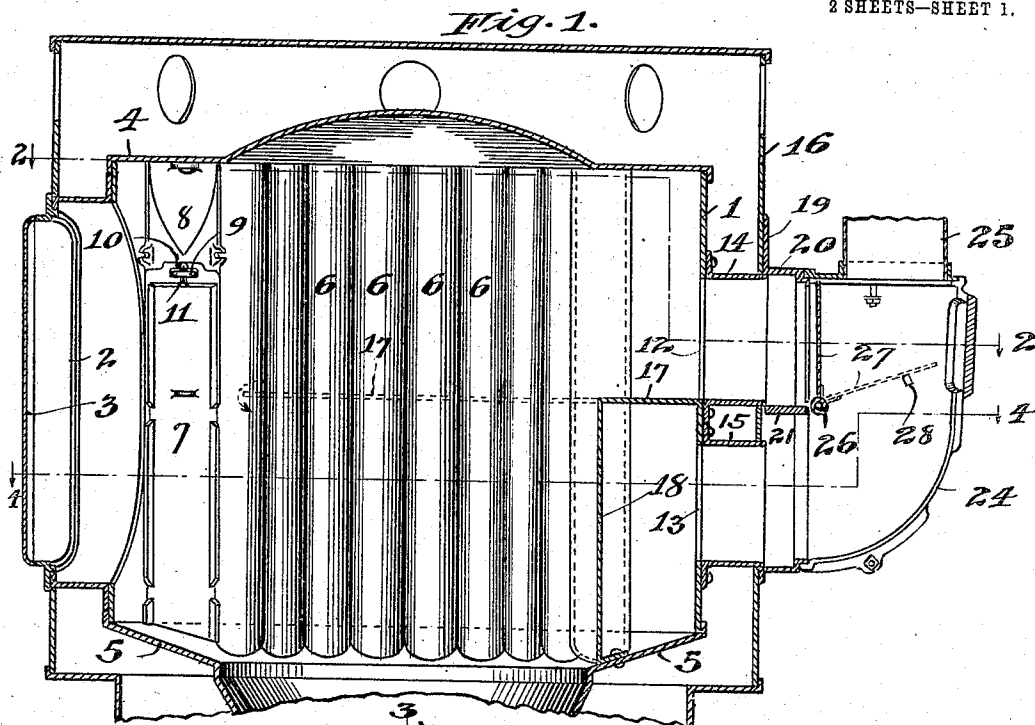


E. H. ROBINSON.
HEATING FURNACE.
APPLICATION FILED APR. 10, 1908.

932,579.

Patented Aug. 31, 1909.

2 SHEETS—SHEET 1.



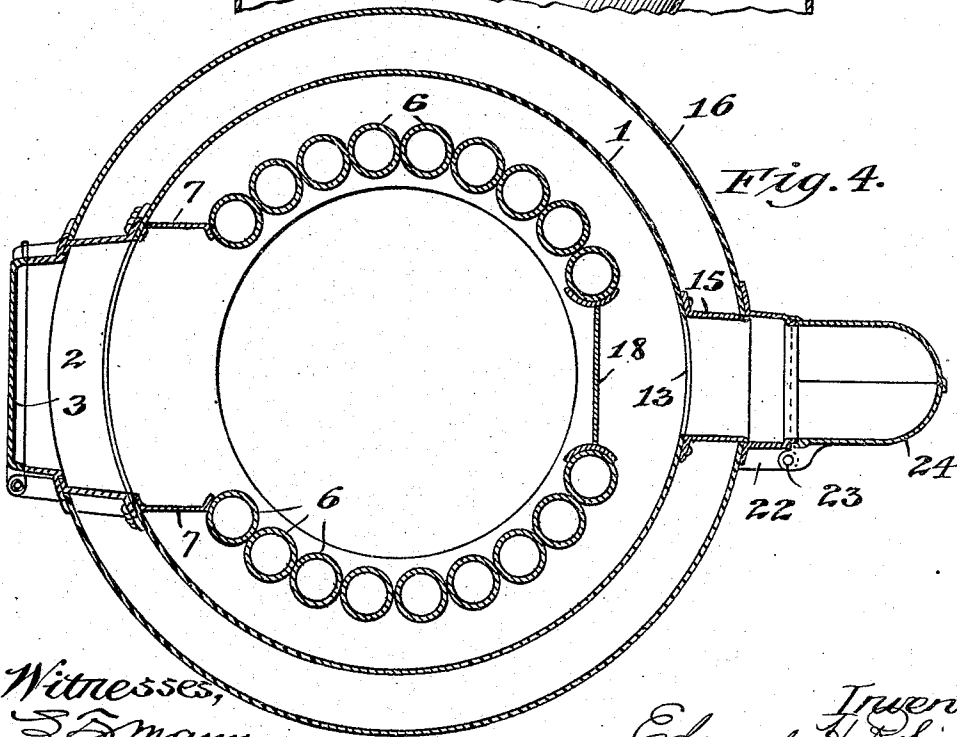
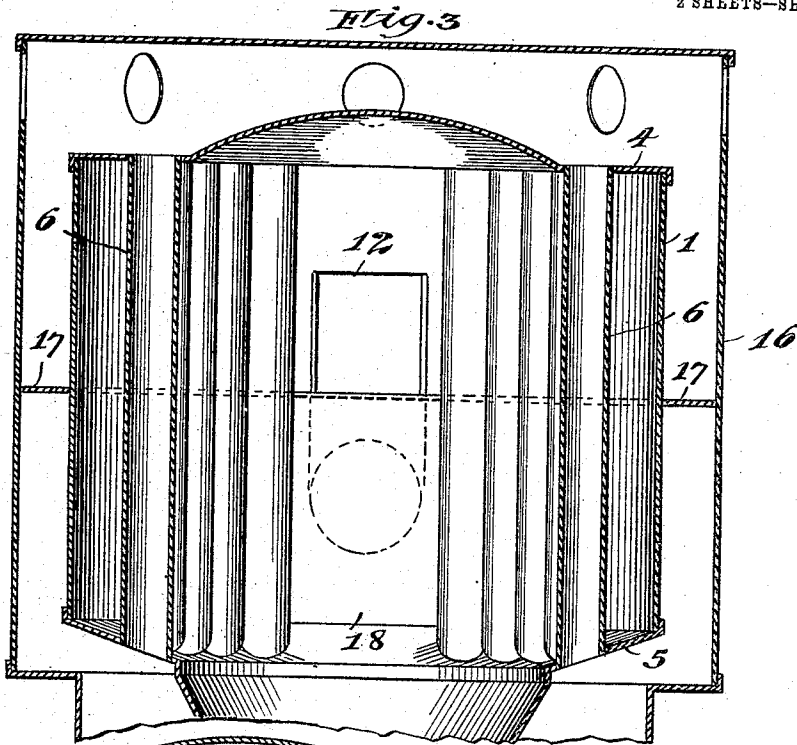
Witnesses,
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UNITED STATES PATENT OFFICE.

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HEATING-FURNACE.

932,579.

Specification of Letters Patent.

Patented Aug. 31, 1909.

Application filed April 10, 1908. Serial No. 426,380.

To all whom it may concern:

Be it known that I, EDWARD H. ROBINSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Heating-Furnaces, of which the following is a specification.

This invention relates to that class of heating furnaces which employ air-heating flues or tubes that are so arranged within or above the combustion chamber or fire-boxes as to constitute one wall of the smoke flue or passage, whereby the air tubes are subjected to more intimate contact with the heat.

The type of furnace to which my present improvements relate is well illustrated in Letters Patent to Robert and Edward H. Robinson, No. 538,701, granted May 7, 1895, and my present invention may be said to constitute an improvement upon the heating furnace disclosed in and forming the subject-matter of the aforesaid Letters Patent.

Among the principal objects sought by the present improvements are, first, to facilitate the cleaning of the smoke passages and external walls of the heating flues or tubes; and, second, to effect an improved control of the path of travel of the smoke and heated products of combustion, whereby a greater heating effect is obtained from the latter.

To these and other minor ends, my invention consists in the novel features of construction hereinafter described and more particularly pointed out in the claims.

My invention will be readily understood when considered in connection with the accompanying drawings, in which,—

Figure 1 is a vertical longitudinal section taken on the line 1—1 of Fig. 2, of the upper part of a heater provided with my improvements. Fig. 2 is a plan section thereof, taken on the offset line 2—2 of Fig. 1. Fig. 3 is a vertical section, taken at right angles to that shown in Fig. 1, on the line 3—3 of Fig. 2. Fig. 4 is a plan section taken on the offset line 4—4 of Fig. 1.

Referring to the drawings, I will first briefly describe such parts of the furnace as are old and shown in the Letters Patent aforesaid, and I will then more particularly

set forth the improved features of construction constituting the subject-matter of the present invention.

The furnace to which my present improvements are applicable is of that type employing, directly above the fire-box, a chamber or dome through which the smoke and products of combustion are caused to travel through passageways the walls of which are constituted in part by vertical air flues, the said chamber or dome being surrounded or incased by a drum or jacket having at or near its upper end air exit holes, communicating with the hot air flues or conduits leading to the registers.

In the drawings, 1 represents as an entirety the vertical wall of the dome which constitutes the combustion chamber or, if desired, a special chamber arranged over the combustion chamber and having a feed-opening 2 of approximately the full height of the vertical walls of the said chamber, which opening is guarded by a door 3 of usual construction. This dome is provided at its upper and lower ends, respectively, with flue-rings 4 and 5, between which are the air-heating tubes or flues 6, which are arranged, as best shown in the cross-sectional views Figs. 2 and 4, in two rows or series in an upright position a short distance from and parallel with the circular wall 1 of the dome, so as to constitute passages or flues between said wall and said rows of tubes. Each row of tubes 6 starts from a point on each side of the feeding door and extends around the opposite sides of the dome to points adjacent to the exit passages of the products of combustion, thus leaving a clear space immediately in front of the feeding door, and likewise a passage for the products of combustion between the rear ends of the rows of flues, all as clearly shown in Figs. 2 and 3. The several tubes of each row are arranged in contact with each other in order to prevent the passage of smoke and products of combustion between the tubes of each series.

The vertical circular wall 1 of the dome has formed therethrough directly opposite to the feeding door upper and lower openings 12 and 13 for the exit of the smoke and products of combustion, these openings being connected by short pipe sections 14 and

15, respectively, with corresponding openings in the rear wall of the external drum or jacket 16.

The space between the two rows of air-heating flues 6 and the vertical circular wall of the dome 1 is divided into two horizontal passages by a horizontal partition-plate 17 located about midway of the height of the flues 6 and extending from a point near the forward end of one series of flues around to a similar point near the forward end of the other series of flues, as clearly shown in Fig. 2.

Referring now more especially to the additional features in which my present improvements reside, 7 designates each of a pair of removable partition-plates interposed between the front tube of each series and the wall 1 of the combustion chamber on each side of the door, these partition-plates being suspended from the lower end of fixed short partition-plates 8 that are secured to and depend from the upper flue-ring 4. As shown, the plates 8 have each a laterally extending apertured lug 9, that engages a slot 10 in the upper end of the removable partition-plate 7, a cotter-pin 11 securing the removable plate in place. Said removable plate 7 extends to and at its lower end is in contact with the lower flue-ring 5. By this means the arc-shaped passages or spaces lying between the rows of heating flues 6 and the adjacent wall 1 of the dome are closed at their ends adjacent to the feeding door. In the Letters Patent above referred to, this closure is effected by an extra or additional heating flue. My present invention substitutes for this extra heating flue the removable partition-plate 7 and its means of support and attachment as described, the advantage of the latter being that the partition-plate 7 can be readily removed to permit access to the flue or passage closed thereby for purposes of cleaning.

18 designates a vertical partition-plate that is interposed between the rear ends of the two rows of heating tubes 6, and extends, as best shown in Fig. 1, from the horizontal partition-plate 17, downwardly to the lower flue-ring 5. This partition-plate 18 corresponds in function with the vertical partition-plate 9 shown in Letters Patent No. 538,701, above referred to, but cuts off direct communication between the central space of the combustion chamber and the chimney below the horizontal partition 17 instead of above said partition, as in the aforesaid Letters Patent, the purpose and advantage of which will be hereinafter explained.

Secured to the vertical wall of the jacket 16 at the rear and surrounding the rear ends of the pipe sections 14 and 15 is a plate 19 having an integral rearwardly projecting flange or collar 20 provided with a substantially central horizontal partition-strip 21

substantially flush with the partition 17 and forming with the collar 20 extensions of the smoke passages through the short pipe-sections 14 and 15. Hinged to lugs 22 on one side of the collar 20, as shown at 23, is an elbow pipe-section 24, the upper end of which connects and communicates with the lower end of a stove-pipe 25 leading to the chimney. Hinged in and between the side walls of the elbow-section 24 on a hinge-pintle 26 is a damper 27. This damper, when set to the vertical position shown in full lines in Fig. 1, closes the upper passageway for the smoke and products of combustion through the exit opening 12 of the combustion chamber, and opens the lower passageway through the exit opening 13. When swung to the lower position indicated by dotted lines in Fig. 1, in which it may rest against stops 28, it opens the upper passageway through the opening 12 and closes the lower passageway through the opening 13. The elbow-section 24 is maintained in closed position by any simple fastening, such as the latch 29 shown in Fig. 2.

In operation the smoke and products of combustion arising in the combustion chamber first enter the upper horizontal flue above the partition 17, passing between the rearmost vertical air-heating flues 6. If the damper 27 is then in the lowered or dotted line position (Fig. 1) the smoke and products of combustion are drawn thence directly through the opening 12 into the smoke-stack and chimney; this being the arrangement when it is desired to obtain a direct and strong draft, as in starting or reviving the fire. When, however, the damper 27 is in the vertical position, cutting off the passage for the smoke and products of combustion through the upper opening 12, said smoke and products of combustion, after entering the upper flue between the air tubes 6 and the walls of the dome 1, are caused to travel forwardly as indicated by the arrows in Fig. 2 to and around the forward ends of the partition 17, whence they pass below the latter, as indicated by the arrows, and through the lower horizontal flue below the partition 17 to the lower opening 13, and thence through the elbow-section 24 to the stove-pipe and chimney. By reason of this more extended and roundabout circulation, the air-heating flues 6 are exposed and subjected throughout practically their entire extent to the heating effects of the smoke and products of combustion.

By causing the direct draft to pass to the chimney through the upper opening 12 instead of through the lower opening 13, I obtain a greater heating effect upon the air tubes under direct draft; and by causing the smoke and products of combustion to first rise to the upper horizontal passageway and then circulate therethrough and thence down-

wardly to and through the lower horizontal passageway, under indirect or circulating draft, I also obtain an increased heating effect upon the inner sides of the series of air tubes 6, as compared with the circulation in the reverse direction employed in the Letters Patent aforesaid.

The chief advantages of my present improvements, however, reside in the facility with which the passageways and air tubes 6 may be cleaned, since the amount of heat abstracted from the products of combustion depends very largely upon the free or obstructed condition of the passageways and especially the clean or coated condition of the external surfaces of the tubes 6, as is well known. By withdrawing the cotterspins 11 and taking out the removable partition-plates 7, access may readily be had through the feed opening by a properly shaped brush to the passages surrounding the air tubes 6; and by temporarily detaching the elbow-section 24 from the stove-pipe 25, said elbow-section may be swung laterally to the dotted line position shown in Fig. 2, thus permitting ready access from the rear through the exit openings 12 and 13.

I claim:

1. In a heating furnace, the combination with a combustion chamber having a feed opening and upper and lower smoke exits opposite said feed opening, of two rows of upright air tubes located within and on opposite sides of said combustion chamber and inwardly of the walls of the latter, the tubes of each row being in contact with each other and each row extending from a point near one side of said feed opening to a point near one side of said smoke exits, a horizontal partition-plate dividing the space between said air tubes and the wall of said combustion chamber into two horizontal flues communicating directly with said upper and lower smoke exits, respectively, the upper of said horizontal flues also opening directly into the space between said rows of tubes, said partition plate terminating at points near the front ends of said rows of tubes, closures for the forward ends of said

horizontal flues, a vertical partition-plate between the rear ends of said rows of air tubes extending from said horizontal partition-plate to the bottom of the combustion chamber, and a damper movable to cut off the draft through either of said smoke exits, leaving the other open, whereby the products of combustion may be discharged directly from the interior of the combustion chamber through the upper smoke exit or may be caused to circulate through said horizontal flues and issue through the lower smoke exit, according to the position of said damper, substantially as described.

2. In a heating furnace, the combination with a combustion chamber having a feed opening and upper and lower smoke exits opposite said feed opening, of two rows of upright air tubes located within and on opposite sides of said combustion chamber and inwardly of the walls of the latter, the tubes of each row being in contact with each other and each row extending from a point near one side of said feed opening to a point near one side of said smoke exits, a horizontal partition-plate dividing the space between said air tubes and the wall of said combustion chamber into two horizontal flues communicating with said upper and lower smoke exits, respectively, said partition-plate terminating at points near the front ends of said rows of tubes, closures for the forward ends of said horizontal flues, a vertical partition-plate between the rear ends of said rows of air tubes and closing communication between one of said horizontal flues and the space between said rows of air tubes, a hinged elbow-section covering said smoke exits, by opening which access may be had through said smoke exits for cleaning said air tubes and horizontal flues, and a damper pivoted in said elbow-section and movable to a position closing either of said smoke exits, substantially as described.

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