

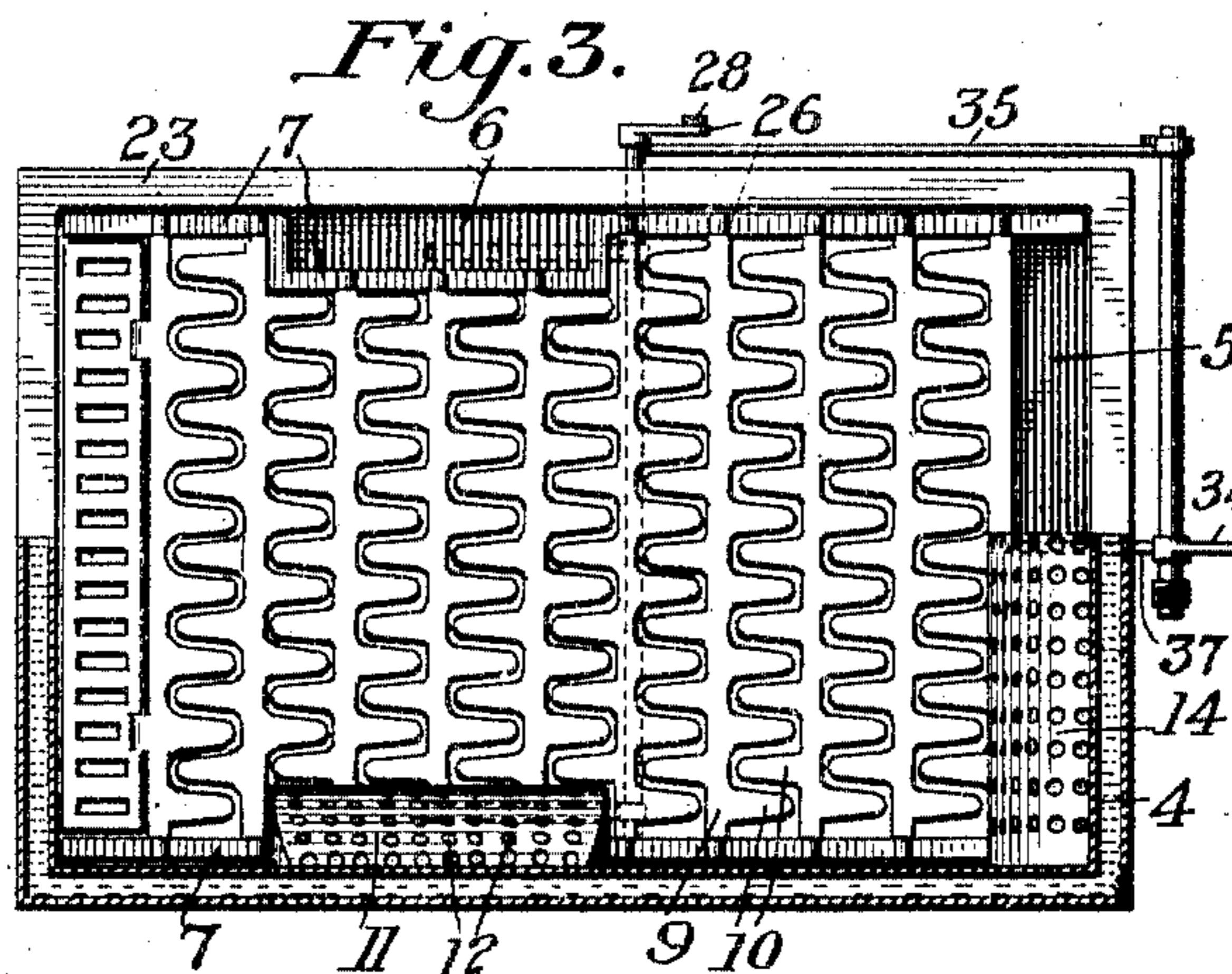
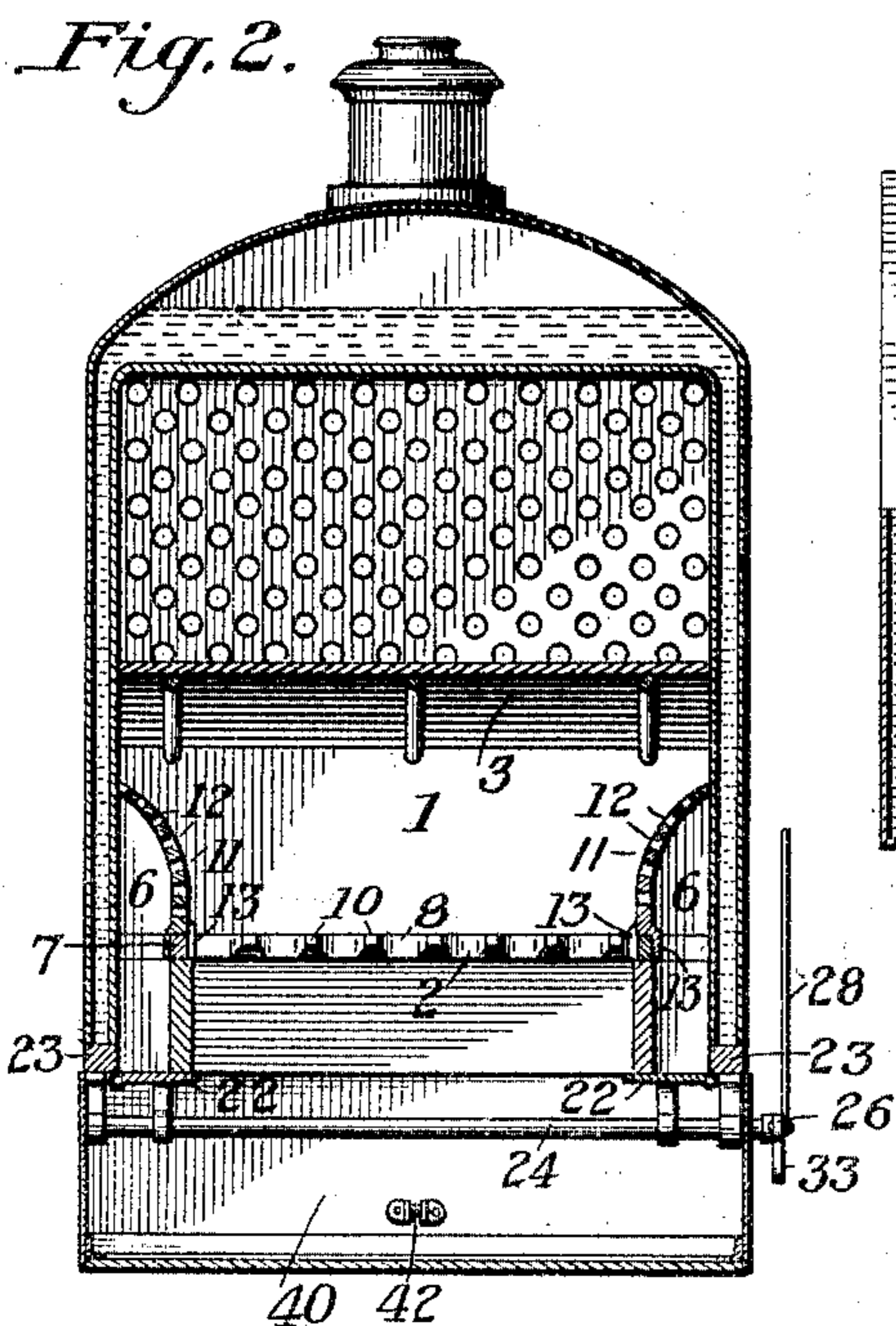
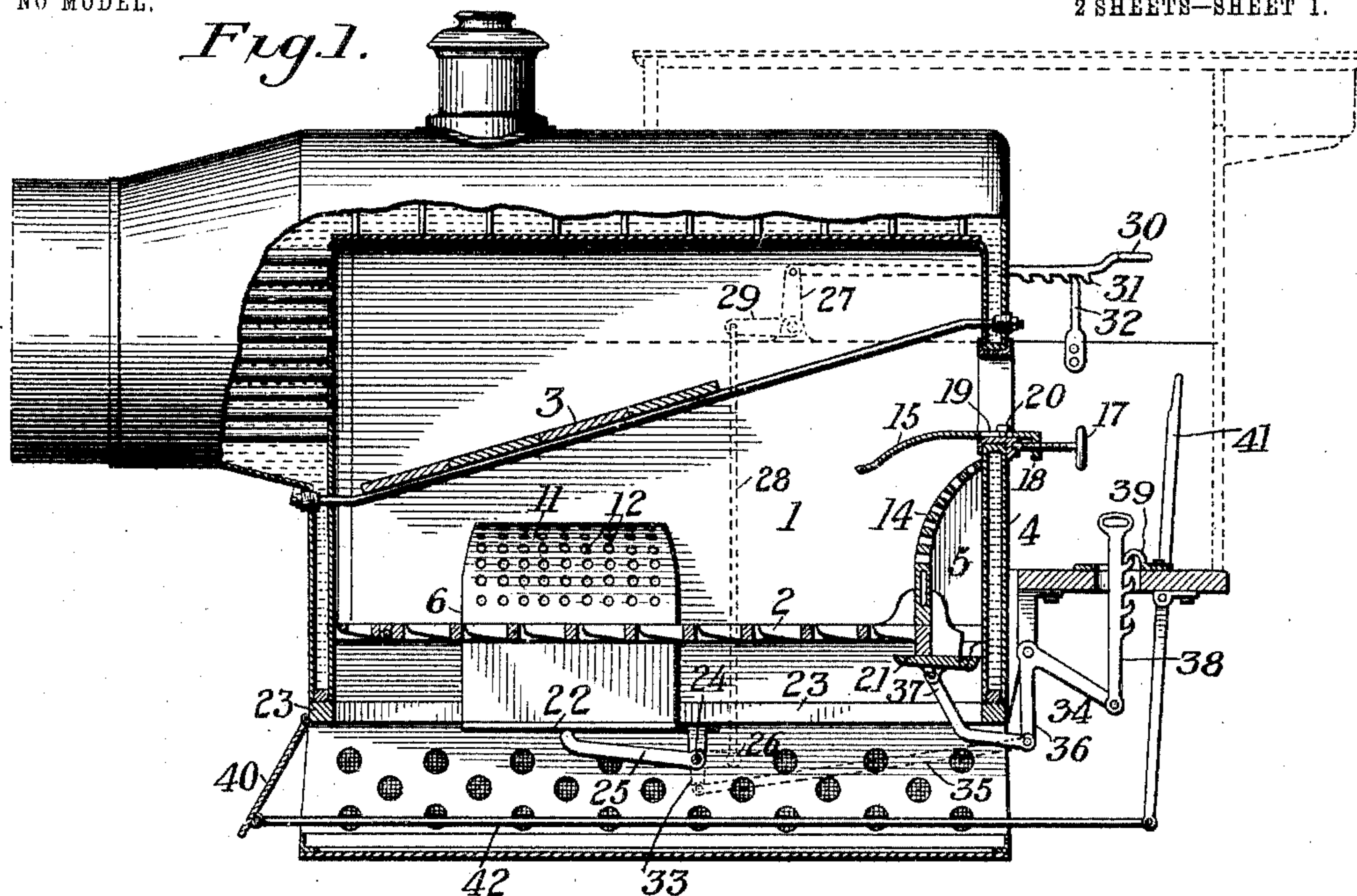
No. 777,331.

PATENTED DEC. 13, 1904.

M. J. CARRIGAN.
STEAM BOILER FURNACE.
APPLICATION FILED JUNE 7, 1904.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

R. A. Balderson.
F. R. Fitton

Inventor:
Michael J. Carrigan.

by *William F. Hall*
his Atty.

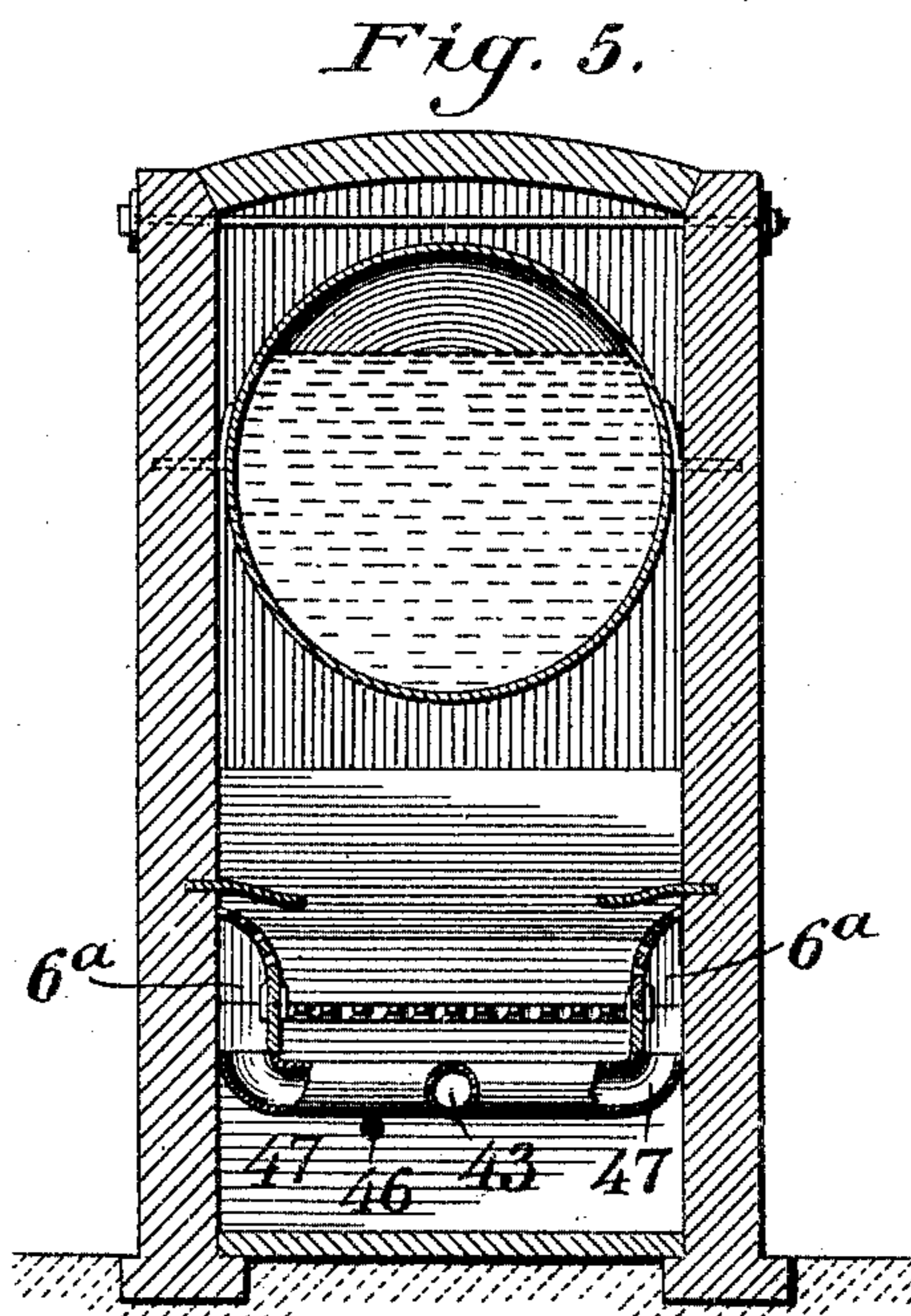
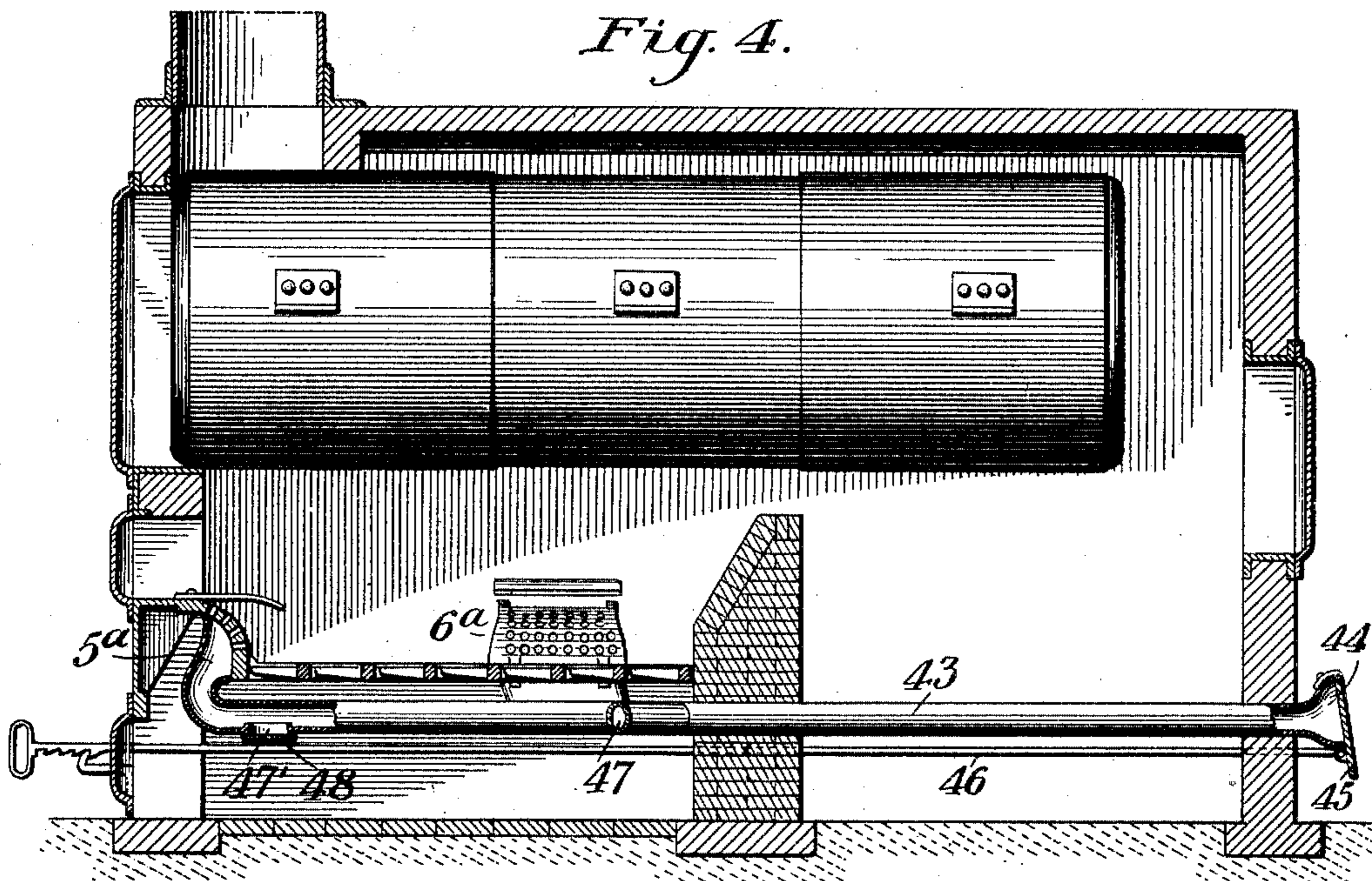
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UNITED STATES PATENT OFFICE.

MICHAEL J. CARRIGAN, OF GLENN'S FERRY, IDAHO.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 777,331, dated December 13, 1904.

Application filed June 7, 1904. Serial No. 211,504. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL J. CARRIGAN, a citizen of the United States, residing at Glenn's Ferry, in the county of Elmore and State of Idaho, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification.

My invention relates to steam-boiler furnaces; and one of the primary objects thereof is to provide a construction for admitting varying quantities of air to the fire-box and so controlling the air after it is admitted that substantially complete and perfect combustion will be obtained of all the combustible constituents of the material employed for the fuel, thereby securing great economy in the use of fuel with high efficiency, avoiding the escape of smoke, and preventing the passage of cinders through the boiler-tubes.

A further object is the provision of means for preventing cold air passing through the fire-box unconsumed and unheated and entering the flues in this state, thus causing the flues to contract and leak, and at the same time acting to lower the temperature of the water in the boiler.

Other objects of the invention will appear and the many advantages thereof be appreciated as the same is more fully described.

To effect the ends sought, the invention includes the combination and arrangement of component parts and the details of construction to be hereinafter described, and particularly pointed out in the claims.

Although the invention is susceptible of various embodiments, it has been deemed necessary to illustrate and describe herein a preferable embodiment thereof only, together with but a single modification of the same.

In the accompanying drawings, Figure 1 is detail side elevation with parts in section of a locomotive having my invention embodied in the fire-box thereof. Fig. 2 is a transverse sectional view of the same. Fig. 3 is a detail plan view. Fig. 4 is a longitudinal sectional view of a modification, and Fig. 5 is a transverse sectional view of the latter.

The invention includes generally a fire-box having one or more edge or marginal openings on opposite sides of the fire-surface and

an additional opening at the rear end of the fire-surface, through which openings air is forced up from below said surface, a guard-plate associated with each opening having orifices through the same constructed to direct a plurality of air-streams in varying directions, a damper for controlling the effective area of each opening, and baffle-plates for redirecting the air-currents passing upwardly through said orifices downwardly toward the fire-surface.

In the exemplification of my invention illustrated in Figs. 1 to 3, inclusive, the fire-box is designated by 1, within which is located a grate 2, and above the front portion of the latter an inclined fire-arch 3 is arranged. Between the rear wall 4 of the fire-box 1 and the grate 2 an air-inlet opening 5 is provided, and similar openings 6 are located between opposite side walls of the fire-box and the grate 2 adjacent to the front end of the latter. In the particular construction of grate mechanism illustrated in the accompanying drawings the grate proper preferably includes side bars 7, in which are supported transversely extending grate-bars 8, each comprising preferably a stem 9 and oppositely-extending separated fingers 10, coacting with the fingers of the adjacent bar. The opening 5 is provided by omitting one set of fingers from the outermost bar 8 at the rear end of the grate, thus affording an unobstructed opening between the stem of said outermost bar and the rear wall 4, while the openings 6 are provided by offset or reentrant portions of the side bars 7. Extending over the openings 6 are curved guard-plates 11, provided with air-directing orifices 12 and having lugs 13 engaging the offset portions of the side bars 7. The lower edges of the plates 11 preferably rest directly upon the offset portions of the side bars 7, while their upper edges rest against the adjacent walls of the fire-box. The orifices 12 are so disposed and arranged that some air-currents will be directed substantially parallel with the fire-surface and in close proximity thereto, while other currents will be directed at an angle to the fire-surface. A guard-plate 14, similar to plates 11 and for the same purpose as the latter, is associated

with the opening 5. Baffle-plates 15 are arranged above the guard-plates for redirecting the upwardly-directed air-currents downwardly toward the fire-surface, and thus insuring an even and thorough distribution of the air. The baffle-plate 15, associated with the guard-plate 14 of the opening 5, is mounted so that the front edge thereof may be adjusted to vary the position of the same in relation to the length of the arch 3 or depth of the fire-box. The illustrated means for effecting this adjustment includes a thumb-screw 17, held against lengthwise movement and having an engagement with a lug 18, depending from the rear end of the baffle-plate. The latter is provided with a slot 19, through which extends a retaining-pin 20. In the present exemplification of my invention the arch 3 is utilized as a baffle-plate for the side opening 6; but it will be understood that in fire-boxes in which this arch is not properly located to serve the purpose a baffle-plate similar to that associated with the opening 5 may be provided for each opening 6. The damper 21 for controlling the opening 5 is preferably pivoted in the ends of the side bars 7 of the grate to swing toward the wall 4, while the dampers 22 for controlling the side openings are preferably pivotally supported from the mud-ring 23. Means are provided for operating the side and end dampers in unison, either from the footboard or platform of the locomotive or for operating the end damper 21 entirely independently of the side dampers 22. The illustrated means for accomplishing this result comprises a rock-shaft 24, journaled at its opposite ends in brackets depending from the mud-ring or in the upper portion of the side walls of the ash-pan and having radially-extending arms 25 coacting with the dampers 22 and mechanism for rocking said shaft. One set of mechanism for accomplishing this purpose includes an arm 26, extending from one end of the shaft 24 and arranged exteriorly of the ash-pan, a bell-crank lever 27, a link connection 28 between one arm 29 of said bell-crank and the arm 26, and an operating-handle 30, connected to the other arm of the bell-crank and provided with ratchet-teeth 31, designed to be interlocked with a fixed detent 32. Another set of mechanism includes an arm 33, extending radially from the shaft 24, a bell-crank lever 34, a link connection 35 between one arm 36 of the bell-crank lever 34 and the arm 33, a link connection 37 between said arm 36 and the damper 21, and an operating-arm 38, connected to the end of the other arm of the bell-crank lever 34, having a handle that may be manipulated from the platform, and having ratchet-teeth designed to be engaged by a fixed detent 39. If all of the dampers are to be worked in unison from the handle 38, the link 28 is disconnected, but if the damper 21 is to be worked independently

of the dampers 22 the link 35 is disconnected, and the side dampers 22 are then under the entire control of the handle 30. The front end of the ash pan or pit is preferably left open for the admission of air and has associated therewith a damper 40 for controlling the effective area of the same. This latter damper is under the control of a hand-lever 41, connected thereto by a link 42.

By the use of the mechanism hereinbefore described it is possible to introduce into the fire-box the desired quantity of air and to so control the same as to obtain substantially perfect combustion, and thereby secure the highest efficiency from the fuel. The intense heat obtained through the perfect combustion permits of the enlargement of the exhaust-nozzle, as it avoids the need of the great amount of forced draft ordinarily found necessary in locomotive-boilers, and by the introduction of the air on top of the fire substantially all of the clinkers are consumed when coal is used as the fuel.

In the exemplification of my invention disclosed in Figs. 4 and 5 the end opening with associated parts, including the guard-plate and baffle-plate, is designated by 5^a and the side openings with associated parts by 6^a. Air is fed to these openings by a conduit 43, extending lengthwise of the furnace beneath the boiler and the grate and opening out at one end through the furnace-wall, where it is provided with an enlarged mouth 44, the effective area of which is controlled by a damper 45, operated through the medium of a rod 46 from the front of the furnace. Lateral branches 47 lead from the conduit 43 to the opening 6^a. For the purpose of cleaning the conduit an opening 47 is provided in the front end of the same, with which is associated a cover 48, which is normally held in closed position and is opened, when desired, by any suitable means. As will be appreciated, the air entering the conduit 43 will be heated during its passage therethrough, and will thus aid in a more perfect combustion taking place within the fire-box when said air is discharged thereinto.

The construction and operation of my invention will be readily understood upon reference to the foregoing description and accompanying drawings, and it will be appreciated that the parts and combinations recited may be varied within a wide range without departing from the spirit and scope thereof.

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

1. The combination with the fire-box of a furnace, of a fire-bed having marginal air-inlet openings at opposite sides of the same and an additional marginal air-inlet opening at one end thereof through which openings air is forced from below the fire-bed, a guard-plate associated with each of said openings and pro-

vided with orifices for directing the air passing through the latter, a deflector also associated with each opening, and means for varying the quantity of air admitted through said openings, substantially as described.

2. The combination with the fire-box of a furnace, of a fire-bed having marginal air-inlet openings at opposite sides of the same and an additional marginal air-inlet opening at one end thereof through which openings air is forced from below the fire-bed, a guard-plate associated with each of said openings and provided with orifices for directing the air passing through the latter, a deflector also associated with each opening, and a damper arranged below each opening for varying the effective area thereof, substantially as described.

3. The combination with the fire-box of a furnace, of a fire-bed having marginal air-inlet openings at opposite sides of the same and an additional marginal air-inlet opening at one end thereof through which openings air is forced from below the fire-bed, a guard-plate associated with each of said openings and provided with orifices for directing the air passing through the latter, a deflector also associated with each opening, a damper arranged below each opening for varying the effective area thereof, and means for simultaneously shifting two of said dampers, substantially as described.

4. The combination with the fire-box of a furnace, of a fire-bed having marginal air-inlet openings at opposite sides of the same and an additional marginal air-inlet opening at one end thereof through which openings air is forced from below the fire-bed, a guard-plate associated with each of said openings and provided with orifices for directing the air passing through the latter, a deflector also associated with each opening, a damper arranged below each opening for varying the effective area thereof, and means for simultaneously operating two of said dampers and independently operating the other damper, substantially as described.

5. The combination with the fire-box of a furnace, of a fire-bed having marginal air-inlet openings at opposite sides of the same and an additional marginal air-inlet opening at one end thereof through which openings air is forced from below the fire-bed, a guard-plate associated with each of said openings and provided with orifices for directing the air passing through the latter, a deflector also associated with each opening, a damper arranged below each opening for varying the effective area thereof, means for simultaneously operating the side dampers, and independent means for operating the end damper, substantially as described.

6. The combination with a locomotive, of a fire-box, marginal air-inlet openings at opposite sides of the fire-bed, an additional air-inlet opening at one end of the fire-bed, a damper

arranged below each opening for varying the effective area of the same, and means for operating the side dampers, including a transversely-extending rock-shaft located below the fire-bed, arms extending radially therefrom coacting with the side dampers, and means for rocking said shaft, substantially as described.

7. The combination with a locomotive, of a fire-box, marginal air-inlet openings at opposite sides of the fire-bed, an additional air-inlet opening at one end of the fire-bed, a damper arranged below each opening for varying the effective area of the same, and means for operating the side dampers, including a transversely-extending rocking shaft located in the ash-pan, arms extending radially therefrom contacting with the side dampers, and means for rocking said shaft operated from the footboard of the locomotive, substantially as described.

8. The combination with a locomotive, of a fire-box, marginal air-inlet openings at opposite sides of the fire-bed, an additional air-inlet opening at one end of the fire-bed, a damper arranged below each opening for varying the effective area of the same, and means for operating the side dampers, including a transversely-extending rock-shaft located beneath the fire-bed, arms extending radially therefrom contacting with the side dampers, and means for rocking said shaft operated from the platform of the locomotive, substantially as described.

9. The combination with a locomotive, of a fire-box, marginal air-inlet openings at opposite sides of the fire-bed, an additional air-inlet opening at one end of the fire-bed, a damper arranged below each opening for varying the effective area of the same, and means for operating the side dampers, including a transversely-extending rock-shaft, arms extending radially therefrom coacting with the side dampers, an additional arm extending from said shaft, a bell-crank lever, a link connection between one arm thereof and said additional arm, an operating-handle, and a connection between the latter and the other arm of the bell-crank lever, substantially as described.

10. The combination with a locomotive, of a fire-box, marginal air-inlet openings at opposite sides of the fire-bed, an additional air-inlet opening at one end of the fire-bed, guard and baffle plates associated with each opening, a damper arranged below each opening for varying the effective area of the same, and means for operating the side dampers, including a transversely-extending rock-shaft, arms extending radially therefrom coacting with the side dampers, an additional arm extending from said shaft, a bell-crank lever, a link connection between one arm thereof and said additional arm, a handle having a part adjacent the footboard of the locomotive, a connection between said handle and the other arm of said

bell-crank lever, and means for retaining the handle in adjusted position, substantially as described.

11. The combination with a locomotive, of a
5 fire-box, marginal air-inlet openings at opposite sides of the fire-bed, an additional air-inlet opening at one end of the fire-bed, guard and baffle plates associated with each opening, a damper arranged below each opening for varying the effective area of the same, and means
10 for operating the dampers including a rock-shaft, arms extending radially therefrom coacting with the side dampers, an additional arm extending from one end of said shaft, a
15 bell-crank lever, a link connection between one arm thereof and said additional arm and end damper, respectively, an operating-handle, and a connection between the latter and the other arm of the bell-crank lever, substantially
20 as described.

12. In a furnace, the combination with a fire-box, of a grate therein, comprising cross-bars, side bars supporting the same projecting at one end beyond the outermost cross-bar, between which and the adjacent wall of the
25 furnace an air-opening is provided, and having offset portions providing with the adjacent side walls of the furnace side marginal air-openings, guard-shields and baffle-plates associated with the openings, and dampers for controlling the same, substantially as described.
30

13. In a furnace, the combination with a fire-box, of a fire-surface having marginal air-openings arranged at opposite sides of the
35 same, and an additional air-opening located at one end thereof, a guard-plate associated with each opening, a movable baffle-plate or deflector associated with one of said openings

having a part projecting beyond the outer wall of the fire-box, and means coacting with
40 said projecting portion for shifting the same, substantially as described.

14. In a furnace, the combination with a fire-box, of a fire-surface arranged therein and having side marginal openings, an end marginal opening, a guard-plate associated with
45 each opening, a baffle-plate associated with the end opening, and a fire-arch located within the fire-box arranged to provide a baffle-plate for the two side marginal openings, substantially as described.
50

15. The combination with the fire-box of a furnace, of a fire-bed having marginal air-inlet openings at opposite sides of the same and an additional marginal air-inlet opening at one
55 end thereof through which openings air is forced from below the fire-bed, a guard-plate associated with each of said openings and provided with orifices for directing the air passing through the latter, a deflector also associated with each opening, a damper arranged
60 below each opening for varying the effective area thereof, and means for operating all of the dampers in unison, or operating one of the same independently of the others, substantially as described.
65

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Glens Ferry, in the county of Elmore and State of Idaho, this 1st day of
70 June, 1904.

M. J. CARRIGAN.

Witnesses:

J. C. KENNEDY,
T. W. ROACH.