

No. 656,059.

Patented Aug. 14, 1900.

J. THURELL.
STEAM BOILER FURNACE.

(Application filed Nov. 11, 1899.)

(No Model.)

2 Sheets—Sheet 1.

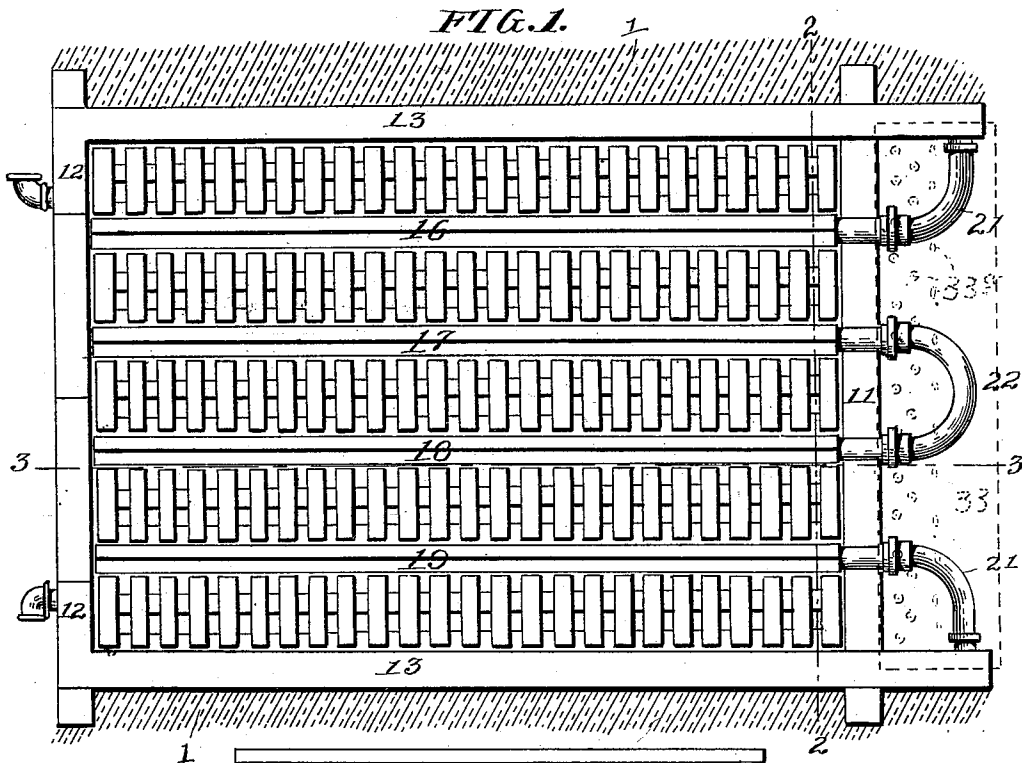


FIG. 2.

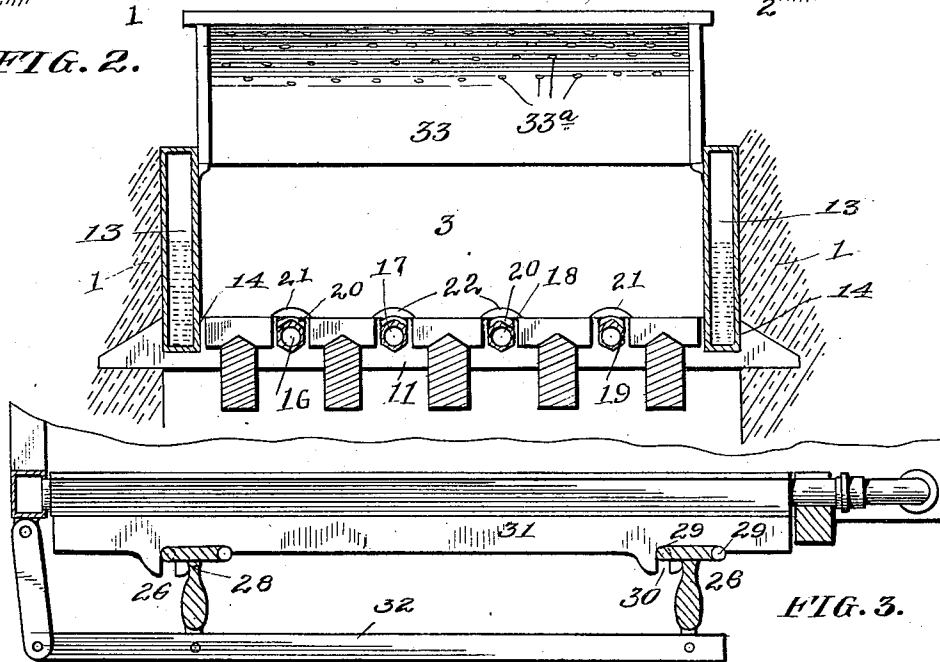


FIG. 3.

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FIG. 4.

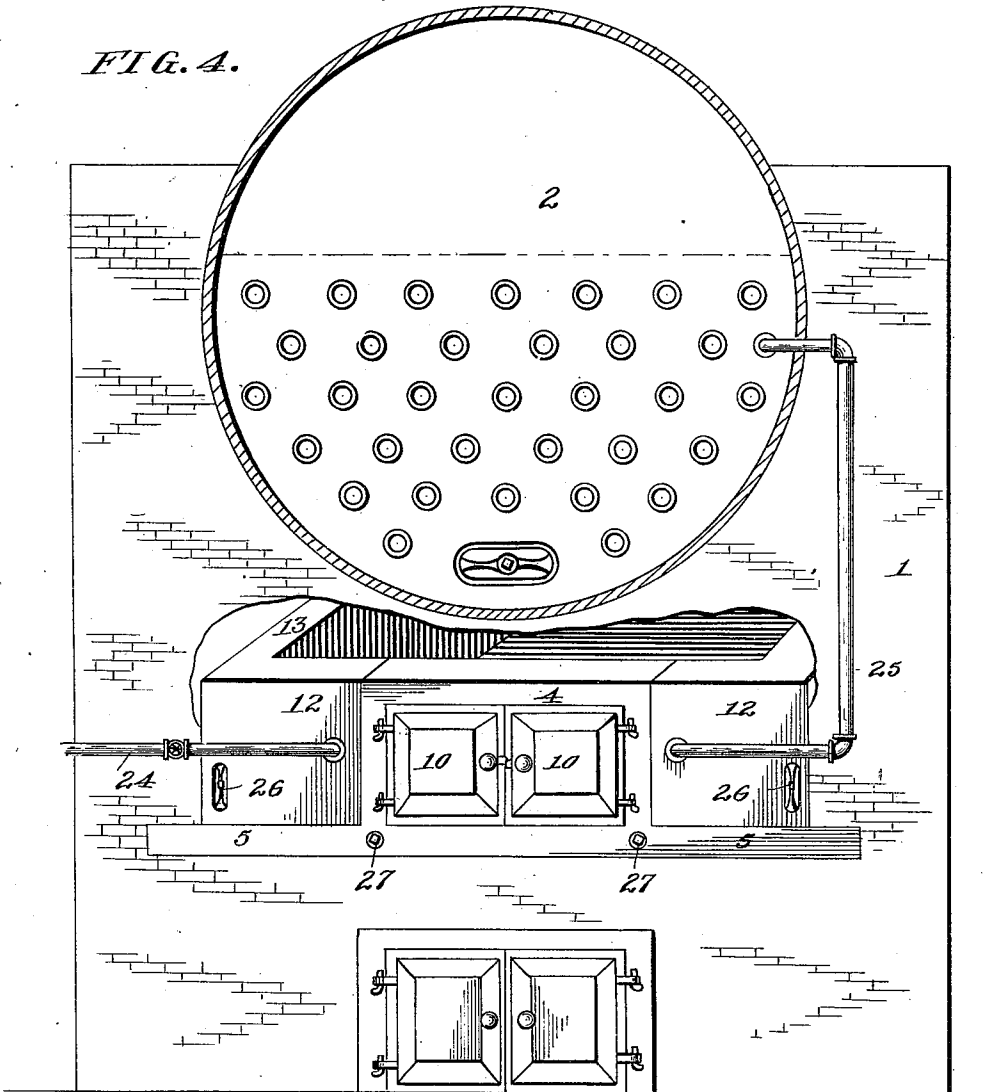
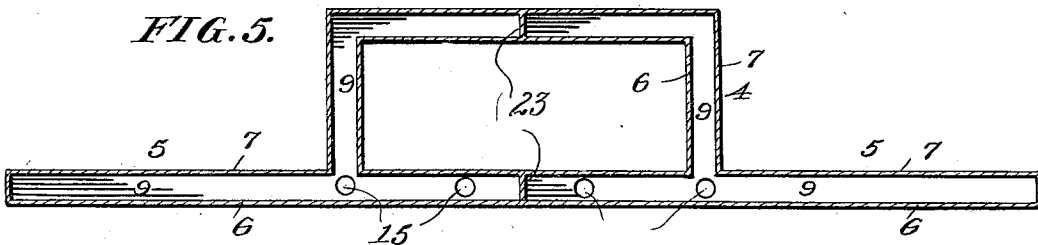


FIG. 5.



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STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 656,059, dated August 14, 1900.

Application filed November 11, 1899. Serial No. 736,683. (No model.)

To all whom it may concern:

Be it known that I, JOHN THURELL, a citizen of the United States, residing at North Adams, in the county of Berkshire and State of Massachusetts, have invented new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification.

This invention relates to steam-boiler furnaces and grates therefor; and it has for its object to provide an improved water-grate and grate-frame by means of which the feed-water is directly heated by the fire and the furnace-walls and grate-bars are protected from the destructive effects of the excessive heat to which they are usually subjected in steam-boiler furnaces.

To this end my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a top plan view of the grate and grate-frame. Fig. 2 is a transverse sectional view taken on the line 2 2 of Fig. 1. Fig. 3 is a similar view taken on the line 3 3 of Fig. 1. Fig. 4 is an end view of the furnace and boiler, partly broken away. Fig. 5 is a vertical sectional view of the hollow door frame or casing.

Referring to the drawings, the numeral 1 indicates the walls of a steam-boiler furnace, 2 the boiler, and 3 the fire-box.

Built in the front wall of the furnace is a hollow door frame or casing comprising a rectangular frame 4, provided with laterally-extending arms 5, that project horizontally from the opposite ends of the rectangular frame and practically form extensions or continuations of the bottom thereof. Said rectangular frame and arms or extensions are made hollow—that is to say, are provided with inner and outer walls 6 and 7, forming a water-space 9, through which the water circulates, as will more fully hereinafter be explained. In the door frame or casing are hinged doors 10, by means of which access may be had to the fire-box for stoking, trimming the fire, and the like. As shown, the ends of the arms 5 are built into the side walls of the furnace, and said arms and the

bottom of the door-frame rest on a course of brickwork or other refractory material of which the furnace-walls are constructed.

Arranged at the rear of the furnace, at approximately the same height as the arms 5, is a cross-beam 11, the opposite ends of which are built into the side walls of the furnace, as most clearly shown in Fig. 2 of the drawings. The arms 5 and cross-beam 11 form supports for the grate-frame, comprising two L-shaped hollow casings, each having a short member 12, that rests upon one of the arms 5 and extends from one end of the door frame or casing to the opposite side wall of the furnace, and a relatively-long member 13, that rests at its rear end portion in a recess 14, formed in the upper side of the cross-beam 11. It will of course be understood that two hollow casings 12 13 are provided, one upon each side of the fire-box, and that the arms 12 thereof, in connection with the hollow door-frame and its doors and arms 5, completely close in the fire-box at the front of the furnace. The hollow side casings are built up close against the side walls of the furnace or may, if desired, be built into said side walls. The hollow casings 12 13, as shown in Figs. 2 and 4, extend up along the entire sides and front of the fire-box, so that under no circumstances does the fuel ever come in contact with the furnace-walls, and the top of the door-casing preferably lies level or flush with the top of the members 12 of the hollow casings. Tapped into the inner wall of the lower side of the hollow door-casing, as indicated at 15, Fig. 5, are a plurality of water-tubes 16 17 18 19, which extend longitudinally of the fire-box and at their rear end portions rest in recesses 20, formed in the upper side of the cross-beam 11. The tubes 16 and 19 are connected by elbows 21 to the rear ends of the side casings 13, while the rear ends of the tubes 17 and 18 are connected together by an elbow 22. Diaphragms or partitions 23 are formed centrally in the upper and lower portions of the hollow door-casing, (see Fig. 5,) whereby the water-space in said casing is divided into two compartments. A feed-pipe 24, leading from any suitable source of water-supply, is tapped into the short member 12 of one of the hollow casings, and a pipe 25 is in similar manner tapped into the opposite member 12 of the

other hollow casing and leads to the boiler, as most clearly shown in Fig. 4. Removable plugs 26 are inserted in suitable apertures formed in the hollow members 12 opposite the ends of the hollow side members 13, and similar plugs 27 are inserted in the bottom of the hollow door-casing. By removing said plugs the hollow side casings and door-frame may be readily cleaned out.

10 Journalled in suitable bearings (not shown) formed on the side members 13 of the grate-casing are two cranked rocker-arms 28, (see Fig. 3,) the cranks 29 of which engage notches 30, formed in the under sides of the longitudinal grate-bars 31. The cranks are formed alternately on opposite sides of the rocker-arms, so that as said arms are rocked one set of grate-bars will be raised while the alternate grate-bars will be lowered in an ordinary and well-known manner. As shown most clearly in Figs. 1 and 2 of the drawings, a grate-bar is set between each two adjacent water-tubes, whereby a water-tube will lie adjacent to each side of each grate-bar. The rocker-arms are coupled together by a link 32, which may be reciprocated by any well-known or preferred means for rocking said arms and agitating the grate-bars.

The operation of my improved boiler-furnace will be readily understood from the foregoing description. The water enters by way of the pipe 24 into the short member 12 of the hollow grate-casing on the left side of the furnace, as illustrated in the drawings, then passes down the hollow side member 13, through the elbow 21, and by means of the water-tube 16 into the hollow door-casing. From the latter it is deflected by the partitions 23 into the water-tube 17, thence through the elbow 22 into and through the water-tube 18 back into the other side of the hollow door-casing, out of the latter through the water-tube 19 and by way of the other elbow 21 into the rear end of the hollow side member on the right of the furnace, through the latter, and enters the boiler through the pipe 25. The various passages through which the water passes before it reaches the boiler being in direct contact with the fuel and flames, the water by the time it reaches the boiler is raised to an exceedingly high temperature, ready to be instantly converted into steam. Moreover, the water-tubes passing between the grate-bars prevent the latter from being burned out, warped, and otherwise damaged, while the hollow members 12 and 13, which extend up above the normal height of the furnace, prevent the brickwork of the furnace-walls from being burned out, cracked, and impaired by the excessive heat. In the same manner the door-casing is prevented from cracking and warping, so that the furnace-doors will at all times properly fit the casing, whereby the drafts can be properly controlled. By the means described the water is compelled to traverse a very long heating-circuit before it reaches the boiler, thus in-

surings its being raised to a very high temperature before it reaches the boiler irrespective of how low the furnace-fire may be, while at the same time the grate-bars and furnace-walls and the door-casing are effectually protected from the injurious effects of the excessive heat necessarily maintained in steam-boiler furnaces. By connecting the water-tubes in the manner described they may be very readily taken apart for cleaning and without disturbing any of the other parts, and in like manner the grate-bars may be easily removed for removing the clinkers therefrom and for other purposes.

In practice a curved metallic shield 33 is supported above the elbows 21 and 22 at the rear of the furnace and acts as a protection for the latter. Said shield is perforated, as at 33, to permit the furnace-gases which are apt to accumulate at the back of the furnace to ascend and mix with the products of combustion that arise from the burning fuel.

Having described my invention, what I claim is—

1. In a boiler-furnace, the combination with a grate-frame comprising two hollow casings supported on opposite sides of the fire-box and extending up the inner sides of the latter above the normal level of the fuel, said hollow casings at their front ends being formed with right-angled hollow extensions built into the front wall of the furnace, a return-bend conduit connecting the rear ends of said hollow side casings and disposed horizontally in the bottom of the fire-box, a water-inlet leading into one of said hollow extensions, and a water-outlet leading from the other hollow extension into the boiler, substantially as described.

2. In a boiler-furnace, the combination with a grate-frame comprising two hollow casings supported on opposite sides of the fire-box and extending up the inner sides of the latter above the normal level of the fuel, of grate-bars supported in the lower portion of said hollow grate-frame, water-tubes arranged between the grate-bars and connecting the rear ends of said hollow casings, a water-inlet connected to the front end of one of said hollow casings and a water-outlet connected to the other hollow casing, substantially as described.

3. In a boiler-furnace, the combination with a grate-frame comprising two hollow casings supported on opposite sides of the fire-box and extending up the inner sides of the latter above the normal level of the fuel, of longitudinal grate-bars supported in the lower portion of said hollow grate-frame, water-tubes arranged between the grate-bars, elbows connecting the rear ends of the outermost water-tubes to the rear ends of the hollow side casings, means for connecting together the rear ends of the intermediate water-tubes, a hollow casing connecting together the front ends of the water-tubes, a water-inlet connected to the front end of one of said

hollow casings and a water-outlet connected to the front end of the other hollow casing, substantially as described.

4. In a boiler-furnace, the combination with
 5 a grate-frame comprising two hollow casings supported on opposite sides of the fire-box and extending up the inner sides of the latter above the normal level of the fuel, of longitudinal grate-bars supported in the lower
 10 portion of said hollow grate-frame, water-tubes arranged between the grate-bars and alternately connected together at their opposite ends, the rear ends of the two outermost of said water-tubes being respectively connected to the rear ends of the hollow casings,
 15 a water-inlet connected to the front end of one of said hollow casings and a water-outlet connected to the front end of the other hollow casing, substantially as described.
- 20 5. In a boiler-furnace, the combination with a grate-frame comprising two hollow casings supported on opposite sides of the fire-box, of longitudinal grate-bars supported in the lower
 25 portion of said hollow grate-frame, water-tubes arranged between the grate-bars, elbows connecting the rear ends of the two outermost water-tubes to the rear ends of the hollow side casings, means for connecting together the rear ends of the intermediate water-tubes, a hollow casing connecting together
 30 the front ends of the water-tubes, a water inlet and outlet connected respectively to the front ends of the two hollow side casings, and an arched perforated shield supported over
 35 the rear connections of the water-tubes, substantially as described.

6. In a boiler-furnace, the combination with a grate-frame comprising two hollow casings supported at the opposite sides of the fire-box
 40 and formed at their front ends with right-angled hollow extensions built into the front wall of the furnace, of a hollow door-casing

fitted between said hollow extensions, longitudinal grate-bars supported in the lower portion of the grate-frame, water-tubes arranged
 45 between the grate-bars, said water-tubes communicating at their front ends with the hollow door-casing, elbows connecting the rear ends of the two outermost of the water-tubes with the rear ends of the hollow casings, means for
 50 connecting the rear ends of the intermediate water-tubes, and water inlets and outlets respectively connected to the said hollow extensions, substantially as described.

7. In a steam-boiler furnace the combination with the hollow door-casing provided
 55 with lateral arms supported at their ends in the sides of the furnace-walls, of the grate-frame comprising two hollow casings disposed in the opposite sides of the fire-box and formed
 60 at their front ends with right-angled hollow extensions supported on said lateral arms between the ends of the door-casing and the side walls of the furnace, a cross-beam fitted at its opposite ends in the side walls at the
 65 rear of the furnace and supporting the rear ends of the hollow side casings, grate-bars supported in the bottom of the grate-frame, water-tubes disposed between the grate-bars, said water-tubes at their front ends being
 70 connected with the hollow door-casing and alternately connected together at their rear ends, the ends of the outermost of said water-tubes being connected respectively to the rear ends of the hollow side casings, substantially
 75 as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN THURELL.

Witnesses:

MILTON L. FIRO,
 ARCHIE GUILBO.