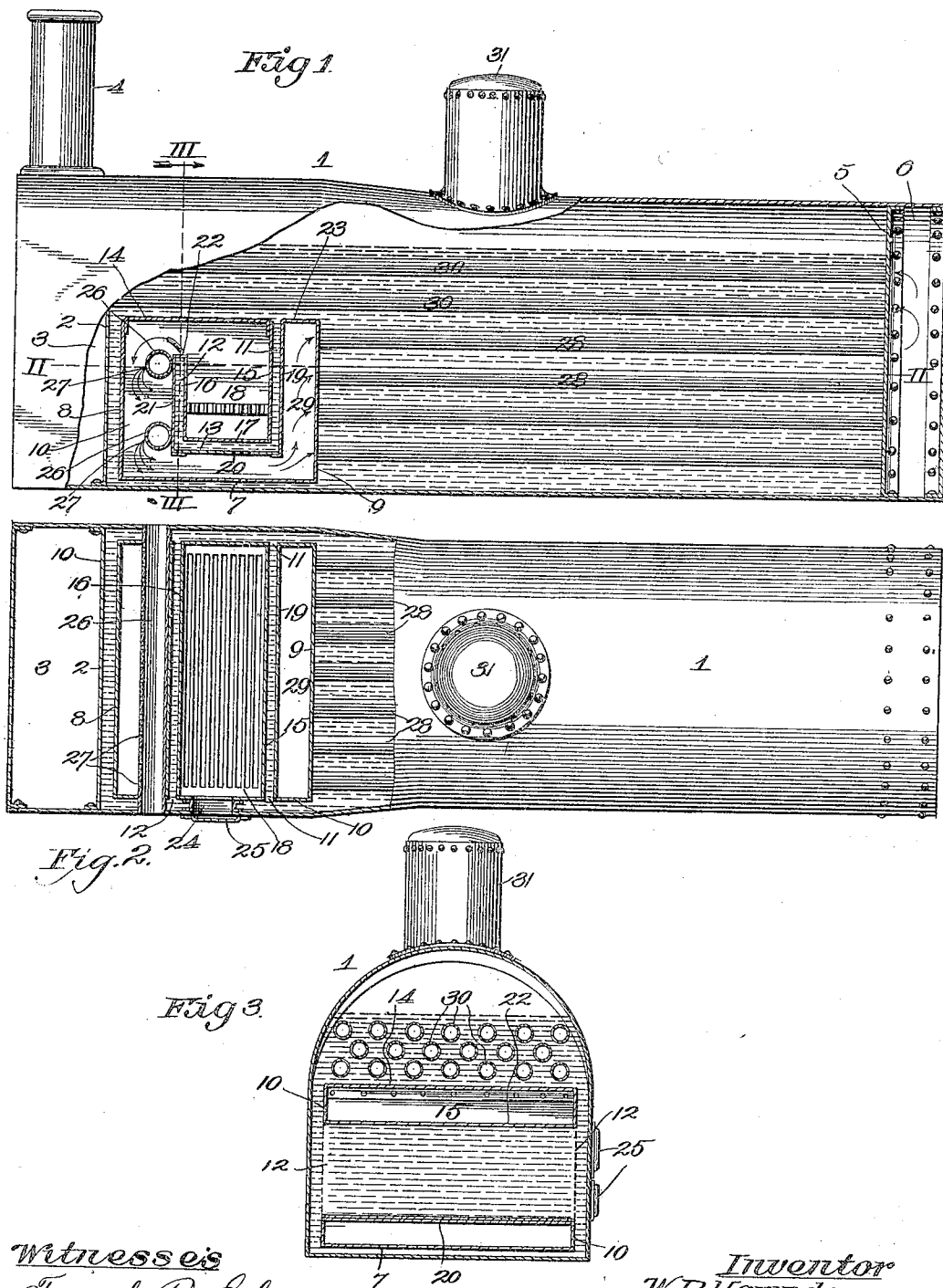


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W. R. HAMPDEN.
STEAM BOILER FURNACE.
APPLICATION FILED JULY 22, 1905.



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STEAM-BOILER FURNACE.

No. 813,380.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WELLESLEY R. HAMPDEN, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification.

This invention relates to steam-boiler furnaces; and my object is to produce an apparatus of this character whereby steam shall be produced expeditiously and at a minimum expenditure of fuel.

A further object is to produce an apparatus of this character having a double combustion—viz., a combustion of the fuel on the grate and a second combustion, namely, that of the combustible gases and smoke which are liberated from the fuel under the first combustion and ordinarily escape to the atmosphere.

A still further object is to produce a steam-boiler furnace of simple, strong, durable, and comparatively inexpensive construction.

To these ends the invention consists in certain novel and peculiar features of construction and organization, as hereinafter described and claimed, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 represents a view, partly in side elevation and partly in central vertical section, of a steam-boiler furnace embodying my invention. Fig. 2 is a view, partly in plan and partly in horizontal section, on the line II II of Fig. 1. Fig. 3 is a vertical transverse section on the line III III of Fig. 1.

In the said drawings, 1 indicates a boiler-furnace of the usual or any preferred configuration with the exception, as hereinafter explained, that the doors controlling the fire-pot and ash-pit chambers are at the side. In view of this fact the boiler-furnace shown is designed particularly for use for stationary engines, traction-engines, &c., though it is obvious that with slight modification it could be adapted for use as a locomotive-boiler furnace.

2 indicates a partition near the front end of the shell to provide the customary smoke-box 3 in communication with the smoke-stack 4. 5 indicates a partition near the op-

posite end of the shell or body to produce a chamber 6.

Referring now to the furnace construction particularly, 7 indicates its bottom plate, disposed a slight distance above the bottom of the boiler at the end contiguous to the smoke-stack, and 8 and 9 indicate substantially upright walls projecting upward from the ends of said bottom 7.

10 indicates the side walls rising from the bottom and connecting the same and the opposite ends of walls 8 and 9, said side walls being provided with substantially hook-shaped openings, said hook-shaped openings comprising the upright stem and terminal portions 11 and 12, connected at their lower ends by the horizontal portion 13.

14 indicates the crown-sheet, connecting the upper ends of the side walls and the upper end of wall 8 with the upper end of one wall 15 of the fire-pot, said wall connecting the side walls and the crown-sheet and disposed at the front side of the stem portions 11 of the hook-shaped openings, the lower edge of said fire-pot wall 15 being connected to the opposite wall 16 of the fire-pot by the bottom plate 17 of the ash-pit below grate 18. The bottom 17 of the ash-pit is disposed at the upper side of the horizontal portion of the hook-shaped openings and connects the walls 10, the walls 16 likewise connecting said walls 10. Paralleling walls 15, 16, and 17 at the opposite side of the hook-shaped openings and likewise connecting walls 10 are walls 19 and 20 and 21, respectively, the upper ends of walls 16 and 21 being connected by a top plate 22.

23 indicates a top plate which connects the upper ends of walls 9, 10, and 19, all of the walls described as connected together having a water-tight relation, as will be readily understood.

24 indicates tubes connecting the fire-pot above and below the grate with the outer side of the boiler, suitable doors 25 controlling the outer ends of said tubes, and therefore the access to the fire-pot above and below the grate. As tubes 24 are of duplicate construction and formation, only one appears in Fig. 2.

26 indicates air-tubes, one above the other, of comparatively large capacity, which ex-

tend transversely through the furnace and the boiler and communicate with the atmosphere, said tubes being disposed between walls 8 and 21 and in contact with the latter by preference, and they are each provided with the longitudinal series of orifices 27, disposed toward wall 8.

28 indicates flues extending longitudinally through the boiler and communicating at their opposite ends with chambers 6 and 29, and 30 indicates flues connecting chamber 6 with the smoke-box 3, the boiler being of course provided with the usual steam-dome 31.

From the above description, taken in connection with the drawings, it will be seen that the furnace is not only substantially enveloped, as usual, in the water contained in the boiler between partitions 2 and 5, in which all of the flues are submerged, but it is likewise equipped, as shown clearly, with a water-jacket which almost completely envelops the fire-pot.

In practice the fuel is placed upon the grate and the fire started in the usual manner, the draft being through the ash-pit chamber, up through the grate, forwardly over plate 22 and the topmost air-tube, it being understood in this connection that one air-tube may be employed if of sufficient capacity, thence down through the passage between walls 8 and 21, rearwardly through passage 20 and into the chamber 29, escaping thence through flues 28 into chamber 6, and from the last-named chamber through flues 30, through the smoke-stack to the atmosphere. As soon as the fire is well started the ash-pit door is closed and the fuel-door also if open, the draft being supplied by the air tube or tubes alone, the air being drawn into the tubes by the suction exerted by the passage of the heat and products of combustion down through the passage between walls 8 and 21. The air discharged through the orifices in the tubes into the furnace becomes thoroughly commingled with unconsumed combustible gases and smoke from the fuel and produces a highly-inflammable gas, which spontaneously takes fire and burns in the passage occupied by said tubes, this combustion being so perfect and thorough that practically all of the combustible gases and smoke arising from the fuel is consumed in the space surrounding the fire-pot. This gas-fire is intensely hot, and the heat generated, in conjunction with that produced by the burning fuel, first heats the hook-shaped body of water interposed between the fire-pot and said second combustion-chamber and starts a circulation which soon results in the production of steam. The heat and non-combustible gases pass through tubes 28 into chamber 6 and then by the course already outlined to the atmosphere. It will be noted that after the fire has been thoroughly started no air is admitted to the

fire-pot, and as a consequence clinkers are not formed, and a small quantity of ashes will be left from each supply of fuel. It will furthermore be apparent that a greater percentage of heat will be generated from a given amount of fuel than ordinarily, because of the fact that all of the heat-producing units of the fuel are consumed, and that a further advantage results from this fact because the fire-pot need not be charged with fuel at as frequent intervals.

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

1. A boiler-furnace, comprising a shell or body, partitions therein forming a water-chamber, a smoke-box and a smoke-chamber, at opposite sides of the water-chamber and provided with an exit for the smoke-chamber, flues extending through the water-chamber and connecting the smoke-box and smoke-chamber, a furnace within the water-chamber and enveloped on all sides by the water therein and formed with a fire-pot and with a substantially U-shaped chamber opening into the upper end of the fire-pot and enveloping the front, rear and lower sides of the same but spaced from said sides to provide an interposed water-space, flues connecting the front portion of said enveloping-chamber with the smoke-chamber, and one or more air-supply tubes extending through the rear portion of said enveloping-chamber and communicating with the atmosphere and provided with air-jet orifices opening into said enveloping-chamber.

2. A boiler-furnace, comprising a shell or body having a side opening, partitions therein forming a water-chamber, a smoke-box and a smoke-chamber, at opposite sides of the water-chamber and provided with an exit for the smoke-chamber, flues extending through the water-chamber and connecting the smoke-box and smoke-chamber, a furnace within the water-chamber and enveloped on all sides by the water therein and a side opening communicating therewith, said furnace being formed with a fire-pot and with a substantially U-shaped chamber opening into the upper end of the fire-pot and enveloping the front, rear and lower sides of the same but spaced from said sides to provide an interposed water-space, flues connecting the front portion of said enveloping-chamber with the smoke-chamber, one or more air-supply tubes extending through the rear portion of said enveloping-chamber and communicating with the atmosphere and provided with air-jet orifices opening into said enveloping-chamber, a tube connecting the side opening of the shell and fire-pot, and a door controlling said openings.

3. In a boiler-furnace, a shell or body having a water-chamber, a furnace within and enveloped on all sides by the water in said

chamber, and formed with a fire-pot and
with a substantially U-shaped chamber open-
ing into the upper end of the fire-pot and en-
veloping the front, rear and lower sides of the
5 same but spaced from said sides to provide
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air-supply tubes extending through the rear
portion of said enveloping-chamber and com-
municating with the atmosphere and pro-

vided with air-jet orifices opening into said 10
enveloping-chamber.

In testimony whereof I affix my signature
in the presence of two witnesses.

WELLESLEY R. HAMPDEN.

Witnesses:

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