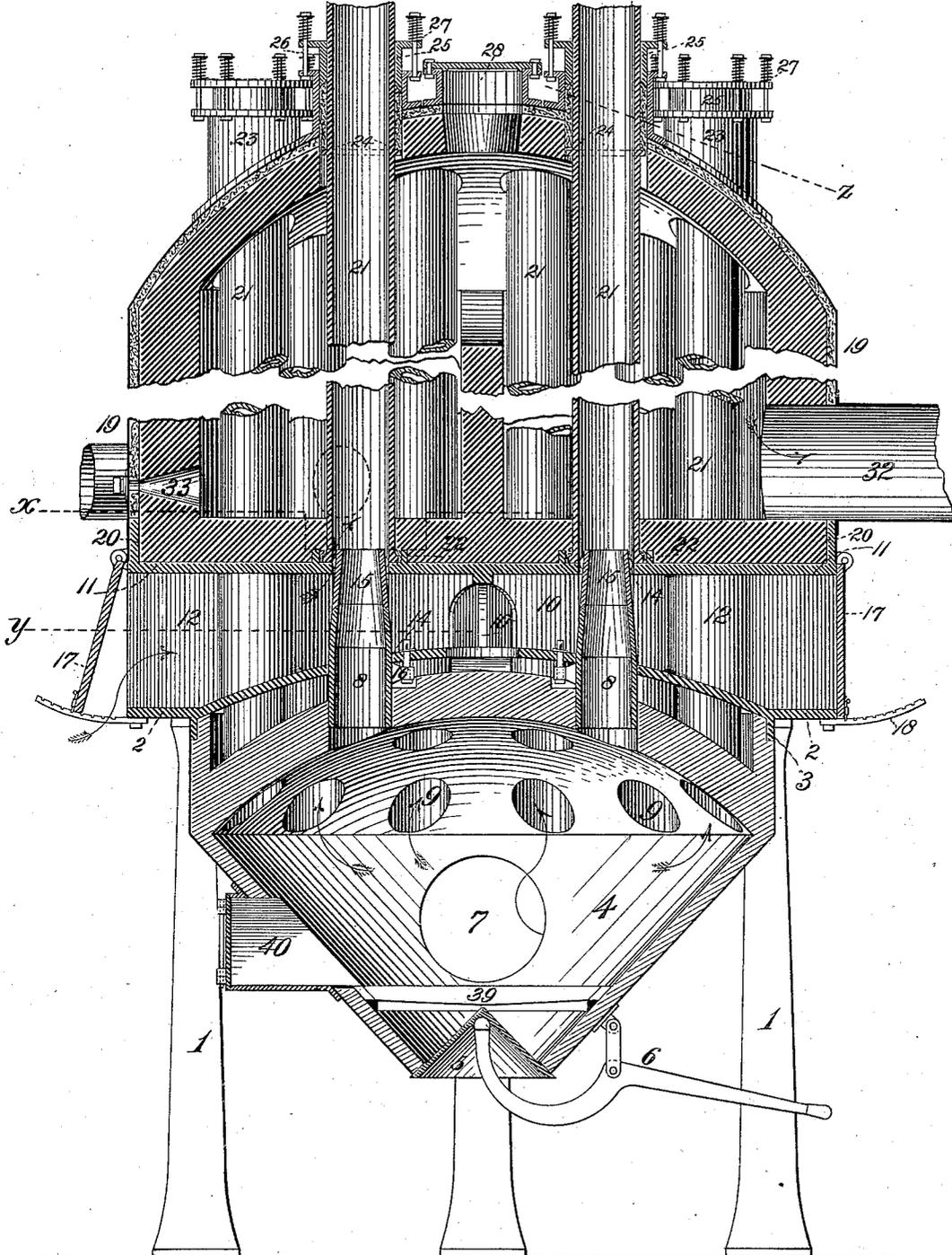


W. ROTTHOFF.
HOT BLAST STOVE.

No. 312,902.

Patented Feb. 24, 1885.



WITNESSES:

Damon S. Wolcott

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Fig. 1.

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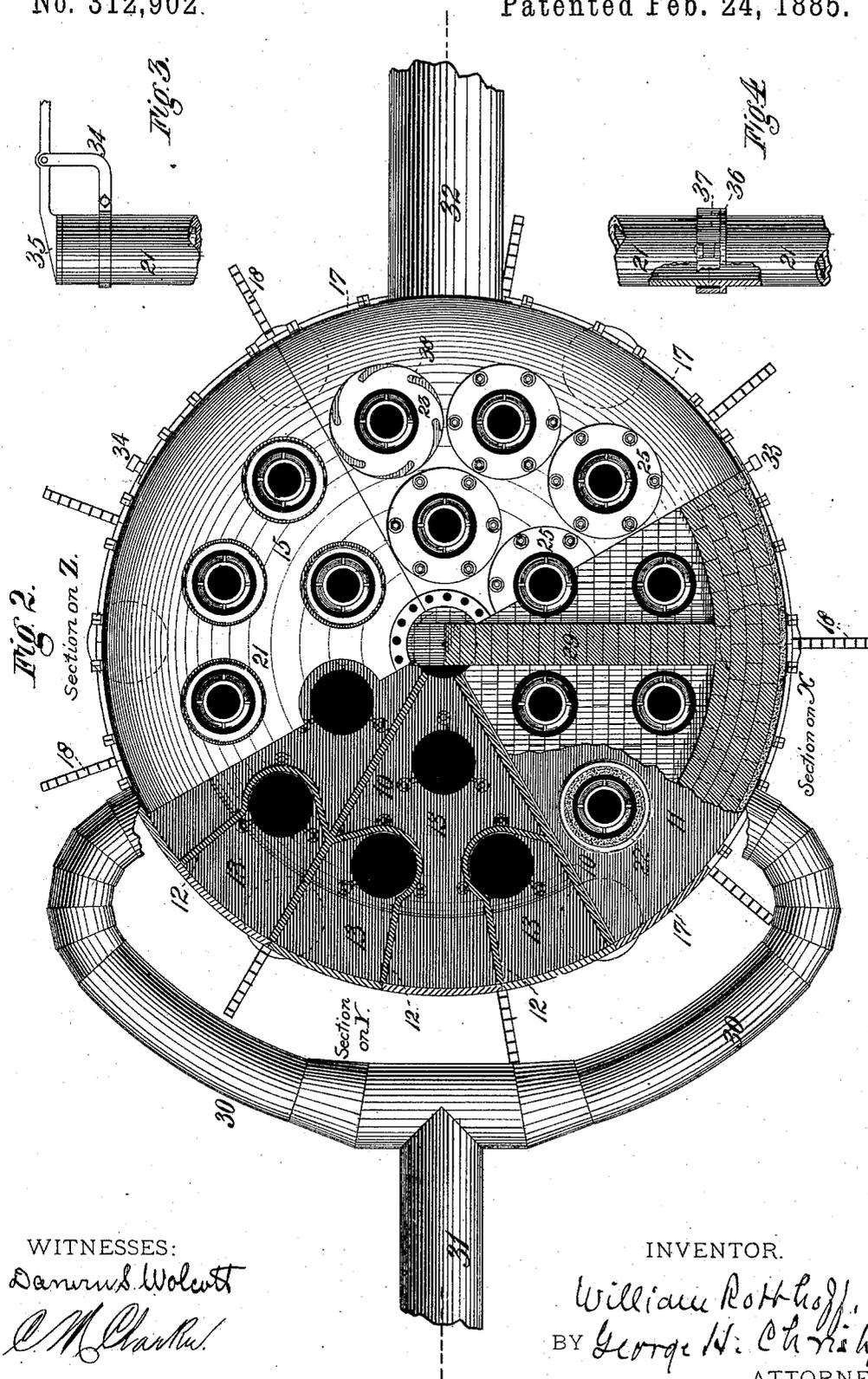


Fig. 2.

Section on Z.

Section on I.

Section on X.

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM ROTTHOFF, OF PITTSBURG, PENNSYLVANIA.

HOT-BLAST STOVE.

SPECIFICATION forming part of Letters Patent No. 312,902, dated February 24, 1885.

Application filed October 23, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ROTTHOFF, a subject of the Emperor of Germany, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Hot-Blast Stoves, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a sectional elevation of my improved hot-blast stove. Fig. 2 is a partially top plan and partially sectional plan view, the sections being taken on the lines *x*, *y*, and *z*, Fig. 1. Figs. 3 and 4 are detail views of certain parts of the stove.

My invention relates to an improved construction of stove for heating the blast in smelting-furnaces, and the object of my invention is to so construct such a stove as to avoid the necessity of alternating the flow of the heating-gas and the blast, as is necessary in the Whitwell form of stove, this form of stove requiring duplicate stoves in order to produce a continuous hot blast for the furnace; and a further object of my invention is to avoid the liability of the bursting of the pipes in that class of stoves in which a continuous blast is attained without a duplication of the stoves; and to these ends my invention consists, generally stated, in the construction and combination of parts, all as more fully hereinafter described and claimed.

Upon suitable pillars, 1, is supported the curved bed-plate 2, having the depending flange 3, to which is secured the casing of the gas-supply chamber, having the shape of an inverted cone, said casing being lined with fire-brick or other refractory material, the lower end of said chamber being normally closed by the conical stopper 5, held in place by the lever 6, pivoted to the side of said chamber, the upper end of said chamber being closed by a fire-brick arch.

In the side of the chamber 4 is formed the opening 7, through which gas is conducted by a suitable pipe from the top of the blast-furnace into the chamber. From thence it passes into burners 8, inserted in openings 9 in the top of the chamber.

On the bed-plate 2 is formed a series of

radial partition-walls, 10, which in turn support the bottom plate, 11, of the heating-chamber, said plate being formed integral with the main partitions 10 and with the wing-walls 12, projecting from the main partition-walls, and forming, in connection with the main walls, pockets or chambers 13, opening at their outer ends, as shown in Fig. 1.

In the bed-plate 2 and bottom plate, 11, are formed a series of openings, 14, said openings being in line with the openings 9 in the top of the chamber 4, and so arranged that only one opening in each plate shall be located in the same pocket or chamber 13. Through these openings 14 and through the pockets pass the burners 8, as shown in Fig. 1, the upper end of each burner being provided with a removable tip, 15, said tips being formed tapering so as to fit loosely in the openings 14 in the bottom plate, 11, and being provided with projecting lugs for the purpose of centering the tips within the openings 14, the burners 8 held in position by lugs 16, projecting therefrom below the bed-plate, and provided with pins projecting up through holes in said bed-plate, and held in position by keys passing through slots in that portion of the pins which project above the bed-plate.

The open ends of the pockets 13 are closed by doors 17, hinged to the periphery of the bottom plate, 11, said doors being provided with catches adapted to engage toothed bars 18, projecting from the bed-plate 2, for the purpose of holding the doors in an open or closed position.

The heating-chamber is formed on the bottom plate, 11, the outer casing, 19, of said chamber being secured to the peripheral flange 20 of the bottom plate. The inner walls and bottom of the heating-chamber are formed of fire-brick or other refractory material, a slight space being left between the fire-brick wall and the outer casing, said space being filled with asbestos or mineral wool.

Through the heating-chamber are passed a series of pipes, 21, the lower ends of said pipes resting upon the bottom plate, 11, within flanges 22, formed around the openings 14 in said plate, through which the tips 15 of the burners project, as above stated, the space between the lower ends of the pipes 21 and the

flanges being packed with iron filings or any other suitable material.

On the casing 19, around the openings through which the upper ends of the pipes 21 pass, are secured the stuffing-boxes 23, asbestos or mineral wool being packed between said boxes and the pipes passing therethrough, said pipes being provided with flanges 24, which serve to support the packing in place. This packing is forced down between the boxes and pipes by the glands 25, fitting closely around the pipes and within the boxes, said glands being connected to the boxes by the threaded bolts 26, on which are placed the springs 27, said springs being arranged between the top of the gland and the nut on the bolt, so as to allow of the yielding of the packing and gland on the longitudinal expansion of the pipes 21.

Over the center of the heating-chamber is formed a man-hole, 28, to allow access to said chamber.

Diametrically across the chamber is formed the wall 29, extending from the bottom nearly to the top and dividing said chamber into two compartments, into one of which the cold blast is conducted by the branch pipes 30, extending from the main conductor 31, and entering the heating-chamber near the bottom. The hot-blast pipe 32 leading to the tuyeres is inserted into the other compartment near the bottom plate.

It will be observed that the pipes 21 are arranged in sets of three, and for each set I provide a peep-hole, 33, through the wall of the heating-chamber, said peep-hole being so located with reference to the pipes of a set that each pipe of the set can be inspected through a glass plate secured over the mouth of said holes.

To the top of each of the pipes 21 is secured the bracket 34, to which is pivoted the arm of the damper 35, the outer end of said arm being provided with a rod or chain, whereby said damper may be operated.

In Fig. 4, I have shown the manner of connecting two lengths of pipe in case it is desirable to form the pipes 21 in sections. Near the ends of one of the sections is formed the flange 36, on which rests the band 37, surrounding the sections at their abutting ends, the space between the band and the sections being packed with iron filings or other suitable material.

I provide for the easy removal of the glands 25 by forming curved slots 38 in the flanges of the stuffing-boxes for the reception of the bolts 26. In order to remove the glands, it is only necessary to loosen the nuts on the bolts and give a partial turn to the glands, when the bolts will be freed from the slots in the flange of the stuffing-box.

At times it may be desirable to dispense with the use of gas from the blast-furnace, in which case I provide for the generation of gas in the supply-chamber by placing grate-bars 39 in the gas-supply chamber 4, the fuel being charged upon said grate-bars through the

opening 40, formed in the walls of the chamber, the draft being regulated by the opening and closing of the stopper 5, the gases being conducted, as before described, into the pipes 21 by the burners 8.

In using this stove the gas is conducted from the blast-furnace through the opening 7 into the supply-chamber, the opening 40 and that in the bottom of the chamber 4 being closed, or else generated therein, as above stated. From thence it passes through the burners 8 into the pipes 21, where, mingling with air entering the pipes around the tips 15, it is burned, highly heating said pipes. The blast is forced into the lower part of one of the compartments, from whence, after circulating around the pipes in said compartment, it passes up over the partition-wall 29, and then passes down and around the pipes in the other compartment, out through the hot blast-pipe 32 to the tuyeres. By opening and closing the doors 17 of the pockets 13 the amount of air supplied to each of the burners can be regulated, and as there is only one burner in each pocket, each burner can be independently regulated, and, if necessary, the combustion in any of the burners can be stopped or reduced by closing or partially closing the damper at the top of pipe 21 and the door of the pockets.

The glands 25 should not be forced down tightly on the packing until after the expansion caused by heating the pipes 21 has taken place. In case of the burning out or any other injury to any of the pipes, said injured pipe can be removed and another inserted in its place by removing the gland, when the exchange can be easily effected.

If desired, valves may be placed in the burners 8 for the purpose of regulating and cutting off the gas from any one of the pipes.

It will be observed that as the blast passes around the pipes instead of through them, as in some forms of stoves, there is no danger of destroying said pipes by the high pressure of the blast, and as the air is heated by passing along surfaces which can be constantly heated, I avoid the duplication of parts necessary in that class of stoves in which the heating agent and the air are passed alternately over the same surfaces.

In lieu of the doors 17 the mouth of the pockets 13 may be closed, or partially so, by placing bricks therein, or any other convenient means for effecting the regulation of the aperture of the pockets may be adopted.

The dividing-wall 29 may, if desired, be omitted, in which case the cold blast should enter the heating-chamber near the top, and the heated blast escape from an opening near the bottom on the opposite side of the chamber, and in some cases it may be desirable to employ two or more dividing-walls in the heating-chamber, so as to insure a more thorough circulation and consequent heating of the blast.

I claim herein as my invention—

1. In a hot-blast stove, a heating-chamber,

having a wall passing transversely across said chamber, in combination with a series of open-ended pipes passing through the chamber, said pipes being separated from each other, so as
5 to allow of a free circulation of the air around each, and a like series of gas-burners having their tips within the ends of the pipes, substantially as set forth.

10 2. In a hot-blast stove, the combination of a heating-chamber, having a series of open-ended pipes passing therethrough, and a like series of gas-burners located in line with said pipes, each of said burners passing through
15 separate pockets or chambers in the base of the heating-chamber, substantially as set forth.

20 3. In a hot-blast-stove, the combination of a heating-chamber, a series of pockets formed on the under side of the bottom plate of the heating-chamber, and a series of gas-burners
25 passing through said pockets, and projecting through openings in the bottom plate of the heating-chamber, substantially as set forth.

4. In a hot-blast stove, a heating-chamber, having a base provided with series of open-ended pockets, in combination with a series
of gas-burners passing through the pockets,

and a series of doors for regulating the admission of air to said pockets, substantially as set forth.

5. In a hot-blast stove, a gas-supply chamber, in combination with an air-heating chamber, having a series of open-ended pipes passing therethrough, and a series of burners for
30 conducting the gas from the supply-chamber into the pipes in the heating-chamber, substantially as set forth. 35

6. In a hot-blast stove, a heating-chamber, having a base provided with a series of open-ended pockets, in combination with a series of gas-burners passing through the pockets, 40
45 means for obstructing or closing the open ends of the pockets, a series of pipes passing through the heating-chamber and arranged with their axes in line with the axes of the gas-burners, and dampers located at the top of said pipes, substantially as set forth.

In testimony whereof I have hereunto set my hand.

WILLIAM ROTTHOFF.

Witnesses:

DARWIN S. WOLCOTT,
R. H. WHITTLESEY.