(No Model.)

S. P. HUTCHINSON.

FURNACE.

No. 492,020. Patented Feb. 21, 1893.

FIG. 1.

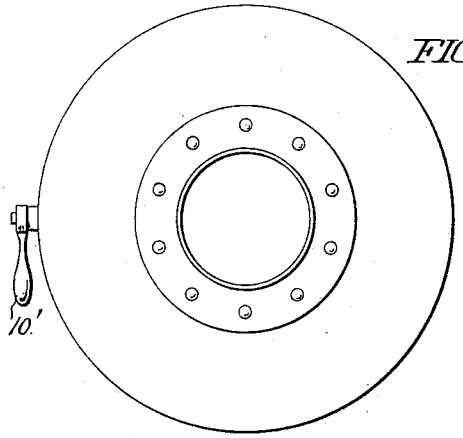


FIG. 3.

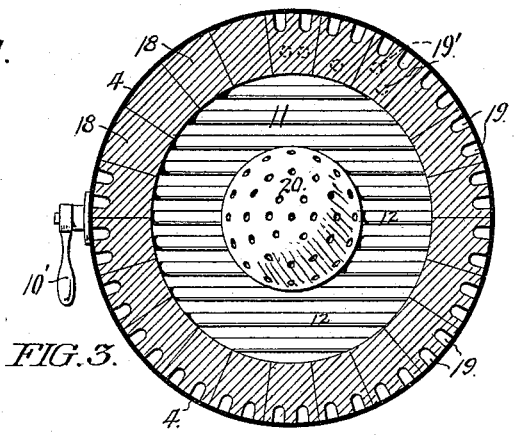


FIG. 2.

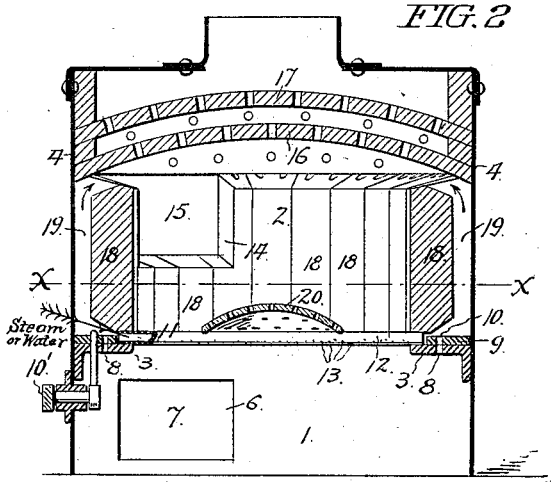


FIG. 4.

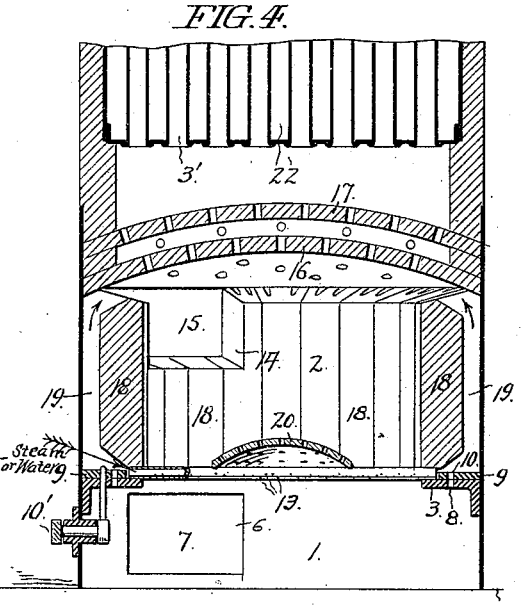
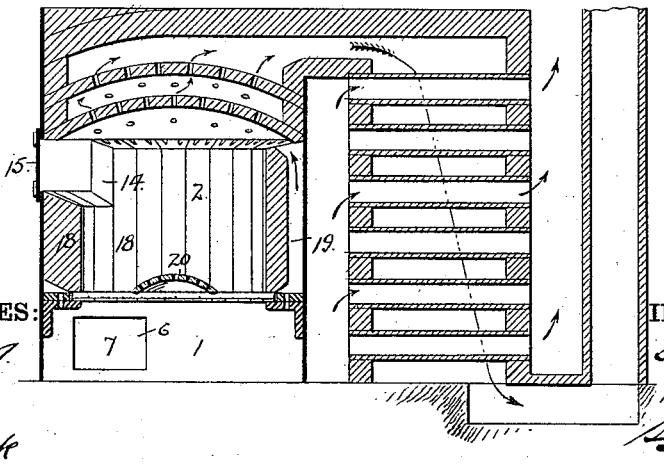


FIG. 5.



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FURNACE.

SPECIFICATION forming part of Letters Patent No. 492,020, dated February 21, 1893.

Application filed July 28, 1891. Renewed June 13, 1892. Serial No. 436,483. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL P. HUTCHINSON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces; and I do hereby declare the following to be a sufficiently full, clear, and exact description thereof as to enable others skilled in the art to make and use the said invention.

This invention relates to stoves and furnaces, and has for its object cheap construction and economical combustion of fuel, and more particularly the avoidance of the discharge of smoke and partially consumed gases from the fuel.

To this end my invention consists in an improved construction of furnace and grate and a device for heating the air preliminary to contact with the solid and gaseous portions of the fuel as hereinafter set forth more fully and particularly, and shown in the accompanying drawings, in which,

Figure 1 shows a plan of a furnace embodying this invention. Fig. 2 a central vertical section thereof. Fig. 3 a horizontal section in the plane indicated by the dotted line *x x* in Fig. 2. Fig. 4 a vertical central section of the furnace as applied to a vertical steam boiler, and Fig. 5 a vertical central section as applied to an air heating furnace.

1 represents the ash pit, 2 the furnace chamber, 3 the grate bearing, 4 the shell inclosing the furnace chamber, 2, and ash pit 1. The shell 4 should be air-tight and is preferably made of plate iron or steel and tightly fitted and secured to the base or hearth.

In the ash pit 1 are draft openings 6, which serve also to empty ashes, and are provided with doors 7, by which the air draft can be moderated or entirely closed.

The grate bearing 3 is in the form of an internally projecting flange, having a series of perforations 8 in it upon which fits a ring 9, having similar perforations 10, which register with the perforations 8 when the ring 9 is in one adjustment, and in another, closes them, and by intermediate adjustments, varies the extent of uncovering of the openings 8; the ring 9 is adjusted by a lever 10′ fitted air tight through the shell 4.

Within the ring 9, on the bearing 3, rests a grate 11, formed preferably of tubular bars 12, having minute apertures 13, from which water in a finely divided state, or steam may be introduced into the ash pit.

In the shell 4, is a door opening 14, for the introduction of fuel, fitted with an air tight door 15. Above the door opening, is an arch or tile 16, of perforated refractory material, such as steatite, or fire brick, and above this tile 16, is a second perforated arch 17, of refractory material, preferably having the perforations not opposite those in the tile or arch 16.

Resting upon the grate 11, are a series of parallel strips or staves 18, of refractory material, having grooves or lengthwise spaces 19 in the back reaching from the openings 10 up nearly or quite to the upper ends, through which grooves air passes from the apertures 10, and becoming heated, enters the furnace chamber above the fuel. Instead of groove 19 in the back of the staves 18 they may be made with a long channel or a tube 19′ formed in them.

Upon the central portion of the grate 11 is placed a perforated dome 20, which protects the center of the grate from excessive heat, and consequent warping, and also serves to distribute the air, and partially heat it, as it passes from the ash pit 1 into the fuel.

The fire is kindled by light fuel placed on the grate, and coal or coke, for the permanent fire, added; the feeding door is then closed, and as the staves 18 become heated, the air from the ash pit passes through the apertures 9 and 10, through the grooves 19, and mingles with the gases above the fuel, and burns at a high temperature; the arch or tile 16 becomes highly heated and deflecting heat back upon the fuel, greatly increases the heat at the center of the furnace and facilitates the liberation of gas from the fuel. The temperature rises in the furnace chamber above the fuel to an intense heat, which can be moderated by partially closing the apertures 8, by the lever 10 and ring 9, and can be arrested by entirely closing the apertures 8 and the ash pit doors 7. The products of combustion pass upward through the perforations in the tiles or arches 16 and 17, and are utilized as shown in Fig. 4 by passing through the flue 3′ of a boiler 22, and as shown in

Fig. 5 they pass around the air heating flues of a hot air apparatus. The effect, of the double perforated tiles 16 and 17, is to retain the heat of the gases and air in the furnace, until complete combustion has been effected, and prevent the apparatus for utilizing the heat, from reducing the furnace temperature.

The proportions of furnace that experience has indicated best for working this furnace is with the chamber from the grate 11 to the tile 16 equal to one diameter of the furnace, and that preferably, not less than eighteen inches, and the diameter of the dome 20, about one half the diameter of the inside of the furnace chamber within the staves 18. When combustion is actively in progress it is accelerated by allowing steam or water to enter the ash pit 1 and moisten the air supply therein.

Having described my invention and the operation thereof, what I claim is—

1. In a furnace the shell 4, ash pit 1, grate 11, dome 20, staves 18, perforated grate bearing 3, and adjustable ring 9, in combination with the perforated tiles 16 and 17, arranged to operate substantially as set forth.

2. In a furnace the ash pit 1, provided with air tight fitting doors, and the perforated grate bearing 3, and tubular perforated grate 11, with perforated dome 20 in combination with the grooved staves 18 arranged to operate substantially as set forth.

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