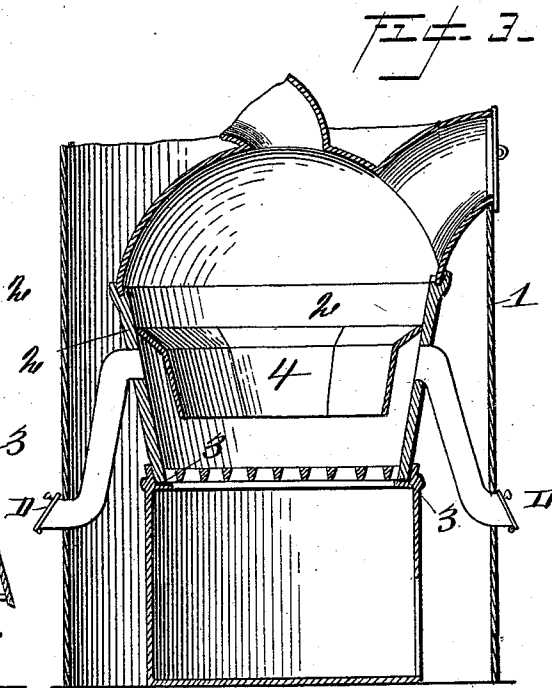
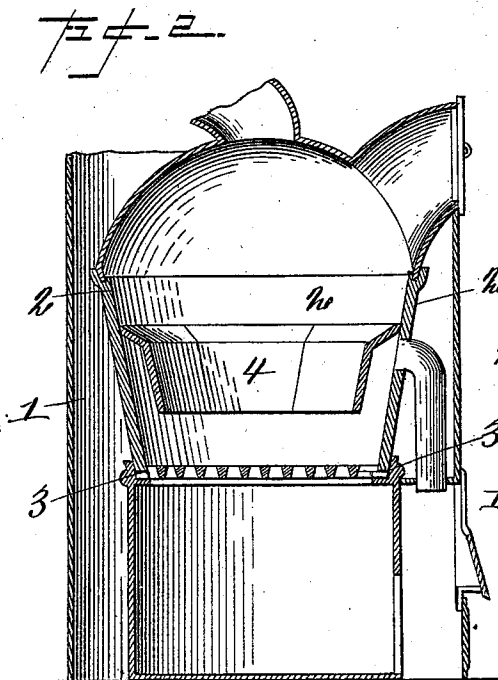
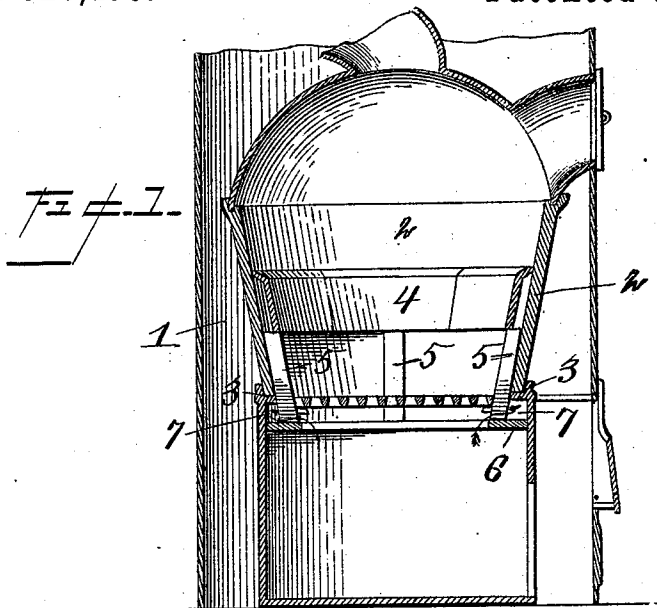


(No Model.)

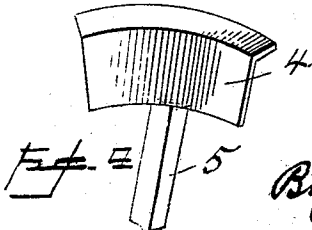
C. D. HOWARD.
HEATING FURNACE.

No. 528,479.

Patented Oct. 30, 1894.



WITNESSES
J. C. Johnson
James E. Foster



INVENTOR
Chas. D. Howard
By *J. R. Nottingham*
att'y.

UNITED STATES PATENT OFFICE.

CHARLES D. HOWARD, OF SYRACUSE, NEW YORK, ASSIGNOR TO THE
HOWARD FURNACE COMPANY, OF SAME PLACE.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 528,479, dated October 30, 1894.

Application filed May 15, 1894. Serial No. 511,358. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. HOWARD, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Heating-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in heating furnaces; and it has for its objects to provide for the thorough consumption of the fuel and gaseous products of combustion, so as to effectually utilize the heat thereof, as more fully hereinafter set forth.

The above mentioned objects are attained by the means illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical sectional view, showing the fire-pot, ash box, and ring fitting within the fire-pot, whereby the air is heated and passed into the fuel; Fig. 2, a modification, showing a similar view of my invention; Fig. 3, a similar view of another modification, of my invention, and Fig. 4, a detail view of one of the sections comprising the deflecting ring.

In the combustion of solid fuel, carbonic acid gas is generated where the fuel is first burned and where the temperature is at its highest, or "incandescent." Above, in the furnace, the fuel is at a lower temperature, and the carbonic acid gas, CO_2 , initially generated in passing through the fuel, parts with one equivalent of its oxygen, which combines with a portion of the carbon of the fuel, producing carbonic oxide gas. This gas being inflammable can be utilized as fuel, and it is the object of my invention to so construct a furnace that the carbonic oxide gas, at the moment of its generation, or while in a nascent state, shall be met by a current of air, while in this condition, so that it will unite with the oxygen thereof, thus producing secondary combustion.

Referring to the drawings, the numeral 1 indicates the walls or casing of the furnace, which may be of any suitable material capa-

ble of resisting the internal heat of the furnace.

The numeral 2 indicates the fire-pot, which is preferably constructed in the form of a truncated cone, or frustum, and is located, in an inverted position, upon a seat 3 at the upper edge of the ash-box.

The numeral 4 indicates a ring or annulus, which is designed to sit within the fire-pot about midway between the top and bottom of said pot. This ring is also in the form of a truncated cone, and is reverse so that its reverse base will sit within the reverse portion of the truncated fire-pot and may be held therein, naturally, as shown in Figs. 2 and 3 of the drawings. Preferably, the ring is constructed in segmental sections, see Fig. 4, in which the annulus or ring-section is provided with a dependent flue or conduit 5, open at their lower ends and extending around the fire space of the fire-pot into the intermediate zone thereof. In this case the lower ends of the dependent flues or conduits rest upon an internal annular ledge, 6, in the ash box, which supports each internal section comprising the ring, but permits a free draft through the tubes or conduits, the air entering through spaces 7, back of said conduits.

In practice, I prefer to construct the depending portions of the annulus in the form of half flues or troughs, that is, flues open longitudinally at one side, so that when fitted within the fire-pot the walls of said fire-pot will close the open side of each flue and make a practically closed passage through each, from the ash-box to the lower edge of the annulus or ring.

The operation of my improved invention is as follows:—The furnace being properly charged with fuel and a fire started, combustion begins at the bottom of the charge of the fuel, where it is virtually complete, resulting, as in all cases of complete combustion, in the production of carbonic acid gas CO_2 . This gas in ascending through the mass of fuel above, which is at a considerably lower temperature, and meeting with such fuel above, parts with one equivalent of its oxygen, which goes to the carbon, forming carbonic oxide gas CO . This carbonic oxide gas, just at the

zone and period of its generation, is met by the incoming current of air, being heated by striking against the deflecting ring, places the two gases—that is, the heated air and the carbonic oxide just generated—in a condition to unite and prevent the loss of effective heat, which would occur if the carbonic oxide should be turned at the surface of the fuel or pass off as unconsumed.

10 In the modification shown in Fig. 2, the annulus or ring is supported naturally, as before mentioned, within the fire-pot, the air passages or flues, in this instance, lead by an elbow bend from the ash-pit to the space between the annulus and the wall of the fire box, so as to heat the air and discharge it at the zone of decomposition.

15 In the modification shown in Fig. 3, the general arrangement of the parts of the apparatus is the same, with the exception that the air, to supply the fuel at the intermediate point of combustion, is taken directly from the outside, instead of being taken from the ash-box of the furnace. The outer ends of the air conduits are provided with dampers D to regulate the supply of air.

In all cases, the air strikes the deflecting ring and is heated before passing into the decomposing zone of the fuel.

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

1. The combination, in a furnace, with a fire-pot in the form of a truncated cone, of a flanged ring adapted to be inserted therein and supported at a point between the top and bottom of said fire-pot, and means whereby

air may be directed against said ring, heated thereby, and discharged into the decomposing zone of the fire-pot, substantially as specified. 40

2. The combination, in a furnace, of a truncated conical fire-pot, a ring adapted to fit therein about midway between the top and bottom of the fire-pot, and conduits leading from the ash-box to said ring, so as to conduct a heated current of air against the ring and then discharge said heated air into the fuel and the decomposing zone, substantially as specified. 45

3. The combination, in a furnace, of a truncated conical fire-pot, a ring situated therein about midway between the top and bottom of said fire-pot, and depending flues or conduits communicating with the ring and the ash-box of the furnace, whereby a current of hot air may be conveyed from the ash-box to the ring and from thence to the decomposing zone of the furnace, substantially as specified. 50

4. The combination, in a furnace, of a truncated conical fire-pot, a sectional ring situated therein about midway between the top and bottom of said fire-pot, each section having depending flues or conduits communicating with the ring and ash box, whereby a current of air may be conducted from said ash box to the ring, and from thence to the decomposing zone to the fuel, substantially as specified. 55

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

CHARLES D. HOWARD.

Witnesses:

E. A. PAUL,

J. R. NOTTINGHAM.