

(No Model.)

R. H. LAIRD.
FURNACE.

No. 515,867.

Patented Mar. 6, 1894.

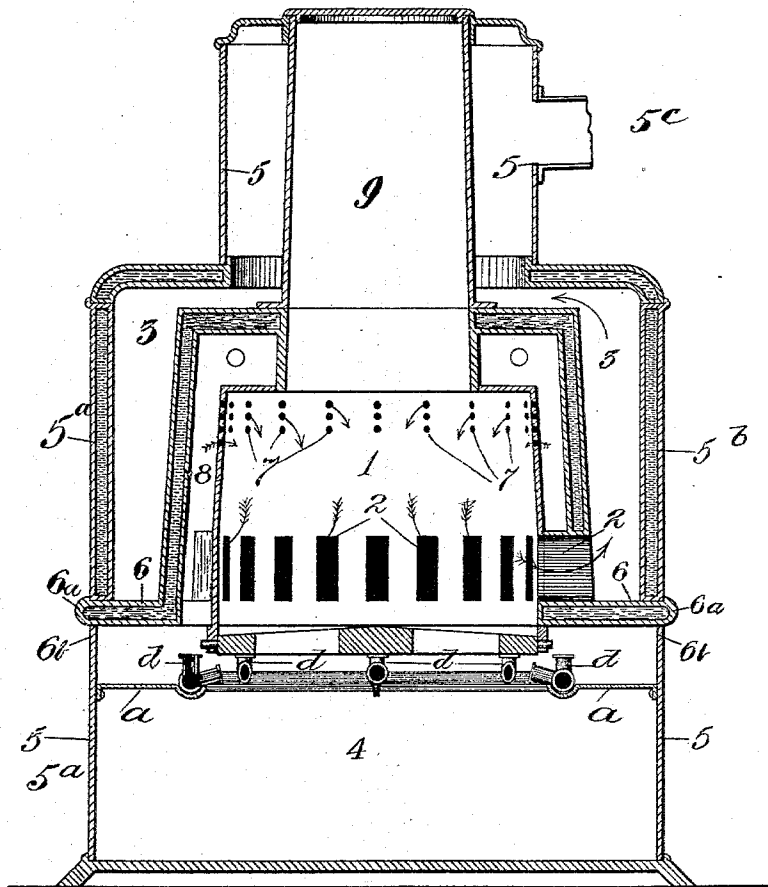


Fig. 1.

Witnesses,

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Inventor,

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UNITED STATES PATENT OFFICE.

ROBERT H. LAIRD, OF TORONTO, CANADA, ASSIGNOR TO WILLIAM HENRY LAIRD, OF NEW YORK, N. Y.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 515,867, dated March 6, 1894.

Application filed March 15, 1893. Serial No. 466,025. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. LAIRD, of the city of Toronto, in the county of York and Province of Ontario, Canada, have invented certain new and useful Improvements in Furnaces; and I hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to certain improvements in furnaces and has for its object to provide a furnace of an improved construction whereby considerable economy is effected in the consumption of fuel, and wherein the combustion is so nearly perfect that almost the whole of the carbon of the fuel is converted into carbonic acid gas, all as will be hereinafter fully described.

The novel features of my invention will be carefully defined in the claims.

In the accompanying drawing which serves to illustrate my invention I have illustrated in vertical axial section a furnace constructed according to my invention.

In the drawing 5 represents the casing as a whole, said casing being composed of a lower or base-ring 5^a, and a drum 5^b, surrounding the fire-pot, said drum having hollow walls forming a water jacket thereabout as clearly shown. The interior of this upper drum 5^b of the casing or shell is provided with an opening or outlet 5^c adapted for connection with the chimney at which opening the products of combustion pass off, and between the two sections 5^a and 5^b of the casing is arranged an annular diaphragm or partition 6 formed about the lower edge of an air tube 8, surrounding the combustion chamber or fire-pot 1, as seen in the drawings.

1^a is the grate, arranged at the base of the fire-pot and 9 is a fuel magazine having a close fitting cover over its upper end, the lower end of said fuel magazine being open to the upper portion of the fire-pot in order to deliver the fuel thereto in the ordinary manner. The air tube 8 is of a somewhat larger diameter than the fire pot 1, whereby an annular space is left between the two and said air tube being of smaller diameter than the internal diameter of the drum 5^b of the casing a second annular space is left between said drum and air tube.

2, 2, are a series of radial draft flues formed through the lower portions of the walls of the fire-pot 1 and extending across the space between said fire-pot and the air tube and through said air tube into the space between the same and the drum 5^b of the casing. The air tube 8 is closed at its upper end, but is in communication with the upper portion of the fire-pot 1 just below the fuel magazine by means of apertures or perforations 7, 7, formed through the upper portions of the side walls of said fire-pot, and said air tube 8 is open at its lower end to the ash pit 4 of the furnace, from which it draws its supply of air as will be shortly described.

Mounted on suitable supports *a*, in the ash-pit 4 just below the grate 1^a is a steam pipe arranged in the form of a ring or coil and provided with jets or nozzles *d*, *d*, arranged at suitable intervals and adapted to admit steam into the lower open end of the air tube 8, and also through the interstices in the grate 1^a into the lower portion of the fire-pot. The steam so admitted greatly augments the draft and insures proper combustion of the fuel in the fire-pot although the same is not essential to my invention.

The operation of my improved furnace is as follows: The fuel magazine having been charged and a fire kindled in the fire-pot at the lower portion thereof, the products of combustion arising from such fire pass out of the fire-pot through the radial draft flues 2, into the space between the air tube and the drum 5^b of the casing or shell, whence they pass through the outlet 5^c to the chimney. The air required to support this combustion enters the fire-pot in part through the interstices in the grate bars 1^a, and in part through the perforations 7 in the upper side walls of the fire-pot after passing up through the air tube 8. Thus it will be seen that the products of combustion are drawn out sideways or radially from the point of combustion through the flues 2, and the combustion is supported by two drafts, an upward draft through the grate and a down draft through the perforations 7, as indicated by the arrows in the drawing.

In furnaces, and especially in magazine furnaces and stoves as ordinarily constructed

heretofore, there has been a great waste of fuel owing to the heat from the burning fuel at the base of the fire-pot acting on the unignited fuel near the top of the fire-pot and in the magazine to decompose the same, whereby the various gases,—hydrogen, carbon monoxide, carbonic acid, marsh gas, olefiant gas, nitrogen, &c.,—which are evolved during the destructive distillation of the coal, &c., and some of which are very valuable for heating purposes, pass off with the products of combustion to the outlet of the shell and escape through the chimney. By my improved furnace, however, the escape of these valuable gases is prevented by the down draft from the perforations 7 in the upper side walls of the fire pot, said down draft carrying any gases which may be produced by the heating of the fuel above the point of combustion, down to said point of combustion, where they are consumed as will be readily perceived.

My invention is susceptible of considerable modification and therefore I do not wish to be understood as limiting myself to the precise construction and arrangement herein shown.

Having thus described my invention, I claim—

1. In a furnace, the combination with a shell or casing having an outlet for the gaseous products of combustion, of a fire-pot arranged in said casing, a grate arranged in said casing beneath the said fire-pot, an air-tube having a diameter greater than that of the fire-pot and having a less diameter than that of the casing, said air-tube being arranged in the space between the fire-pot and the casing whereby an annular air-flue is formed between the said air-tube and the fire-pot, and an annular gas-space or chamber is formed for the products of combustion between the said air-tube and the casing, said gas-chamber being in communication with the outlet to the chimney, said air-tube being closed at its upper end to said gas-space and having its lower end arranged below the grate, said fire-pot having a series of openings in the upper portion of its wall whereby air is supplied to the upper part thereof from beneath the grate, and a series of draft flues, the inner ends of which are open to the lower part of the fire-pot at or near the level of the grate said draft flues extending across said air-flue and being closed off therefrom and having their outer ends opening into the annular gas-space outside the air-tube, substantially as set forth.

2. In a furnace, the combination with the shell or casing consisting of a base-ring constituting an ash-chamber, and a drum mounted above said base-ring and provided with an outlet for the gaseous products of combustion, of a fire-pot having a smaller diameter than said drum, said fire-pot being arranged in said drum whereby an annular space or chamber is formed between the said drum

and fire-pot, said fire-pot having in the upper portion of its side-walls a series of openings, an air-tube of a larger diameter than said fire-pot, said air tube having a closed upper end and being arranged in the annular space or chamber surrounding the fire-pot whereby said space is divided into two annular chambers, one of which is arranged between the said air-tube and the fire-pot and constitutes an air-flue, and the other of which is arranged between said air tube and the said drum and forms a gas chamber for the gaseous products of combustion, said gas-chamber being in communication with the outlet of the casing, a grate arranged in said casing at the base of the fire-pot, said air tube having its lower end arranged below said grate whereby a current of air is supplied through said air flue from below the grate through the openings in the upper part of the side walls of the fire-pot, the lower end of said air-tube being provided with an outwardly projecting annular flange or ledge which is arranged between the base-ring and drum of the casing and closes the lower end of the annular gas-chamber in the shell, and a series of draft-flues having their lower ends adapted for communication with the interior of the fire-pot at or near the level of the grate, said draft flues passing across said air-flue and being closed off therefrom and having their outer ends adapted for communication with the annular gas-chamber in the shell whereby the gaseous products of combustion are drawn through said draft-flues from the point of combustion at or near the level of the grate outwardly into said gas-chamber, substantially as set forth.

3. In a furnace, the combination with a shell or casing consisting of a base-ring constituting an ash-chamber, and a drum mounted above said base-ring and provided with an outlet for the gaseous products of combustion, of a fire-pot having a smaller diameter than said drum, said fire-pot being arranged in said drum whereby an annular space or chamber is formed between the said drum and fire-pot, said fire-pot having in the upper portion of its side-walls a series of openings, an air-tube of a larger diameter than said fire-pot, said air tube having a closed upper end and being arranged in the annular space or chamber surrounding the fire-pot, whereby said space is divided into two annular chambers, one of which is arranged between the said air-tube and the fire-pot and constitutes an air-flue, and the other of which is arranged between said air-tube and the said drum and forms a gas-chamber for the gaseous products of combustion, said gas-chamber being in communication with the outlet of the casing, a grate arranged in said casing at the base of the fire-pot, said air tube having its lower end arranged below said grate whereby a current of air is supplied through said air-flue from below the grate through the openings in the upper part of the side walls of the fire-pot,

the lower end of said air-tube being provided with an outwardly projecting annular flange or ledge which is arranged between the base-ring and drum of the casing and closes the lower end of the annular gas-chamber in the shell, a series of draft-flues having their lower ends adapted for communication with the interior of the fire-pot at or near the level of the grate, said draft-flues passing across said air-flue and being closed off therefrom and having their outer ends adapted for communication with the annular gas-chamber in the shell whereby the gaseous products of combustion are drawn through said draft flues from the

point of combustion outwardly into said annular gas-chamber, and a steam-pipe arranged in the casing below the grate, said steam pipe being provided with a series of nozzles adapted to discharge jets of steam into the lower end of the annular air-flue, where- by an upward draft of air is caused to circulate therethrough, substantially as set forth.

Toronto, November 5, 1892.

ROBERT H. LAIRD.

In presence of—

C. H. RICHES,
MARGUERITE ANGELL.