M. A. CUSHING.

Improvement in Hot-Air Furnaces.

No. 115,444. Patented May 30, 1871.

Fig. 1.

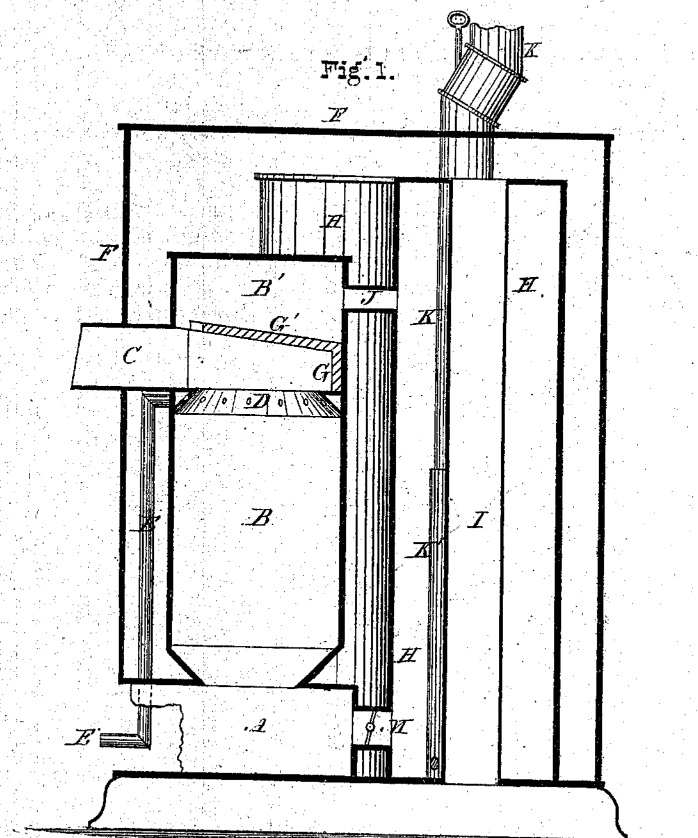
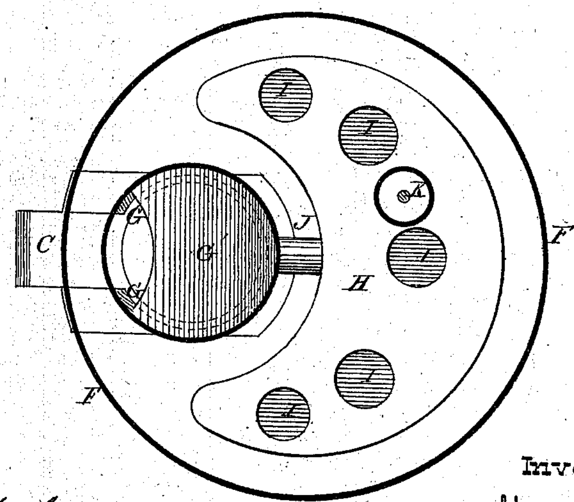


Fig. 3.

Fig. 2.



Witnesses.

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UNITED STATES PATENT OFFICE.

MARK A. CUSHING, OF AURORA, ILLINOIS.

IMPROVEMENT IN HOT-AIR FURNACES.

Specification forming part of Letters Patent No. 115,444, dated May 30, 1871.

To all whom it may concern:

Be it known that I, MARK A. CUSHING, of Aurora, in the county of Kane and State of Illinois, have invented a new and useful Improvement in Heating-Furnace; and I do declare that the following is a true and accurate description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon, and being a part of this specification, in which—

Figure 1 is a vertical section of my furnace with a portion of the ash-pit broken away to show the pipe which supplies air to the gas-ring. Fig. 2 is a plan of the furnace with its top and that of the combustion-chamber removed. Fig. 3 is a vertical section of the exit-pipe.

Like letters indicate like parts in each figure.

The nature of this invention relates to an improved construction of air-heating furnaces, whereby more perfect combustion and an increased radiating-surface are secured within a small compass. The invention consists in the peculiar construction of a radiating-chamber for the reception of the heated products of combustion, in connection with the combustion-chamber and the sleeve exhaust-pipe patented by me July 6, 1869, and numbered 92,282, whereby a large radiating-surface is secured within the cylindrical casing of the furnace.

In the drawing, A represents the ash-pit, surmounted by a fire-pot, B, the upper part of which forms a combustion-chamber, B′, closed at the top. C is a chute through which the fuel is supplied to the fire-pot. D is an annular channel encircling the fire-pot at the plane of the lower side of the feed-chute, and is perforated in the usual manner to form a gas-ring, the invention of which I disclaim. E is a tubular conduit, tapping said gas-ring at any convenient point, delivering thereto a supply of fresh air taken from the external atmosphere at or near the bottom of the furnace, passing up within the outer casing F, whereby the air delivered by it is heated in its passage to the gas-ring, the more readily to ignite the gases of combustion with which it mixes on its introduction to the fire-pot. G is a segment of a cylinder, formed of fire-clay, properly molded and burned, or of other refracting material, resting upon the gas-ring and extending entirely around the fire-pot, except at the mouth of the chute. G′ is a diaphragm of the same material, resting on the walls of the segment, which are inclined from front to rear. The diaphragm is cut away at the front edge, as shown in Fig. 2, to give exit to the products of combustion from the fire-pot into the combustion-chamber B′ above. H is a crescent-shaped sheet-metal radiator, partially surrounding the fire-pot, with an air-space between them, as there is also a similar space between the outer wall of the radiator and the casing F, which incloses the whole. A number of tubes, I, extend through the top and bottom heads of the radiator, from the interior of which the exit-pipe carries away the unconsumed products of combustion discharging into it by the flue J leading from the combustion-chamber. The exit-pipe is in two sections, K K′, the latter being sleeved on the former and operated as a downward extension by the rod L, as set forth in said Letters Patent. M is another flue leading from the back of the ash-pit into the radiator, and is provided with a valve for closing it. The bottom plate of the furnace is provided with proper openings for the admission of cold air to the space inclosed by the shell. From the top hot-air pipes convey the heated air to the required points. The fire-pot being supplied with fuel, combustion proceeds in the usual manner, heating to a high degree the fire-clay walls G and diaphragm G′. A large volume of gases evolved from the fuel is detained by the diaphragm G′, affording a chance to the gas-ring to deliver to it a supply of oxygen, which, being heated in its passage through the conduit E, readily mixes with the gases of combustion and ignites them, the ignition being rapid and the combustion perfect, by means of the great heat radiated from the fire-clay walls and diaphragm.

It is a well-settled principle in calorifics that, to insure rapid and perfect combustion, the supply of oxygen to the gases should be heated before its delivery thereto; hence the importance of the conduit E.

The heated currents pass from the combustion-chamber through the flue J into the radiating-chamber H, whence their outflow and the rate of combustion may be regulated by

raising or lowering the sleeve of the exit-flue. The lower the mouth of the sleeve is the slower the combustion will proceed; but with a constantly-increasing ratio of economy, as, in obedience to natural laws, the heat discharged into the radiating-chamber rises as it enters, and must completely fill it before finding an exit at the bottom of the chamber. Being thus detained in the chamber, its thin walls readily transmit, by radiation, the heat to the atmosphere passing up through the furnace in contact with the exterior of the radiators. The tubes I afford an additional radiating-surface, but are not essential. The sleeve of the exit-pipe is provided with several openings, of such area that when the sleeve is lowered to the bottom of the radiator there will pass up a current of heat in volume sufficient to maintain draft enough for combustion and to carry off the unconsumed non-inflammable products of combustion. The flue M is kept closed at all times, except when shaking the grate, when, by opening its valve or damper, the dust and ashes will be drawn up the exit-pipe or into the radiating-chamber, whence they are readily removed as occasion requires.

What I claim as my invention, and desire to secure by Letters Patent, is—

The construction and arrangement, within the casing F, of the ash-pit A, fire-pot B, flue J, and crescent-shaped radiator H, having a sleeved or extensible exit-pipe K, and with or without the air-pipes I, substantially as described, and for the purpose specified.

MARK A. CUSHING.

Witnesses:
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