J. MAC GREGOR, Jr.

Hot Air Furnace.

No. 7,143. Patented March 5, 1850.

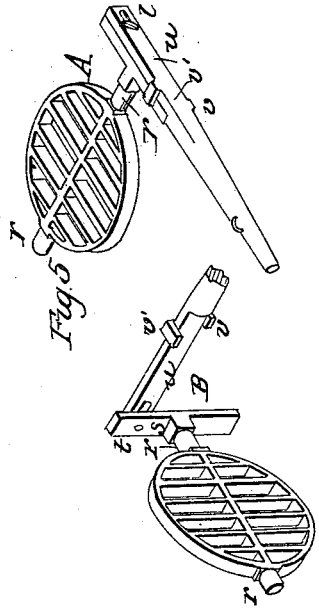

Fig. 5

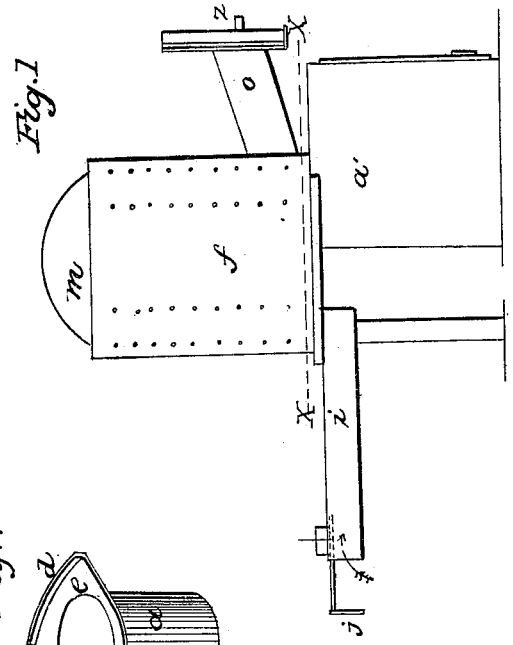

Fig. 1

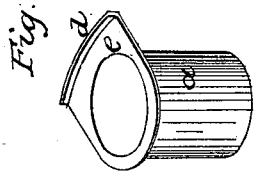

Fig. 4

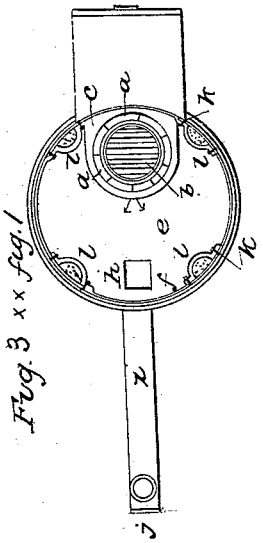

Fig. 3 x x fig. 1

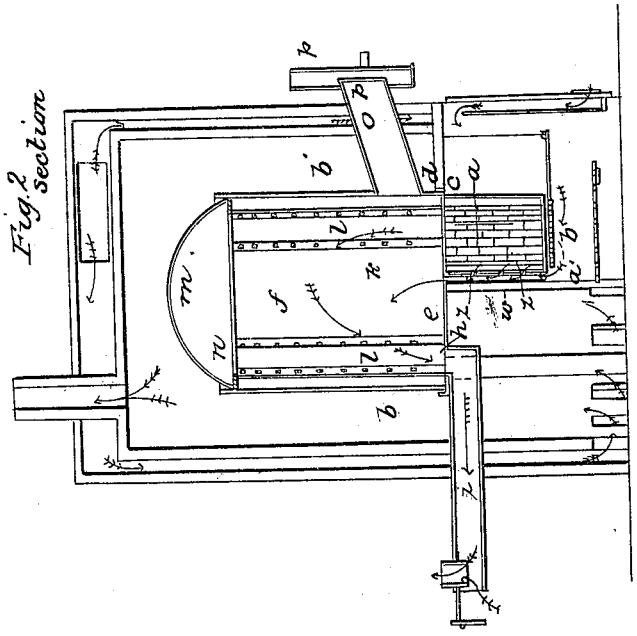

Fig. 2 section

UNITED STATES PATENT OFFICE.

JAS. MACGREGOR, JR., OF WILTON, NEW YORK.

HEATING-FURNACE.

Specification of Letters Patent No. 7,143, dated March 5, 1850.

To all whom it may concern:

Be it known that I, JAMES MACGREGOR, Jr., of Wilton, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Heating-Furnaces, and that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1, is an elevation of my improved furnace, Fig. 2, is a vertical section, Fig. 3, is a horizontal section taken at the line (*x*, *x*,) of Fig. 1, and Fig. 4, is a perspective view of the fire pot, and Fig. 5 a view of the grate.

The same letters indicate like parts in all the figures.

In my improved furnace the fire pot is suspended to the bottom of a large vertical cylinder, and near one edge of it, near the opposite edge, and through the bottom of the vertical cylinder is another aperture which opens into the smoke flue (on the same principle of my heating stove patented by me in 1846), the cylinder being provided at the side with an inclined spout and door closely fitted through which the fuel must be fed to the fire pot. It is highly important in furnaces of this general character that the chamber in which the products of combustion revolve and circulate before their escape to the chimney be large and made of thin metal, that the heat may pass through it with facility, and in sufficient quantity when the cylinder is far below a red heat, to warm the air in the surrounding chambers up to the proper temperature of heating apartments without injuring it for breathing. To effect this it is necessary to form the cylinder of several pieces, to make the joints air tight to prevent the escape of smoke and other gases is found to be very difficult in consequence of the working of the joints by the expansion and contractions of the plates composing the cylinder. Another difficulty arises from the fact that the fire pot which is liable to derangement and which therefore requires to be frequently repaired is either placed within the heating cylinder or permanently connected with the bottom, so that it can only be removed with much labor and expense.

In the usual way of setting furnaces another difficulty occurs, the fire pot has been so placed that its sides come in contact with the air in the air chamber, and the fire pot being usually red hot, injures the air so heated and renders it unfit for respiration, which is remedied by inclosing the fire pot in a separate chamber.

In all the furnaces heretofore made there has been much loss of fuel and heat, in consequence of unconsumed gas escaping to the chimney without being burned; these difficulties I have overcome by my improvements hereafter described. These consist, first, in forming on the inside of each segment of the cylinder, and at each seam or joining of the plates or staves composing the cylinder, a semi cylindrical or other formed tube to be filled with sand to form sand lutes, which will render the joints air tight, and thus prevent the escape of smoke and other gases, and second, in separating the fire pot from the air chamber by a partition, and suspending it to the bottom of the heating chamber by providing the upper edge of the fire pot with a horizontal flanch fitted to corresponding grooves in the bottom of the heating chamber, so that the fire pot can be pushed in and out with facility.

In the accompanying drawings (*a*) represents a cylindrical fire pot surrounded by a partition (*a'*) which separates it from the air chamber (*b'*) with a fire grate (*b*) at the bottom, and with a horizontal flanch (*e'*) at the upper edge of said fire pot, the rear half of which is concentric, and the sides parallel tangents, to admit of sliding in and out, while the front edge (*d*) is turned up to correspond with the outer periphery of the bottom plate (*e*) of the heating chamber. This flanch fits in a groove formed by a flanch around the opening in the bottom (*e*) of the heating chamber (*f*) or instead thereof it may be bolted directly to the bottom of the heating chamber, which has a hole corresponding with the fire pot, and another and smaller hole (*h*) near the opposite edge, which opens into a horizontal flue (*i*) the outer end of which is provided with a door (*j*) to admit of cleaning and to regulate the draft; as in my stove heretofore patented; the products of

combustion pass from this flue to a chimney through a vertical pipe, the lower end of which may run down into the horizontal flue (*i*) about half of the depth of said flue that the products of combustion which are coolest and therefore nearest the bottom shall pass up the chimney while those which are warmest and therefore nearest the top are retained in the upper part of the flue to give out heat to the surrounding air in the inclosed apartment or air chamber (*b'*).

The heating chamber (*f*) is a cylinder of about double the diameter of the fire chamber more or less, formed with reference to containing the greatest amount of heated air, and made, as are all the other parts of thin cast metal or other suitable material (when it is made of sheet metal the vertical sand heater joints may be omitted and the others varied) in staves or otherwise which are united with lap joints (*k*) in the well known manner of making such joints and to prevent the escape of the products of combustion through these joints particularly after they become loose by the expansion and contraction of the metal, there is a segment of a cylinder (*l*) formed on the inside lap of the staves of the cylinder and near the edge of the stave—this is to be filled with sand, to form a sand lute at each lap—these sand lutes extend from the top to the bottom and the edge of the staves on which the semicircle is cast is recessed so as to admit the thickness of the next stave which laps on it, so that the exterior of the cylinder will be smooth.

The heating cylinder is covered with a dome (*m*) made air tight by resting the edge of it on a flanch (*n*) extending all around, and a little below the top of the heating chambers, and forming a space between the dome and the upper edge of the cylinder, which is first cemented and then filled with sand to form a sand lute. There is also a similar joint between the bottom head of the cylinder and the lower edge. The edge of the bottom plate being turned up out side the cylinder and a flanch inside, for the purpose of forming a sand lute at the lower end of the heating cylinder. This method of forming a sand lute, effectually prevents the sand from being drawn out by the draught, as is the case with those formed in the ordinary way of resting the bottom edge of the cylinder on sand.

The fuel is to be fed into the fire pot through an inclined spout (*o*) in the side of the heating chamber—which spout is to be provided with a closely fitting door (*p*) or the spout may have its mouth horizontal and have a sand lute formed around its edge and have a door with a flanch made to fit down into the sand lute, and thereby render the feeder air tight. It will be obvious that the form of this apparatus may be changed at pleasure, without affecting the principle of the improvement pointed out above. The flues (*z z z*) that lead into the pipe (*w*) are placed one above the other, so that one or more of the apertures may at all times be below the top of the ignited coal and by this means allow the flame to pass into the chamber of combustion and radiation, with the air that is admitted at the lower end of the pipe (*w*). By this means when the combustible gases are given off by the coal, they are ignited and consumed as they come in contact with the flame and air that ascends through the pipe (*w*) and flues (*z z z*). From the lightness of the specific gravity of the combustible gases they cannot descend to the smoke flue until after combustion has taken place. The pipe (*w*) that conveys the flame and air into the chamber of combustion, is formed by casting a half circle or other cavity on the side of the fire pot, and letting the lining of the fire pot pass over the cavity above stated and through the lining, having flue or flues that lead into the cavity or pipe (*w*). The lower end of the pipe (*w*) communicates with the air that surrounds the fire pot.

When the fire pot is placed inside of the chamber of combustion, the flue (*z*) sometimes passes directly into the chamber of combustion and the pipe (*w*) communicates with it, where it leaves the fire pot, being so low that the coal is always ignited to the top of the flue (*z*) while much coal may be unignited above the flue (*z*). The combustible gases as above stated, being of less specific gravity than the noncombustible gases, rise in the chamber of combustion and there circulate until consumed as above stated, while the smoke and noncombustible gases descend and pass to the exit pipe or flue. By the above arrangement all the combustible gases are consumed before they can descend to the exit pipe and give out their heat to the extensive surface of the heating chamber, which may be made of great capacity and thus greatly economize fuel. Or more than one cylinder may be employed which receive the products of combustion in succession. The grate shown in Fig. 5 is made with journals (*r*) on the end of one of which there is a cross piece (*s*) cast at right angles. Through one end of this cross piece there is a bolt (*t*) that passes through an oblong hole in lever (*u*) and connects it with the cross piece (*s*). This lever has two studs (*v v'*) projecting from it which when the lever is parallel with the cross piece (in the position indicated in Fig. 5, A) embraces the cross piece that holds the grate steady. But when the lever is drawn forward which is permitted by the oblong form of the hole through which the bolt (*t*)

passes, the lower stud (v) is released from the end of the cross piece so that the grate can be canted, in which position the drawing B Fig. 5 represents it. When the fire pot is put inside of the heater I use a different grate, resting on a sliding frame that can be drawn out with the grate when desired, for the purpose of cleaning or substituting a new one—this together with other improvements I contemplate patenting at some future period—they will not therefore be more particularly described here.

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

1. Making the heading cylinder in sections, in combination with the segments of tubes or vertical cavities, cast on the plates at the laps, containing sand substantially as described whereby they are rendered air tight as described.

2. I claim the mode of fastening the handle to the grate and keeping the grate true with the handle by means of the bolt (t), by which they are connected with the two studs (v v') as substantially set forth.

3. I claim the separate chamber for the fire pot which is suspended below the chamber of combustion to prevent the air heated by the fire pot from entering into the air chamber (b') surrounding the heating cylinder for the purpose and in the manner as substantially set forth.

4. I claim admitting air and flame through the pipe (w) and its aperture or apertures (z, z, z,) into the chamber of combustion and radiation, in the manner and for the purpose, substantially as set forth.

5. I also claim this mode of introducing the heated air and flame in combination with the descending draught as described.

JAMES MACGREGOR, JR.

Done in presence of—

T. H. GODDARD,

J. J. GREENOUGH.