C. Chilson.

Hot Air Furnace.

No. 7,780. Patented Nov. 19, 1850.

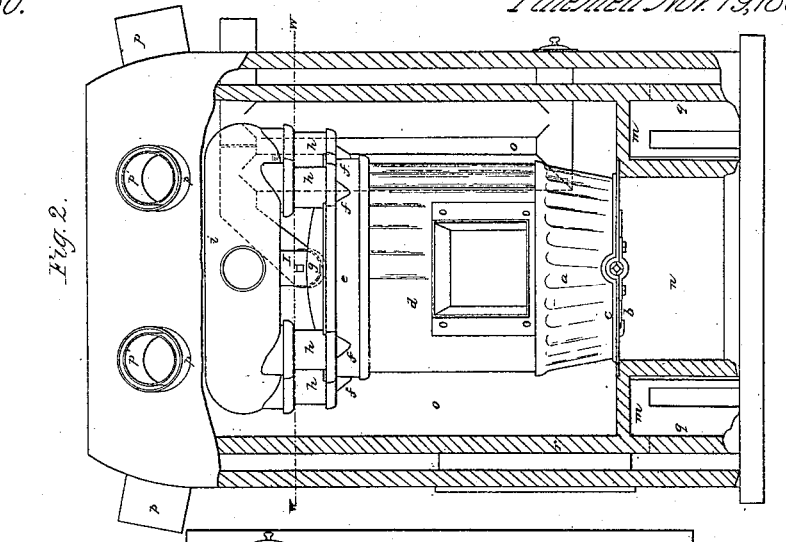

Fig. 2.

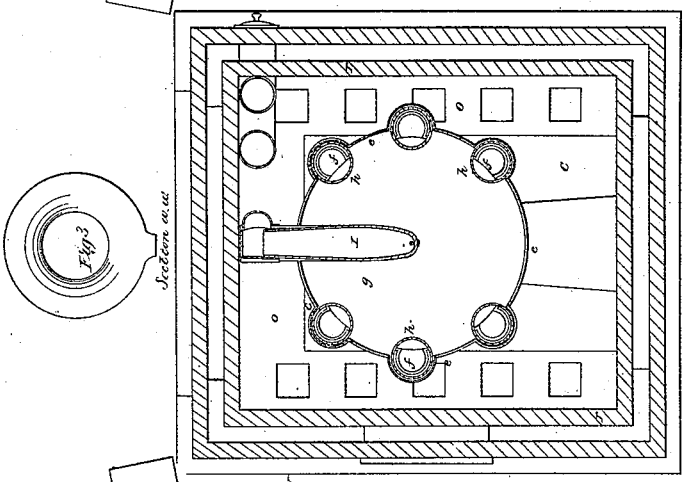

Fig. 4.

Fig. 3

Section on a a.

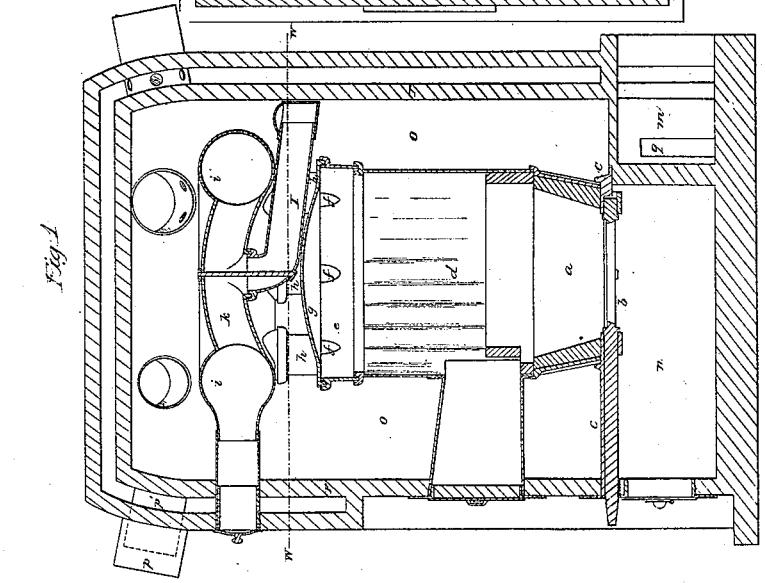

Fig. 1

UNITED STATES PATENT OFFICE.

G. CHILSON, OF BOSTON, MASSACHUSETTS.

AIR-HEATING FURNACE.

Specification of Letters Patent No. 7,780, dated November 19, 1850.

To all whom it may concern:

Be it known that I, GARDNER CHILSON, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Warming and Ventilating Furnaces for Buildings, and that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known, and of the usual manner of making, modifying, and using the same, reference being had to the accompanying drawings, which form a part of the same.

Figure 1 is a vertical section; Fig. 2, an elevation of the furnace with a portion of the front removed. Fig. 3 the annular chamber modified without the cross pipe—Fig. 4 is a horizontal section through the line (*w w*).

To make a perfect furnace for warming, and ventlating, buildings especially when anthracite or other coal or wood, is the fuel to be used, I find from my long experience that certain requisites, are absolutely essential, to effect the object. These I will first enumerate, the more clearly to illustrate my invention, and its purposes; for the construction, although reduced to great simplicity is the work of much time, experience, and labor requiring for its perfection a large expenditure of money. The most prominent things to be observed, are first a broad, shallow, fire surmounted by a large chamber above, of proper proportions, so that the direct rays of heat from all parts of the fire, may impinge upon, and heat the surface in every part alike; and draw off the products of combustion equally, from all sides, into a chamber or other receiver, in which it should be made to circulate more sluggishly, before leaving the furnace. The pressure produced by checking the currents from the second chamber, I find, especially important in abstracting all the heat, from the fuel to a useful purpose.

The above desiderati, must be combined with an apparatus, that will secure a constant supply of fresh air, so arranged as to conduct off into the appartments to be warmed and ventilated the greatest amount of heat, from the fuel consumed, and producing a fresh, healthful, salubrious atmosphere perfectly free from the deleterious effects, produced by red hot iron. All the above effects, must be accomplished within a reasonable space, in height, and other dimensions otherwise the furnace, could not be introduced into all buildings, and a due regard must also be paid, in the construction to its durability, the tightness of the joints, and economy in burning fuel. As there is such a variety of important elements, in the accomplishment of the object in view, the difficulty of overcoming them all, in making a simple structure will be perceived to be very great. The mode that I have discovered to be the best adapted to the purpose, will be detailed in the following description; and is the result of some years approximate labor.

The fire pot (*a*) may be of circular form, and about one half of the height of the common ones, say about seven inches, more or less in depth; its figure is an inverted, truncated cone, and displays a surface of fire, two or three times broader than ordinary fire pots. This portion of the furnace, I line with soap-stone, or fire bricks to prevent the fuel from coming in contact, with the iron, thus preventing the iron from becoming red hot. The inclination of the sides of the pot, keeps the coal compact as it burns down, and thus secures its entire consumption. Heretofore it has been objected that by lining the fire pot, with soap stone or brick, there was a waste of heat, as it was a non-conductor; and that was found to be the fact, in deep, straight, cylinders; but by forming them according to my plan, shallow and flaring, no inconvenience arises from that source, which is an important reason for its adoption. Another point is the fact that this broad, shallow fire, admits air freely to all parts of the coal, and prevents it from clinkering, which always takes place in a deep pot, if lined with soap stone, or bricks.

The fire grate (*b*) used in this furnace, and situated at the bottom of the fire pot, is the lever grate, heretofore patented by me; it is attached to, and turns in, boxes attached to the under side of the bed plate, (*c*) on which the fire pot rests. Over the fire pot, I place a large corrugated cylinder, (*d*,) of wrought, or cast iron resting on the top, of the broad, flaring fire pot, where a flange is made to receive it. The height of this cylinder can be somewhat varied, according to the height of the place where it is set; but it must keep within certain limits, such as will give an equal, or nearly

equal heat to all its parts, by the direct radiation of heat from the fire. At the top of the cylinder, there is a broad, annular, groove formed on the upper side of a flange, at that point into which the lower edge of a ring, (*e*,) fits; around which at proper intervals, are six inverted conic sections, (*f*) projecting. The top edge of this ring (*e*) is formed into a similar groove, or channel, as that just above described. An arched dome or top plate, (*g*) fits on to this ring having cylindrical pipes, (*h*) six in number projecting up from its edges; one half the diameter of said pipes, being made to project over the edge of the plate, to correspond with the conic sections above named. These are the exit pipes from the fire chamber, and draw the products of combustion equally from the center, to all sides of the chamber, instead of concentrating them upon one point, and thus over heating it. The tops of these pipes (*h*) are formed, into grooved cups in the same manner, as the parts below, for the purpose of forming sand lute joints, to allow the different plates, to freely expand, and contract without strain or injury.

The whole of the above described structure is surmounted, by a cylindrical annular chamber, (*i*) (which is cast in one piece, or may be cast in sections,) with six openings on its under side, surmounted by collars that fit into the grooves, on the ends of pipes (*n*). Across the diameter of this ring, (*i*) there is a single pipe (*k*) which is of the same bore as the ascending pipes, (*h*). This pipe curves upward at the center, high enough to admit the attachment, of a descending exit pipe (*l*,) at the center, on the under side, and above the dome of the fire chamber; by this construction it will be perceived, that there are six openings for the products of combustion, into the large annular chamber, which has the same area in its cross section, as the six ascending pipes; and only two pipes of the same capacity, as a pipe (*h*) out of it, which two are united at the center, by only one pipe of the same diameter, as one of the ascending pipes; (*h*) through which the smoke etc. is drawn off to the chimney. I thus effect many important objects, first I draw the heated gases from all parts of the fire chamber, equally as before stated, and collect them in a capacious chamber, above where they attain a considerable degree of pressure, that fully insures the equal heating of all parts, of the annulus, from which they are allowed only gradually to escape, after being fully exhausted of their heat, into a descending pipe; which is so combined with, and proportioned to this annular chamber, as to make all the pipes draw alike. These parts are so arranged, as to have a current of air over their whole surface, without any place for it to stagnate. The course of the air will be explained, after the description of the mode of setting, the furnace.

The walls of the air chamber are double, with an air space between them; the cold exterior air is conducted in, through both walls to an air trench, (*m*,) below the bed plate (*c*,), and around the ash pit (*n*); thence a portion of the air, passes up into the air chamber, (*o*,) impinging against, and passing up over the surface of the cylinder, above the fire pot; thence it rises against the annular chamber, where it divides, one portion going inward, over the dome and around the central pipes, while the other continues up around the outside of the chamber, and is drawn off through short pipes, (*p'*) into the hot air pipes, (*p*) to the several apartments to be heated.

I have just described the course of the air, from that portion of the trench, that passes through the hot air chamber, but there is another portion, passing from the cold air trench that enters between the walls, through openings (*q*) made laterally, through the inner wall (*r*) whence it ascends between the walls carrying up with it, all the heat that radiates through the inner wall, and passes out around the pipe, (*p'*) into a common conductor (*p*) where it commingles, with the air from the furnace. It is obvious that the air, between the walls will only rise when heated, and its rapidity of motion is just equal to the amount of heat radiated through the inner wall. This entirely prevents the radiation of heat into the cellar when the furnace is located there and where the heat would not only be lost, but would absolutely be detrimental, by causing vegetables to decay, and spoil anything that is required to be kept cool. In double walls as heretofore constructed, the air is admitted at the top, and then descends between the walls, passing through the inner wall, to the furnace and thence up to the apartments to be heated. In taking this course it will be perceived that the heat passing through the inner wall must be carried down by the current or lost. Of course a highly heated column of air cannot be readily drawn down, and consequently the supply of air is retarded. This increases the difficulty, and causes the inner wall to become hotter, till the power of the current to descend is overcome and an outward current, through the cold air box is produced. Again the air between the walls, being highly heated, imparts heat, to the outer wall, and thus heats the cellar. In the mean time the furnace is not duly supplied with cold air, and gets intensely hot, which sometimes endangers the building in which it is placed. Instead of making the ring (*e*) separate, as above described, it can be cast with the cylinder:

The annular chamber may also be modified, although I deem the exact form I described as the best. For instance, it may be made without the cross pipe, and have a greater or less number of inlets, without wholly losing its beneficial effects. The advantages of curving the central cross pipe, (*k*,) upward are manifold; first it gives room to attach the exit pipe, below without adding to the elevation of the furnace. The ring formed chamber could not be cast whole, without this curvature, which is a matter of great importance, (although it may be cast in sections) and by its upward inclination, from its junction with the annular chamber, the draft is more perfect than it would be if it passed off horizontally. The surfaces are all curved in this furnace, which enables them to withstand expansion; and contraction; this is further aided by the position of the descending smoke pipe, in a very warm place.

Having thus fully described my air warming and ventilating furnace, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The annular chamber constructed, and arranged substantially in the manner, and for the purposes set forth—with or without the cross pipe.

2. I also claim the mode of conducting off the products, of combustion from the fire through ascending pipes, (*h*,) into an annular chamber, and thence into a central descending pipe, to their exit; and the surfaces being all so constructed of a curved figure, as to allow a diverting influence, and free circulation to the exterior air in the air chamber, to be warmed without over-heating it; while it is by the arrangement of parts, forced to impinge directly against the heated surfaces.

3. I also claim the method of setting the furnace, consisting of a double walled chamber, the inner wall of which, encloses a cold air trench, supplied from without, that surrounds the ash pit, with openings at its top for the proper admission of air, into the air chamber around the furnace, and with lateral openings, into the space between the walls to cause an upward current, which is connected, with the warm air pipes leading to the apartments, by means of which a constant, and pure supply of air is insured, and the heat greatly economized.

GARDNER CHILSON.

Witnesses:
J. J. GREENOUGH,
ROWLAND ENIS.