(No Model.) 2 Sheets—Sheet 1.

G. A. RUSSELL.

HEATING FURNACE.

No. 354,489. Patented Dec. 14, 1886.

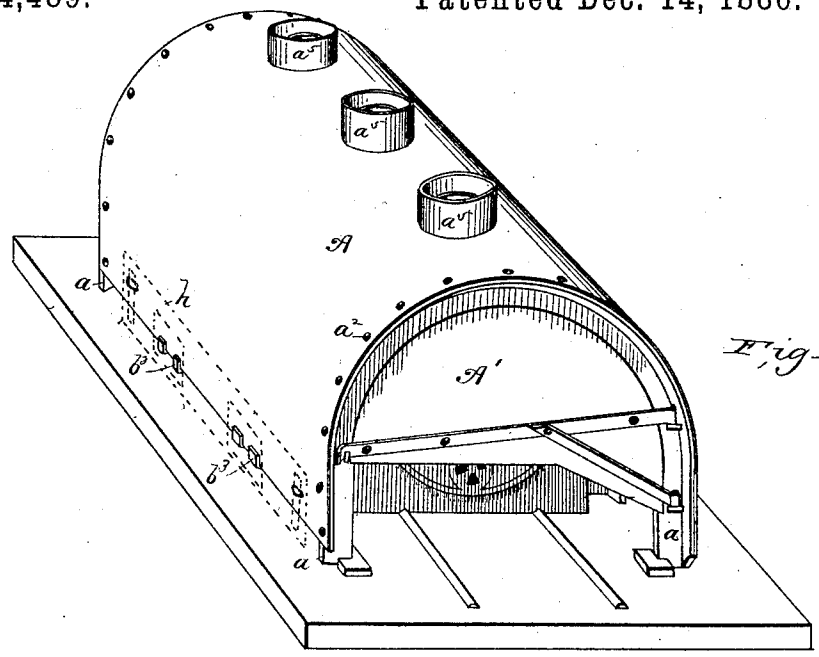

Fig. 1

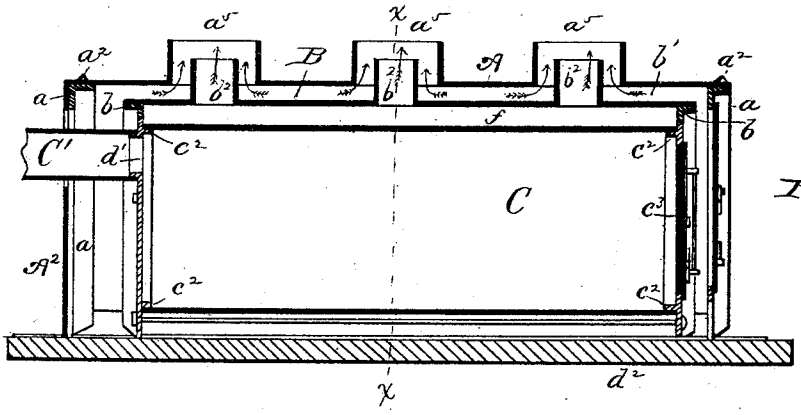

Fig. 2

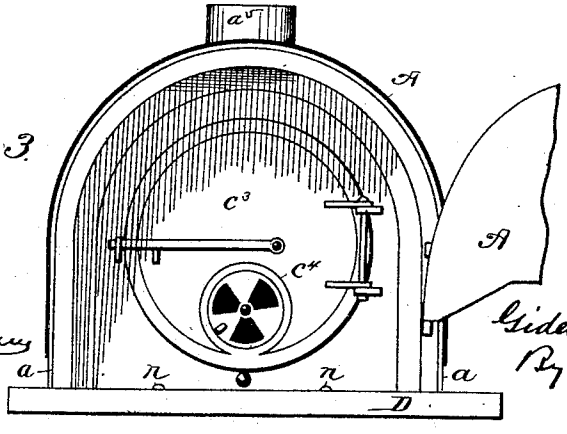

Fig. 3

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(No Model.)

2 Sheets—Sheet 2.

G. A. RUSSELL.

HEATING FURNACE.

No. 354,489. Patented Dec. 14, 1886.

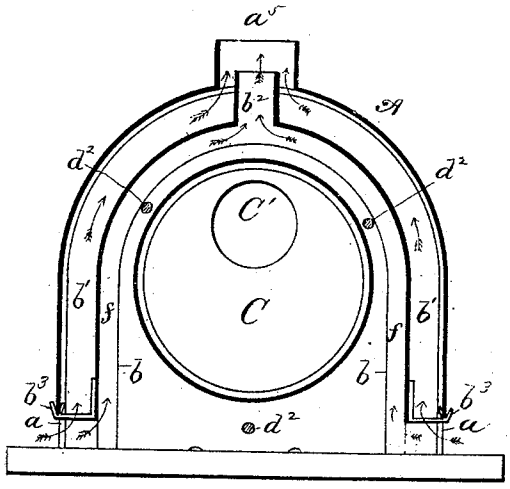

Fig. 4.

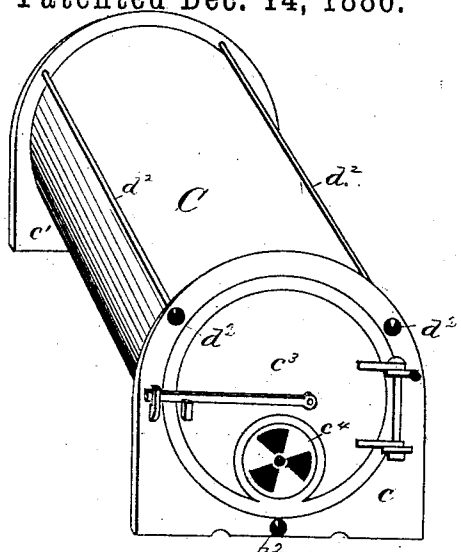

Fig. 5.

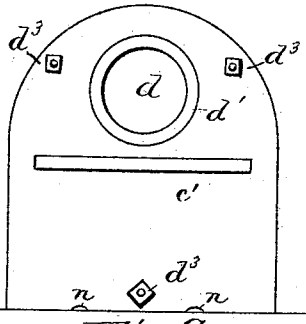

Fig 6.

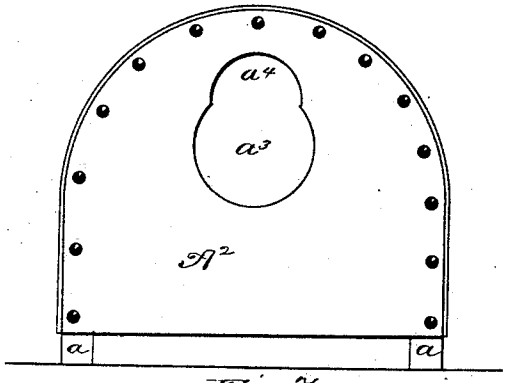

Fig. 7.

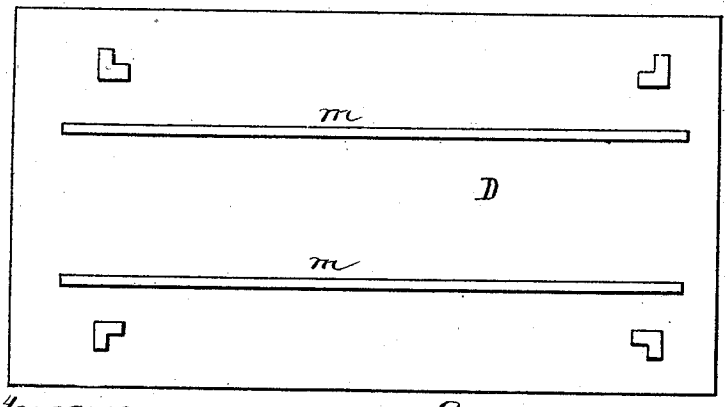

Fig. 9.

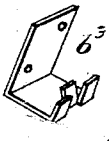

Fig. 8.

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Inventor
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Atty

UNITED STATES PATENT OFFICE.

GIDEON ALONZO RUSSELL, OF LYONS, IOWA.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 354,489, dated December 14, 1886.

Application filed November 30, 1885. Serial No. 184,288. (No model.)

To all whom it may concern:

Be it known that I, GIDEON ALONZO RUSSELL, a citizen of the United States of America, residing at Lyons, in the county of Clinton and State of Iowa, have invented certain new and useful Improvements in Heating-Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in hot-air heating-furnaces designed to increase their heating capacity, lengthen the time of their use without repairs, and lessen their consumption of fuel.

The improved furnace consists, mainly, of a horizontal fire-box adapted to be rotated on bearings to place successively all the portions of the fire-box in contact with the fire, and thus lengthen the time of the use of the box without repairs; of an inner and an outer jacket arranged to form two separate hot-air chambers, both communicating with the hot-air flues, and of cold-air openings all around the furnace to supply cold air to all portions of the heated surfaces and hot-air chambers, all as hereinafter fully set forth and claimed.

In the accompanying drawings, Figure 1 is a perspective view of the entire furnace set up for use. Fig. 2 is a vertical longitudinal section. Fig. 3 is a front end elevation. Fig. 4 is a cross-section on line *x x* of Fig. 1. Fig. 5 is a perspective view of the fire-cylinder detached. Fig. 6 is a back end elevation of the fire-cylinder. Fig. 7 is a back end elevation of the outer jacket. Fig. 8 is a perspective view of one of the side stays detached, and Fig. 9 is a plan view of the furnace-bed.

A designates the outer semi-cylindrical jacket, made of sheet metal, and securely riveted to the cast-iron supporting-ribs *a a*, provided with the flanges *a'*, having the requisite holes to receive the fastening rivets or bolts a^2. The front end of this jacket is provided with a door, A', hinged to lugs on the front rib, *a*, and the back end is closed with a sheet-metal plate, A^2, provided with a smoke-pipe hole, a^3, and hand-hole a^4, for adjusting the smoke-pipe upon or removing it from the collar of the fire-box.

The top of the jacket A is provided with thimbles a^5, to receive the hot-air pipes. (Not shown.) The ends of the supporting-ribs *a* extend below the sides of the jacket, to allow space below the jacket to admit cold air to the furnace.

B designates an inner semi-cylindrical jacket, made of sheet metal, secured to supporting-ribs *b*, extended below the sides of the jacket, similar to the outer jacket and its supporting-frame. The length and diameter of this inner jacket is enough less than the outer jacket to form the hot-air chamber *b'* between the two jackets. The top of the inner jacket, B, is provided with short exit-pipes b^2, made smaller than the thimbles a^5, and extended upward into them, as shown. On the lower edges of the sides of the inner jacket are fastened sheet-metal stays b^3, constructed to receive and hold in place the lower edges of the outer jacket, as shown.

C designates a cylindrical horizontal fire-box, constructed of boiler-iron or of any other suitable material, supported by the end plates, *c c'*, extended below the bottom of the cylinder, to allow proper space between the bottom of the cylinder and the bed of the furnace. The inner sides of these end plates are provided with collars c^2, extended into and forming the bearings of the ends of the cylinder, which is made to fit over and be revolved around the collars, for the purpose hereinafter explained.

The front plate, *c*, is provided with a hinged door, c^3, having draft-openings and a circular damper, c^4. The back end, *c'*, of the cylinder is provided with a smoke-exit, *d*, and collar *d'*, to receive the smoke-pipe C'. The supporting ends of the cylinder are securely fastened and held in place by the stay-rods d^2, the ends of which are threaded and extended through holes in the end plates to receive the threaded nuts d^3 on the outside of the plates. The cylinder is made shorter and enough less in diameter than the inner jacket to form the air-chamber *f* between the cylinder and jacket.

It is evident that the furnace may be made any size to give the required heating capacity, and the relative sizes of the cylinder and the inner and outer jackets may be such as to secure the required size of air-chambers; and in construction these relative sizes may be varied to correspond with the different sizes and heating capacities of the furnaces.

The supporting-frames, extending below the fire-cylinder and the jackets, as set forth, leave the cold-air openings *h* below and all around the furnace, affording thus an abundant supply of cold air for all parts of the hot-air chambers and heated surfaces to force the hot air upward and through the supply-pipes. It is generally believed that the quantity of cold air required in heating-furnaces depends somewhat upon the location of the furnace, the condition of the outside air, and the direction of the wind, and hence that the size of the cold-air openings may be required to be varied; but the difficulties met with in the regulation of the supply of cold air in the operation of the ordinary furnaces arise mostly from the cold air being admitted at one point only of the furnace. The cold-air openings, extending all around my furnace, admit the air at once to every portion of the heated surfaces and chambers, so that the cold air acts at once on all portions of the heated air, forcing it to the exit and supply pipes; and my theory is, that with this system of the supply of cold air the operation of the furnace will be affected much less, if any at all, by the location of the furnace, the changes in the state of the air, or the direction of the wind. It is believed that so much only of the cold air as may be needed will be utilized, and therefore a variation in the size of the cold-air openings will not be required; but if such variation should be found to be desirable it may be readily obtained by a damper, *h'*, adjustably attached to the lower portion of the outer jacket, as shown in Fig. 1 of the drawings.

D designates a bed for the furnace, constructed of brick or any other suitable material, and provided with track rods or bars *m m*, fastened upon the bed in any suitable manner the proper distance apart to form a track for the fire-cylinder, the lower edges of the end plates of which cylinder are provided with notches *n*, to fit over the track-bars, to guide and hold the cylinder in position laterally in being introduced and removed from the furnace for repairs and other purposes.

The horizontal position of the fire-cylinder and inclosing-jackets admits of the construction of a low furnace possessing any required heating capacity adapted to be placed in basements and cellars entirely too shallow to admit the ordinary vertical furnaces. One of the principal difficulties met with in the construction and operation of the vertical furnaces is in the very slight inclination of the hot-air pipes for conducting the heat from the furnaces to apartments of a building. It is well known that the hot air naturally tends upward, and the hot air will flow much more readily through a vertical pipe, or a pipe having a steep inclination, than through a horizontal or slightly-inclined pipe. The ordinary vertical furnaces are too high to allow much inclination to the hot-air pipes even in basements of ordinary height, and in comparatively shallow basements the pipes of such furnaces are necessarily nearly horizontal, requiring very strong currents of cold air to force the hot air through the pipes, thus cooling the heated air and diminishing the supply of heat.

My horizontal furnace is only about thirty inches in height, allowing all the hot-air pipes to be placed on a very steep inclination, so that the heat will naturally and readily flow through the pipes.

The elongated cylindrical horizontal fire-box possesses superior capacity for generating heat. The fire and draft being at the front, the heat is required to pass along the whole length of the cylinder before the smoke or any portion of the heat can escape. The heat naturally rising to the dome or upper portion of any furnace, it is well known that its principal heat-generating surface is the upper portion of its fire-box; hence it is evident that my horizontal fire-cylinder possesses increased heating capacity, because of its increased upper heat-generating surface.

The cylindrical form for a fire-box is better adapted to resist the action of the heat and is less liable to be sprung out of shape by the heat, and is better adapted to be rotated to increase the time of its use than a square or angular-shaped cylinder having flat surfaces.

After the furnace has been in use till the portions of the cylinder in direct contact with the fire have been damaged by the heat the cylinder may be readily withdrawn through the front of the furnace, (the supporting ends of the cylinder sliding on the track-bars,) the stay-rods loosened, and the cylinder rotated partly around on its end bearings, thus turning to the direct action of the fire the portions of the cylinder which have been less affected by the heat. In this manner all the portions of the fire-cylinder may be successively placed in and out of direct contact with the fire; and for the same purpose the ends of the cylinder may be reversed, placing the back end, less affected by the heat, in front and in more direct contact with the fire. By this means the time of the wear of the cylinder may be greatly increased, and when all portions of the fire-box have been successively placed in contact with the fire and the whole box is thus burned out it is drawn out, and the stay-rods are loosened and removed, and the cylinder is taken out and a new one inserted in its place.

In the operation of inserting and removing the fire-cylinder the lower edges of the supporting ends *c c'* slide on the track-bars *m*. The notches *n*, fitting and sliding over the bars, guide and hold the cylinder in position laterally.

While the cylindrical form of the fire-box is preferred, I do not wish to be limited to that form, because an angular fire-box may be employed without departing from the main principles of my invention.

It is well known that heat is generated more

rapidly through thin walls than through thick walls, and for this reason I usually make the fire-cylinder of three-sixteenth-inch boiler-iron.

The two cylindrical chambers, separate from each other and each supplied with cold air all around them, cause two currents of hot air moving in the same direction to enter simultaneously the supply-pipes, as shown by the arrows in the drawings. These double currents of hot air tend to increase the force and accelerate the speed of the currents of hot air through the supply-pipes. It has been tested by actual use that this furnace heats much faster and requires very much less fuel for a given amount of heat than the ordinary vertical furnace.

Though the fire-cylinder constructed as herein set forth is especially adapted for the burning of wood, it may be readily adapted for burning coal by supplying the fire-box with the proper grates and fire-linings.

This furnace being very simple in its construction and the fire-cylinder being changeable and removable, as set forth, the cost of its manufacture and for its repairs is much less, and the time the furnace will last is much greater, than the ordinary vertical furnace.

Having described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with end plates, *c c'*, provided with a flue-door and a smoke-exit, of a horizontal fire-box adjustably connected with and supported by the end plates by suitable devices, as herein set forth, whereby the entire fire-box may be rotated and reversed in position, substantially as and for the purposes described.

2. In a heating-furnace, the combination, with the end plates, *c c'*, provided with a flue-door, a smoke-exit, and bearing-collars, of a horizontal fire-box, C, loosely mounted on the collars, and means, as herein set forth, for securing in place the plates, whereby the entire fire-box may be rotated and reversed in position, substantially as and for the purposes described.

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

GIDEON ALONZO RUSSELL.

Witnesses:
W. W. SANBORN,
W. C. GROHE.