

(No Model.)

3 Sheets—Sheet 1.

J. J. BLACKMORE.
TUBULAR AIR WARMER.

No. 490,763.

Patented Jan. 31, 1893.

Fig. 1.

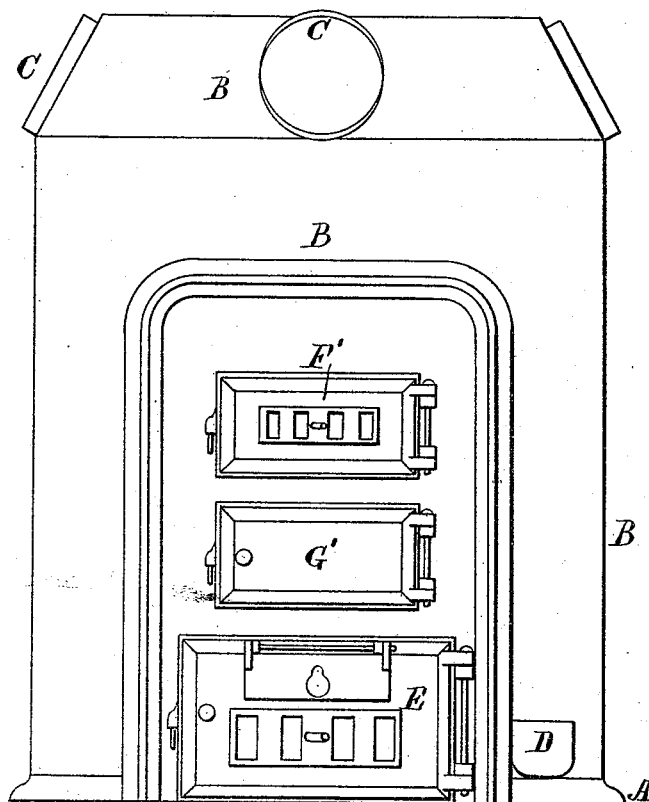
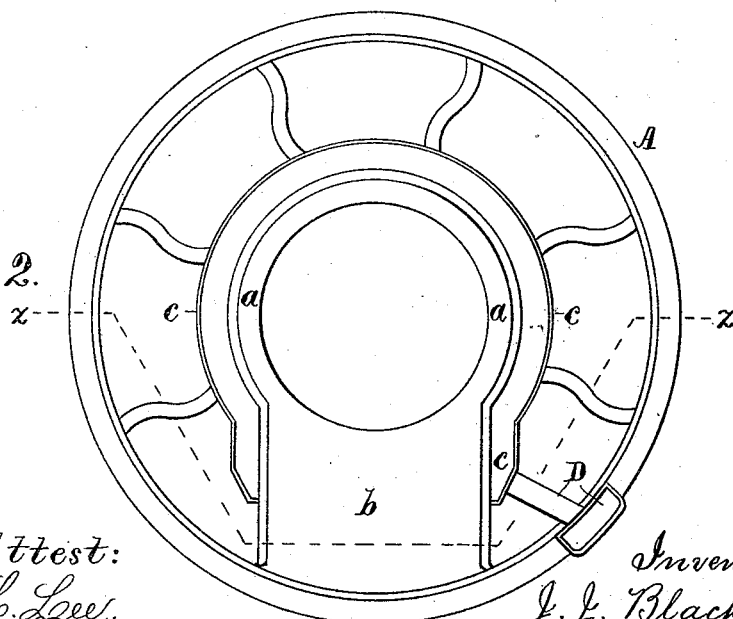


Fig. 2.



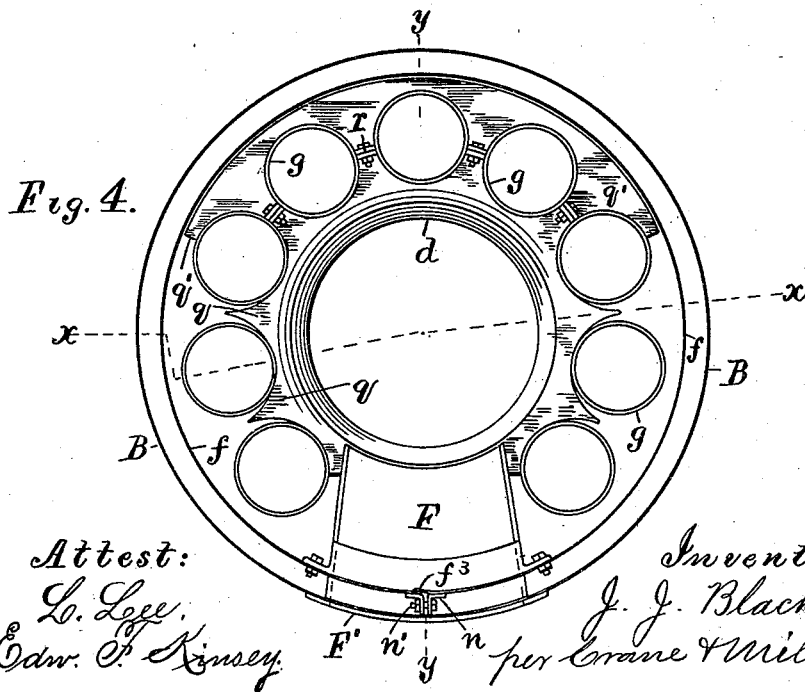
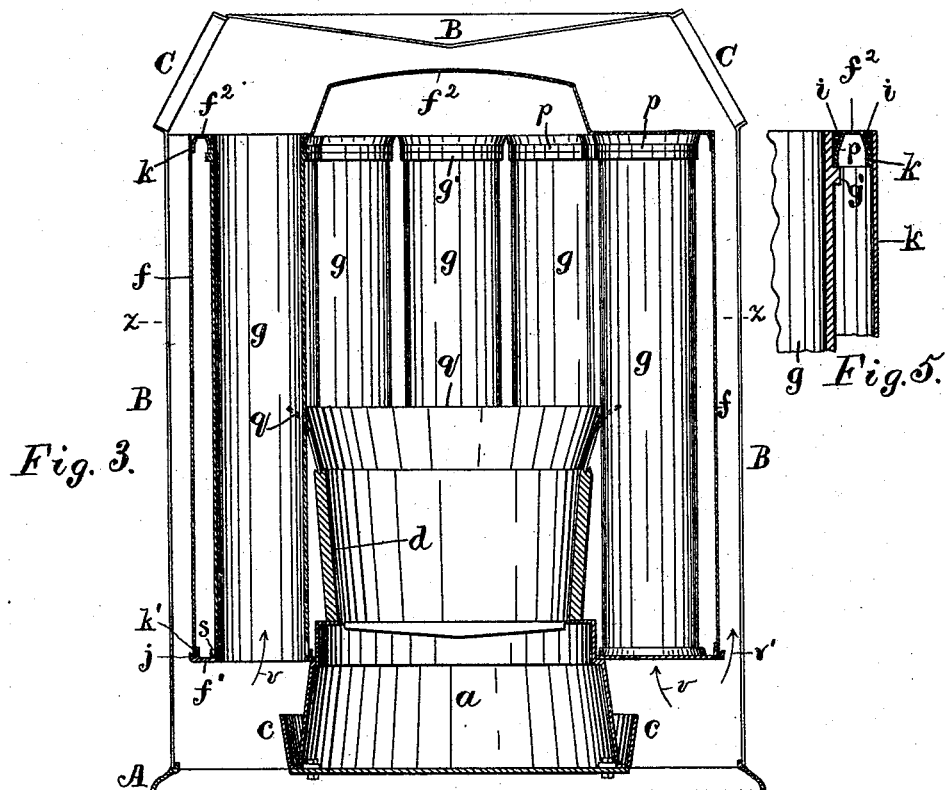
Attest:
L. Lee.
Edw. P. Kinsey.

Inventor,
J. J. Blackmore, per
Crane & Miller, Atty.

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3 Sheets—Sheet 3.

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Fig. 7.

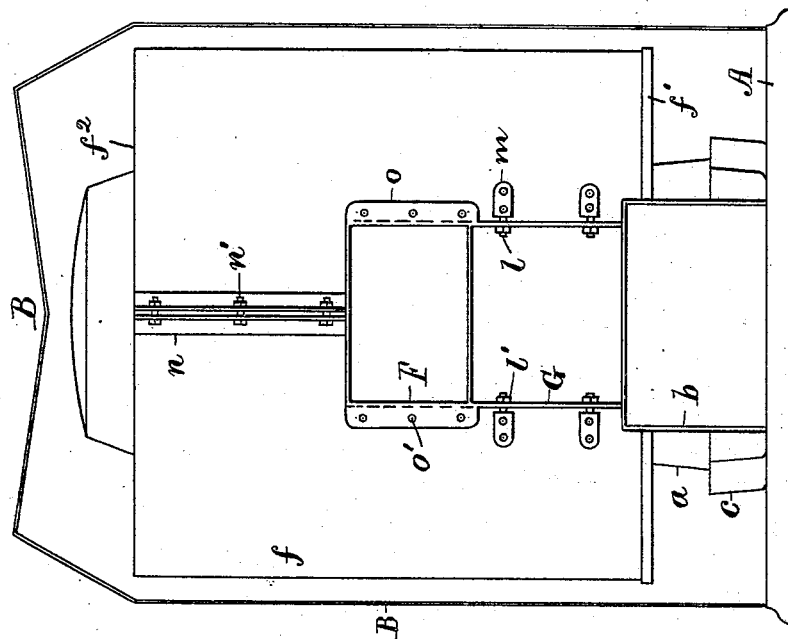
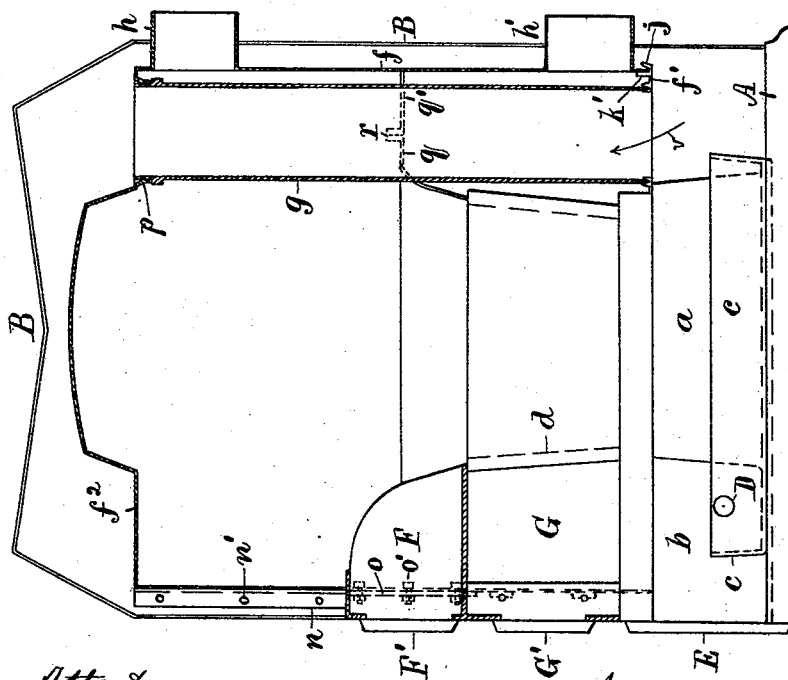


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH J. BLACKMORE, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE
BLACKMORE HEATING COMPANY, OF SAME PLACE.

TUBULAR AIR-WARMER.

SPECIFICATION forming part of Letters Patent No. 490,763, dated January 31, 1893.

Application filed May 16, 1892. Serial No. 433,240. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH J. BLACKMORE, a subject of the Queen of Great Britain, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Tubular Air-Warmers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that class of hot air furnaces in which a fire pot is inclosed within a casing and provided with a drum or radiator in which a series of vertical air tubes is provided for the air to circulate. In furnaces of this class the bottom of the drum has heretofore been set upon a level with the top of the ash box, and the joints between the bottom of the radiator and the jacket have thus been exposed to the direct radiation of the heat from the exterior of the fire-pot, as well as to conduction by direct contact with its lower edge. By my invention the bottom of the radiator drum is set below the bottom of the fire pot where its inner portion is protected from direct radiation from the fire pot by the outer edge of the ash box and where it is sufficiently removed from the fire pot to avoid the wide range of expansion at the joints which would result injuriously, as in the former arrangement. Smoke outlets are extended through the casing from the radiator near its top and bottom, the top one furnishing a direct draft when kindling the fire; and to prevent the air from passing directly from the fire pot to the lower outlet, a deflecting plate or diaphragm of special construction is inserted between the tubes at the top of the fire pot within the rear side of the radiator, thus forcing the heated gases to circulate around the front tubes in their escape to the lower outlet.

Heretofore, a separate water box has been provided for supplying moisture to the heated air, and my present improvements include a water trough cast integral with the lower edge of the ash box, and of which the exterior lower portion of the latter forms one side.

To render the apparatus more portable, I form the radiator in detachable parts and make provision for tightly drawing or straining the jacket of the radiator into contact

with its heads. The radiator in my construction extends above the fire pot to the usual degree, and also extends downward below the same so that it is somewhat larger than those heretofore used; and by the construction just described, I adapt it for transportation in separate parts which much diminishes its bulk.

My improvements also include means for making the joints of the radiator gas tight, and for cleaning it out when required.

In the annexed drawings Figure 1 is a front elevation of the entire furnace; Fig. 2 is a plan of the ash box and base; Fig. 3 is a vertical section on line *x, x*, in Fig. 4, and Fig. 4 is a cross section on line *z, z*, in Fig. 3. Fig. 5 is an enlarged view of the joints at the top of the radiator; Fig. 6 is excepting the fire pot and ash box, a vertical section on line *y, y*, in Fig. 4; and Fig. 7 is a front elevation with the casing in section, showing the means for straining and securing the jacket of the radiator. The door frames are also shown in section on line *z, z*, in Fig. 2.

A is the base of the radiator upon which is set the casing B having the usual collars C at the top to discharge the heated air. The ash box casting *a* is shown formed with a door frame *b* extended through the front of the casing to receive the door E. An annular water trough *c* is formed around the bottom of the ash box and integral therewith, and provided with a pipe D which is extended through the casing to a feeder cup without the same for filling the trough with water. The fire pot *d* is set upon the top of the ash box, and the ash box is formed a little below the seat for the fire pot with a shoulder *s* upon which the bottom *f'* of the radiator is set.

The jacket *f* of the radiator is extended upward from the margin of the bottom, and is closed by a top *f'*². Air tubes *g* are fitted to holes in the top and bottom of the radiator, with their mouths opening into the bottom of the casing adjacent to the sides of the ash box immediately over the water trough D. Smoke outlets *h* and *h'* are extended through the casing B from the top and bottom of the jacket *f*, and would in practice be provided with connections and dampers to use either outlet at pleasure. A door frame F is extended through

the casing to the edge of the fire pot and provided with door F' , and a door frame G of the same width is extended, just below the same, from the casing B to the interior of the jacket f , and provided with a door frame G' which

affords access to the interior of the radiator.

The top f^2 of the radiator is provided with a downwardly projecting flange k (see Fig. 5), and the bottom f' is provided with an upwardly projecting flange k' around which flanges the jacket f is tightly strained, by means applied to its vertical joints. Such means consists partly in bolts l which are attached to the jacket by rivet plates m and are extended through the sides of the frame G , with nuts l' upon the inner sides of the frame; and angle ribs n are also attached to the casing above the door frame F and provided with bolts n' which serve equally to draw the jacket tightly upon the flanges k, k' , when the radiator is erected. The outer sides of the door frame F are also provided with flanges o to which the adjacent edges of the jacket are secured by bolts o' after it is drawn into its proper position. A flange j is formed upon the bottom of the radiator of lesser height than the flange k' , and is arranged to form a groove in which cement may be inserted to pack the joint, and the flange k is also inclined backward from the upper edge of the jacket to form a space for cement which is shown at i in Fig. 5. The lower ends of the air tubes g are also inserted in grooves formed upon the upper side of the bottom f' , and cement may be packed in such grooves when the top f^2 is arranged upon the tubes before the jacket is applied. The tops of the tubes, as shown in Fig. 5, are formed with collars g' , and collars p are projected downward from the top f^2 with a space to admit the cement i in the same manner as upon the flange k .

It will be evident from the construction described that the radiator may be shipped in pieces and may be erected where it is to be used by any competent person and all the joints made gas tight without difficulty. To guard the joint at the front, the edges of the casing may be overlapped behind the angle ribs n , as shown at f in Fig. 4. A star-shaped deflector q is extended from the top of the fire pot outward between the air tubes g , and extensions q' are projected through the same to the jacket between the rear tubes in the radiator to prevent the heated gases from passing directly to the lower outlet h' . The extensions are secured to the deflector q by bolts inserted through lugs r . Apertures t are formed through the sides of the door frame b which afford access to the bottom of the radiator, and permit of the removal of soot from the same in connection with the lower outlet h' which in such furnaces is usually provided with a removable cap upon its outer end.

The air tubes are necessarily omitted from the front side of the furnace where the various door frames are inserted, and the water trough although interrupted by the door

frame b extends around the entire area that is filled with the air tubes, and is therefore adapted to supply the vapor to all of such tubes alike.

It will be noticed that the water trough c is directly under the mouths of the air tubes g , so that the currents of air flowing upward through the tubes as indicated by the arrows v are charged uniformly with the moisture from the trough. It will also be observed that, by casting the water trough integral with the lower edge of the ash box, the exterior of the latter is made to serve as one side of the trough, as shown in the drawings.

Having thus set forth the nature of my invention what I claim herein is:

1. In an air warmer, the combination, with the ash box and the fire pot, of the seat s upon the exterior of the ash box and below the top of the same, the radiator bottom f' supported by such seat with the radiator top f^2 connected thereto by the jacket f , and the hot air tubes g extended through the radiator, substantially as and for the purpose herein set forth.

2. In an air warmer, the combination, with the casing B , of the ash box having the fire pot set removably upon the same, of the frame b extended from the ash pit through the casing, the frame F extended through the casing as set forth, the seat upon the fire pot with radiator bottom f' supported thereby, the radiator top connected therewith by the jacket f , the air tubes g extended through the radiator, and bolts attached to the jacket and extended through the sides of the frame G to tighten the jacket, as and for the purpose set forth.

3. In an air warmer, the combination, with the casing B , of the ash box having the fire pot set removably upon the same, of the frame b extended from the ash pit through the casing, the frame F extended through the casing to the top of the fire pot, the seat upon the fire pot with radiator bottom f' supported thereby, the radiator top connected therewith by the jacket f , the air tubes g extended through the radiator, angle irons attached to the jacket above the frame F with bolts inserted through the same, and the bolts l attached to the jacket and extended through the sides of the frame G to tighten the jacket, as and for the purpose set forth.

4. In an air warmer, the combination, with the fire pot, of the radiator with the jacket f extended to the bottom of the fire pot, and the hot air tubes extended downward past the fire pot and inserted in the top and bottom of the radiator, and the deflecting plate q, q' dividing the radiator horizontally at the rear edge of the fire pot and connected together by means of bolts and bolting lugs r , as and for the purpose set forth.

5. In an air warmer, the combination, with the casing B , the ash box and fire pot inclosed within the same, of the frame F inserted through the casing at the top of the fire pot,

the radiator bottom surrounding the bottom of the fire pot with the projecting flanges *j* and *k'* of different heights, and bolts attached to the jacket and extended through the sides of the frame G to tighten the jacket against the flange *k'* and top *f*², as and for the purpose set forth.

6. In an air warmer, having a radiator with cast metal head and bottom, and sheet metal jacket, the combination, with the same, of metal tubes formed at their upper ends with the collars *g'*, and the collars *p* projected inward from the head of the radiator to receive the necks of the pipes, and provided with a space around such neck for an annular packing, substantially as herein set forth.

7. In an air warmer, the combination, with the casing and an ash box and fire pot enclosed within the same, of a water trough cast

integral with the lower edge of the ash box and encircling the exterior of the same, as and for the purpose set forth.

8. In an air warmer, the combination, with the casing and an ash box and fire pot enclosed within the same, of a water trough cast integral with the lower edge of the ash box and encircling the exterior of the same, a feeder cup without the casing, and a pipe connecting the feeder cup with the water trough, substantially as shown and described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH J. BLACKMORE.

Witnesses:

LLEWELLYN MOORE,

THOMAS S. CRANE.