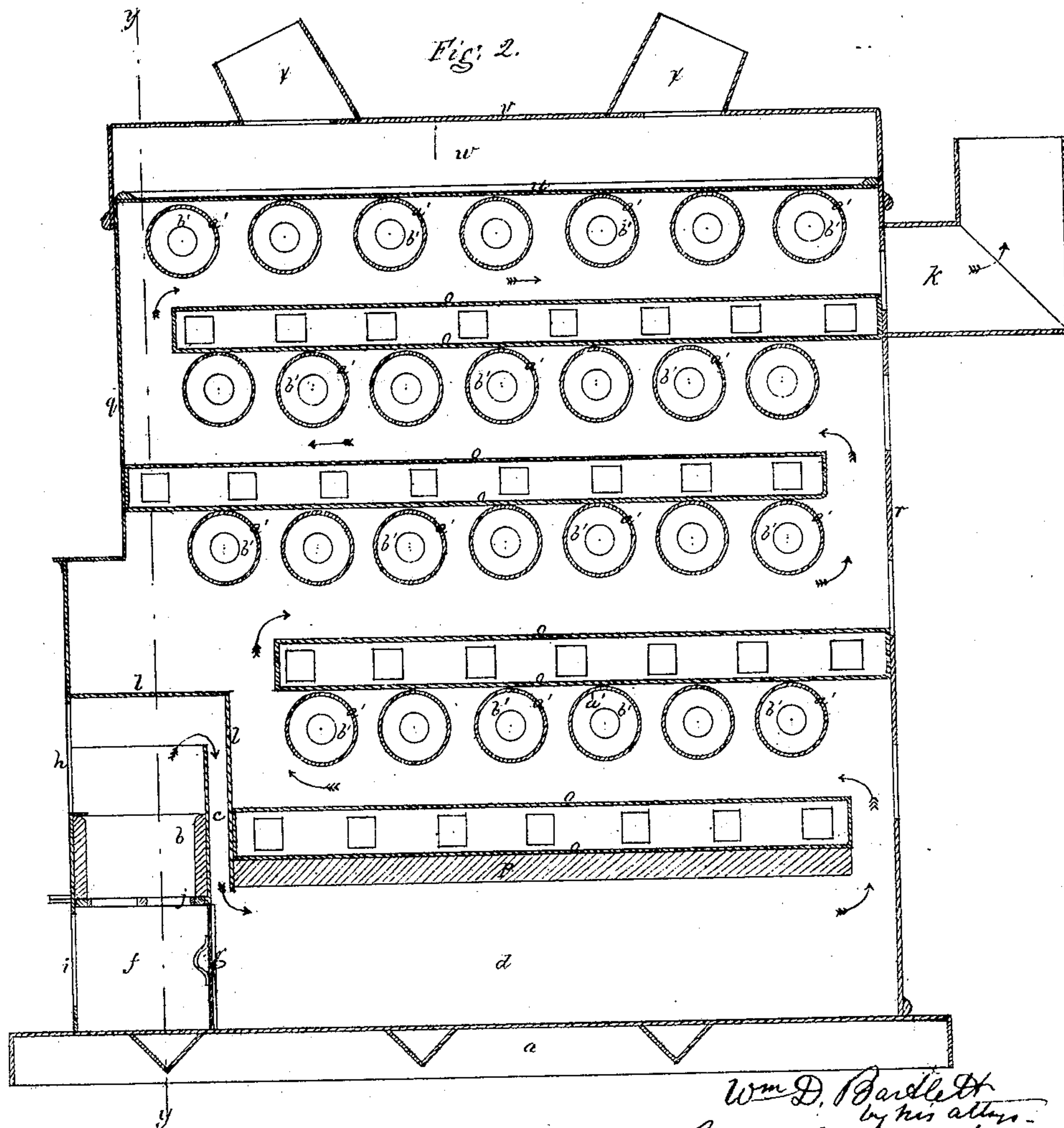
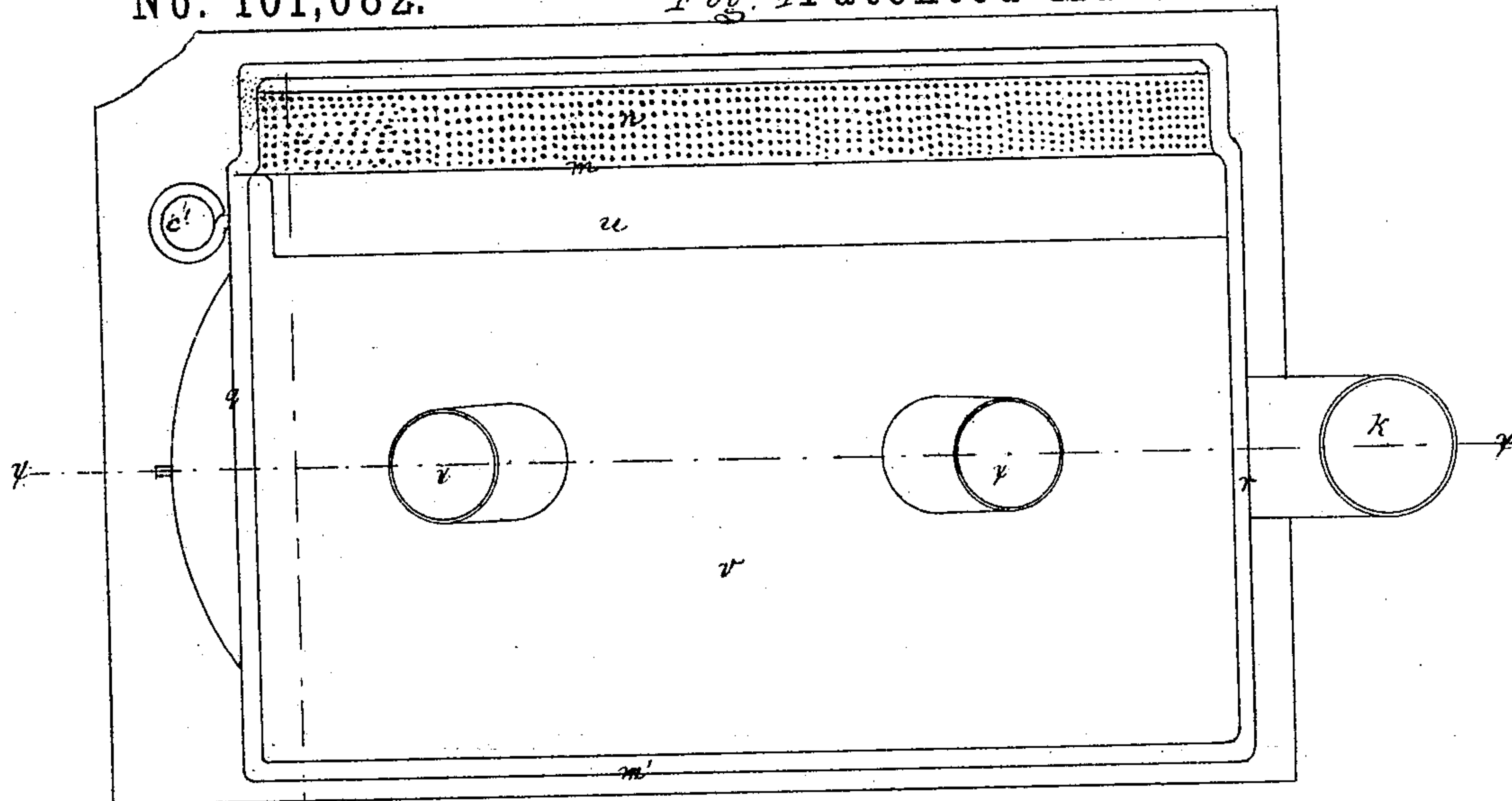


W. D. BARTLETT.

Hot-Air Furnace.

No. 101,082.

Fig. 1 Patented March 22, 1870.



Wm D. Bartlett
by his atty.
Crossy, Halsted & Gould

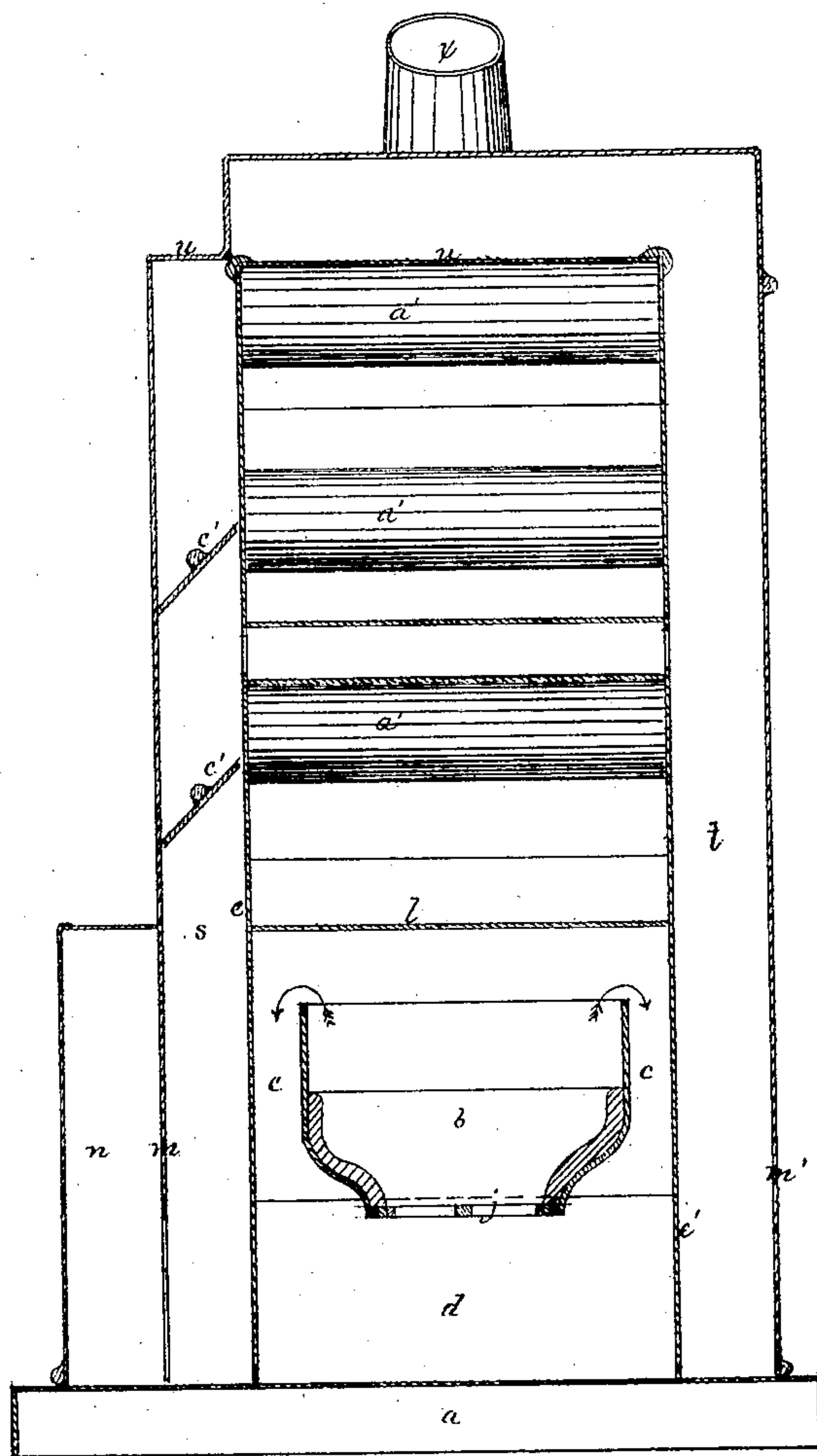
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Patented March 22, 1870.

Fig. 3.



Witnesses } S. B. Kidder.
M. W. Frothingham.

Wm. D. Bartlett
By his Atty.
Crosby, Salistat & Smell

United States Patent Office.

WILLIAM D. BARTLETT, OF AMESBURY, MASSACHUSETTS.

Letters Patent No. 101,082, dated March 22, 1870.

IMPROVEMENT IN HEATING-FURNACES.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, WILLIAM D. BARTLETT, of Amesbury, in the county of Essex and State of Massachusetts, have invented an Improved Furnace; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

A furnace embodying my invention is seen in plan in Figure 1 of the drawings; in vertical central section in Figure 2, the section being taken in the plane of the line *z z*, fig. 1; and in vertical cross-section in Figure 3, the section being taken in the plane of the line *y y*, figs. 1 and 2.

The furnace is erected on a suitable base, *a*, over which, at a height sufficient to give an ash-pit beneath, is set a fire-pot, *b*, provided with a grate, *j*, suitable for burning coal.

All around the sides and rear of the fire-pot is left a flue-space, *c*, communicating with a long high base-flue, *d*, of a width equal to the distance apart of the inner side walls *e e'* of the furnace.

The ash-pit *f* is closed off from the flue *d* by a removable partition, *g*, so that when it is desirable to burn wood instead of coal, the partition *g* is removed, the coal-door at *h* is shut, and long cord-wood is introduced at the ash-door *i* beneath grate *j*, and, being ignited, is consumed on the bottom of the flue *d*.

The side walls *e e'*, are connected by cross-plates, which make within said walls a tortuous flue through which the volatile products of combustion pass from the rear end of the flue *d* to the chimney-funnel *k*, in the direction indicated by the arrows on the drawing.

These plates may be double, as shown, so as to give space between them into which cool air may enter through apertures in one side-wall *e*, and be discharged, when heated, through apertures in the other side-wall *e'*.

Over and around the fire-pot a wall, *l*, is built, preferably of fire-brick, to make a combustion-chamber, from which the volatile products of combustion proceed with a downward draught into the flue *d*.

Outside of the side walls *e e'*, the walls *m m'* are erected, so as to leave air-spaces between the walls *e e'* and *m m'*, and cool air is admitted under proper control into the side box *n* through apertures in the lower part of wall *m*, into the space between walls *m* and *e*.

The space included between the lower cross-plates *o o* is closed at the rear, and also at the front, where said plates abut against the wall of the combustion-chamber, and the lower plate *o* is preferably protected by a facing of fire-brick, *p*, or other suitable material, from becoming overheated.

The front wall of the furnace is marked *q*, and the rear wall *r*, and in practical use they should be made thick, if not double, to prevent radiation therefrom.

The next higher set of cross-plates, *o o*, abuts

against the rear wall, but does not reach the front wall, and the third and fourth sets of plates *o o* are arranged similarly to the first and second sets respectively, openings being made for circulation of pure air through said spaces as before described, so that plates *o o* are radiating surfaces for heating the air which passes between them, in moving from the cold-air space *s* between walls *m* and *e* to the warm-air space *t*, between the walls *m'* and *e'*.

The plate *u* forms the top of the space which is occupied by the volatile products of combustion, and it extends also over the top of the cold-air space *s*.

The wall *e* is continued upward to the same height with the wall *m'* and the walls *q* and *r*, the space included thereby and by the plate *u* and the top *v* of the furnace forming the upper hot-air space or chamber *w*, from which the heated air is conveyed to its destination through distributing-pipes *x x*.

Under the second set of plates *o o*, and under the other sets above, are inserted, in the walls *e e'*, open-ended pipes *a'*, which may act as supports for the lower plate *o* of each set.

These pipes *a'* receive cool air from the space *s*, and pass it when and as heated into the hot-air chamber *t*, from which it passes into the chamber *w*, and out of the pipes *x x*.

To increase the efficiency of the pipes *a'* as heaters of the air passing through them, I place in the ends thereof opening into the space *s* perforated diaphragms *b'*, which contract the openings into the pipes, and allow the cool air to expand therein and check the rapidity of the flow of the air-currents through said pipes.

In the cool-air spaces I place dampers or valves, *c'*, by the position of which I can control the amount of cool air flowing into the upper or lower cross air-flues.

In the rear wall *r* opposite each upper plate *o*, I make cleaning-out holes, through which the solid deposit on said plates can be brought into the lower flue by moving it in directions opposed to those indicated by the arrows in fig. 2, and the lower flue *d* can be cleared of all deposited matter through the ash-door at *i*, after having removed the movable partition *g*.

For the plates *o o* inclosing air-spaces may be substituted solid plates resting on the air-flues *a'*, the pipes *a'* in said case being then the only conduits connecting the air-spaces *s* and *t*.

The furnace may be made up mostly of iron, either wrought or cast, or it may be made, with exception of the fire-pot, grate, doors, dampers, &c., of brick, soap-stone, &c., and the pipes *a'* may be of some kind of clay. When made with the least possible amount of metal, the heat from the furnace will be soft and mild, and the air proceeding from it will be uncontaminated with the coal-gases which are now supposed to pass through heated cast-iron.

The draught of the furnace is to be regulated by

dampers or valves in the fire and ash-pit doors, and by a valve in the smoke-funnel, by which more or less air can be admitted into or excluded from it.

Furnaces made as shown and described have so large an area of radiating-surface that all the heat generated from combustion of fuel therein is communicated to the air admitted to the air-spaces of the furnace, except that amount which is necessary to create a chimney-draught; and the flue through the furnace for the escaping volatile products of combustion, though long and tortuous, is yet free and unobstructed.

I claim—

The furnace as made with a tortuous ascending flue leading from the base-flue *d* to the smoke-outlet *k*, and with vertical cold and hot air-spaces *s* and *t* united by horizontal air-flues, all arranged and operating as described.

Also, the elevated fire-pot *b*, the down-draft flue *c*, base-flue *d*, movable partition *g*, and ash-pit *f*, combined and arranged as and for the purpose specified.

Also, the arrangement of the air-flues *a'*, as described, when made with contracted entrances for the cold air, and full openings for the escape of the hot air, as described.

Also, the arrangement of a damper or dampers *c'* in the vertical cold-air space *s*, so as to cause the cold air to pass more or less through the upper or lower air-flues on its way to the hot-air space *t*, as may be desired.

WM. D. BARTLETT.

Witnesses:

J. B. CROSBY,
S. B. KIDDER.