

# A. Knobel. Hot-Air Furnace.

N<sup>o</sup> 76203

Patented Mar. 31, 1868.

Fig. 6.

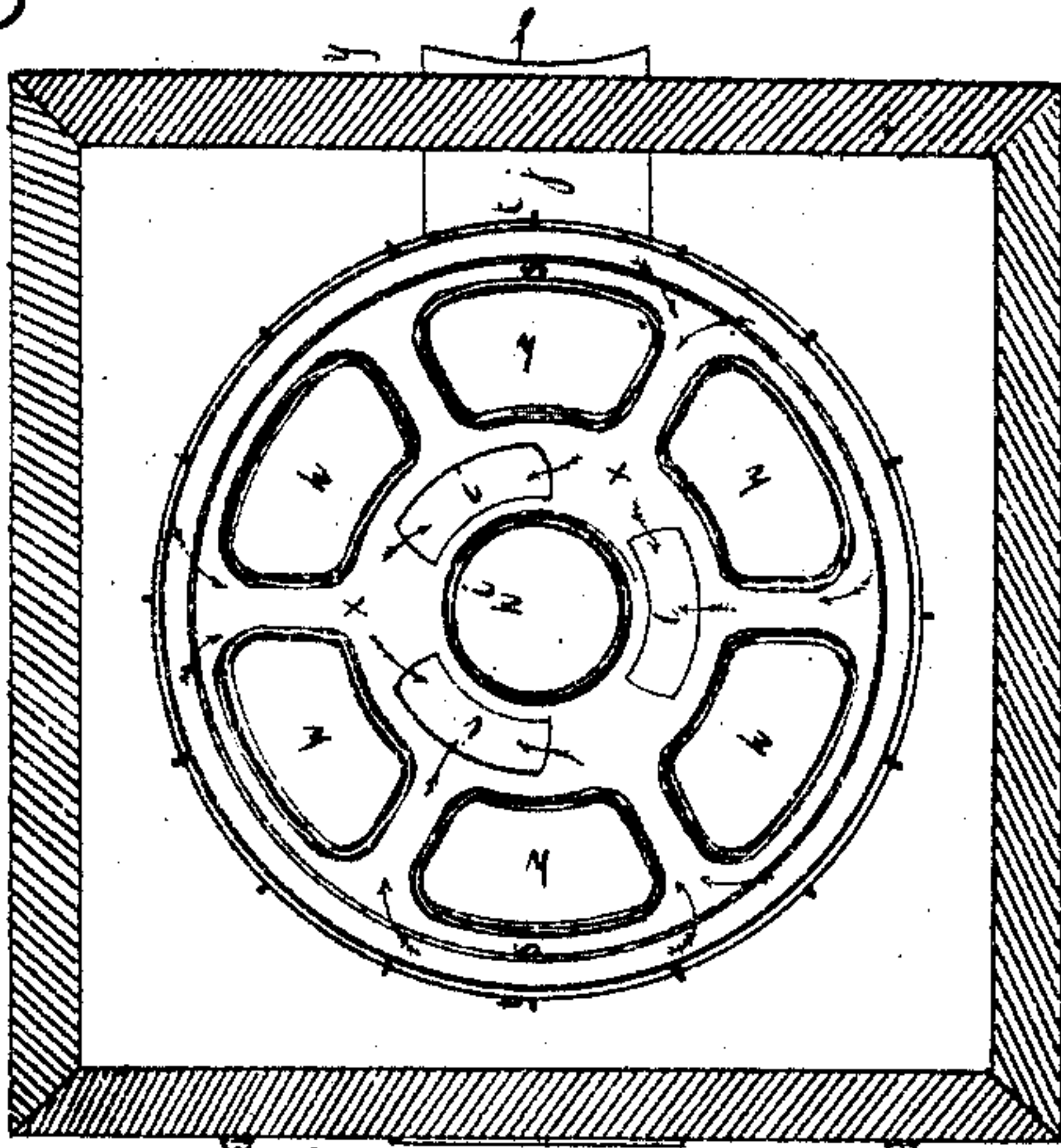


Fig. 7.

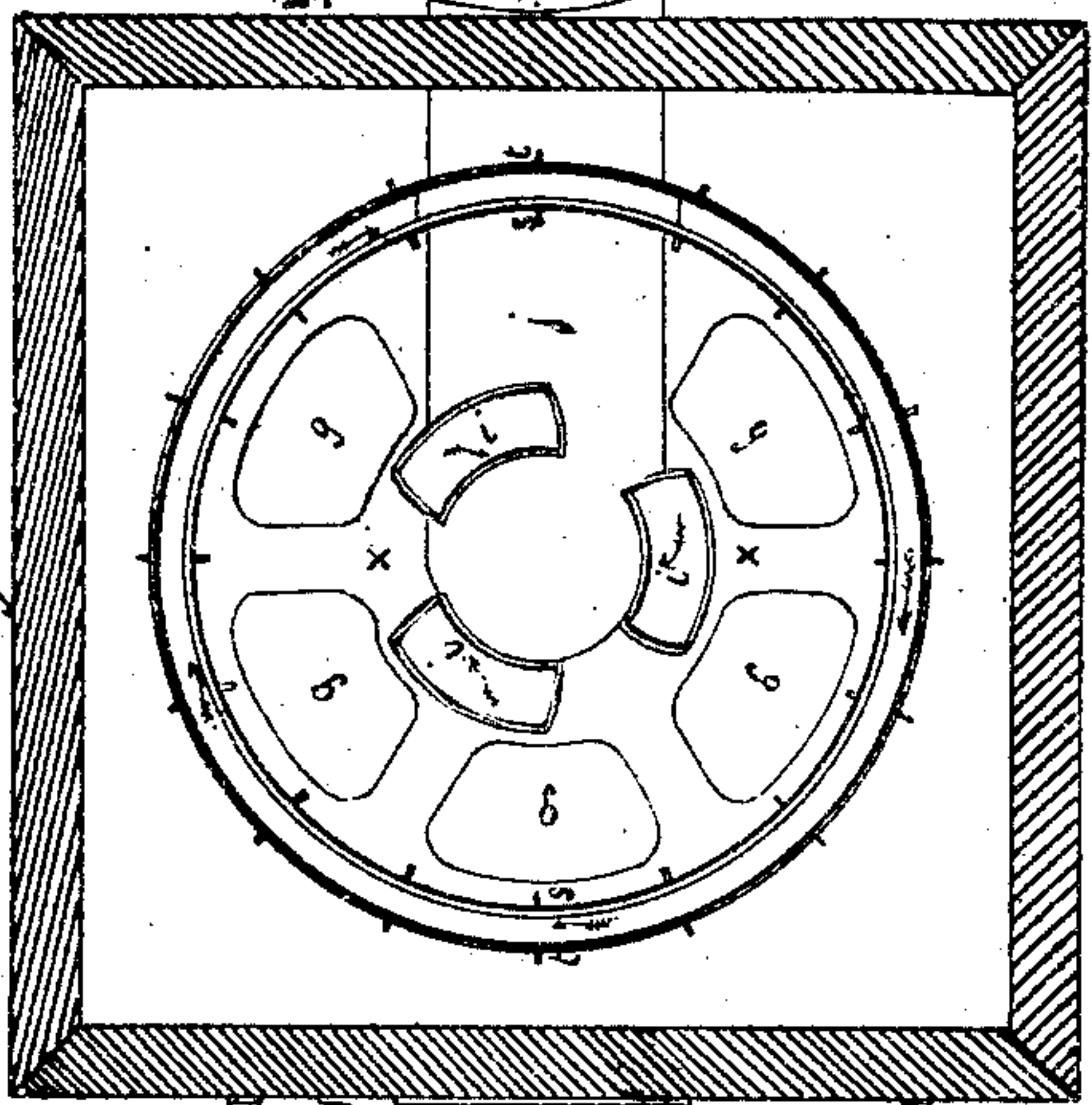


Fig. 8.

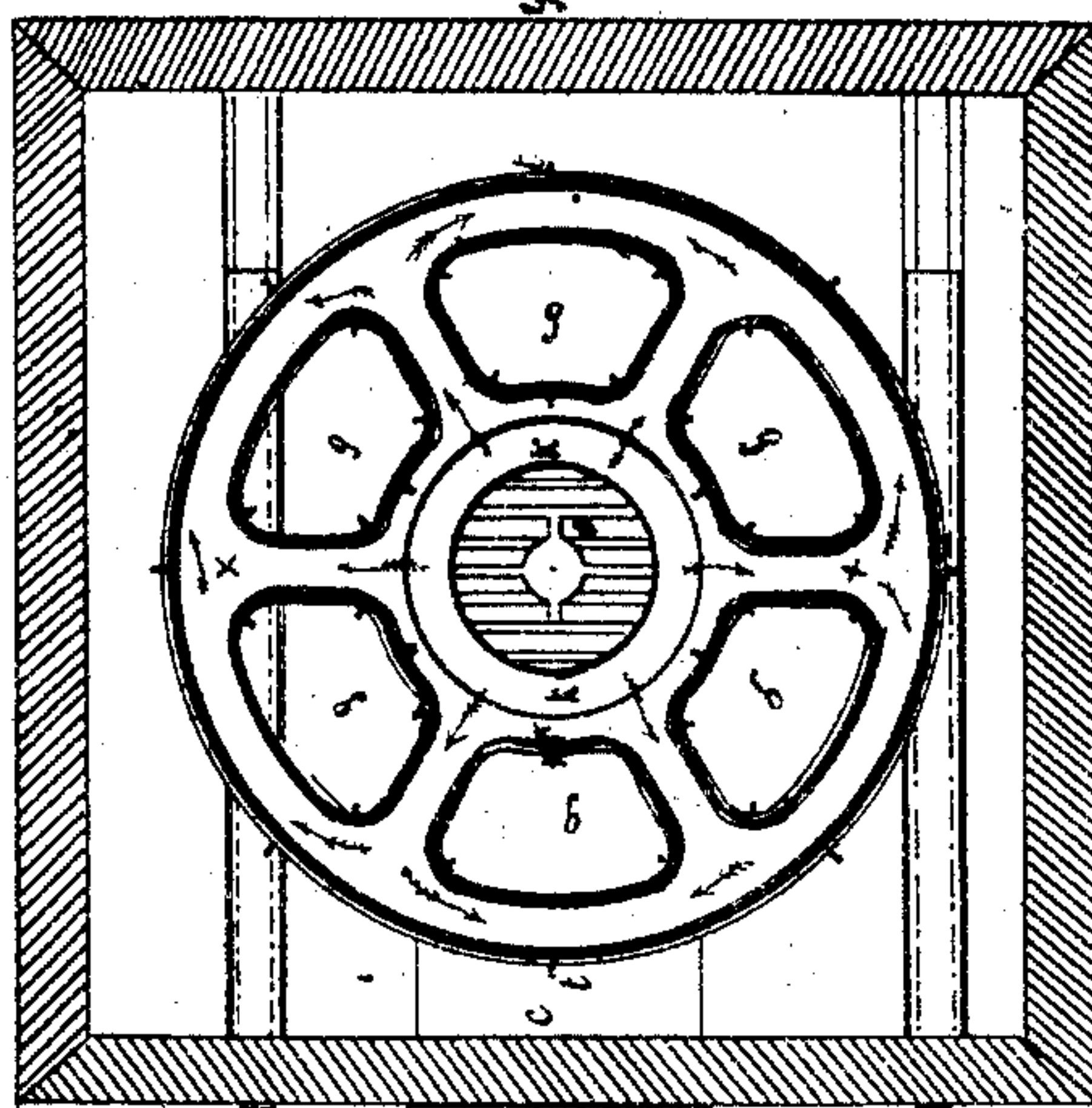


Fig. 9.

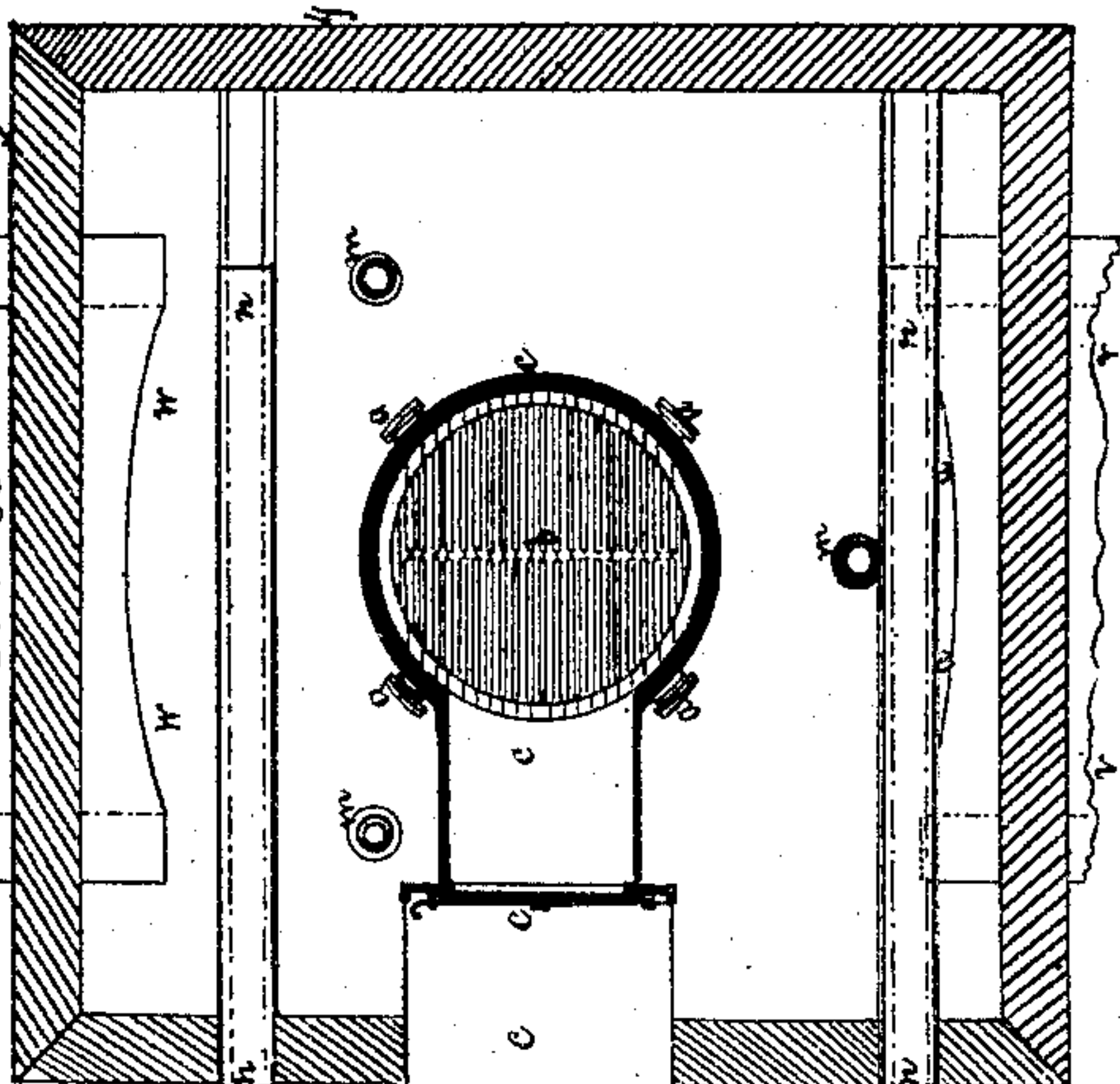
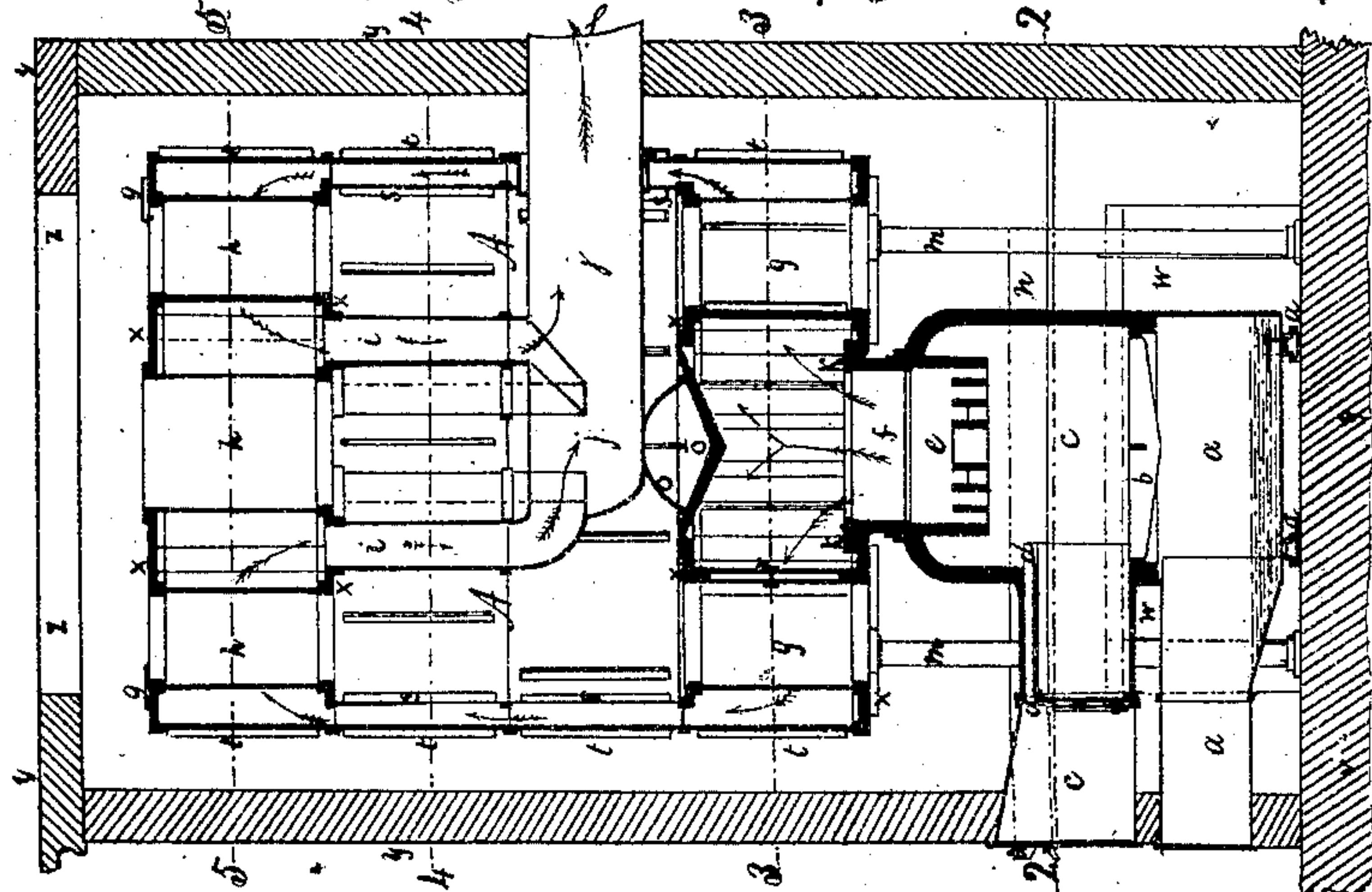


Fig. 1.



Witnesses

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ANDREW KNOBEL, OF MONROE, WISCONSIN.

Letters Patent No. 76,203, dated March 31, 1868.

## IMPROVEMENT IN HOT-AIR 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, ANDREW KNOBEL, of Monroe, Green county, Wisconsin, have made certain new and useful Improvements in Heating-Furnaces; and I do declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings making part of this specification, in which—

Figure 1 represents a vertical section.

Figure 2, a horizontal section on red line in fig. 1, marked 2 2.

Figure 3, a horizontal section on red line marked 3 3.

Figure 4, a horizontal section on red red line marked 4 4.

Figure 5, a horizontal section on red line marked 5 5.

Like letters refer to like parts in all the figures.

The nature and object of my invention consist in constructing a heating-furnace so as to more perfectly consume the fuel and utilize the heat generated; in making provision for keeping the heated air moist; in providing a gas-burner of peculiar construction above the fire-pot; in the peculiar construction and arrangement of the passages and chambers for heat and air; and in the several devices and combinations hereinafter fully set forth.

To enable others skilled in the art to make and use my invention, I proceed to describe its construction and operation.

In the drawings, *a* represents the ash-pan; *a'*, mouth of ash-pit; *a''*, four supports on which *a* rests. The ash-pan has a regulator or door attached for regulating the air to be consumed. The pan may be filled with water, as shown in fig. 1. The water, becoming heated, evaporates rapidly, and the vapor ascending through the grates, and being mixed with fresh air, causes a thorough combustion. The fuel is placed on the grate *b*. *c* is the fire-pot, the opening to which is closed by the door *c'*. *c''* is the connection between the fire-pot and the wall or enclosure. Above the door or opening *c* is a narrow air-passage, which conveys, in fine streams, hot air to the gas-burner *e* above the fuel. This passage is provided with a door or regulator in front. The gas-burner *e* consists of a cylindrical basin suspended above the fireplace, as shown in fig. 1, manufactured of suitable metal, and provided with a number of perpendicularly-arranged plates, and the spaces between the plates should together have greater capacity than the smoke-pipe *j*. *f* is a cylinder, above and resting upon the gas-burner *e*, through which the products of combustion are conveyed to the smoke-passages. *g* represents vertical pipes, as shown in fig. 3, which pass through the plates *x' x''*, connecting them together, and forming passages through which air enters the furnace. *h* represents other vertical pipes or air-passages, similar to *g*, and located above them, passing through and connecting the plates *x''' x''''*. The central pipe *h'* is made removable, for the purpose of cleaning, when necessary. *i* represents the pipes through which the smoke is conveyed from the body of the furnace into the escape-pipe *j*, which is connected with the chimney. The diameter of this pipe is one-third the diameter of the grate *b*, and it is provided with a regulator or damper, and a door for cleaning the pipe *j* outside of the wall *y*. The passage for the smoke-pipe *j* between the cylinders *s'* and *t''* is closed around the opening by a separate pipe, somewhat larger than *j*. *k* is an annular plate, provided with annular flanges, to which the cylinder *f* and plate *x'* are connected; and by which the fire-pot and smoke-passages are entirely separated and cut off from the air-passages. That portion of the furnace containing the air-tubes and cylinders is supported by the pillars *m*. Water-tubs *n*, provided in front with a funnel and cock, rest on iron rails. *o* is a conical plate to convey the products of combustion to the spaces between the pipes *g*, and to prevent the passage of the smoke into the air-chambers. *o'* is a bar supporting the inner end of the pipe *j*. *q* represents covers over ports, for cleaning the smoke-passages *t'' t''' s' s''*. The smoke-passage *t'* can be cleaned through the door *r*. *s' s''* are two cylinders or cylindrical sections. *s'* rests on plate *x''*, and *s''* rests on the upper edge of *s'*. The plate *x'''* is supported by *s''*. The two plates *x'' x'''* and the cylinders *s' s''* form a large space, cavity, or chamber, A, in which to heat a large volume of air, which is heated partly by the heat in the smoke-passages surrounding the cavity or chamber A, and partly by the pipes *i* and *j* which pass through the chamber A. *t' t'' t''' t''''* are large cylinders standing one upon another, and surrounding the whole of the apparatus above the plate *x'*, and, with the cylin-



ders  $s' s''$ , forming smoke-passages, as shown. Together, they form the surrounding of the smoke and air-passages, and also form a heating-surface to heat the air between them and the walls  $y$ . These cylinders, as well as cylinders  $s' s''$  and the pipes  $g$  and  $h$ , are provided with ribs or projections or corrugations, to enlarge the heating-surface.  $v v$  are openings through the walls  $y$ , fig. 2, which continuously supply the apparatus with fresh air. These openings can be as numerous as may be desired. They should be provided with regulators, and their capacity should equal one-twentieth of the heating-surface.  $w w$  are the inner ends of the openings  $v v$ .  $x'$  is a base-plate, on which the cylinders  $t' t'' t''' t''''$  rest, as shown, and this plate is supported on pillars  $m$ , and is connected with plates  $x''$  by the pipes  $g$  which support it.  $x''$  is the plate on which the cylinders  $s$  rest.  $x'''$  is a plate resting on cylinder  $s''$ , and perforated by the openings  $g$ , air-pipe  $h$ , and smoke-pipes  $i$ .  $x''''$  is an upper plate resembling  $x'$ , and perforated by openings  $h q$ .  $y y$  is an enclosure, of common brick, enclosing the apparatus, and at proper distance therefrom, but it should be so far away that a current will be created in the space, utilizing the heat of the outside surface of the apparatus.  $z$  is an outlet for the air after it has been heated. Each outlet should be provided with a regulator, and the capacity of the outlets should be in the aggregate a little larger than the inlets  $v w$ .

The flesh-coloring in the drawings shows the air-currents, the white shows the smoke-currents. The sections cut through iron are colored blue, the brick-work red.

The furnace may be made of cast or sheet iron, or other suitable material, and the several parts may be cemented together with any suitable composition. When made of either material, the furnace will be made in cylindrical sections, as shown.

It will be seen that the cylinders  $s''$  and  $t'''$  can be removed, and the upper one,  $t''''$ , with its flues and pipes, attached to cylinders  $s'$  and  $t''$ , and fit without any change in any of the remaining cylinders, and thereby materially reduce the height of the furnace. Additional ones can also be inserted, so as to increase its height and adapt it to the height of any basement or place where it is to be used, and all of these changes in height and capacity can be produced without any change of construction or of patterns, which is of great advantage, particularly when made of cast iron, and of great convenience in adapting it to different localities.

In use, the fire is made in the usual manner. Air may then be admitted to the fire-chamber through the passage  $d$ , to aid the combustion of the gases in the gas-burner  $e$ . An intense heat will be formed at this point, the burner will become red hot, a rapid current of air will be produced, and smoke and gases will be thoroughly consumed. The heat and unconsumed products pass into the smoke-chamber immediately above the cylinder  $f$ , and, finding their way around the air-passages  $g$ , pass into the smoke-passage between the outer cylinder  $t'' t'''$  and  $s' s''$ . Thence, they pass into the upper smoke-chamber, and, there finding their way through the spaces around the air-passages  $h$ , they pass downwards, through the pipes  $i$  into the outlet-pipe  $j$ , as indicated by the arrows.

Currents of air entering at the openings  $v$ , pass into the apparatus, and through all the air-passages therein, and also around the apparatus to the opening  $z$ , taking up nearly all the heat generated, and by means of the peculiar arrangement of the passages for heat and air, nearly all the heat is utilized. The air is kept moist by means of evaporation from the reservoirs  $n$ , and a supply of hot water is also provided.

A water-reservoir might be so placed that one end would project into the space above the burner  $e$ , and there be in contact with the flames. A great quantity of hot water could thus be obtained, or steam could be made for heating purposes.

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

1. Providing the ash-pit  $a$  and fire-box  $c$  with lined openings  $a' a''$  extending through the outer wall, substantially as specified.
2. The suspended gas-burner  $e$ , constructed and operating substantially as specified.
3. Constructing the furnace in cylindrical sections, so arranged that the middle sections  $s''$  and  $t'''$  may be removed or others added, without changing the other sections, substantially as specified.
4. Supporting the chambered and flued portion of the furnace upon the pillars  $m$ , and the combustion portion upon the pedestals  $a''$ , as described, so that the combustion portion  $a$  and  $c$  may be removed or replaced without disturbing the heating portion.
5. The small central chamber  $f$ , located immediately above the gas-burner  $e$  and fire-box  $c$ , for burning the unconsumed products of the fire below, and provided with side openings at the top, door  $r$ , and conical inverted plate  $o$ , substantially as specified.
6. The combination and arrangement of the fire-box  $c$  and gas-burner  $e$ , with the cylindrical sections  $t' t'' t''' t''''$  and  $s' s''$ , divided and supported by the horizontal plates  $x' x'' x''' x''''$ , substantially as and for the purposes specified.

Witnesses:

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