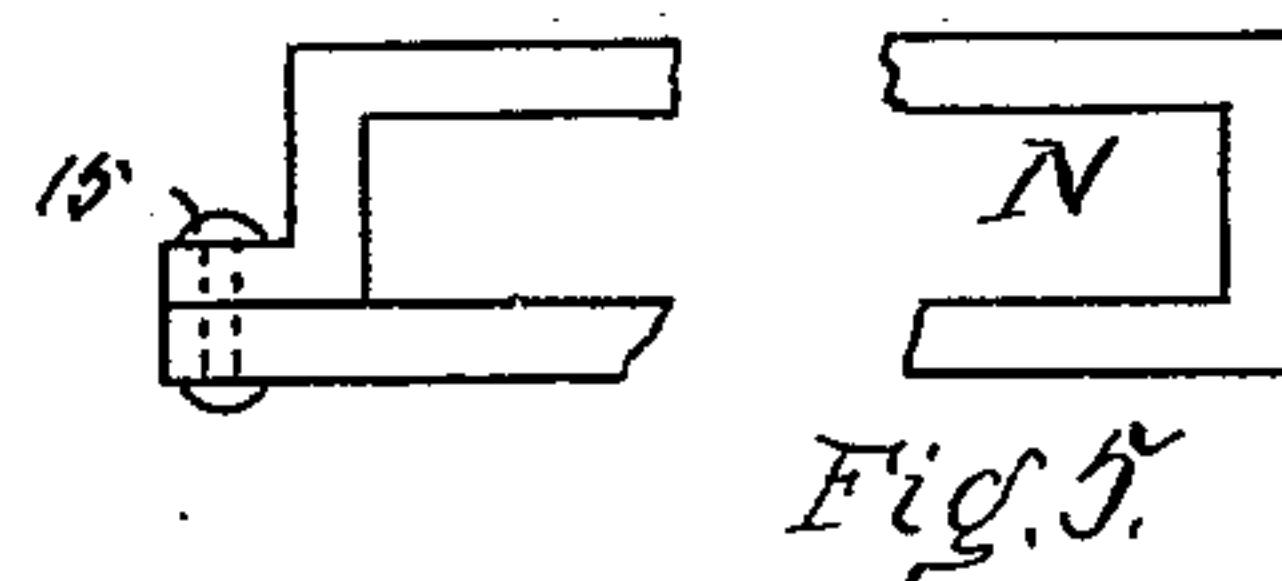
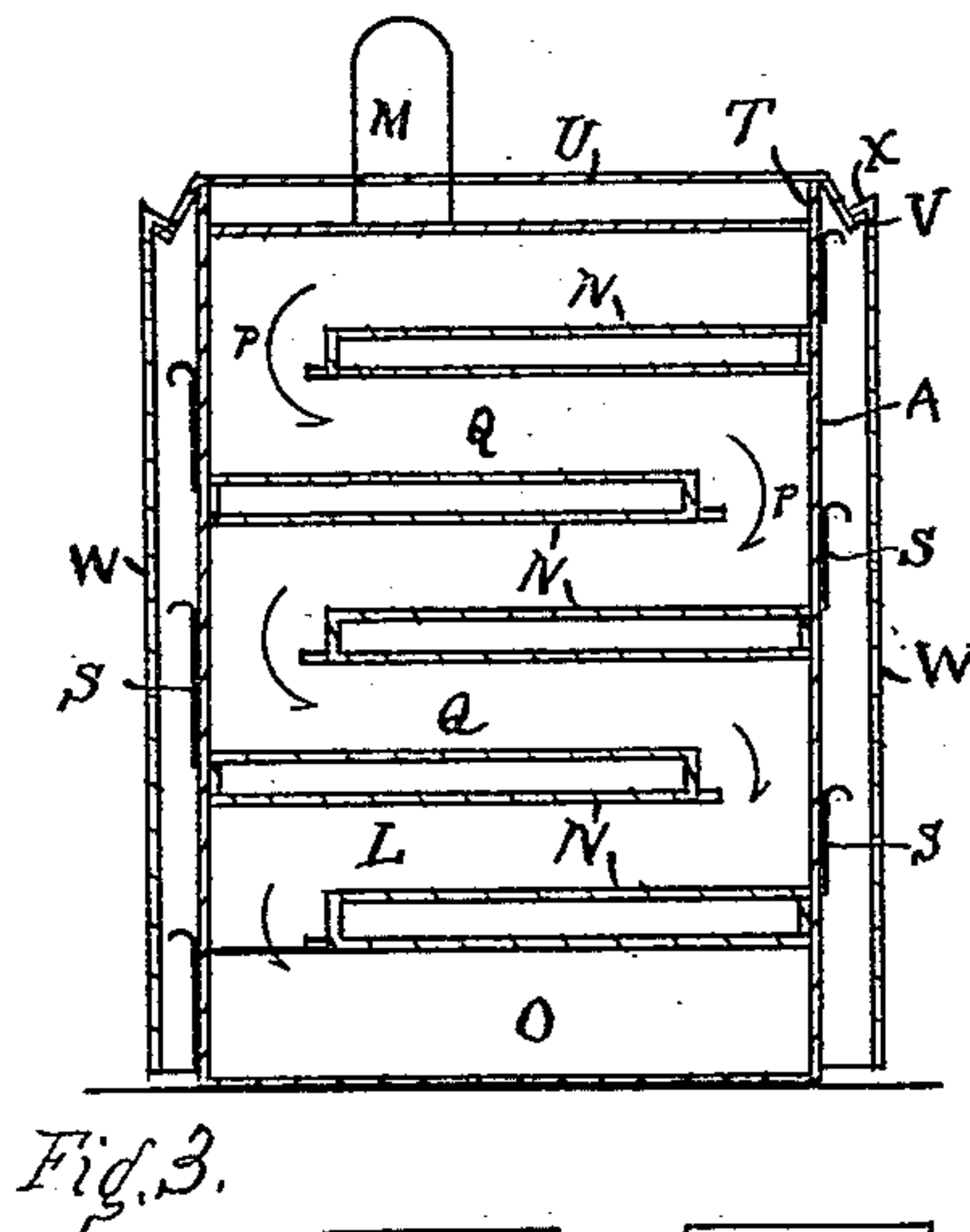
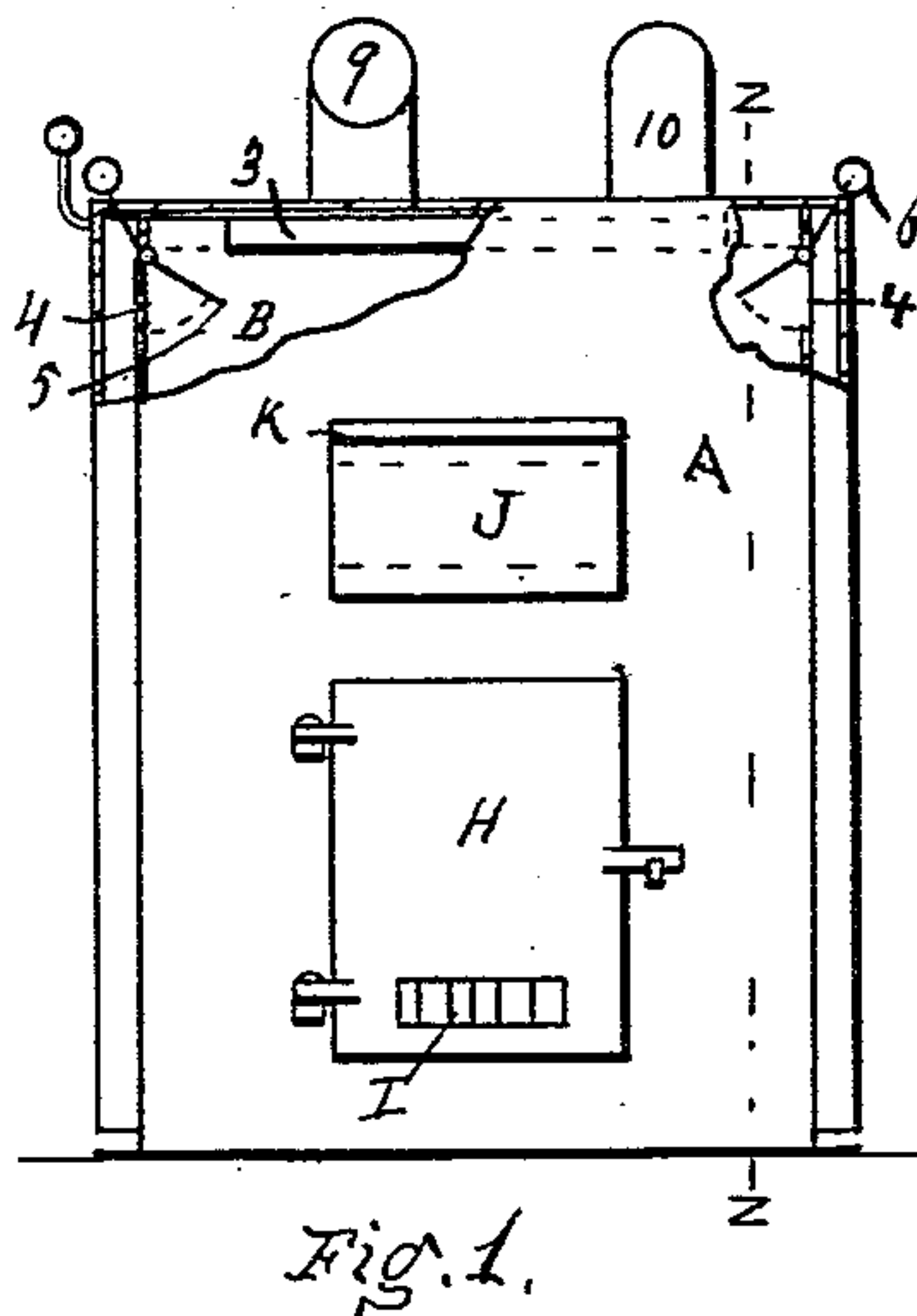
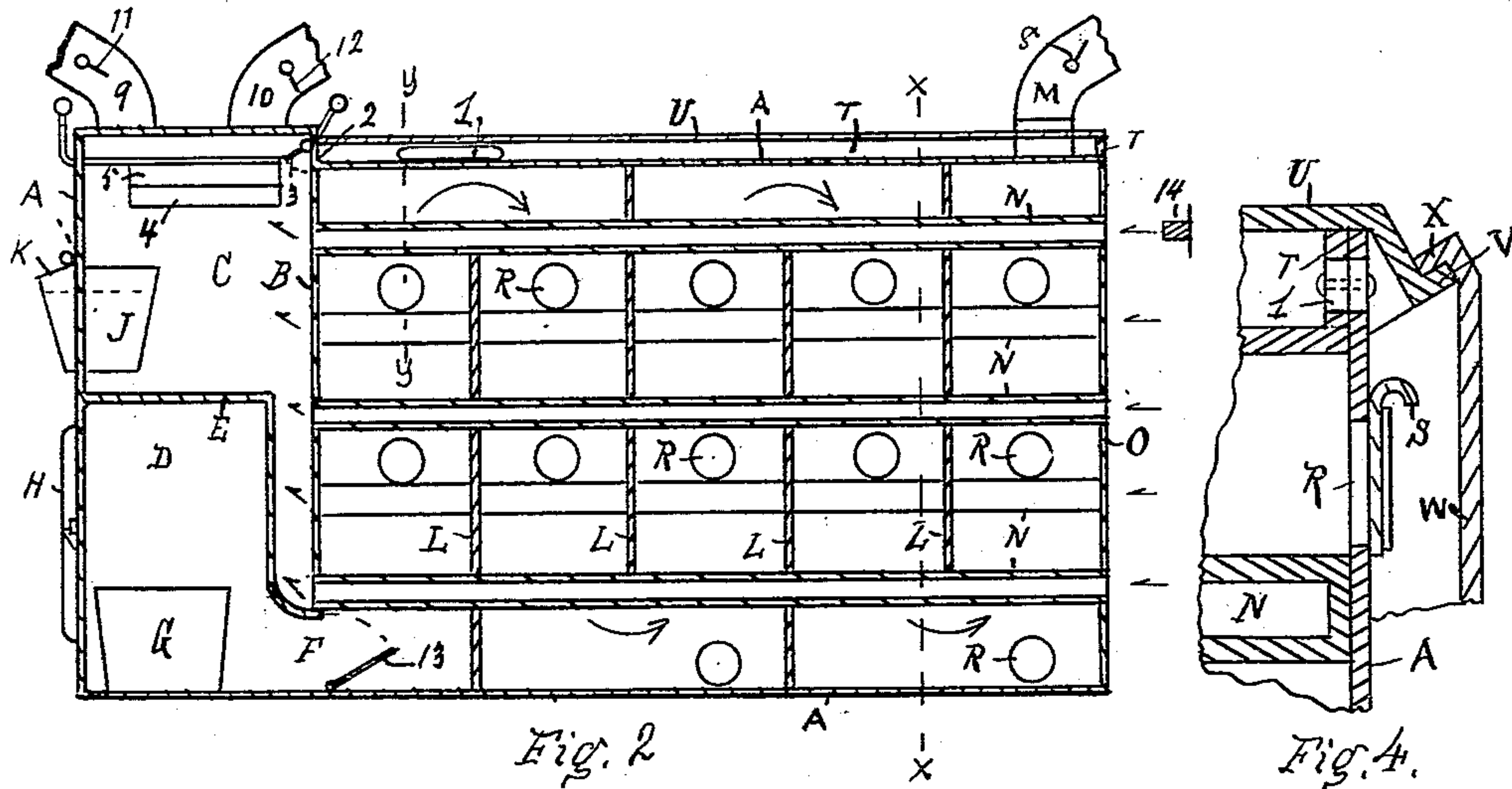


(No Model.)

H. E. TWITCHELL & J. FRAZER.
HEATING AND VENTILATING FURNACE.

No. 559,918.

Patented May 12, 1896.



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UNITED STATES PATENT OFFICE.

HERBERT E. TWITCHELL AND JAMES FRAZER, OF HAMILTON, OHIO.

HEATING AND VENTILATING FURNACE.

SPECIFICATION forming part of Letters Patent No. 559,918, dated May 12, 1896.

Application filed May 8, 1895. Serial No. 548,502. (No model.)

To all whom it may concern:

Be it known that we, HERBERT E. TWITCHELL and JAMES FRAZER, residents of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Heating and Ventilating Furnaces, of which the following is a specification.

Our invention relates to that class of heating and ventilating furnaces adapted to regulate the temperature of residences and other buildings; and the objects of our improvement are to provide such form of construction and assemblage of parts as will utilize the fuel economically and obtain the utmost efficiency therefrom. These objects are attained in the following described manner, as illustrated in the accompanying drawings, in which—

Figure 1 illustrates a front elevation of the furnace with parts broken away to expose portions of the interior; Fig. 2, a longitudinal vertical section on the dotted line *zz* of Fig. 1; Fig. 3, a transverse vertical section on dotted line *xx* of Fig. 2, looking toward the rear; Fig. 4, the portion of an enlarged transverse vertical section on the dotted line *yy* of Fig. 2; Fig. 5, an enlarged end elevation of one of the flues.

In the drawings, A represents the shell or casing of the furnace, preferably consisting of sheet metal, and constructed in the form of a rectangular prism. Transverse partition B therein separates the furnace into a front and a rear apartment. Hot-air chamber C occupies the upper portion of the front apartment and is separated from the burner-space D thereunder by crown-sheet E. The front portion of said crown-sheet is horizontal, with its rear wall depending therefrom parallel with partition B, thence terminating under the lower edge of said partition, to which it is joined, and forming the top of throat F for the passage of the heat from burner G. Said burner may consist of any of the well-known forms of either gas, oil, or coal burners that are used to generate heat from the combustion of fuel. Door H in the furnace-wall provides access to the burner and contains adjustable draft-ventilators I. Water-vessel J is removably secured in the furnace-wall in such position that its principal portion projects within hot-air chamber C. A portion of

its top opens without the furnace-wall for convenience in filling, and is provided with lid K to prevent the escape of the steam therefrom. The rear apartment of the furnace contains a series of vertical transverse partitions L that terminate alternately a short distance from the top and bottom of the furnace, that the heat from the burner may pass successively over and under them to reach the smoke-exit pipe M, the direction of the heat alternately over and under the partitions being indicated by the curved arrows shown in Fig. 2.

A series of horizontal flues N, formed of sheet metal and rectangular in cross-section, as shown in Figs. 3 and 5, is supported at their respective ends in the rear wall O of the furnace and partition B, that forms the rear wall of hot-air chamber C. Both ends of the flues are left open for the free passage of the air from without the rear of the furnace to the interior of hot-air chamber C. The intermediate portions of the flues are supported in openings formed in transverse partitions L and through which they are passed. The width of the flues is less than that of the interior of the furnace, and while they alternately extend from opposite sides of the furnace they do not quite reach the side opposite, but leave a sufficient space for the upward or downward passage of the heat between the edge of the flues and the corresponding inner side of the furnace, as at P. Spaces Q are also left between the flues, as they are disposed the one above the other and for the same purpose.

A series of hand-holes R is formed in the shell of the furnace and along its sides to admit the hand between the respective flues and between the transverse partitions L to remove the accumulations of soot or dirt. Sliding doors S serve to close the respective hand-holes to prevent the smoke or soot from passing outwardly therethrough.

The sides and rear end of the casing or shell A project a short distance above the top surface of the furnace, as at T, to form a marginal support for the removable cover U that loosely rests thereon. The cover is some wider than the casing and its projecting margin is turned downwardly and thence outwardly at right angles to form lips V for the re-

movable engagement of the top edges of side jackets W thereon. Said jackets are formed of plain sheets of metal and with lips X turned inwardly along their respective top edges to engage with lips V of the removable top. The side jackets W depend from the edges of the top or cover U parallel with the sides of the casing and terminate a short distance above the floor whereon the furnace is situated to permit the air to enter the space between the jackets and the sides of the shell. Said jackets and the top cover join the shell at the rear end and at their front ends preferably terminate on a line with transverse partition B. The front portion of the furnace, to the extent occupied by the hot-air chamber C, is provided with side jackets similar to jackets W, but preferably not removable, as their removal is not necessary to obtain access to the interior of the front portion of the furnace. The top margin T of the casing is provided with side openings 1, that communicate between the air-spaces under jackets W and the space formed by the cover U on the top of the furnace. The hot-air chamber C is preferably extended above the front end of cover U, which abuts snugly against it, and openings 2, controlled by dampers 3, permit the air to enter the hot-air chamber from beneath cover U. Similar openings 4 are formed in the side walls of the hot-air chamber and controlled by dampers 5 and 6 for the admittance of the air from under the front jackets to the interior of said chamber.

Pipe M, provided with damper 8, leads the smoke from the furnace to the chimney in the usual manner. Hot-air mains 9 and 10 of the desired number and provided with dampers 11 and 12 convey the heated air from chamber C to the radiators distributed throughout the building in the usual manner. A regulating-damper 13 is provided for throat F to modify the quantity of heat that passes from the burner G. Doors 14 may be used, if desired, to close the rear ends of any or all of the flues N. Said flues are formed separately of sheet metal with longitudinal bends, as shown in Fig. 5, and with the edges securely fastened together by rivets 15 to make the seam substantially air-tight. The side jackets W may be easily detached from the cover U and removed to permit free access to the hand-holes R for the purpose of cleaning the interior of the rear apartment of the furnace. Access to the interior of the hot-air chamber C is obtained by the removal of water vessel J from the opening in the furnace-wall.

In operation the furnace is preferably located in the cellar of the building to be heated, and with the rear end of the flues exposed to the outside air. In cases where this exposure of the ends of the flues is not convenient the ends of the flues may communicate with the outside of the building through a tubular main arranged for the purpose. (Not shown.) The pure air from the outside of the building

enters the rear ends of the flues and is drawn therethrough to the hot-air chamber by the draft caused by the escape of the heated air from said chamber in an upward direction through the hot-air mains. The heat generated in burner G raises the temperature of the space below crown-sheet E and thence overflows through throat F to the rear apartment of the furnace occupied by the cold-air flues N. After leaving the throat the heat tends in an upward direction through the space between the front portions of the flues that are exposed to its action from transverse wall B to the first adjacent vertical partition L, thence downwardly and upwardly through the spaces formed between said partitions L to the rear end of the furnace and through pipe M to the chimney. In its passage rearwardly and alternately up and down among the flues N the air in said flues absorb almost the entire amount of the heat generated by the burner. The retardation of the heat by means of the serpentine passage, through which it is compelled to pass rearwardly, leaves very little, if any, of the heat to escape, and permits its utilization by absorption to the utmost extent to raise the temperature of the air in the flues. When the outside air first enters the flues N, and until it passes the plane of the most rearward partition L, its temperature is slightly raised by the action of the least-heated portion of the interior of the furnace. Its continued forward movement, however, leads it through successive vertical stratas of heated air that occupy the spaces formed by partitions L, and whose temperature increases with their proximity to the burner. In its passage through the flues the air is thus acted upon by successive stratas of heat, the temperature of each being much higher than the one next preceding. Upon its entrance to the hot-air chamber the air from the flues is further raised in its temperature by the radiant heat of the crown-sheet E. The air contained in the spaces between the respective jackets and the shell of the furnace becomes heated by the radiation from the shell or casing and may be admitted to the hot-air chamber when desired through the openings provided with dampers for the purpose. In the same manner the strata of air under the cover of the furnace may be admitted to the hot-air chamber. Water vessel J exposes its contents to the action of the heated air to provide it with the desired moisture in its passage through the hot-air chamber.

Having fully described our improvement, what we claim as our invention, and desire to secure by Letters Patent, is—

1. In a heating and ventilating furnace, the combination, with the shell, of a transverse partition extending nearly to the bottom and forming two chambers, a fire-box in one of the chambers, and a series of vertical partitions within the other one, said partitions terminating alternately a short distance from

the top and bottom of the shell, a series of horizontal open-ended flues secured at their ends to the end of the shell and to the first-mentioned partition, said flues being of a less
5 width than the shell and terminating alternately a short distance from the sides of the shell, and passing through the second-mentioned partitions, and smoke and hot-air outlets communicating with the chambers sub-
10 stantially as set forth.

2. In a heating and ventilating furnace, the combination with a shell, of a transverse partition near one end forming two chambers, one of which extends above the other, a fire-
15 box in the extended chamber, vertical partitions and horizontal flues in the other cham-

ber, the shell being provided with a series of doors registering with said flues between the partitions, a jacket around the shell, the por-
tion over the doors being removable, and the 20 top being also removable, a passage communicating with the chamber provided with a fire-box, and with the space between the shell and the top of the jacket, and a damper for
controlling said passage, substantially as set 25 forth.

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Witnesses:

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