3 Sheets—Sheet 1.

W. BLISS.

HEATING APPARATUS.

No. 192,559. Patented July 3, 1877.

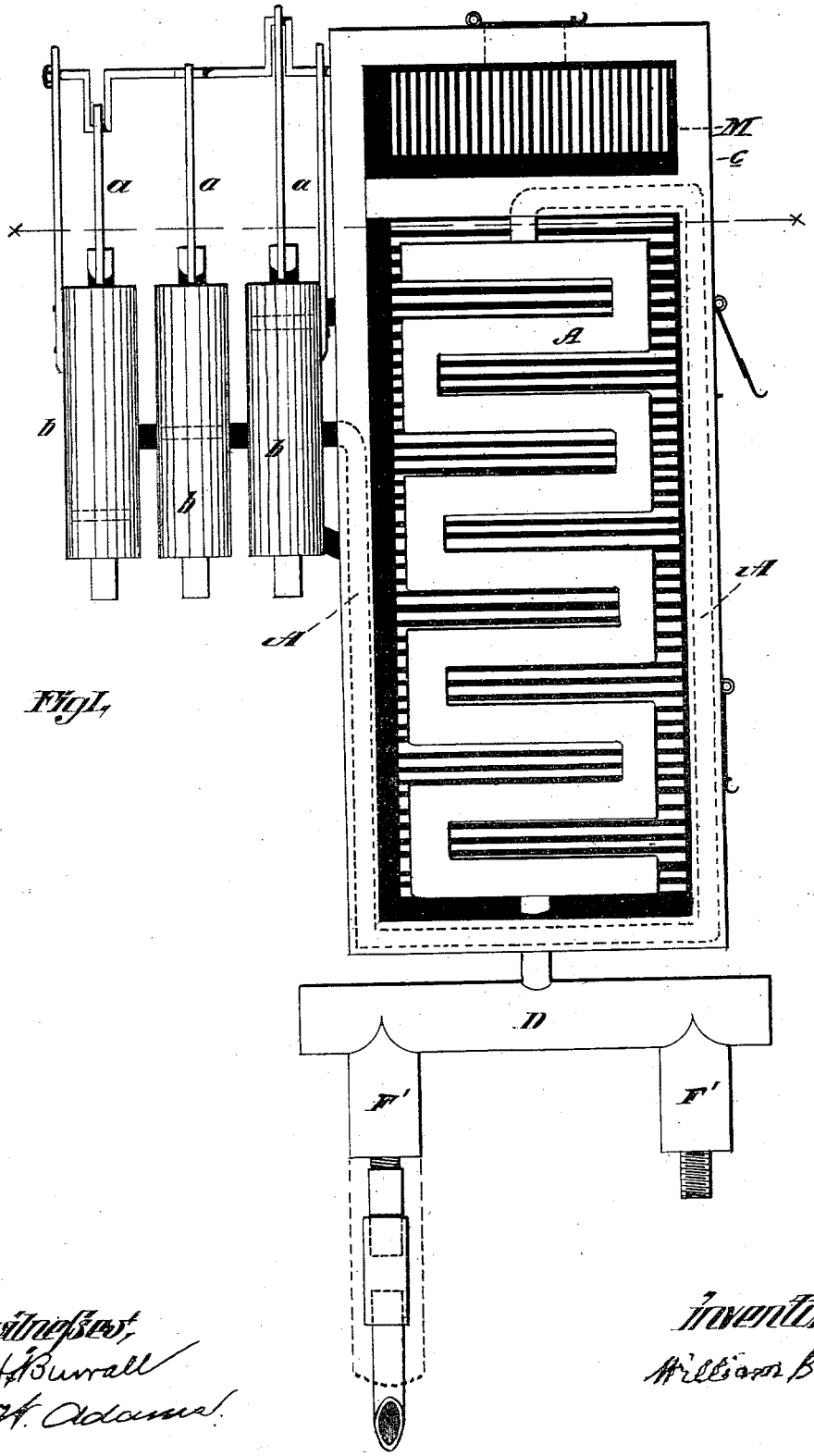

Fig 1.

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T. H. Adams

Inventor:
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3 Sheets—Sheet 2.

W. BLISS.

HEATING APPARATUS.

No. 192,559. Patented July 3, 1877.

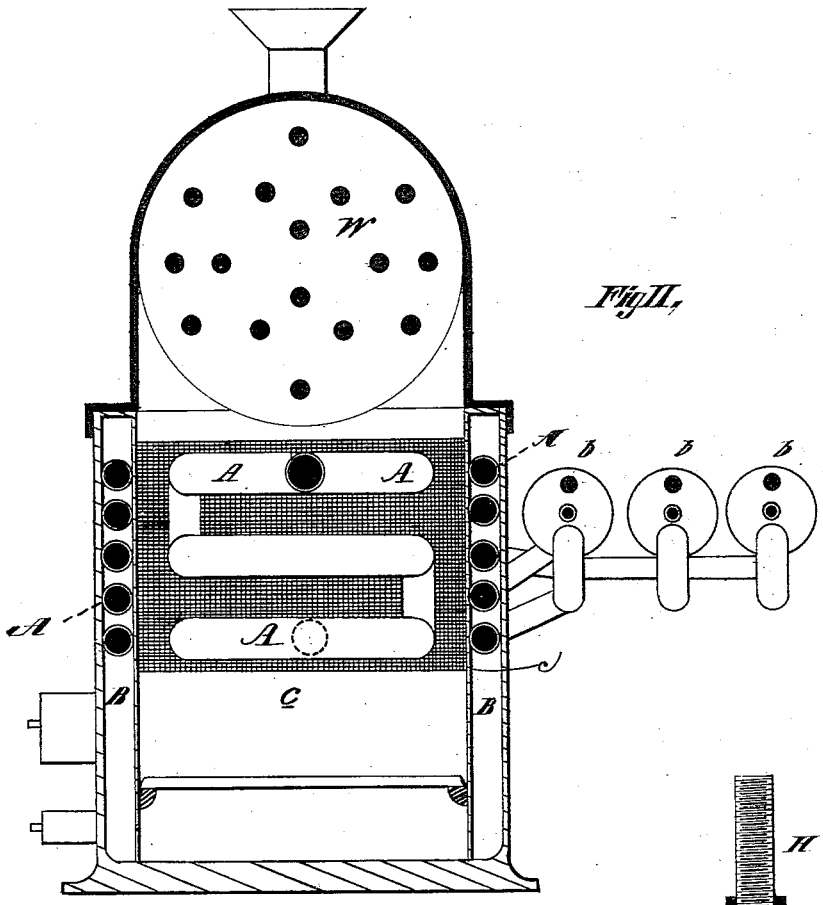

Fig II.

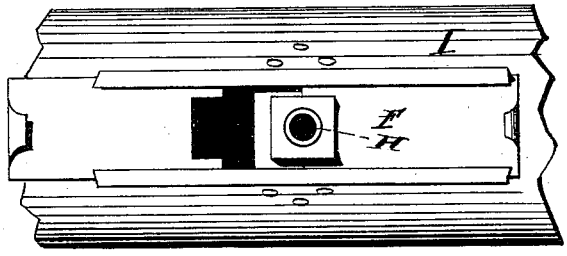

Fig IV.

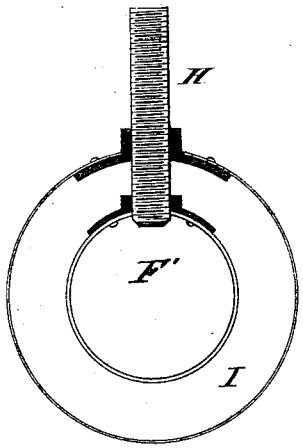

Fig III.

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3 Sheets—Sheet 3.

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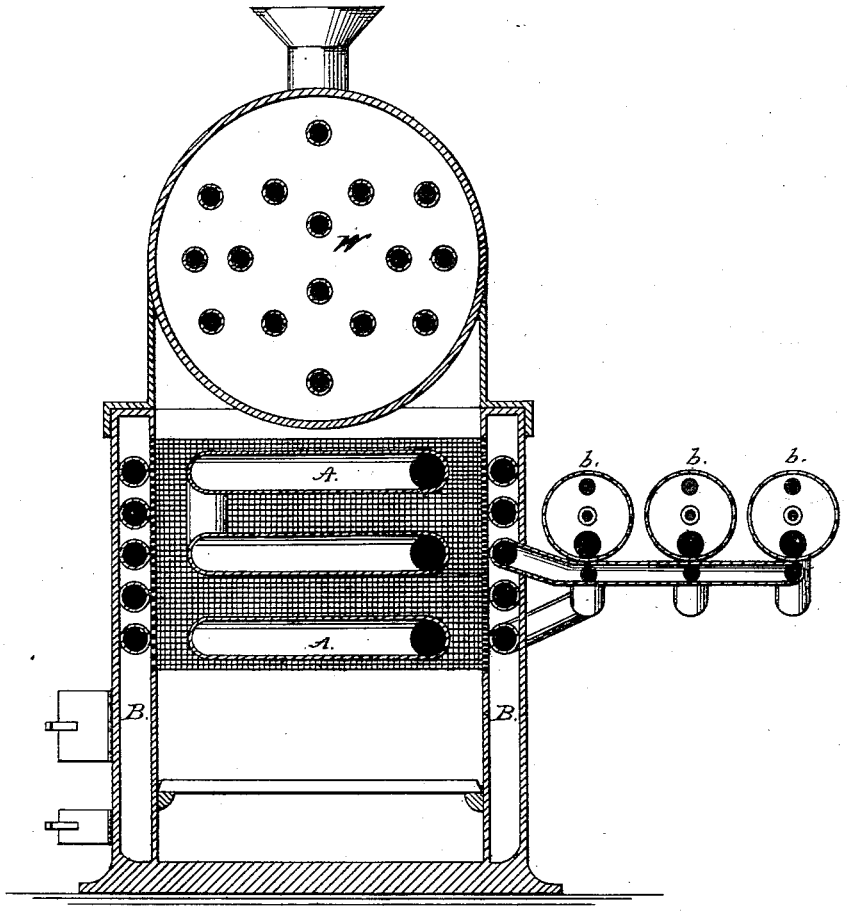
HEATING APPARATUS.

No. 192,559. Patented July 3, 1877.

Fig. 5.



Witnesses;
M. H. Burrall
T. W. Adams

Inventor;
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UNITED STATES PATENT OFFICE.

WILLIAM BLISS, OF ASHLEYVILLE, MASSACHUSETTS.

IMPROVEMENT IN HEATING APPARATUS.

Specification forming part of Letters Patent No. **192,559**, dated July 3, 1877; application filed August 4, 1876.

To all whom it may concern:

Be it known that I, WILLIAM BLISS, of Ashleyville, in the county of Hampden and State of Massachusetts, have invented a new and useful High-Pressure Hot-Air Heating Apparatus for cities or villages, which invention is fully set forth in the following specification and accompanying drawings.

My invention consists in a combination of devices whereby air can be forced through a heating-furnace, and thence through a series of air-mains or distributing-pipes laid under ground and in buildings, in order to conduct said heated air through all the streets of a village or city, for use in manufacturing or mechanical industries, and to serve in dwelling-houses for warming and culinary purposes.

My invention is primarily based upon the well-known principle that air compressed to a certain degree of density is a better conveyer of heat, retaining caloric better, than that under the opposite conditions.

To make my plan operative for the purposes above named it is necessary to heat the air to be distributed to a high degree.

Having forced the air through a proper heating-furnace, with the requisite devices to give the air the desired density and heat, and consequent distributing-force, it next becomes necessary to provide suitable main and branch pipes for conducting it to the places of consumption, that shall prevent the loss of heat, to any great degree, by radiation or contact with the ground.

Under certain conditions, or for special purposes, air may be required possessing a greater degree of heat than may be obtainable from that in the mains at points remote from the main furnace, and to provide for such a contingency I place reheating-furnaces wherever upon the line of the mains it may be found necessary for the above purpose.

For convenience in laying the air-mains, and to insure more perfect joints therein, a non-conducting material, which is placed around the air-main, and held in its place by an outer sheath concentric with the main, is placed in the annular space, between the main pipe and the sheath, after the mains are laid; and to render this operation convenient, the sheath is constructed with a longitudinal opening on one side throughout its length, or nearly so, and said opening is bordered by flanges, in which suitable covers slide for the purpose of closing such openings.

For the purposes of obtaining the requisite density in the circulating heated air in the distributing-mains, and to insure an ample delivery of air through them, I employ air-pumps, placed near the heating-furnace, which force the air through the furnace, and thence through the mains, said air-pumps to be run either by steam or water power, as may be most convenient.

To obtain steam-power in the most economical way for running the air-pumps by a steam-engine, I set a steam-boiler on the top of the furnace, which heats the hot-air pipes so that heat in passing from the furnace to the chimney will pass through the flues of the boiler, and generate steam therein.

In completing the details of this circulating system of hot air under pressure, I shall place safety-valves at such points on the line of the air-mains as may be found necessary to prevent an undue pressure upon the pipes. I shall also employ stop gates or valves on the mains, such as are usually placed on the lines of gas or water mains.

Having explained the object of my invention, and the functions of the various devices which I propose to employ to render it operative and useful, I would now still further explain some of its peculiarly novel features.

I am aware that hot air can be conducted through pipes in buildings upwardly, and, to a limited extent, horizontally by its rarefication by heat, and consequent tendency to rise to higher points; and I am also aware that a certain degree of force may be imparted to a current of heated air by a fan, used to drive the air with more force than it attains by its rarefication, or to more remote parts of a building than it could be made to reach were it not so propelled; but it is neither of these results that I seek to obtain by my devices, and such means as would accomplish those results successfully would be inoperative in supplying heated air under the conditions and for the purposes demanded by my plan.

I do not propose to blow hot air into rooms in a house for the purpose of warming them, but to circulate hot air, under pressure, through pipes and radiators, for warming buildings, substantially as steam is circulated for the same purpose.

I propose also to furnish hot air for industrial purposes, under such a degree of pressure that fans and bellows may be dispensed with in iron-founderies and smith's shops, and the air be delivered for such use heated to so great a degree as to materially reduce the consumption of fuel usually required for such purposes.

So also for culinary purposes, I propose to furnish hot air for cooking, conducted from the mains by proper pipes to the kitchen, in substantially the same manner as steam is conducted for similar purposes.

The advantages of hot air circulated for warming and cooking purposes, as specified, over a steam circulation for the same objects, are obvious. In a system of air circulation no trouble can arise from the consequences of condensation, while with steam, that would be an item of serious cost in installation, and a never-ending source of trouble from choking of drips and freezing. Also, the cost of fuel for generating the steam would be much greater than for keeping the furnace and pipes hot for heating the air.

In order to accomplish the results for which my apparatus is constructed, I maintain a pressure of air upon the mains varying somewhat according to the distant points of delivery, but generally from ten to fifteen pounds per square inch.

The degree of heat which I maintain in the circulating air will average 600° Fahrenheit, the non-conducting substance with which I surround my pipes making this high degree of heat safe and practicable.

My furnace is constructed with one or more fire-boxes, and with double walls entirely surrounding that portion of it designed for heating the air-pipes, leaving a space between said double walls sufficiently large to place air-pipes in. The inner wall of the furnaces surrounding the fire box or boxes is perforated so as to admit heat from the fire or fires freely into the space between the walls where the above-mentioned air-pipes are placed.

I introduce my air-pipes through the exterior wall of the furnace into the space between the two walls, carrying them several times around the fire-space in said space, and thence into the upper part of the fire box or boxes, directly over the fire, whence I run the pipes back and forth several times from end to end and crosswise of the furnace, and finally carrying the end through the furnace-walls, where I connect it with the distributing-pipes.

The steam by which I run an engine to supply power for running my air-pumps is generated in the boiler before alluded to, and which is placed over the furnace. The heat from the fire below under the air-pipes is generally sufficient for this purpose, but to guard against contingencies I build an auxiliary fire-box in the end of the furnace, by which additional heat to that derived from the source above mentioned may be obtained.

Referring to the drawing, Figure 1, Sheet 1, is a plane view of the furnace, air-heating pipes, and air-pumps, and a portion of the distributing-mains. Fig. 2, Sheet 2, is a vertical sectional elevation of the furnace, air-heating pipes, air-pumps, and steam-boiler. Fig. 3, Sheet 2, is a view in section of the hot-air-distributing main, its sheath, and a connecting-pipe or branch connection. Fig. 4, Sheet 2, is a longitudinal view of the hot air main, showing its sheath and slides, and a connecting-nut. Fig. 5, Sheet 3, is a vertical sectional view of the furnace, air-pumps, air-heating pipes, and steam-boiler, showing the perforated lining in the furnace between the fire-space and the space in the furnace walls which inclose the air-heating pipes.

b b b are the air-pumps. *c c* is the furnace. A are circulating air-heating pipes. D is a distributing air-pipe between furnace A and mains F′ F′. F′ F′ are the hot-air distributing mains. M is the auxiliary fire-box in furnace. L is a perforated lining to furnace *c c*. B is pipe-circulating space in hollow walls of furnace. W is a steam-boiler. I is a sheath surrounding and concentric with hot-air-distributing pipe F′ F′. Connection-pipe H passes through sheath I, and is secured to the interior hot-air main F′. F is a slide covering the opening in sheath I.

What I claim is—

1. The combination, in a hot-air heating and distributing apparatus, of the air-pumps *b b b*, (actuated by any convenient motive power,) the furnace *c c*, the circulating air-heating pipes A, the hot-air-distributing mains F′ F′, and the sheath I and slides F, substantially as and for the purpose set forth.

2. In a furnace in a high-pressure hot-air heating and distributing apparatus, the combination of the main fire-box and the auxiliary fire-box M, the air-heating pipes A, perforated furnace-lining L, pipe-circulating space B in furnace-walls, and steam-boiler W, substantially as and for the purpose set forth.

3. In a hot-air heating and distributing apparatus, the combination of the forcing-pumps, air-heating furnace and air-pipes, and the incased distributing-mains, substantially as and for the purpose set forth.

WILLIAM BLISS.

Witnesses:

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