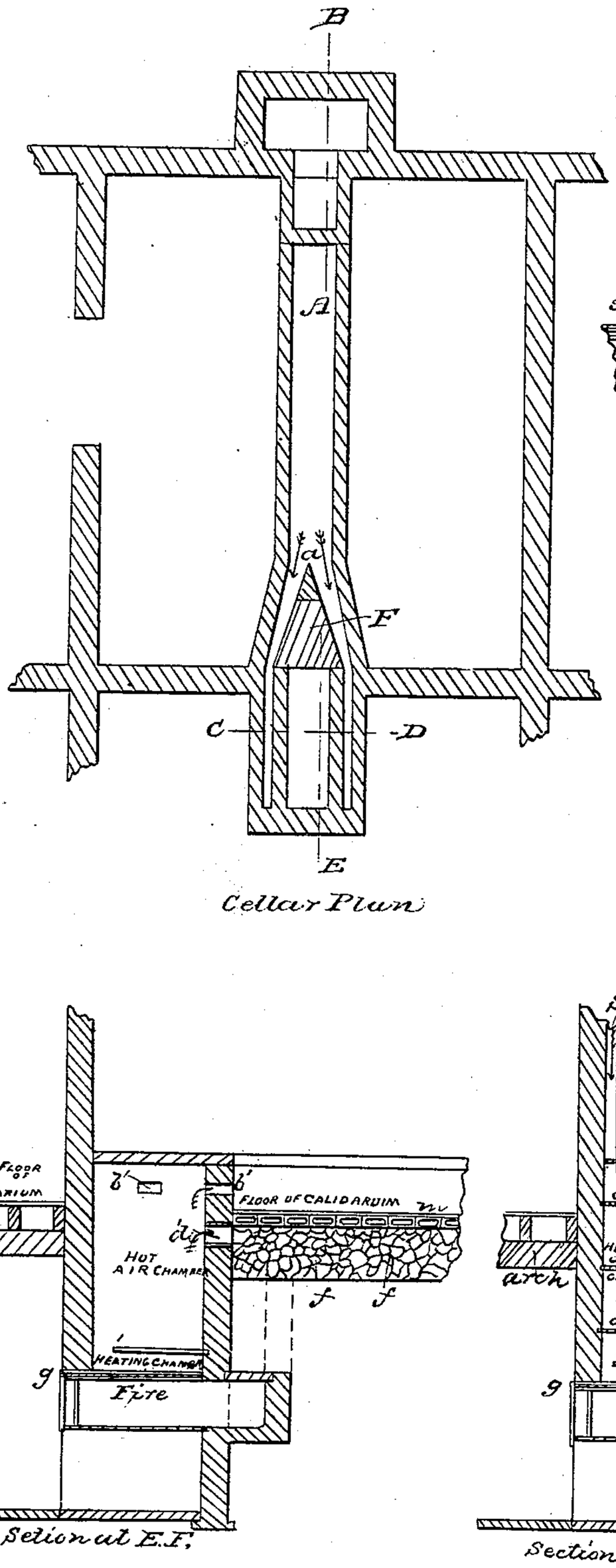
2 Sheets—Sheet 1.

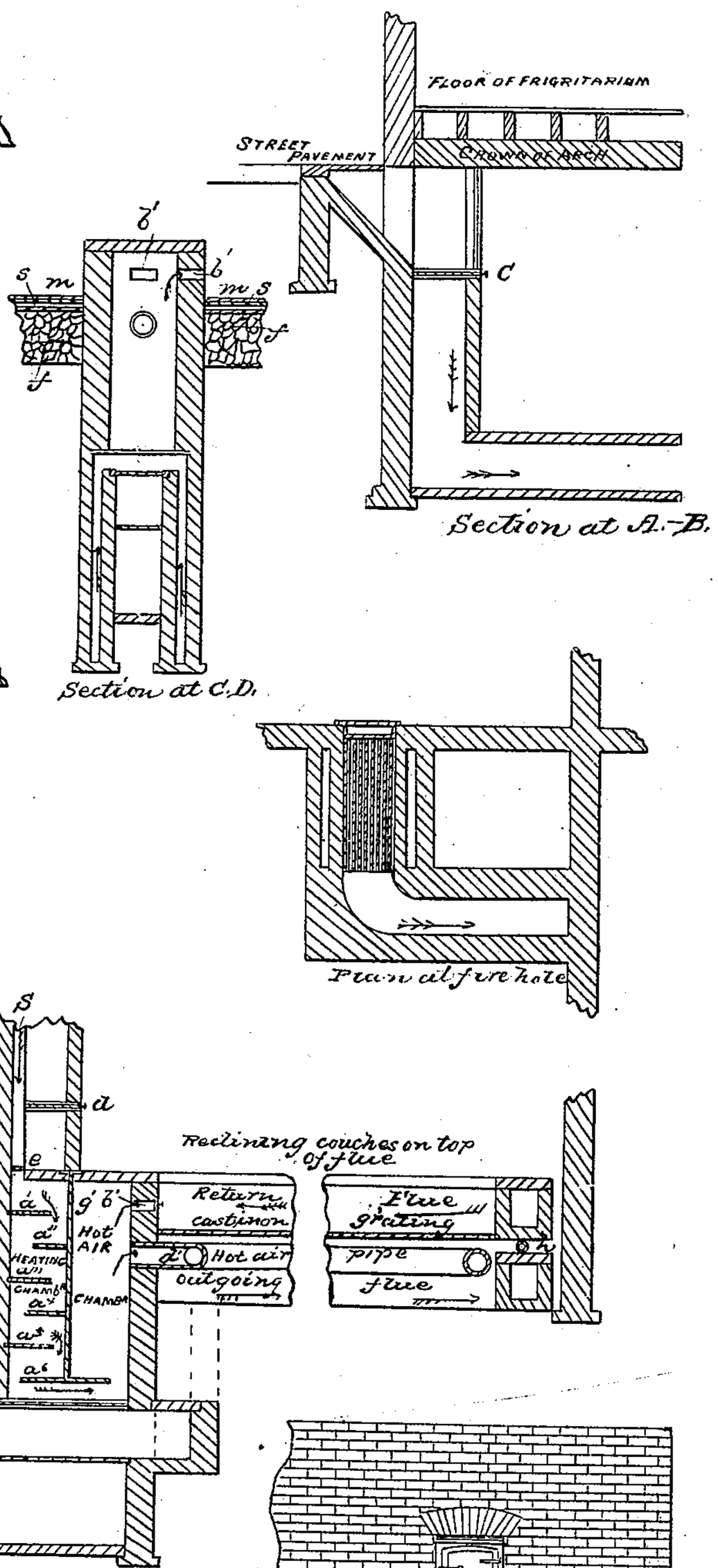
J. A. BOLTON.

Steam Heater.

No. 33,819. Patented Dec. 3, 1861.



Cellar Plan



Section at E.F.

Section at G.H.

Showing the downward current

Elevation

WITNESSES:
John Henry Ireland
William Adams

INVENTOR
John Adams Bolton

2 Sheets—Sheet 2.

J. A. BOLTON.

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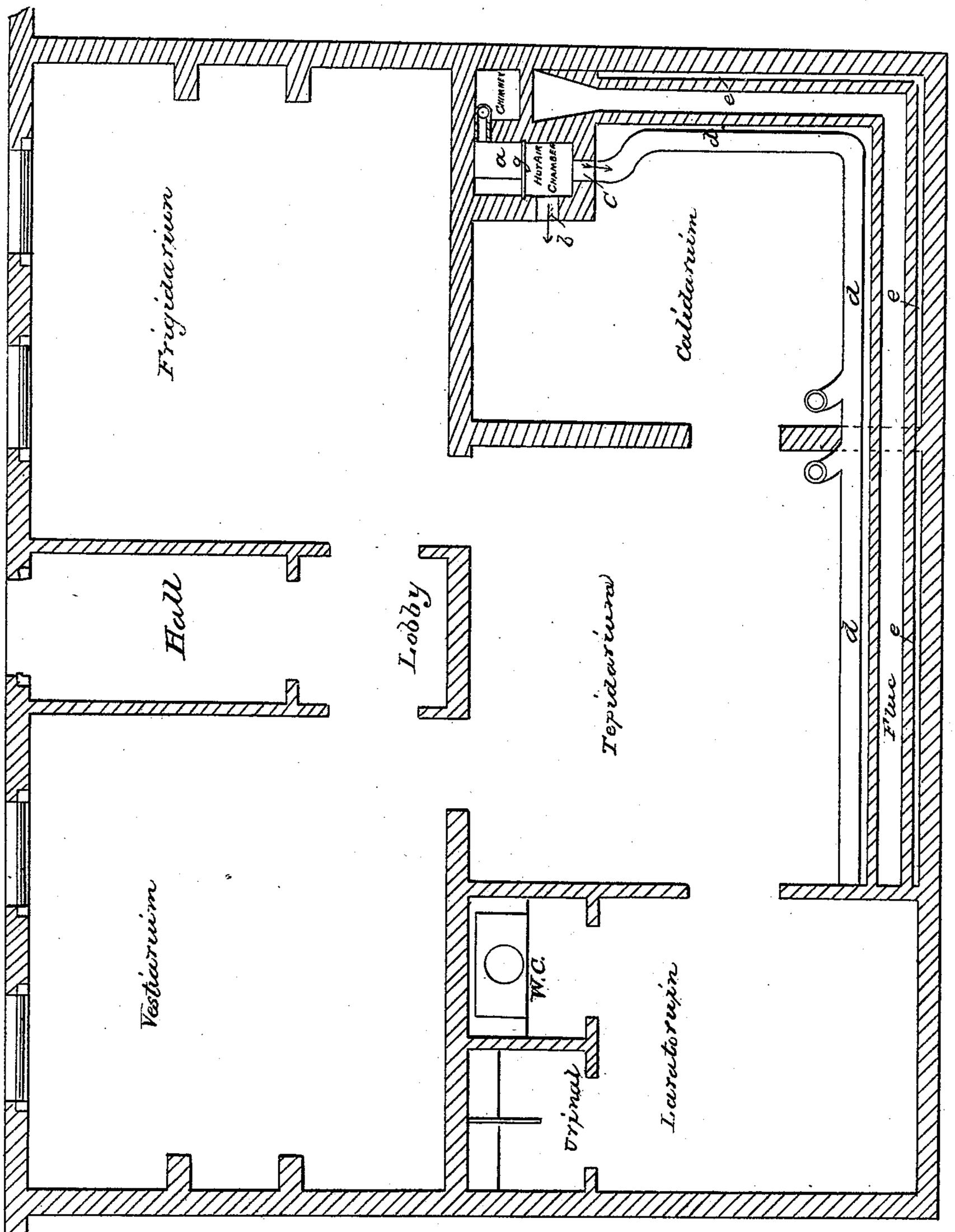

WITNESSES
John Henry Adams
Willard Adams

INVENTOR
John Adams Bolton

UNITED STATES PATENT OFFICE.

JOHN ADAMS BOLTON, OF LEICESTER, ENGLAND.

IMPROVEMENT IN HOT-AIR FURNACES.

Specification forming part of Letters Patent No. **33,819**, dated December 3, 1861.

To all whom it may concern:

Be it known that I, JOHN ADAMS BOLTON, of Leicester, in the Kingdom of Great Britain, have invented a new and Improved Apparatus for Heating Turkish Baths, Public and Private Buildings, Vineries, Hot-Houses, and Cooking-Ovens; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in heating currents of fresh air in improved apparatus of the construction exhibited by the accompanying sheets of drawings, of which the following is a description.

If the fire or furnace be required in the basement, the air may be conveyed from the street, through an ordinary area-grating, down a shaft formed of wood, iron, brick, stone, or any other hard material, to a flue under the floor. Such shaft and flue may be of any size, according to the requirements, should be perfectly smooth on the inside, as far as practicable air-tight, and should gradually diminish from the mouth to the point of bifurcation *a*, the flue under the floor to be carried toward the furnace, and at about three or four feet bifurcates as shown at *a* on drawing No. 1. Thence the air-currents proceed to a flue on either side of the fire-hole, by which the air ascends to the heating-chamber shown on section C D, Drawing No. 1, and thence to the chamber above.

The heating-chamber may be supplied with air by a downshaft *s*, formed of metal, clay, or stone, or other material, either encircling the chimney or carried straight down the flue, so that the air may be warmed before it reaches the heating-chamber. This tube may be of any required size, should taper from the top toward the bottom, and should have a large bell-mouth, so fixed that it should revolve with the wind.

When the cold-air shaft is intended to take the course of the chimney, it opens upon the uppermost instead of upon the undermost plate, and thus entirely reverses the course of transit, as in this case it comes in contact with the hottest plate last of all instead of first of all, and pursues a descending instead of an ascending journey to reach the hot-air chamber or reservoir. This method of heating by a descending cold current is shown in the section G H, which exhibits the position of the heating-plates and shows the hot-air chamber by their side instead of above them, as in section E F, Drawing No. 1. The iron plates should be of cast-iron, about three-fourths of an inch thick, and if, as shown on the drawings, six plates are used, the upper plate a' should be so much smaller than the width of the heating-chamber as to leave a passage of nine inches for the air, while all lower plates are gradually increased in width, diminishing thereby the passage for the air, so that said passage for the air round the lower plate a'' will be only three inches wide. The divisional plate g' should be cast-iron one inch thick, the bottom plate a^{vi} and two of the others a'' and a^{iv} cast in one with the divisional plate. The thickness of these plates must be governed by circumstances, also their number. All the other divisional plates are fixed in grooves in the brick-work, such grooves being large enough to allow ample scope for the swelling of the iron.

The perpendicular divisional plate is hung by means of a strong flange at the top fixed in the cover of the chambers. Over the fire in all cases the three-fourths-inch cast-iron plate should slide in a strong cast-iron frame.

Instead of metal or mineral plates, hollow globes or alternately-inverted bell-shaped cast-iron or other metal receptacles may be used for protracting the stay and intensifying the heat of the passing air; or the air may be made to pass through a convoluted series of tubing, single or double, as desired. In the event of double tubes being used, the larger tube should contain the lesser tube, conveying the cold air in the early part of its course. The exit of the small tube would join the entrance of the larger tube, and a coil or horizontal to-and-fro form of distribution of them may be made over the metal fire-plate, as required.

The section E F, Drawing No. 1, represents the heating and collective chambers supplied with air from below, as shown by the cellar plan, Drawing No. 1. In this as in the other case the metal plate should be placed about six inches above the fire-plate, so that the air collected and heated between the two plates

may pass through an opening the whole length of the top plate into the chamber above. These iron plates may also be multiplied, as required, and may be of the same description and fixed as before described. Where great intensity is required, there may be two distinct heating-chambers—one for the downward current and one for the upward current of cold air—which may be collected when heated in a chamber common to both. By this means the most intense heat may be generated—the doors to fire-hole to be the ordinary cast-iron double doors, one within the other, so as to economize the heat.

The air from the chamber may be admitted directly into the room by means of finely-perforated slide-ventilator gratings of zinc, iron, or brass. The hot air may also be carried to any distance by means of stoneware glazed socket-pipes or metal pipes with openings for gratings, where required or thought necessary for any purpose whatever where heat is required—as, for instance, a public building, large or small, and of any description, may by this means be heated at about one-fourth the cost of any other method at present in use, besides being much more effective and healthy. The pipes may be carried round a conical, domical, or square oven by a series of windings, as an elongated scroll with gratings or tubes between its turns, where required for cooking and other purposes. The principle may be applied in almost any way for cooking purposes. Thus a large beefsteak may be cooked in ten minutes when placed near the slide-ventilator grating aforesaid.

The air in the entrance-shaft next the area of street, and also in the entrance-shaft in the chimney, may be regulated at pleasure by means of a wrought-iron or zinc plate made to slide in an iron frame, as shown in sections A B and G H at *c* and *d*, Drawing No. 1. The window for lighting the cellar may be placed as shown in section A B.

It is not necessary that the furnace should be in the cellar. Any position on the ground floor would do as well.

The smoke from the fire may be made use of in a Turkish bath, as shown in section G H, Drawing No. 1. The smoke passes from the fire-hole into a flue eighteen inches below the floor of the coldarium and tepidarium, &c., which flue may traverse round the rooms required for use. At the farthest extremity this under flue ascends into another immediately over and so returns to the chimney-shaft, which may be placed in contiguity to the fire-hole. The top flue is eighteen inches above the floor-level. Both flues may, however, be placed below the floor-level, if required, either one over the other or side by side. In the drawings it is shown above the floor-level as the most convenient for a Turkish bath, and forms a bench for reclining-cushions placed on wrought-iron spring-frames. Around by the top flue is fixed on the floor-level a cast-iron ornamental grating nine inches or a foot wide and directly over the hot-air pipe. Between the top and bottom flues is a space—the whole length four and one-half inches deep—between which a metal or earthenware pipe *h* may be carried with openings into the rooms where required. The air passing down through the grating aforesaid comes in contact with the hot-air pipe, passes between the flues, and rises at the back between the flues and the wall, thus assisting in heating the rooms and economizing fuel. The pipe running along between the flues should have a communication with the cold air at one end, and the other end should be provided with a plug or grating. If a pinery adjoin a vinery, let the issue be there; if a Turkish bath, it may be there in addition to the specific hot-air tubes, which ramify from the hot-air chamber. If a stable adjoin, let the issue be there for converting it into a Turkish bath for grooms and horses.

The offshoots from the hot-air pipe (shown in Drawing No. 2 at *d'' d''*) are formed either with metallic or stoneware pipe bends and junctions six inches in clear diameter, and may be closed with wood plugs or metallic round slide-ventilator grating, so that when the rooms are required for the bath the plugs may be removed or the slide of the gratings turned—likewise the gratings *b' b'* of hot-air chamber shown in sections C D, E F, and G H, Drawing No. 1—and the temperature of the room may be speedily raised to 250° Fahrenheit's thermometer, increased and decreased at pleasure.

The floor of the rooms, for the purpose of keeping them perfectly cool and agreeable, to be constructed as follows: On a bed of bowlders is laid a floor of patent pressed hollow bricks, so that the hollow spaces of the bricks may form a series of flues all over the floor, terminating at either end against a long ornamental cast-iron grating on the outside of walls or with a fresh-air chamber, or with the ends of pipes bringing cold air from the outside to each flue formed by hollow bricks, by which means a constant current of cold air is kept circulating all over the floor. Above this brick floor the tile floor is to be laid either of black-and-blue quarries or of encaustic tiles.

In forming the Turkish bath on these principles it is intended to avoid the expense of hot-water boiler by fixing a metallic cistern near the ceiling of the hot-room, the temperature of the room being sufficient to heat the water, which is supplied by a ball-tap and again conveyed by an ordinary pipe to the washing-room, where a finely-perforated metallic box is screwed onto the pipe, and by turning a tap a shower-bath is at once obtained extremely mild in its operation, like the falling dew or with the force of a thunder-storm, being regulated at pleasure by the bather or his attendant. A similar perforated box is attached to an ordinary cold-water pipe, which furnishes

a cold shower in the same way. The waste-water falling on an inclined floor passes off by an ordinary stench-trap. When the warm shower-bath is being used very freely, a few jets of gas under the cistern in the hot-room will keep a constant supply of warm water in it.

The essential feature of the arrangement of the heating apparatus is that of supplying pure fresh air heated to any degree required in any apartment, instead of heating the confined, vitiated and noxious atmosphere of the rooms, which is the case when flues, water, or steam pipes are employed. The ventilation of the hot-rooms, &c., should be by means of a metallic louver ventilator working at pleasure, or any other equally efficacious manner, as circumstances might require.

In the construction of the hot-rooms care should be taken not to have any of the walls at right angles with each other, and the roof or ceiling must always be at an oblique angle with the walls. By this means the heat is diffused over the whole space, care being always taken not to abuse this principle by making the rooms unsightly. The walls of hot-rooms may be either plastered and painted a light red and varnished or faced with encaustic tiles in which red should have the predominance.

The sides, back, and bottom of fire-hole should be of fire-brick, also a few feet of the flue leading from fire-holes. All the other bricks may be the common bricks or the patent pressed bricks, the last being preferred, and great care must be taken that the brick-work is well put together with the best mortar. All the walls except sides of the flues may be nine inches thick. The flues may be covered with eighteen-inch by six-inch by three-inch tiles or Yorkshire rubbed stone. The same for the bottom of the flues.

Having now fully described my invention, I shall state my claims as follows:

1. The arrangement of the flue conveying the outer air to the heating-chamber, by bifurcating it at or about the said fire-chamber and by so continuing each branch flue as to follow up both sides of the fire-hole and ash-pit and then reunite in the heating-chamber, whence the heated air is delivered to a hot-air chamber and from there delivered to the apartments, as herein shown and described.

2. Forming the heating-chamber and hot-air chamber in one compartment by the use of a divisional plate provided with a bottom plate, so that the air shall be gradually heated in the former and caused to come in contact with the fire-plate previous to its entering the hot-air chamber, as described and shown.

JOHN ADAMS BOLTON.

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