

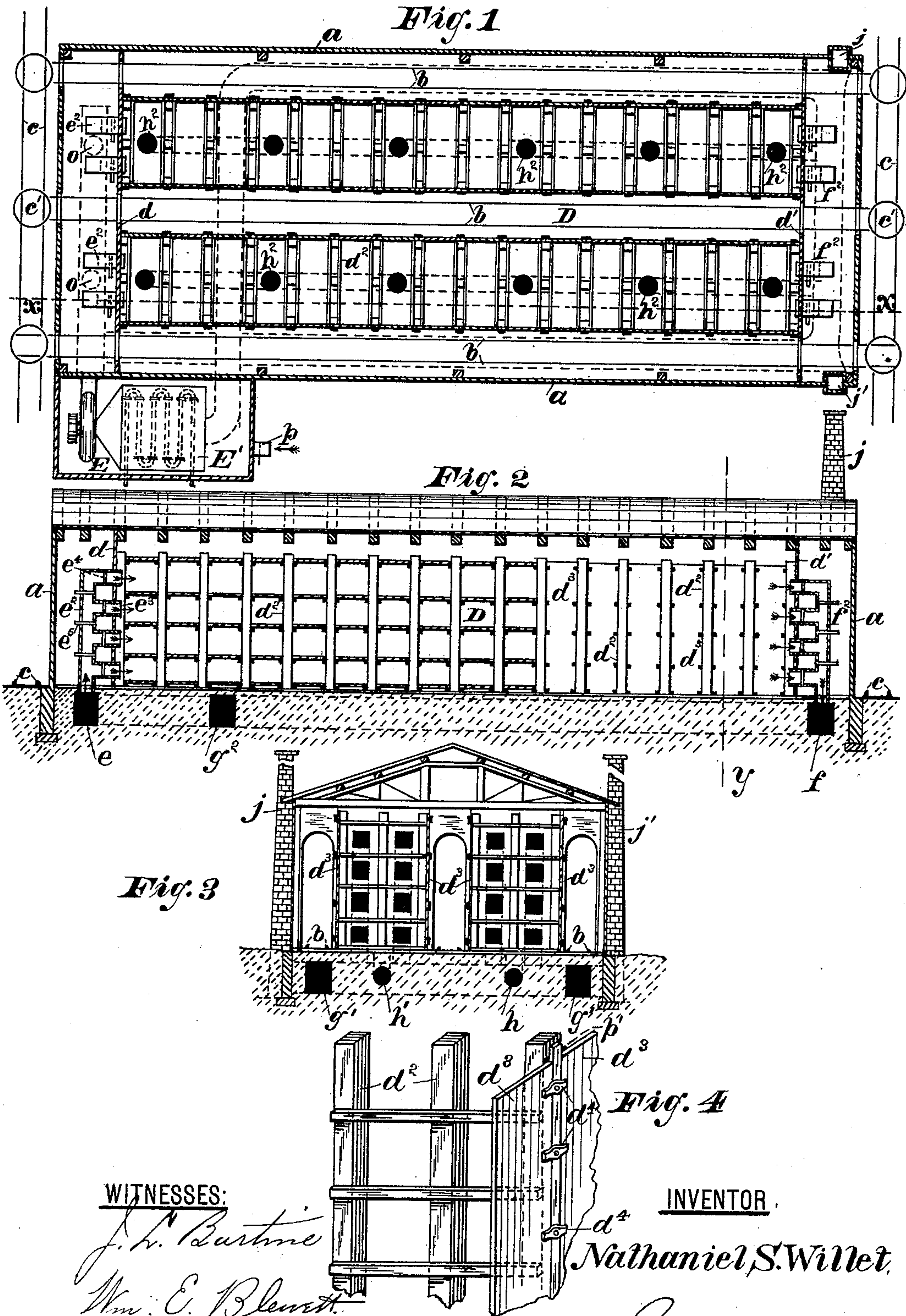
(No Model.)

2 Sheets—Sheet 1.

N. S. WILLET.  
DRYING HOUSE.

No. 390,737.

Patented Oct. 9, 1888.



WITNESSES:

J. L. Burton  
Wm. C. Bennett

INVENTOR

Nathaniel S. Willet

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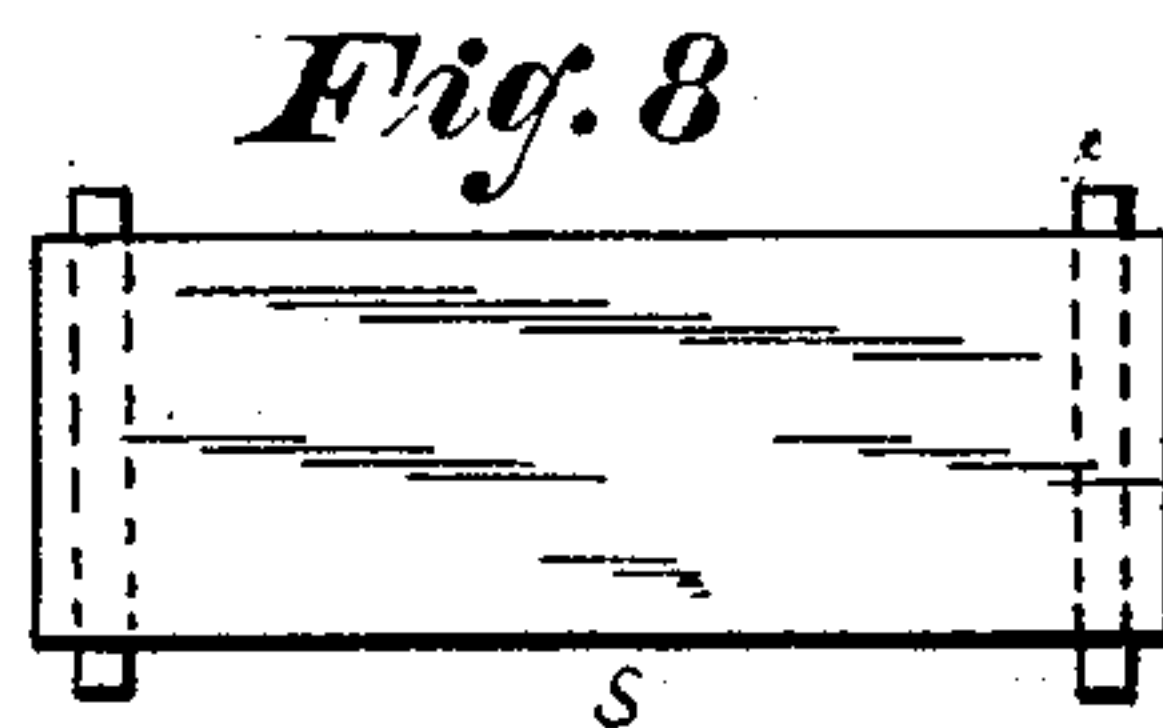
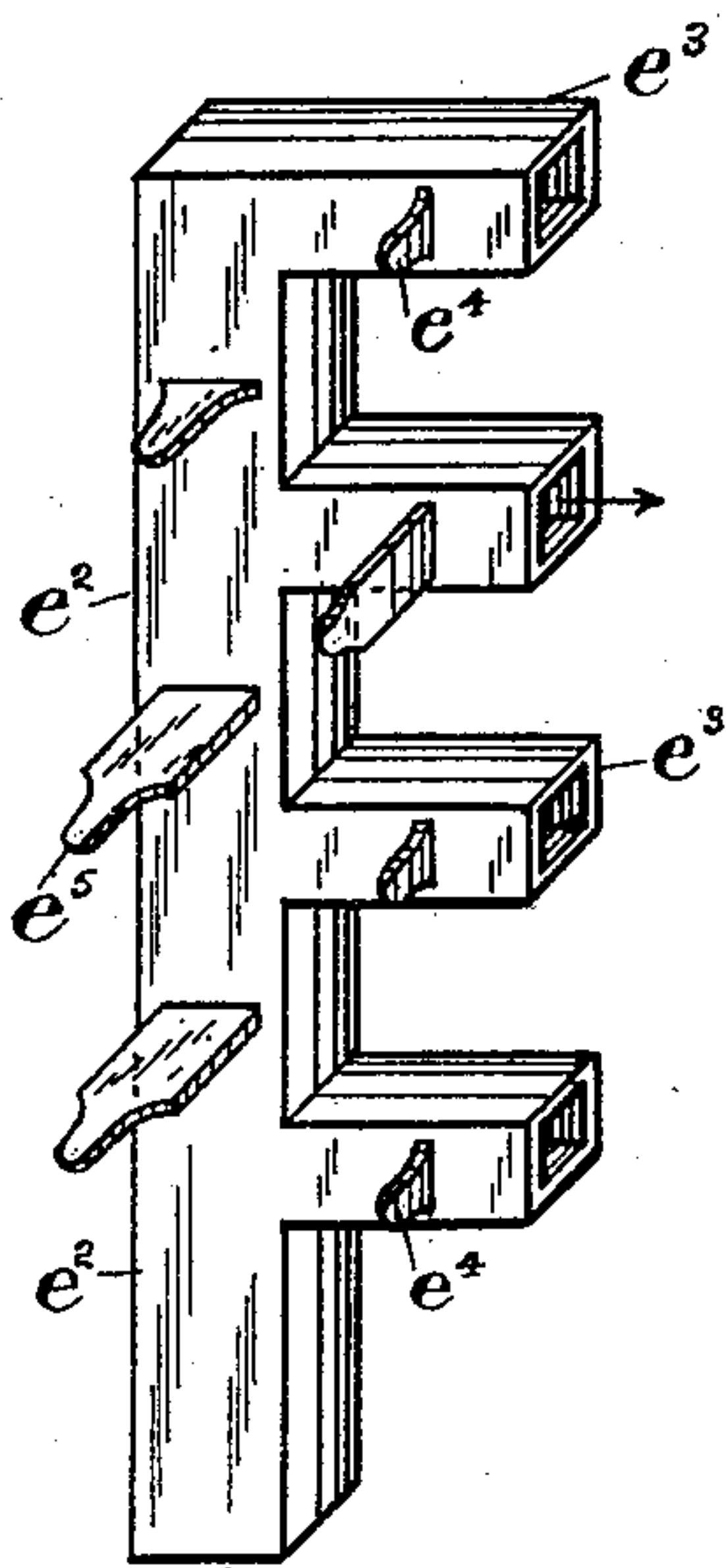
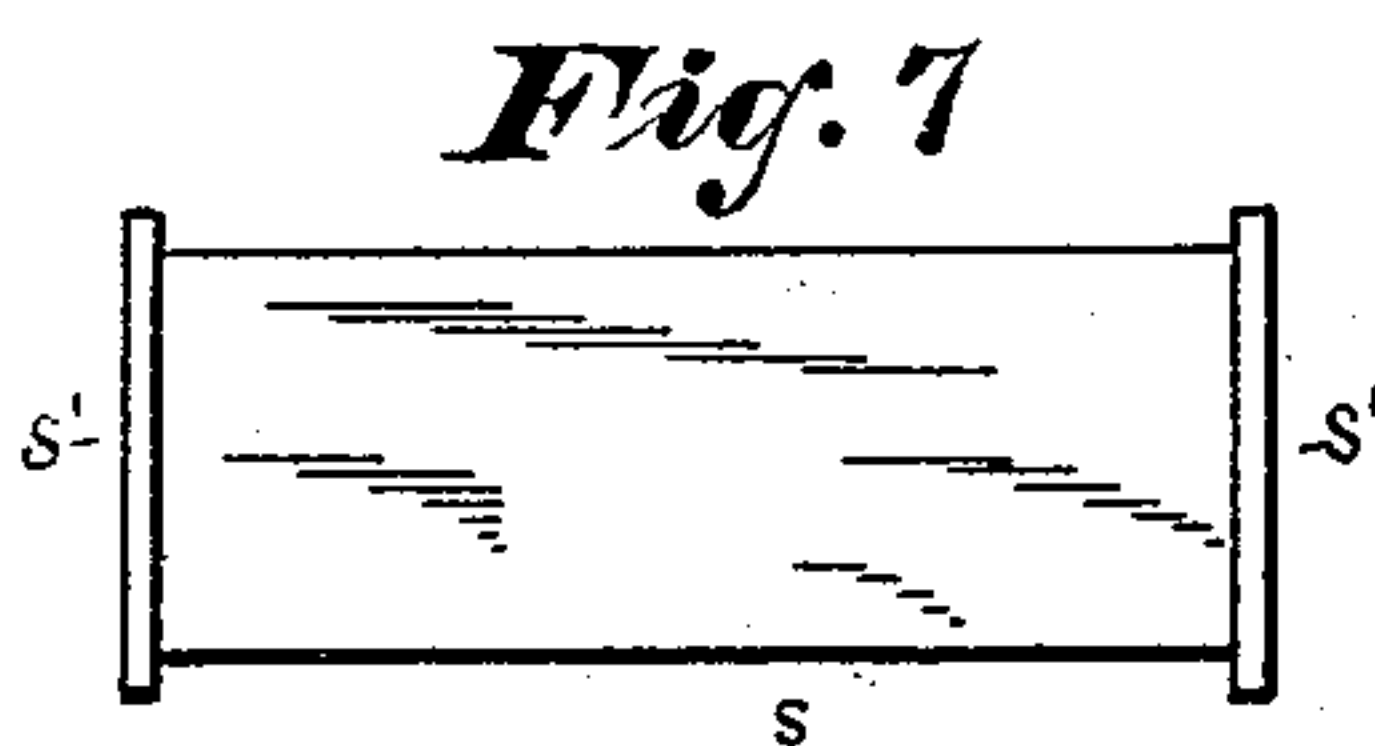
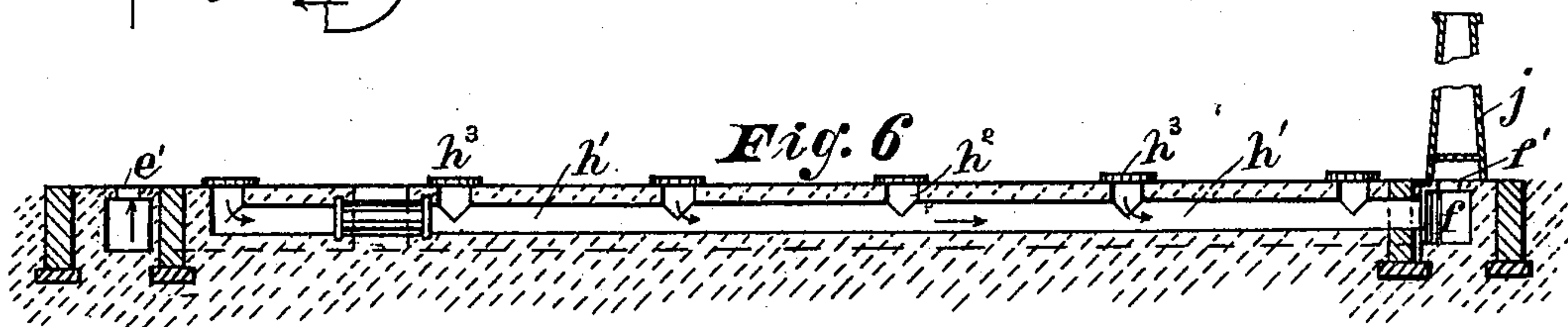
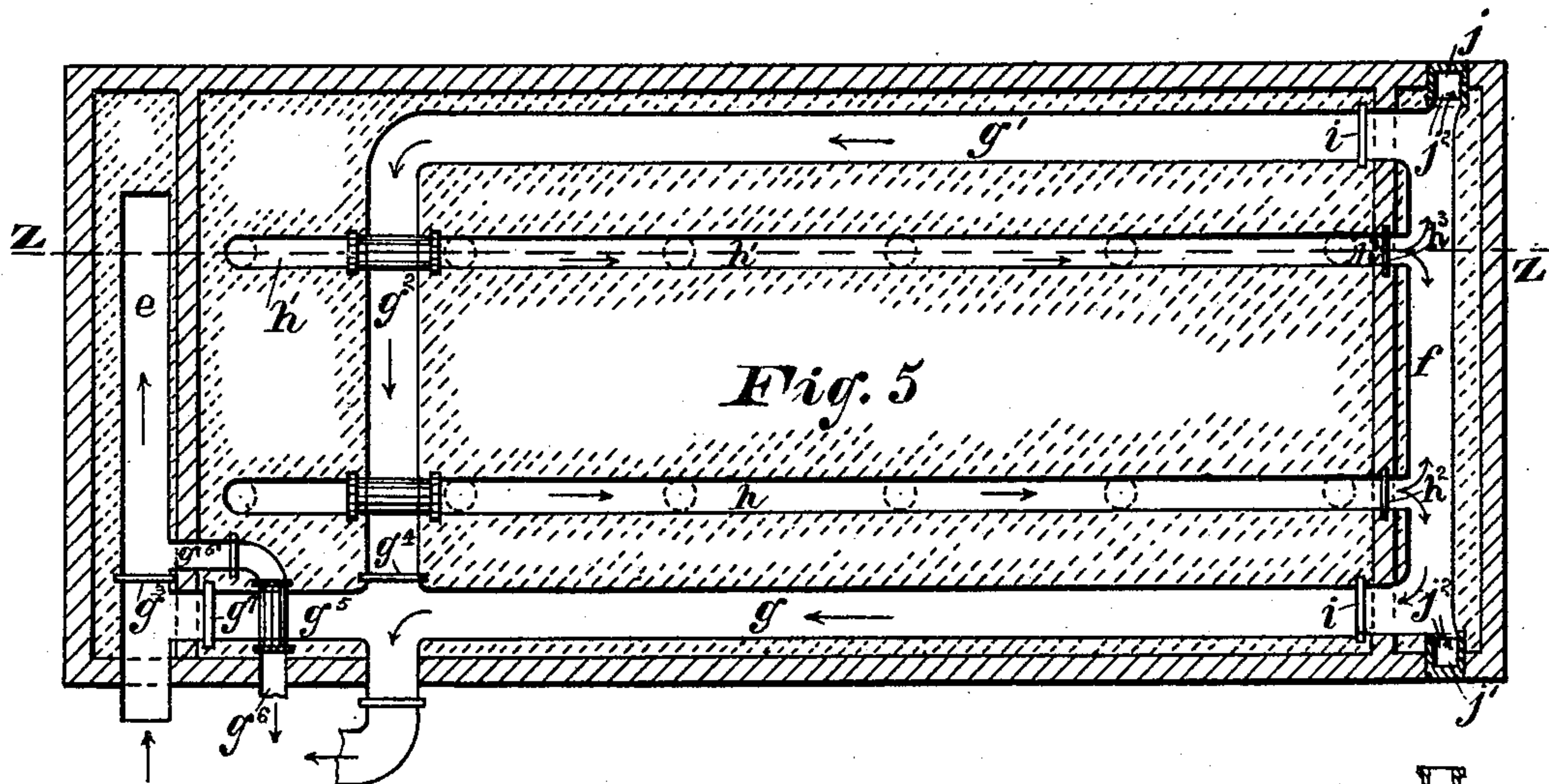
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2 Sheets—Sheet 2.

N. S. WILLET.  
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WITNESSES:

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# UNITED STATES PATENT OFFICE.

NATHANIEL S. WILLET, OF NEWARK, NEW JERSEY.

## DRYING-HOUSE.

SPECIFICATION forming part of Letters Patent No. 390,737, dated October 9, 1888.

Application filed September 29, 1886. Serial No. 214,816. (No model.)

*To all whom it may concern:*

Be it known that I, NATHANIEL S. WILLET, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Drying-Houses; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of this invention is to provide an improved drying-house wherein glue, brick, lumber, cotton, &c., may be thoroughly dried, the primary intention being to control the currents of hot air, so that they may be directed to any part of the house to increase the temperature thereat, particularly on different levels, and also to remove the said air after it has extracted the moisture from the drying material and has become saturated; and, furthermore, by the peculiar arrangement of the air-flues to cause the currents of air to pass through the house at a rapid rate, whereby the drying process is greatly facilitated.

The invention is further designed to utilize all of the hot air forced into the house by so constructing the same that the currents of air may be controlled outside of the drying-chamber.

In the accompanying two sheets of drawings, in which similar letters of reference indicate corresponding parts in each of the several views, Figure 1 is a sectional view taken on a horizontal plane beneath the roof of the house. Fig. 2 is a longitudinal section through line *x*, Fig. 1. Fig. 3 is a transverse section through line *y*, Fig. 2. Fig. 4 is a perspective view of a portion of the drying-racks and of the removable doors. Fig. 5, Sheet 2, is a ground plan of the drying-house, the various ducts or flues being uncovered to indicate the direction and relative arrangement thereof. Fig. 6 is a longitudinal section through *z* on Fig. 5. Figs. 7, 8, 9, and 10 are views of different forms of drying-boards, and Fig. 11 is a perspective view of the vertical flue.

The drying-house, as shown in said views, consists of an outer wall, *a*, of wood, stone,

brick, or other suitable building material, and running longitudinally through said house are tracks *b*, and also extending along each end of the building are cross-tracks *c*, in which are arranged turn-tables *c'*, placed opposite each end of the tracks *b*. These tracks and turn-tables serve as a convenient means of conveyance for the materials to be dried into and from the drying-house; but other means for transporting the material to be dried may be used in lieu of said tracks, all of which, however, are not essential to the drying function of the house.

Extending transversely across the drying-house, at a suitable distance from each end thereof, are partitions *d d'*, provided with doors therein, where the tracks pass therethrough, said partitions forming an interior drying-chamber, *D*, in which are arranged racks *d''*, constructed to hold suitable drying-boards and provided with removable doors *d'''* in each drying-compartment, the space between the vertical posts constituting a drying-compartment, said doors being secured by buttons *d''''*, as shown in Fig. 4.

If desirable, in drying lumber the racks may be removed entirely and the lumber piled within the house.

The system of circulating flues or passages is illustrated more clearly in Fig. 5, one set of flues leading the hot air from the blower and heater into, through, and from the interior drying-chamber back to the heater and blower, the other set of flues conducting the saturated air from the interior chamber out into the open air.

The hot-air system consists of a flue, *e*, extending, preferably, across the end of the drying-house from the blower *E*, and provided with openings *e'*, leading up into the compartment between the cross-partition *d* and the end of the house. Above said openings are arranged vertical flues *e''*, having outlet-flues *e'''* at intervals therein projecting through the partition *d*, each outlet-flue opening into the interior chamber just above each longitudinal row of drying-boards, as indicated in Fig. 2. Each of said flues *e'''* is provided with a cut-off or damper, *e''''*, and in the main vertical flue *e''*, between the flues *e'''*, are also arranged dampers *e'''''*, these several dampers being designed to



control and direct the heated air through any one of the outlet-flues, so as to distribute the same to either the lower or upper parts of the interior drying-chamber, or to any intermediate point therebetween.

At the opposite end of the drying house is a second cross or transverse flue,  $f$ , corresponding to the flue  $e$ , and also provided with openings  $f'$ , leading up into the compartment between the partition  $d'$  and the end of the house, and also provided with vertical flues  $f^2$ , constructed and arranged similarly to the flue  $e^2$ . By this arrangement the hot air may be introduced into the bottom of the chamber D at one end thereof and expelled at the top of said chamber at the opposite end, or it may be introduced at the top and expelled at the bottom, or may be caused to pass through the drying-chamber at any angle or in any direction by means of said vertical flues. Connecting said flue  $f$  with the heater  $E'$ , and through it the blower, are one or more return-flues,  $g$   $g'$ , running on opposite sides of the drying-chamber and communicating with said heater by a transverse flue,  $g^2$ , as shown in Fig. 5.

Should it be desirable to reverse the direction of the current of hot air and introduce the same into the opposite end of the drying-chamber from that previously described, gates  $g^3$   $g^4$  are provided in the flues  $g^2$  and  $e$ , as shown in Fig. 5, which prevent the air from passing therein, and a flue,  $g^5$ , provided, leading from the blower into the flue  $g$ , and therethrough to the farther end of the drying-house. A flue,  $g^6$ , leading from the flue  $e$ , returns the reversed current of air to the heater and therethrough to the blower. When the current is sent through the flue  $e$ , vertical flues  $e^2$ , &c., into the drying-chamber, said gates  $g^3$   $g^4$  are raised and the gates  $g^7$  and  $g^8$  closed, which prevents the air from passing into the flues  $g^6$  and  $g^5$ . Thus the air may be forced into either end of the drying-house, as desirable.

The several passages constitute the system of hot-air flues by means of which the heated air is forced into and expelled from the drying-chamber, passing from and returning to the blower and heater, the blower thus acting also as an exhauster for drawing the air from the drying-house. By thus passing the same charge of heated air repeatedly through the drying-chamber great economy is secured in the fuel consumed in maintaining the proper temperature of the currents of air. After the heated air has passed and repassed several times through the drying-chamber, it becomes saturated with the absorbed moisture and is no longer capable of retaining any more moisture, and must be expelled from the drying-house and be replaced by dry heated air. To accomplish this, suitable conducting-passages are provided, through which the damp air is driven out into the open air.

In Figs. 1 and 5 are illustrated said damp-air passages or flues  $h$   $h'$ , which extend beneath the drying-racks and open at one end into the flue  $f$ , as shown. Openings  $h^2$ , pro-

vided with suitable covers,  $h^3$ , lead from the interior drying-chamber into said passages  $h$   $h'$ , and when uncovered permit the heavily-laden air to descend into said passages and therethrough into the flue  $f$  and into the draft-chimneys.

To prevent the saturated air from passing into the return-flues, gates  $i$  are provided therein, which effectually stop the air from flowing therethrough, and thereby direct the saturated air into the draft-chimneys  $j$   $j'$  and through the same out into the open air. Gates  $j^2$  are provided in the said chimneys, Fig. 5, which are closed when the air is passing through the drying-chamber and are opened to allow the expulsion of the damp air. The damp-air flues  $h$   $h'$  are also provided with gates  $h^2$   $h^3$  at the point where said flues enter the flue  $f$ , and which are closed when the hot air is passing through the drying-chamber from end to end to prevent the air from escaping into said flues  $h$   $h'$ . By means of these gates the air may be forced up into the drying-chamber through the openings  $h^2$ , and pass to the heater and blower through the vertical flue  $e^2$ , flues  $e$  and  $g^6$ . When thus operated, the exit of the air through the flues  $f$ ,  $f^2$ ,  $g$ , and  $g'$  is prevented by closing the gates and dampers therein.

In driving out the saturated air all flues leading back to the heater and blower or exhauster from the interior drying-chamber are closed and the outside air is drawn through the flue  $p$ , Fig. 1, and forced into the drying-house, thereby driving the damp air from the house through the flues  $h$ ,  $h'$ , and  $f$  into and through the draft-chimneys  $j$ , or, if desirable, said flues  $h$   $h'$  may be closed and the damp air forced through the vertical flues to the said chimneys. Before the dry outside air is admitted or forced into the drying-chamber or comes in contact with the material drying therein it is heated by passing through the heater, avoiding thereby any injurious effects upon the drying material by lowering the temperature thereof.

To prevent the escape of heat from the drying-compartments, rubber or other packing,  $p'$ , Fig. 4, may be used around the removable doors. When the racks are removed from the drying-chamber, the boards shown in Figs. 7, 8, and 10, used particularly for brick, may be piled upon each other, as indicated in Fig. 9, the currents of air passing between the boards, which consist of a base-board,  $s$ , and end strips,  $s'$ , which project above the base-board  $s$  and are provided with an opening,  $s^2$ , in either or both of said strips, as in Fig. 10. These openings serve the double purpose of permitting the free passage of the air, and also facilitate the removal of the forming-mold from the brick-board.

While the partitions  $d$ , which form the interior drying-chamber, are advantageous, in that by their use they provide a compartment in which the dampers in the vertical flues may be opened and closed without entering the room in which the drying material is placed



and afford shelter for the workmen, still said partitions may be dispensed with and the dampers in said vertical flues operated from without the house or by the workmen entering the same.

The rapidity with which the drying-operation is carried on depends more upon the rate at which the currents of air pass through the drying-rooms than upon the temperature of the air, as the evaporation of the moisture takes place more quickly under the influence of a rapidly-moving current of air at a low temperature than by a slow current of air at a high temperature; hence it is of prime importance that the air-flues be so constructed that the currents of air from the blower are under perfect control, so that the air may be introduced into the drying-house at any point having the initial pressure or velocity imparted to it by the blower, and that the air at said initial velocity may be directed into any part of the drying-house. Furthermore, by contracting the openings by means of the dampers that lead into the house, so that the area thereof is less than that of the nozzle of the blower, the velocity of the currents may be greatly increased. By constructing the vertical flues at each end of the house, so that they are disconnected one from the other above the transverse flue which communicates with the bottom of each flue, the currents of air are confined within a limited space, and hence are under more perfect control and made much more effective than when the nozzle or flue from the blower opens directly into a large open space and the force of the current is greatly diminished. By employing separate and disconnected flues extending upward and communicating with the blower, of such size in cross-section as that the aggregate size of all of said vertical flues communicating directly with the blower is equal to or less than the size in cross-section of the nozzle of the blower, the initial pressure may be preserved and continued into and through the drying-room. By the employment of dampers to enlarge or diminish the outlets for the escape of the air-currents into the drying-room the pressure, and in consequence the velocity, of the current may be increased above the initial velocity imparted to the air by the blower. The purpose of this construction is to so direct the air-currents directly over and around the drying brick, so as to resemble as nearly as possible the action of the wind in drying in the open air, in which, as is well known, moisture is more readily and quickly evaporated under the action of a high wind than the heat of the sun alone.

I am aware that it is not broadly novel to

force a current of air longitudinally through a drying-compartment, and hence do not claim a drying-house constructed and arranged for that purpose, as various system of flues have been devised to accomplish that end. My arrangement of flues, however, differs from those heretofore made in that the vertical flues are separately arranged and communicate independently with the drying-chamber, and are provided with such a system of inlets and outlets to and from the drying-chamber and dampers that the currents of air can be caused to circulate longitudinally through the drying-room in any direction and at varying velocities, as hereinbefore described.

Having thus described the invention, I desire to claim the following:

1. In a drying-house, the combination of transverse flues arranged one at or near the bottom of each end of the house, with a series of independent vertical flues extending up from each of the transverse flues, each of the said vertical flues having discharge-orifices arranged at different heights therein and provided with a damper to regulate or cut off the passage of air at each orifice, substantially as set forth.

2. In a drying house, the combination of a horizontal flue at each end of the house and vertical flues extending up from each of said horizontal flues and provided with regulating or cut-off gates or dampers at different levels, and orifices below said dampers, also provided with regulating or cut-off gates or dampers in each orifice, and return-flues connecting one of said horizontal flues to a heater, all substantially as and for the purpose set forth.

3. In a drying-house, the combination, with a blower and heater, of a transverse horizontal flue connected directly to the blower, and a branch flue,  $g^b$ , connecting said horizontal flue with the heater, and gates for controlling the passage of air through the same, a second transverse horizontal flue at the opposite end of the house, and return-flues  $g$  and  $g'$ , connecting it with the heater, and branch or extension flue  $g^b$  from return-flue  $g$ , connecting said return-flue with the blower also, and gates for controlling the passage of air through the same, each of said transverse horizontal flues being provided with independent vertical flues, and means, substantially as described, for discharging from the same at any height, as set forth.

In testimony that I claim the invention set forth above I have hereunto set my hand this 27th day of September, 1886.

NATHANIEL S. WILLET.

Witnesses:

FREDK. F. CAMPBELL,  
FREDK. C. FRAENTZEL.