(No Model.)

J. SIEM.

FORCING FRAME.

No. 374,499. Patented Dec. 6, 1887.

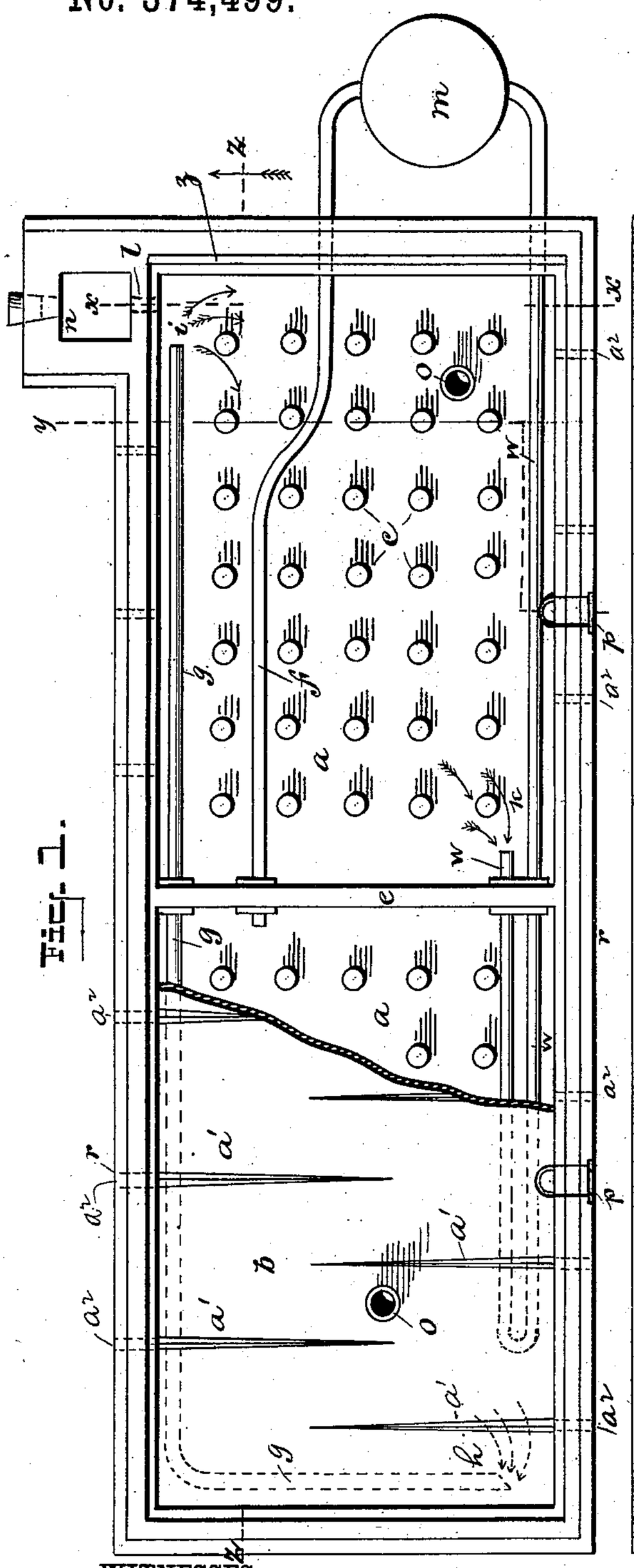

Fig. 1.

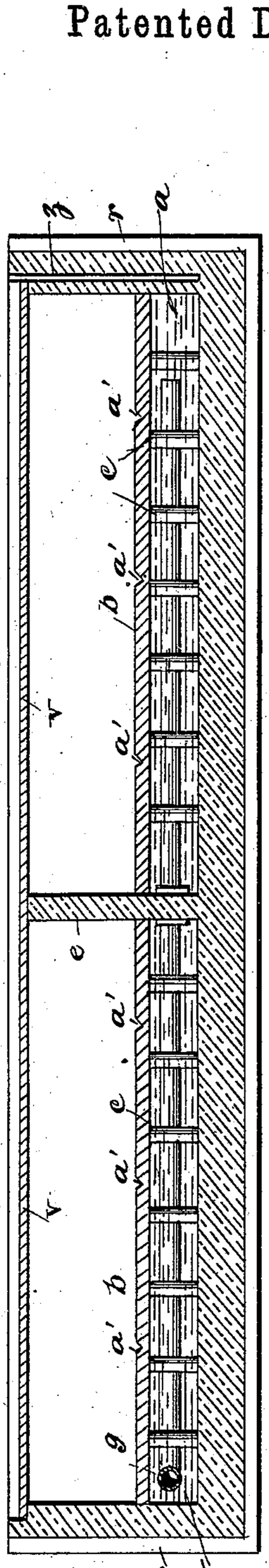

Fig. 3.

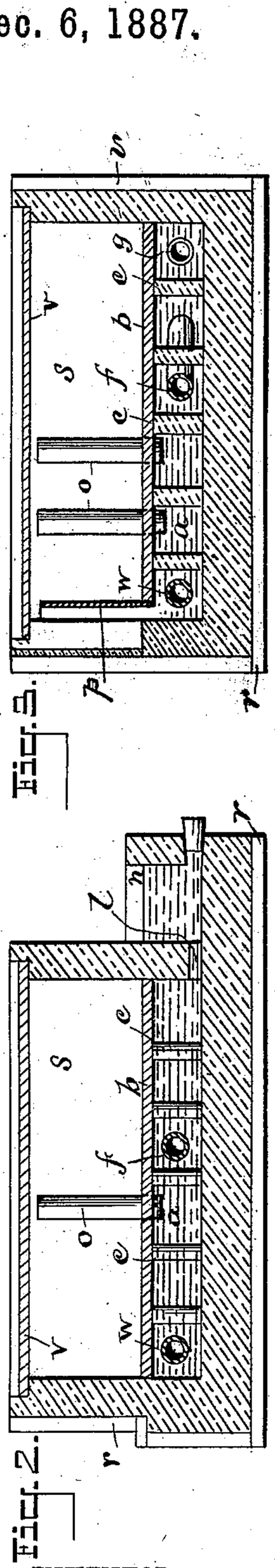

Fig. 4.

Fig. 2.

WITNESSES:

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JACOB SIEM, OF HOMBURG-VOR-DER-HÖHE, GERMANY.

FORCING-FRAME.

SPECIFICATION forming part of Letters Patent No. 374,499, dated December 6, 1887.

Application filed April 26, 1887. Serial No. 236,192. (No model.)

To all whom it may concern:

Be it known that I, JACOB SIEM, a subject of the Emperor of Germany, residing at Homburg-vor-der-Höhe, Germany, have invented new and useful Improvements in Forcing-Frames, of which the following is a specification.

This invention relates to means for producing and maintaining the heat of hot-beds for horticultural purposes by means of hot water. The advisability of warming hot-beds by artificial heat instead of manure has already given rise to many experiments in this direction, but hitherto with unsatisfactory results, the heat having invariably been unequally and irregularly distributed over the bed. According to the present invention these defects are obviated by arranging a hot-water reservoir below the bed, in which reservoir, by a peculiar arrangement of the inlet and outlet pipes, the water heated in a boiler outside continually circulates in such a manner that the entire surface has a uniform temperature.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the forcing-frame, the glass cover being removed and the bottom of the earth-receptacle partly broken away. Fig. 2 is a cross-section on the broken line *x x*, Fig. 1. Fig. 3 is a like section on line *y y*, Fig. 1. Fig. 4 is a longitudinal section on line *z z*, Fig. 1.

The water-reservoir *a a*, which is advantageously constructed of cement, is covered by thin cement plates *b b*, which form the bottom of the earth-receptacles of the bed. These cement plates *b b* rest upon cement columns *c* in the water-reservoir *a a*. The reservoir *a a* is divided by a vertical partition, *e*, into two compartments which communicate with each other through pipes, hereinafter described, the said partition extending from the bottom of the reservoir to near the top of the earth-receptacle, and dividing it also into two compartments. In front of the reservoir, below the level of the same, is placed a small circulating-boiler, *m*, which serves to heat the water in the reservoir *a a*, and to maintain it at the desired degree of heat. A pipe, *f*, conveys the hot water from the upper end of the boiler *m* through the first compartment directly into the second compartment, the hot water flowing through the said pipe giving up a portion of its heat to the water in the first compartment. A second pipe, *g*, passing along the transverse rear wall and one side wall of the second compartment, and then also along one side wall of the first compartment, conveys the water which is in proximity to the back wall of the second compartment into proximity to the transverse front wall of the first compartment—that is to say, from *h* to *i*. A third pipe, *w*, passes through the transverse back wall of the first compartment at *k* to near the back wall of the second compartment, thence back again through the second compartment, and then through the rear wall of the first compartment, and through the said first compartment to the lower end of the circulating-boiler *m*. By means of this system of pipes a good circulation of the water is maintained and a uniform temperature at all points of the reservoir is insured.

On the outside of the reservoir is a small channel, *n*, which is in communication with the said reservoir *a a* through a short passage, *l*. This channel serves for filling the reservoir at the beginning of the operation, the air contained in the reservoir being able to escape through suitable rising pipes, *o*. This channel *n* has a vent provided with a plug, (see Figs. 1 and 2,) so that the reservoir can be emptied by removing the plug. The rising pipes *o* extend from the top of the reservoir *a* to near the top of the bed or earth-receptacle *s* to form passages for the escape of air when the reservoir is being filled, and also to permit steam to rise therethrough against the glass cover and there condense and fall on the earth, keeping it moist and preventing it from becoming hard and dry. Should the temperature rise beyond the desired degree, the burning of the roots can be obviated by temporarily letting off part of the water through the channel. The water then recedes slightly from the cement top of the reservoir. It is, however, essential, under ordinary circumstances, that the heating water should touch the top of the reservoir *a a*—that is to say, of the lower surface of the cement plates *b*. This

condition can be maintained by means of the said channel *n*.

Openings *p p* are formed in the side walls of the forcing-frame above the water-reservoir, and in front of which glasses are fixed in the cement wall, as shown in Fig. 3. These openings serve to receive thermometers, the scale of which is visible through the glasses, the said thermometers indicating the temperature of the water in the reservoir. This arrangement is very suitable during severe cold, when it is not desirable to open the frames to let down the thermometers through the rising pipes.

In order that a tight joint shall always be formed around the circulating-pipes *f* and *w*, which pass through the front wall of the reservoir, a sheet of lead, *z*, is placed perpendicularly in this front wall and connected by soldering with the said circulating-pipes.

The bottom and side wall of the reservoir are isolated from the soil by wooden planks *r*, or by any other material that does not conduct heat.

V indicates the glass top, which in practice will be set in several frames in the usual manner.

In the upper surface of the cement plates *b*, that separates the hot-bed from the hot-water reservoir, is formed a series of grooves, *a'*, the said grooves registering with apertures a^2 in the side walls of the forcing-frame to conduct outward any surplus of moisture in the hot-bed *s*.

As stated at the commencement of this specification, trials have already frequently been made to artifically heat hot-beds. Usually, however, an air-space has been formed beneath the supports of the bed, so that powerful heating is required in order that the earth above shall be warmed. By heating in this manner it is altogether impossible to prevent the earth from becoming dry or even from burning. Heated water has also been used below the beds, the vapors rising from the water being employed to effect the heating of the earth; but such vapors have conveyed too much moisture to the earth, thereby injuring the growth of the plants, apart from other disadvantages which have shown themselves. The present invention differs essentially from the means heretofore employed in the fact that the water-reservoir is tightly covered at the top with cement plates, the hot water being in contact with the lower surfaces of these plates. Now, as the mold to be heated rests upon these plates, which are very uniformly heated, the said mold will also be heated in the most uniform and beneficial manner without moisture from the heating water coming into contact with the mold.

A bed heated in the manner before described can be used for raising plants and forcing flowers and vegetables. It can also be used to heat the ground for pot-plants which are in the open air, and for warming the ground for forcing-houses.

Having thus described my invention and the manner of employing the same, what I claim, and wish to have secured to me by Letters Patent of the United States of America, is—

1. The combination, with the cement reservoir having the columns *c* in its bottom, the filling-channel *n* at the side thereof, and a central transverse division-plate, *e*, forming two compartments, of a cement plate, *b*, at each side of said division plate and resting on the columns, and supply and outlet hot-water pipes leading into and through said compartments, substantially as set forth.

2. A forcing-frame having side apertures, a^2, a hot-water reservoir in its bottom, a bed or receptacle above the same, and cement plates separating the said reservoir from the receptacle and provided with grooves *a'* on the upper surfaces registering with the apertures a^2, substantially as set forth.

3. A forcing-frame constructed with a hot-water reservoir in the bottom having two compartments, in combination with the inlet-pipe *f*, passing through the first compartment and into the forward part of the second compartment, the pipe *g*, extending from the rear part of the second compartment to the forward part of the first compartment, and the outlet-pipe extending from the rear of the first compartment to the rear part of the second compartment and back through the first compartment, substantially as shown and described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JACOB SIEM.

Witnesses:
FRANZ HASSLACHER,
JOSEPH PATRICK.