No. 783,083.

PATENTED FEB. 21, 1905.

W. S. SMALL.

INCUBATOR.

APPLICATION FILED DEC. 7, 1903.

3 SHEETS—SHEET 1.

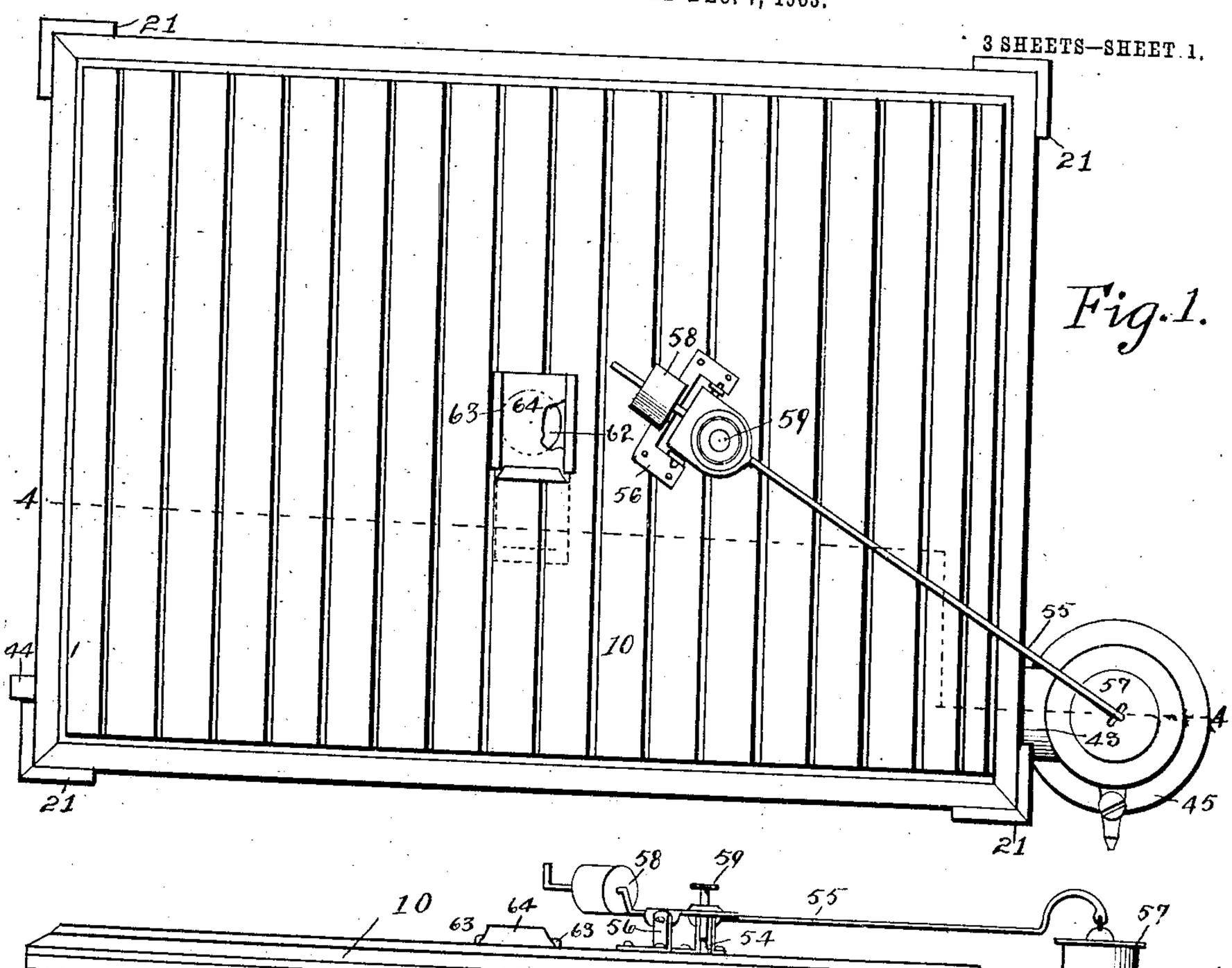


Fig. 1.

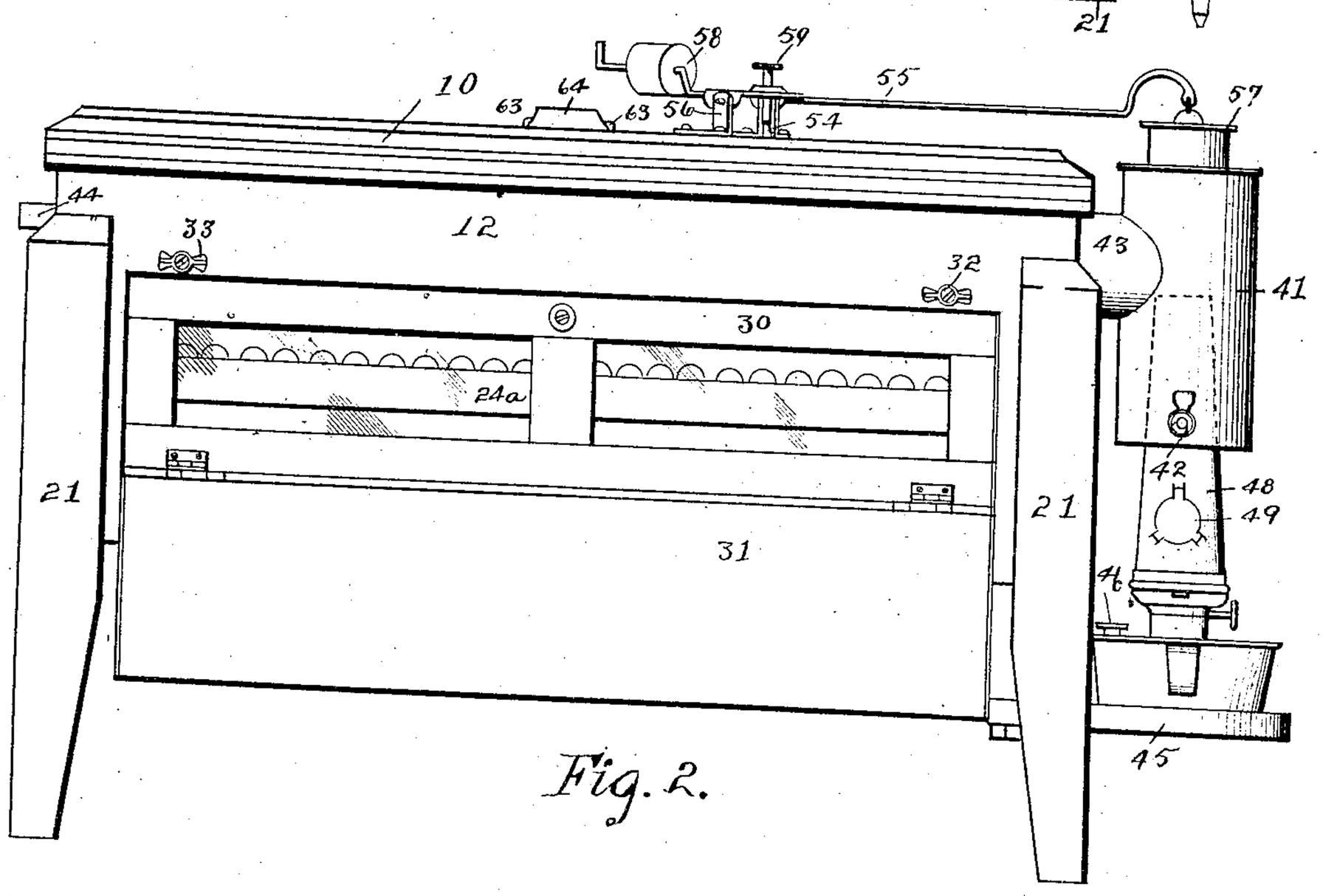


Fig. 2.

Witnesses

A. G. Hague.
S. F. Christy.

Inventor W. S. Small

By Orwig & Lane attys

No. 783,083.

PATENTED FEB. 21, 1905.

W. S. SMALL.

INCUBATOR.

APPLICATION FILED DEC. 7, 1903.

3 SHEETS—SHEET 2.

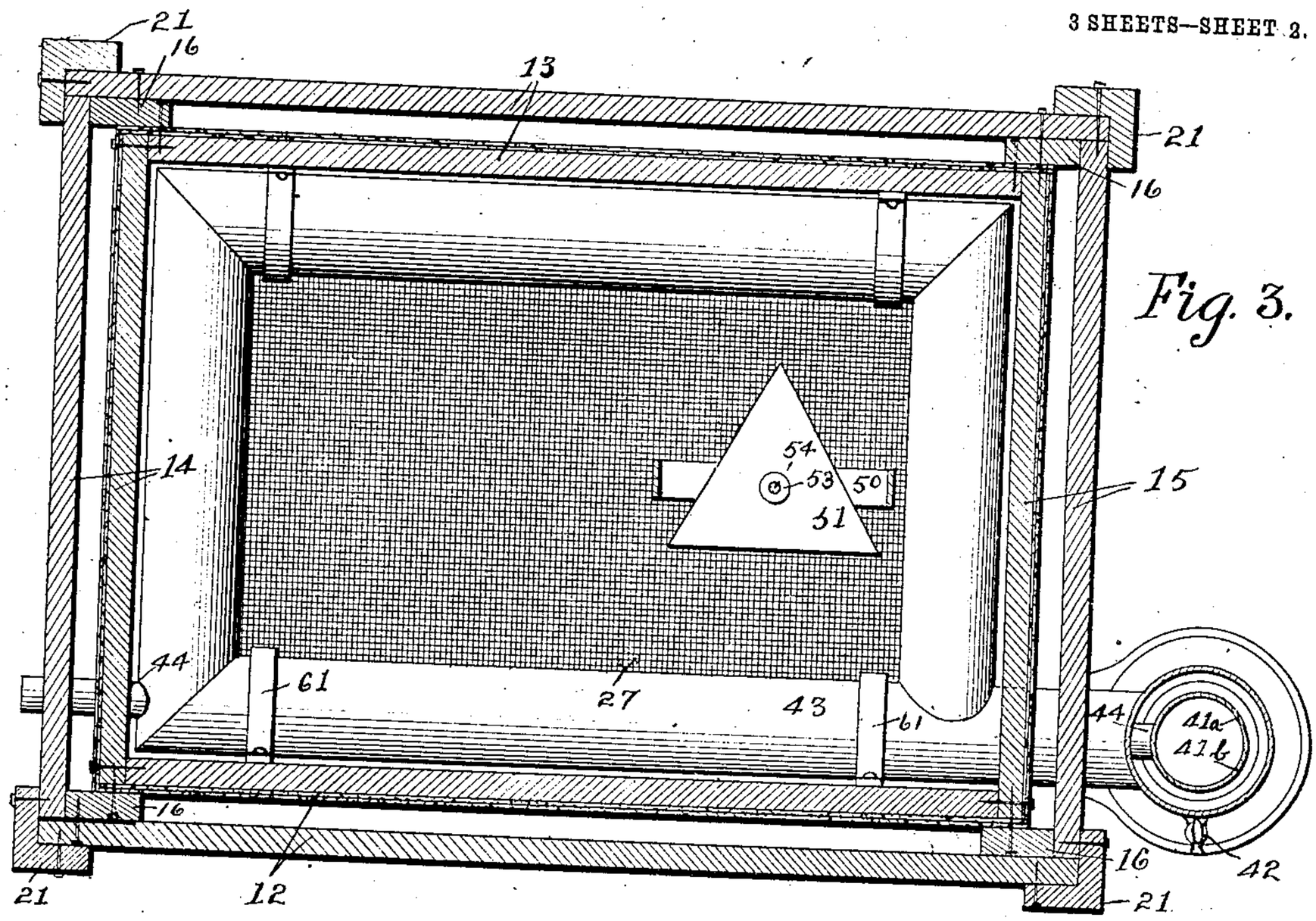


Fig. 3.

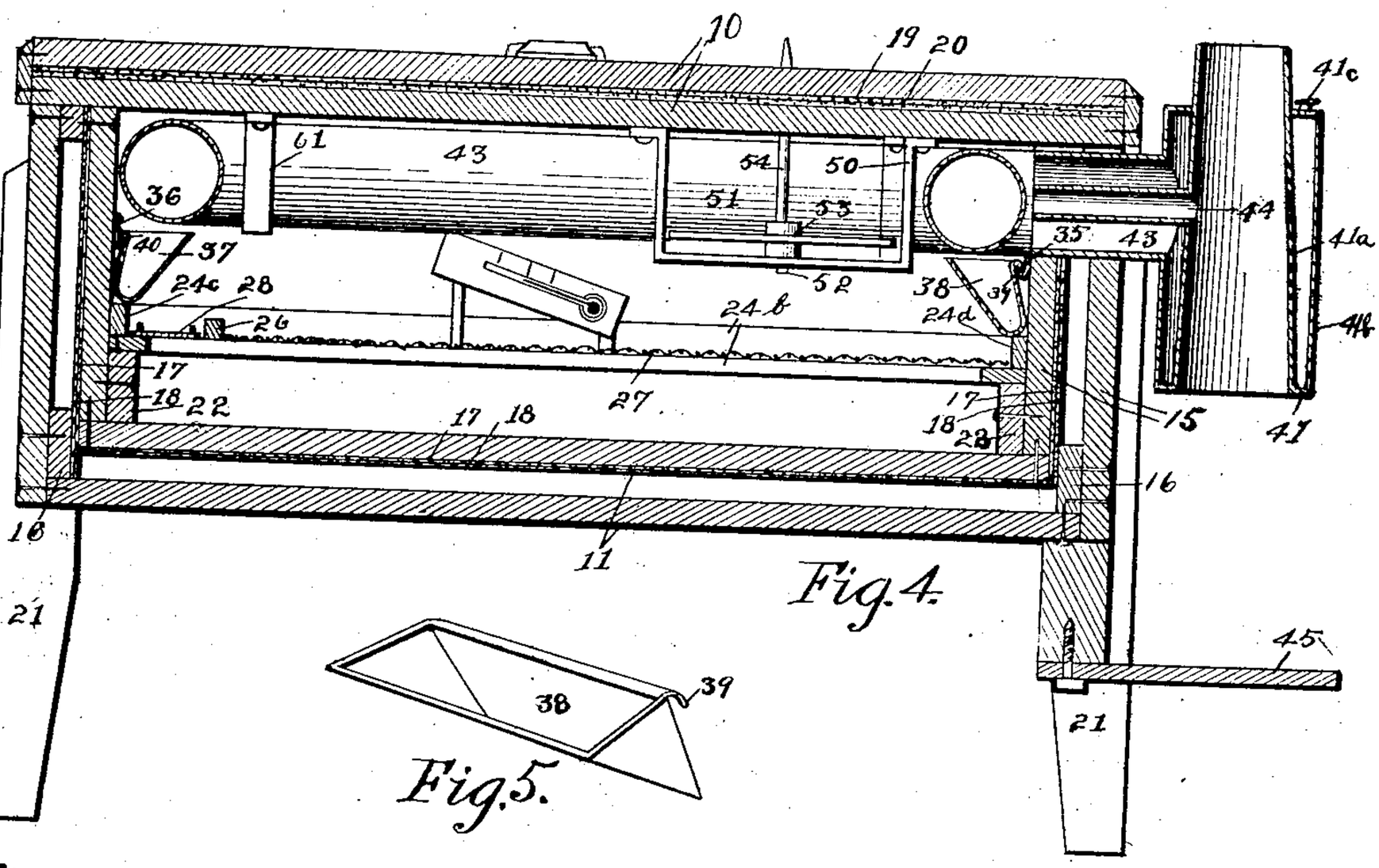


Fig. 4.

Fig. 5.

Witnesses

A. G. Hague

S. F. Christy.

Inventor W. S. Small

By Orrig Lane atty

No. 783,083.

PATENTED FEB. 21, 1905.

W. S. SMALL.

INCUBATOR.

APPLICATION FILED DEC. 7, 1903.

3 SHEETS—SHEET 3.

Fig. 6.

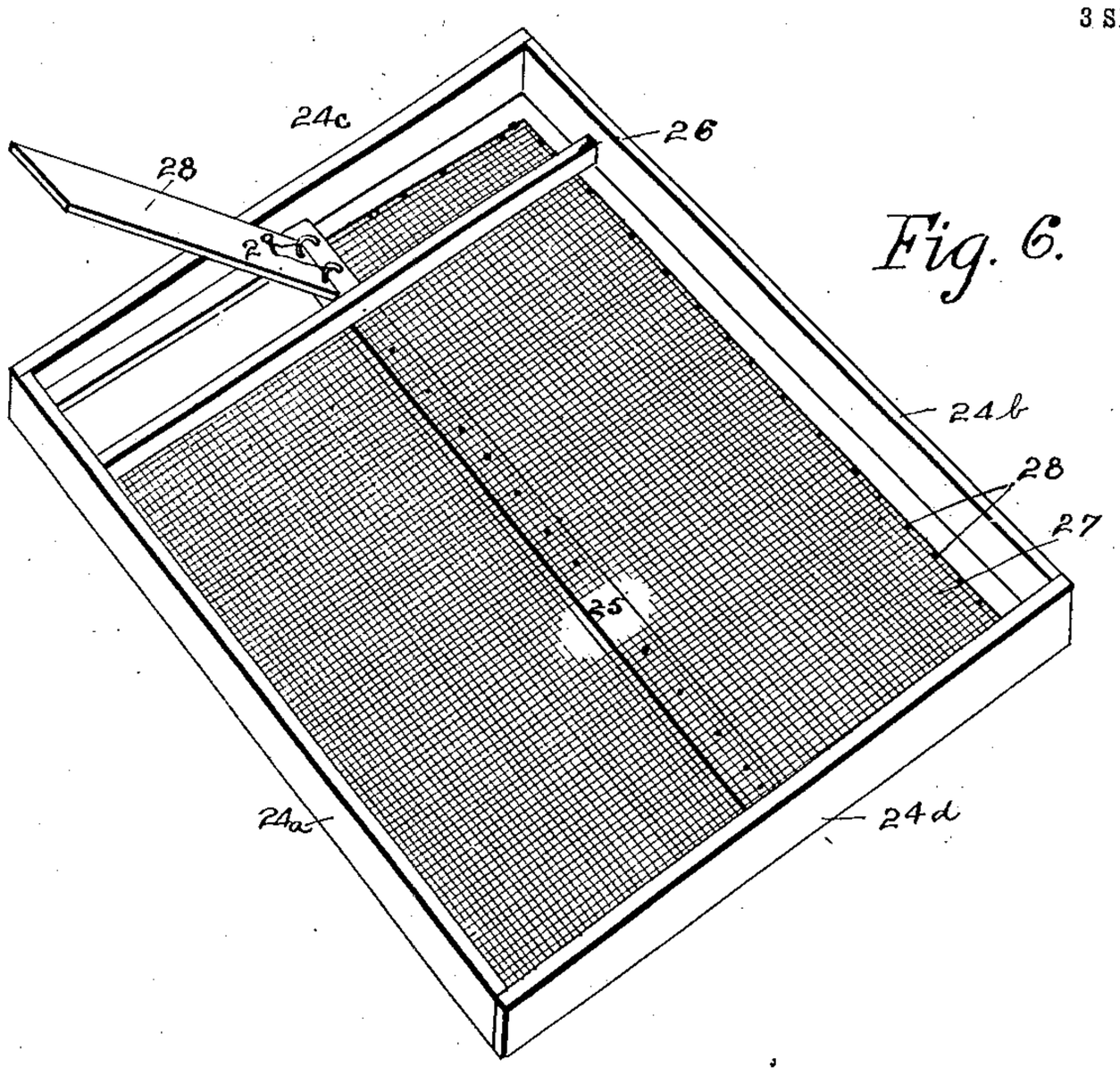
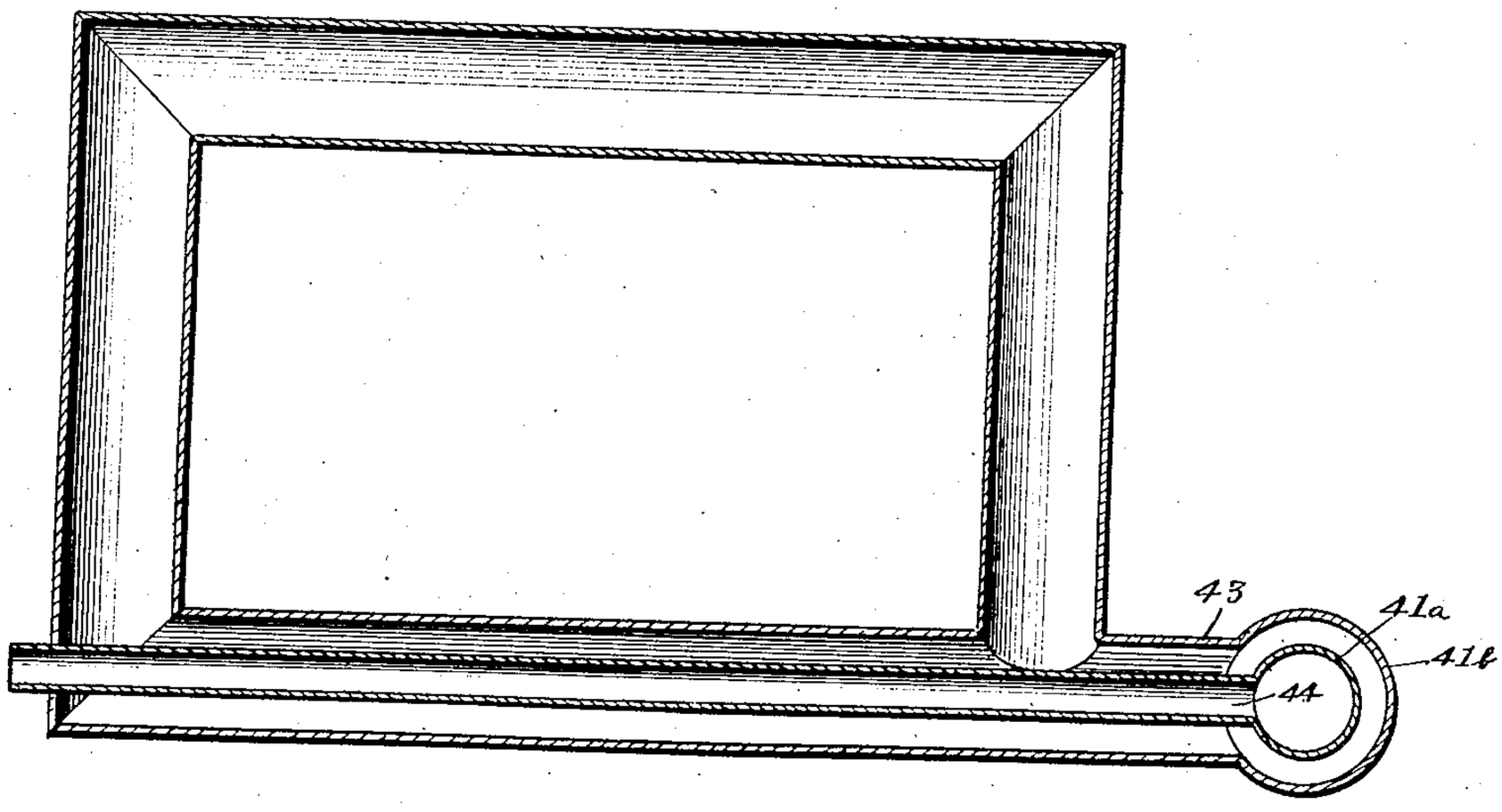


Fig. 7.



Witnesses

A. G. Hague
S. F. Christy.

Inventor W. S Small

By Owig & Lane attys

No. 783,083. Patented February 21, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM S. SMALL, OF DES MOINES, IOWA, ASSIGNOR TO THE DES MOINES INCUBATOR COMPANY, OF DES MOINES, IOWA, A CORPORATION OF IOWA.

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 783,083, dated February 21, 1905.

Application filed December 7, 1903. Serial No. 184,076.

To all whom it may concern:

Be it known that I, WILLIAM S. SMALL, a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented certain new and useful Improvements in Incubators, of which the following is a specification.

The object of this invention is to provide improved means for artificially incubating or hatching eggs.

My invention consists in the construction, arrangement, and combination of elements hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawings, in which—

Figure 1 shows a plan of the complete incubator. Fig. 2 shows a front elevation of the complete incubator, one of the doors being open. Fig. 3 shows a horizontal section of the incubator immediately beneath the top. Fig. 4 shows a vertical longitudinal section of the incubator on the line 4 4 of Fig. 1, the upper portion of the regulator being removed. Fig. 5 shows a perspective view of one of the moisture-pans. Fig. 6 shows a perspective view of the egg-tray, and Fig. 7 shows a horizontal section of the water-tank.

In the construction of the incubator as shown the numeral 10 designates the top, 11 the bottom, 12 the front wall, 13 the rear wall, and 14 15 the end walls of the incubator-casing. The walls, top, and bottom of the casing are made of wood. The walls and bottom of the casing are formed of separate sections spaced apart and arranged parallel with each other, the sections being separated by cleats 16 at their margins, thus producing a hollow construction of material advantage in arresting radiation of heat and cold and in maintaining an equable and uniform temperature in the casing. Sheets 17 18, of heavy paper or cardboard, are interposed between the inner section of each wall and the bottom and the cleats 16 adjacent thereto and provide further protection against the radiation above mentioned. The top 10 is formed of two sections separated only by two sheets 19 20, of paper or cardboard, and attached to the upper margins of the walls. Legs 21, in this instance four in number, are fixed to the casing and serve to support the casing in use. The walls of the casing are built up and connected as follows: The inner sections of the front and rear walls are nailed to the ends of the inner sections of the end walls. The plates 17 18, of paper or cardboard, are then placed on the outer surfaces of the inner sections and the cleats 16 are nailed thereto, the end portions of the cleats on the end sections overlapping and nailed to the ends of the side sections and the ends of the side cleats overlapping and nailed to the ends of the end cleats. The inner section of the bottom is nailed to the inner sections of the walls and the cleats are nailed thereto and confine the sheets of paper or cardboard. The outer sections of the end walls are nailed to the cleats and overlap the ends of the side cleats, and the outer sections of the front and rear or side walls are nailed to the cleats and overlap and are nailed to the ends of the outer sections of the end walls. The outer section of the bottom is nailed to the cleats and is overlapped by the lower margins of the walls and secured thereto by nails driven through said lower margins of the walls. The resultant construction is materially stronger than ordinary box construction and has the advantage of excluding air at the joints as well as interlocking the several sections. The legs 21 are notched at their inner corners and are fitted over and almost conceal the joints between the outer sections of the walls. Cleats 22 23 are positioned horizontally on the upper surfaces of the end portions of the inner section of the bottom and are fixed to the lower portions of the inner sections of the end walls.

An egg-tray is slidingly mounted on the upper faces of the cleats 22 23 and is fitted snugly to the interior of the casing. The tray is formed with L-shaped side and end pieces 24^a, 24^b, 24^c, and 24^d, a central longitudinally-disposed bar 25, notched into and fixed to the central portions of the end bars, and a cross-bar 26, adjacent to and parallel with the end bar 24^c. A bottom 27, of screen or wire-cloth, is mounted on the lower portion of the side

and end bars and the longitudinal bar 25 of the tray-frame and is secured thereto by tacks 28. The cross-bar 26 overlies the screen bottom 27. An opening is formed in the screen bottom 27 of the tray between the forward portion of the bar 26 and the end bar 24^c, extending from the left end portion of the bar 25 to the front bar 24^a, and the said bottom also is tacked to the cross-bar. Thus provision is made for a doorway or opening, through which the newly-hatched chicks may pass from the tray to the lower portion of the casing or incubator-chamber beneath the bottom 27. Since it is desirable to utilize all the space in the tray at the commencement of a "hatch" and it is usual to "test out" some of the eggs during the progress of the hatch, I have provided a gate 28 to close the opening in the bottom 27. The gate 28 preferably is made of sheet metal and of a length that its end portions normally rest on the bars 24^a and 25. The inner end portion of the gate 28 is provided with openings, and staples 29 are driven into the bar 25, with one leg or point of each staple passing through one of said openings. Thus is provision made for hinging the gate to the longitudinal bar, and after enough of the eggs have been "tested out" and the chicks commence to hatch in sufficient numbers to admit them to the space below the tray the gate is turned back to the rear of the bar 25, thus opening the doorway. It is to be understood that the tray is removed from the casing or chamber for the purpose of turning back the gate, and unhatched eggs are prevented from falling through the doorway by the cross-bar 26. A doorway is formed in the front wall of the casing of sufficient length and height to permit of the removal and replacement of the tray and moisture-pans hereinafter to be described, and a door 30 is hinged to the front wall and closes the inner portion of said doorway. A door 31 is hinged to the front wall and closes the outer portion of the doorway. Said door is secured in its closed position by turn-buttons 32 33 on the front wall.

Slide-bearings 35 36, preferably made of sheet metal bent laterally, are fixed in horizontal positions on the inner faces of the end walls of the casing immediately above the end bars of the egg-tray, and moisture-pans 37 38 are provided, preferably made of sheet metal and formed with downturned flanges or hooks 39 40 on their inner faces shaped and arranged to engage over and slide upon said bearings. The moisture-pans 37 38 are approximately V-shaped in cross-section and are formed with ends connected to the integral sides by sealed joints. The space above the tray is sufficient for the moisture-pans to slide in and out through the doorway in the front wall of the casing, and sufficient water is contained in said pans to provide the desired moisture in the chamber to effect the proper incubation of the eggs contained by the tray.

A water-tank is provided and preferably is made of sheet metal, such as copper, and of annular form. The bottom 41 of the water-tank is imperforate between the annular sheets 41^a and 41^b, forming the inner and outer walls of the tank, and the outer wall is of uniform diameter throughout. The inner wall of the water-tank is tapering throughout its length, being wider at its lower end, and the outer wall is provided with a petcock 42, whereby the tank may be drained. The inner wall extends above the outer wall, and a capped ingress-port 41^c is provided in an otherwise imperforate top piece connecting and sealed to the walls. The outer wall of the water-tank is formed with an aperture to receive the outer end portion of a pipe 43, which pipe also is made of sheet metal, preferably copper, and is circular in cross-section. The pipe 43 extends through the end wall 15 of the casing and traverses the upper forward portion of the chamber therein. It is bent rearwardly at the left end of the chamber and extends nearly to the rear wall, is then bent parallel with its initial portion and extends along the rear wall, and is then bent parallel with its left portion and extended to and communicates with its initial portion within the chamber. The pipe 43 preferably is of uniform diameter throughout its length. It may be filled with water through the filling of the tank 41, since the initial end of the pipe opens to the tank and all of the pipe is below the level of the top of the tank. An aperture is formed in the inner wall of the water-tank in registration with but of smaller diameter than the initial end of the pipe 43, and a flue 44 has its initial end portion sealed in said aperture and extends longitudinally and centrally of the initial portion of the pipe. The flue 44 extends out of and is sealed to the first elbow of the pipe 43 and projects through the wall 14 of the casing to the atmosphere. The flue 44 is of materially less diameter than the pipe 41 and yet of sufficient size that the radiation of heat therefrom will raise the temperature of the water in the pipe to the desired degree. The provision of a doorway in the front wall of the casing and the necessity of opening the same frequently during a hatch causes the front portion of the incubator-chamber to cool more than the rear portion, and it is on this account that I have located the flue 44 along the front wall of the chamber, since such location insures the maintenance of slightly greater heat in the front, where it is most needed.

A lamp bracket or shelf 45 is pivoted to and beneath the end wall 15 of the casing by means of a bolt or screw 46, extending through the inner end portion of the bracket and seated in the wall, and said bracket may

be swung beneath the casing or projected laterally therefrom, as desired. A lamp 47 is mounted on the bracket 45 and is provided with a sheet-metal chimney 48, extending within the annular water-tank 41 nearly or quite to the initial end of the flue 44. The chimney 48 is provided with a mica window 49, through which the flame of the lamp may be viewed. I employ a regulator such as is described in Letters Patent of the United States granted to the Des Moines Incubator Company March 1, 1898, and June 28, 1898, and numbered, respectively, 599,959 and 28,950 and constructed generally as follows: A bracket 50 is mounted on and depends from the lower surface of the top of the casing, and a thermostatic cell 51 is fixed by a bolt 52 and rests on said bracket. A socket 53 is fixed to and rises from the central portion of the upper face of the cell 51 opposite the bolt 52, and an actuating-rod 54 stands in and rises from said socket through the top of the casing. A damper-lever 55 is pivoted intermediate of its ends on a stand 56 on the top of the casing, and one end portion of said lever is provided with a damper 57 above the upper end of the inner wall of the annular water-tank 41, while the opposite end of said lever is provided with a counterbalancing-poise 58, adjustably mounted thereon. An adjusting-screw 59 is screw-seated in the damper-lever 55 and is formed with a socket in its lower end portion shaped and arranged to receive the upper end portion of the actuating-rod 54. The adjusting-screw and poise are so set or adjusted that the damper 57 rests lightly on and closes the upper end of the inner wall of the annular water-tank 41, and when the lamp is lighted said damper directs the draft of heated air therefrom through the space between the chimney 48 and the inner wall of the tank and thence through the flue 44 and to the atmosphere at the left end of the casing.

The passage of the heated air through the flue 44 insures the heating of the water in the initial portion of the pipe 43, and the direct radiation of heat from the chimney and the initial end portion of the flue heats the water in the annular tank. The heating of the water in the initial portion of the pipe 43 expands said water and causes it to seek an outlet. Since the heated water cannot travel toward the lamp and tank, where the water is of greater temperature it naturally recedes through the left portion of the pipe 43 toward the rear of the chamber and thence along the rear portion of the pipe and forward again along the right end. The result of the peculiar construction of the pipe and the relative location of the flue is the establishment and maintainance of a contant circulation of water through the pipe that thoroughly warms the interior of the chamber, it being understood that the front portion of the chamber may be slightly warmer than the rear portion. To compensate for the slight possible difference in the temperature of the casing, the tray is reversed frequently during the progress of the hatch, thus providing for the application of like amounts and degrees of heat to all of the eggs.

When the temperature in the incubator-chamber becomes too great for safety to the eggs, the cell 51 expands and raises the actuating-rod 54, which rod in turn raises the adjusting-screw 59 and lever 55. The lever 55 raises the damper 57 and opens the upper end of the inner wall of the water-tank and permits the draft of heated air and products of combustion from the lamp to escape directly to the atmosphere without traversing the flue 44. The result is a slight cooling of the atmosphere within the chamber and a relaxing of the expansive force of the cell. The regulator may be so nicely adjusted that the fluctuations of the damper will be very slight, and the temperature in the chamber may be maintained practically stationary, varying propably not more than one degree of heat from the desired normal. The location of the water or moisture pans at either end of the chamber and extending from front to rear thereof and immediately below portions of the heat-radiating water-pipe 43 provides for the evaporation of the water from said pans uniformly, as required for the supplying of sufficient and desired quantities of moisture to the eggs. The pipe 43 is supported and confined in the desired position in the chamber by means of metal bands 61, embracing said pipe and fixed to the walls of the casing. A ventilator-port 62 is formed in the central portion of the top of the casing, and a slide-bearing 63 is mounted on said top and surrounds said port. A slide-valve 64 is mounted in the slide-bearing 63 and may be adjusted to regulate and determine the degree of vent required through the port 62, providing the single vent 62 in the top of the casing insures the escape of fumes and vapors from the chamber and the entrance of small quantities of fresh atmospheric air, and the opening of the doors in the front wall of the casing frequently for the turning of the eggs and reversing of the tray provides altogether sufficient fresh air. Thus I have found it desirable to omit provision for maintaining a draft of air through the chamber, even though controllable, inasmuch as some inexperienced operators give too much air to the eggs and destroy them inadvertently.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States therefor, is—

1. In an incubator the egg-tray comprising the frame, the screen bottom in the frame formed with a doorway and a gate hinged to the frame and normally closing said doorway.

2. In an incubator, the egg-tray comprising the outer frame formed of connected bars each

L-shaped in cross-section, the central longitudinal bar connected to the end bars of the frame, the screen bottom fixed to the frame-bars and formed with a doorway therein and the gate hinged to the longitudinal central bar and normally closing said doorway.

3. In an incubator, the egg-tray comprising the outer frame, the central longitudinal bar connected to the end bars of the frame, the screen bottom fixed to and mounted on the frame-bars and longitudinal central bar and formed with an opening in one corner to serve as a doorway through said bottom, a cross-bar mounted parallel with one end bar of the frame and fixed to the side bars, the longitudinal central bar and the screen bottom extending along the edge of said opening and a gate hinged at one end on the central longitudinal bar and normally closing said opening.

4. In an incubator, the casing, the water-pipe in and extending out of said casing, the water-tank communicating with said water-pipe, the lamp communicating with said water-tank, the flue in said water pipe and tank and communicating with said lamp, the regulator controlling the draft from said lamp through the water-tank and flue, the pivoted bracket supporting said lamp, the moisture-pans in the casing immediately below said water-pipe, the egg-tray in said casing below the moisture-pans, which egg-tray is formed with a doorway in its bottom, a gate in the egg-tray normally closing the doorway therein, the normally closed doorway in the front wall of the casing and the ventilator-port in the top of the casing.

5. In an incubator, a casing, a water-pipe in and extending out of said casing, a water-tank communicating with said water-pipe, a lamp communicating with said water-tank, a flue in said water pipe and tank communicating with the lamp, moisture-pans in the casing immediately below said water-pipe and an egg-tray in said casing below the moisture-pans.

6. In an incubator, the combination of inner end and side pieces secured together, upright spacing-strips secured along the vertical edges of said end and side pieces, outer end and side pieces, said outer end and side pieces spaced apart from the inner end and side pieces by the said spacing-strips, and top and bottom pieces for the inner and outer end and side pieces.

7. In an incubator, the combination of inner end and side pieces secured together, a spacing-piece secured along the vertical edges of said end and side pieces and projecting outwardly beyond the side and also outwardly beyond the end of the corner, outer sides and ends secured to the said spacing-pieces and secured together and a top and a bottom for the inner and outer sides and ends.

8. In an incubator, the combination of inner side and end pieces and a bottom piece secured together, spacing-pieces secured to the edges thereof, each spacing-piece projecting outwardly from the side, outwardly from the end and downwardly beyond the bottom of the inner end, side and bottom pieces, outer end, side and bottom pieces secured to the said spacing-pieces and a top attached to the inner and outer end and side pieces.

9. The combination of an incubator-casing, an egg-tray with its ends against the inner walls of the casing, heat-radiating pipes above the end margins of the egg-tray and moisture-pans detachably secured to the inner walls of the casing between the radiating-pipes and the end margins of the egg-tray, said moisture-pans having their lower ends close to the end margins of the tray and their inner walls inclined upwardly and inwardly over the tray, said moisture-pans of a size to fill the space between the heat-radiating pipes and the end margins of the egg-tray and not interfering with the use of the entire tray for holding eggs.

WILLIAM S. SMALL.

Witnesses:
J. RALPH ORWIG,
W. R. LANE.