No. 871,908. PATENTED NOV. 26, 1907.

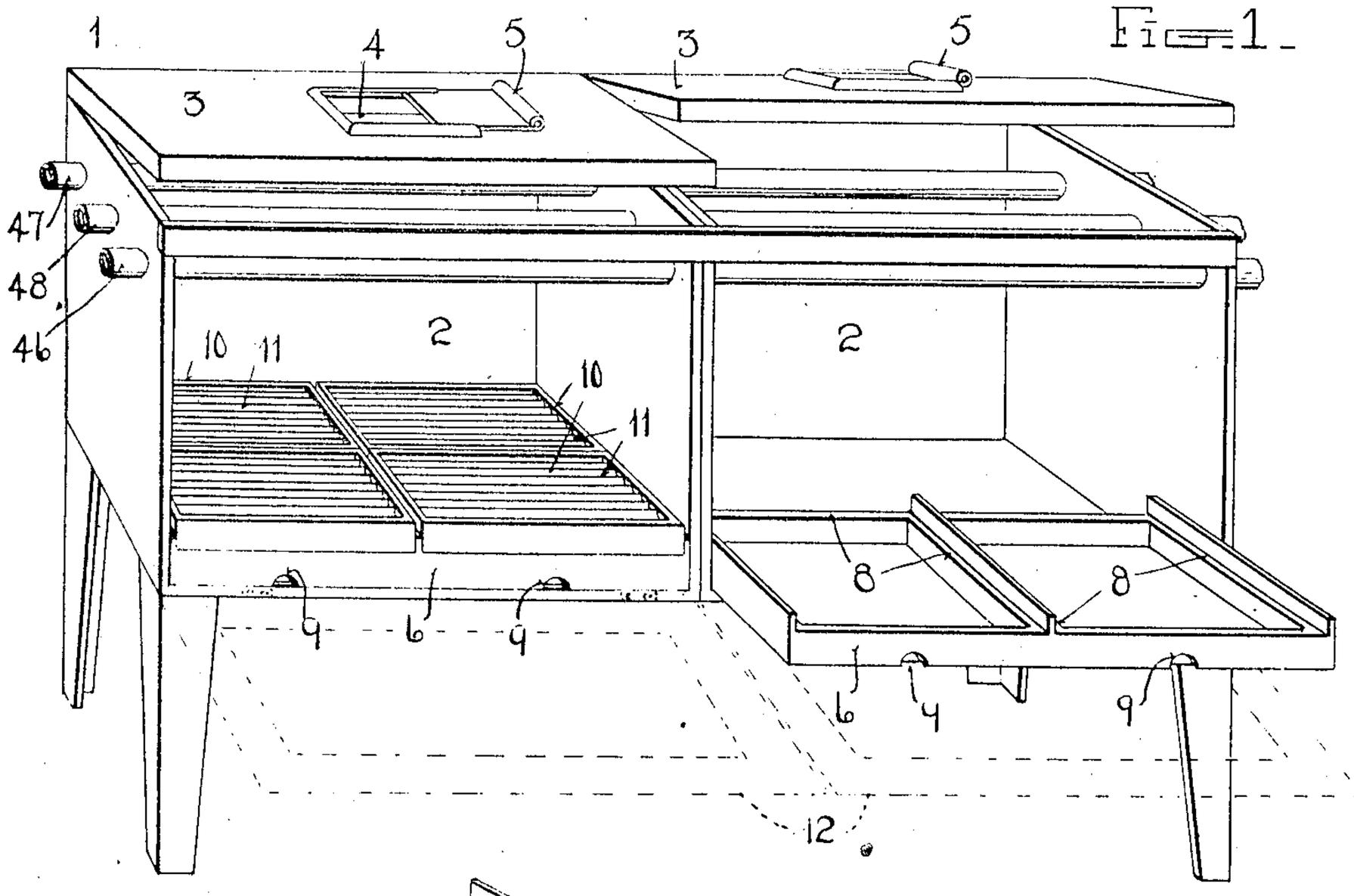
S. F. BIHN.

INCUBATOR.

APPLICATION FILED FEB. 7, 1907.

4 SHEETS—SHEET 1.

Fig. 1.



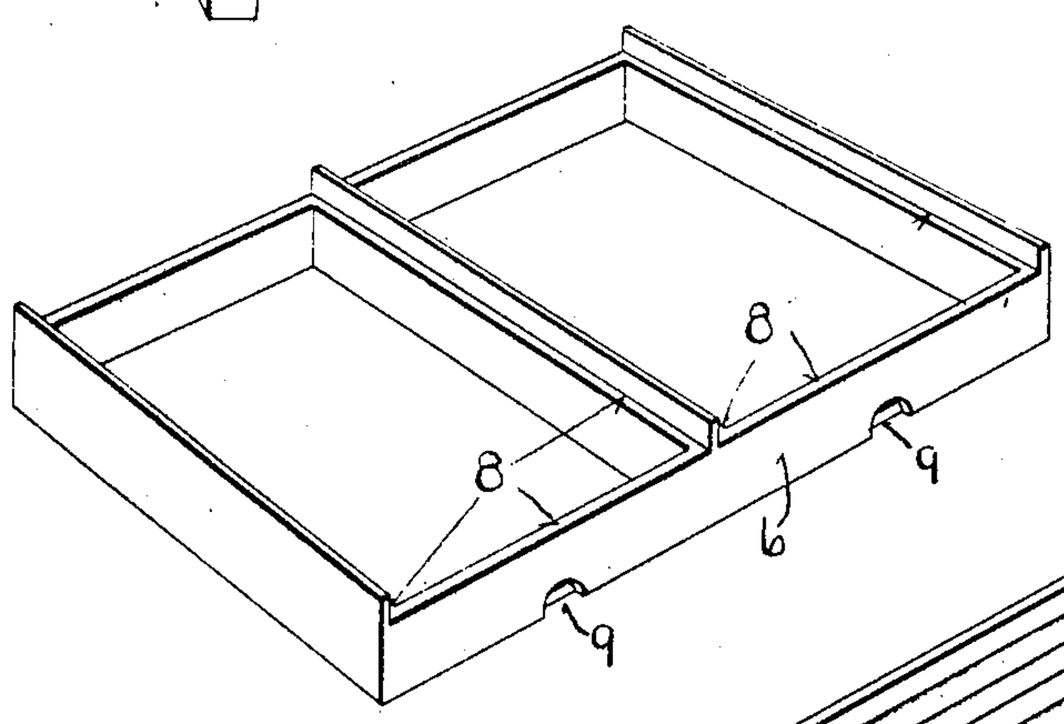
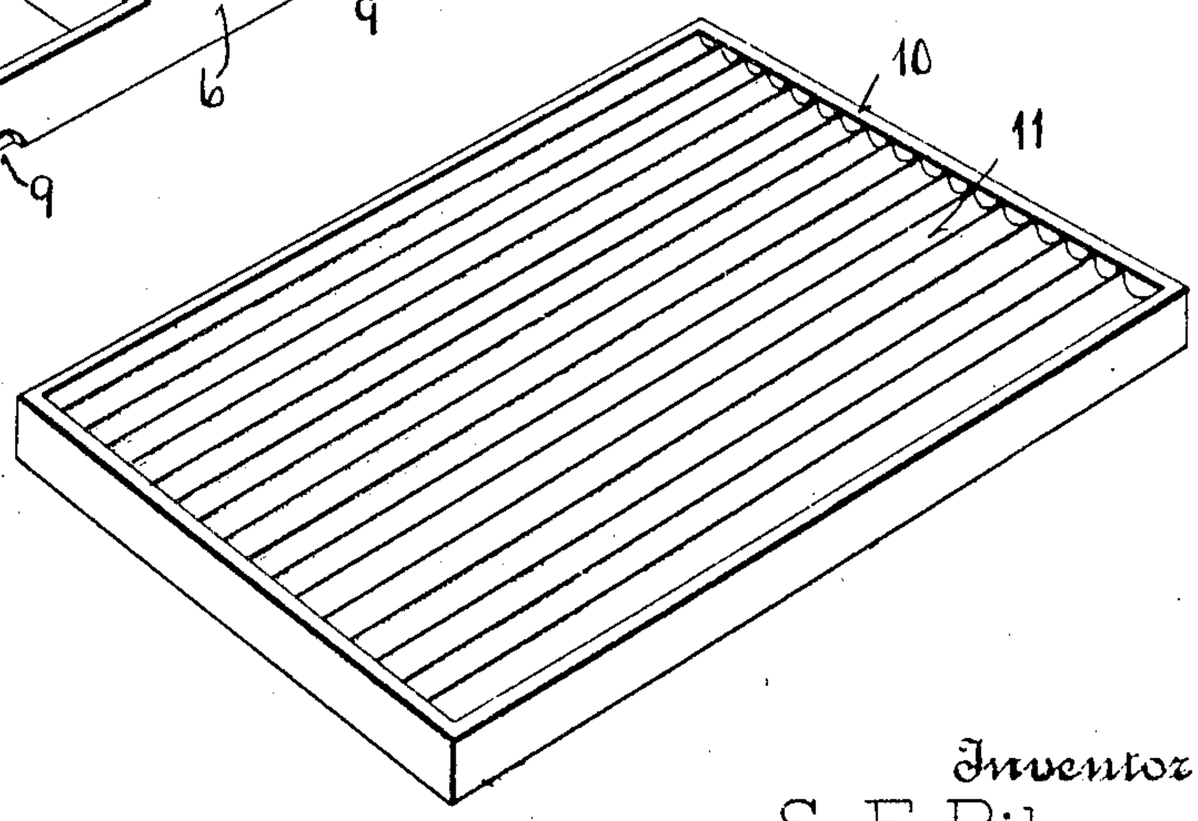


Fig. 2.

Fig. 3.



Witnesses
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4 SHEETS—SHEET 2.

Fig. 7.

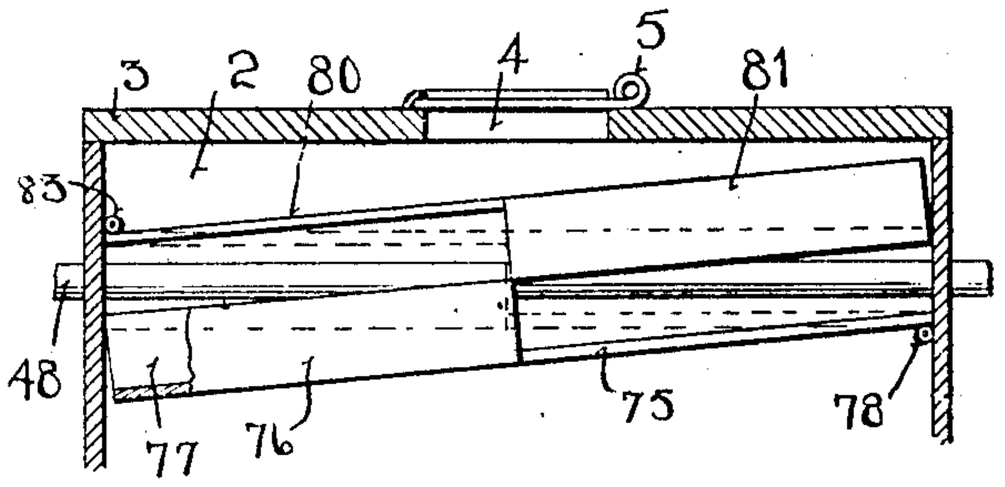


Fig. 4.

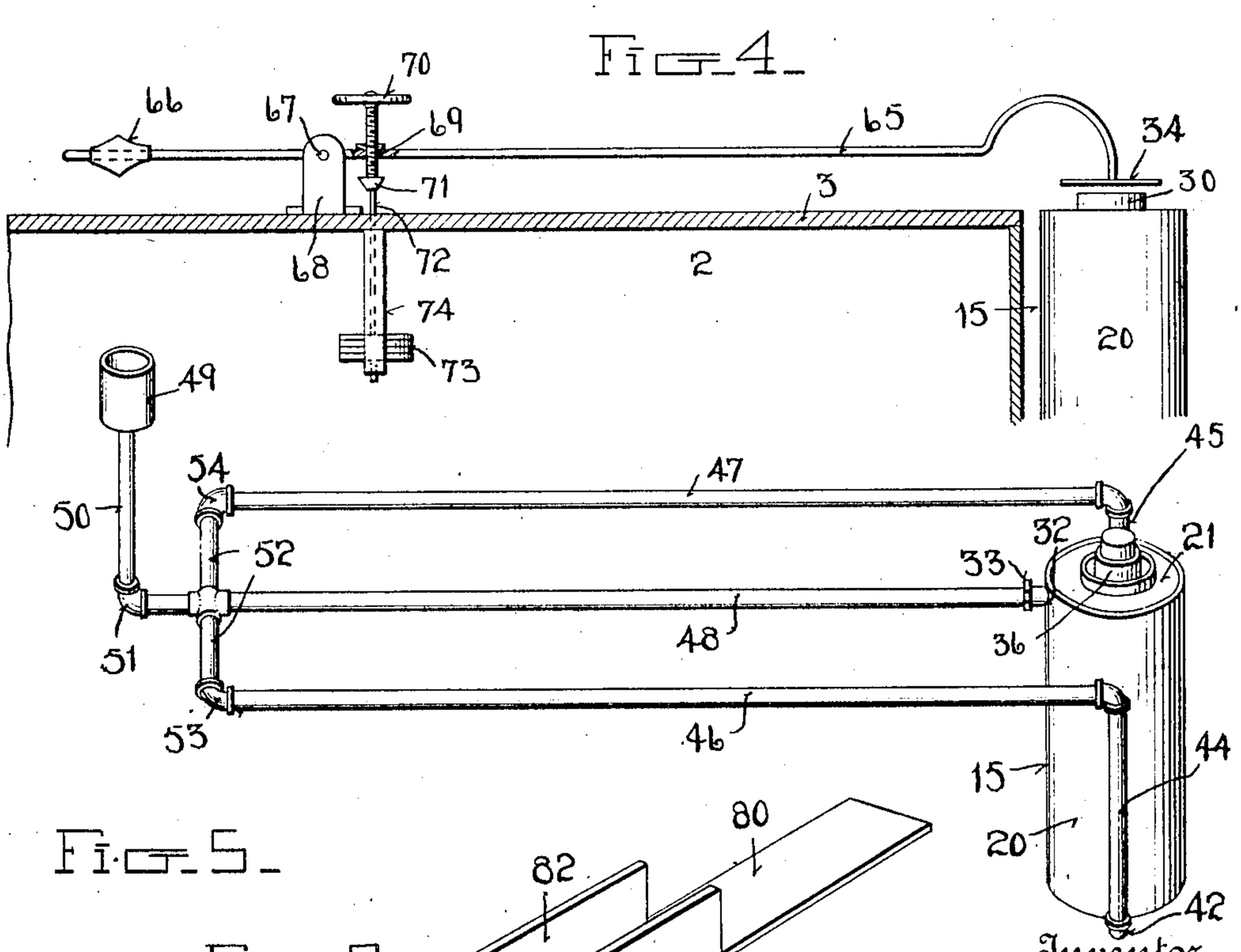
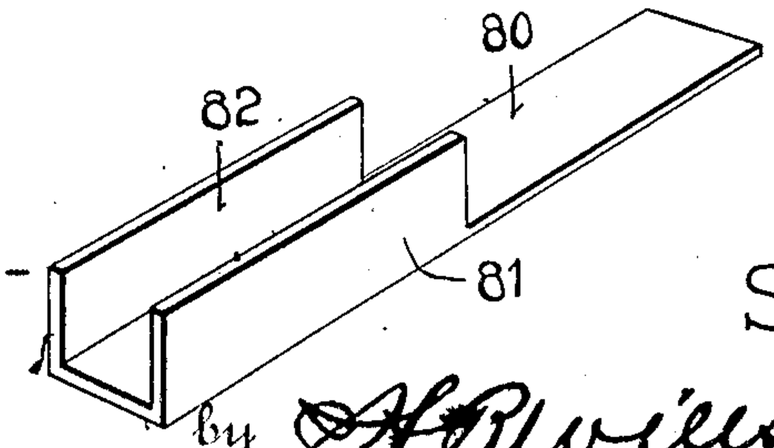


Fig. 5.

Fig. 9.



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4 SHEETS—SHEET 3

Fig. 8.

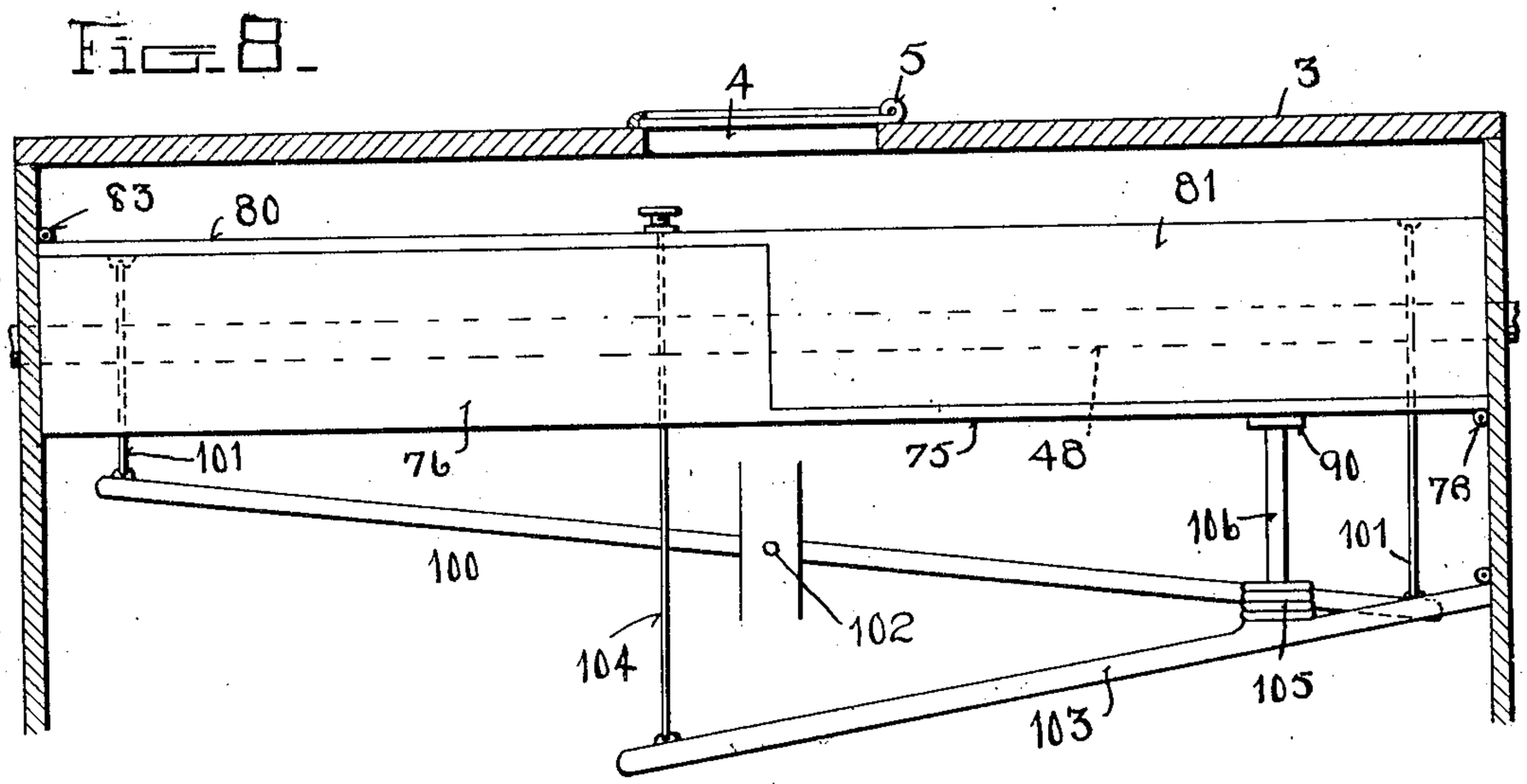
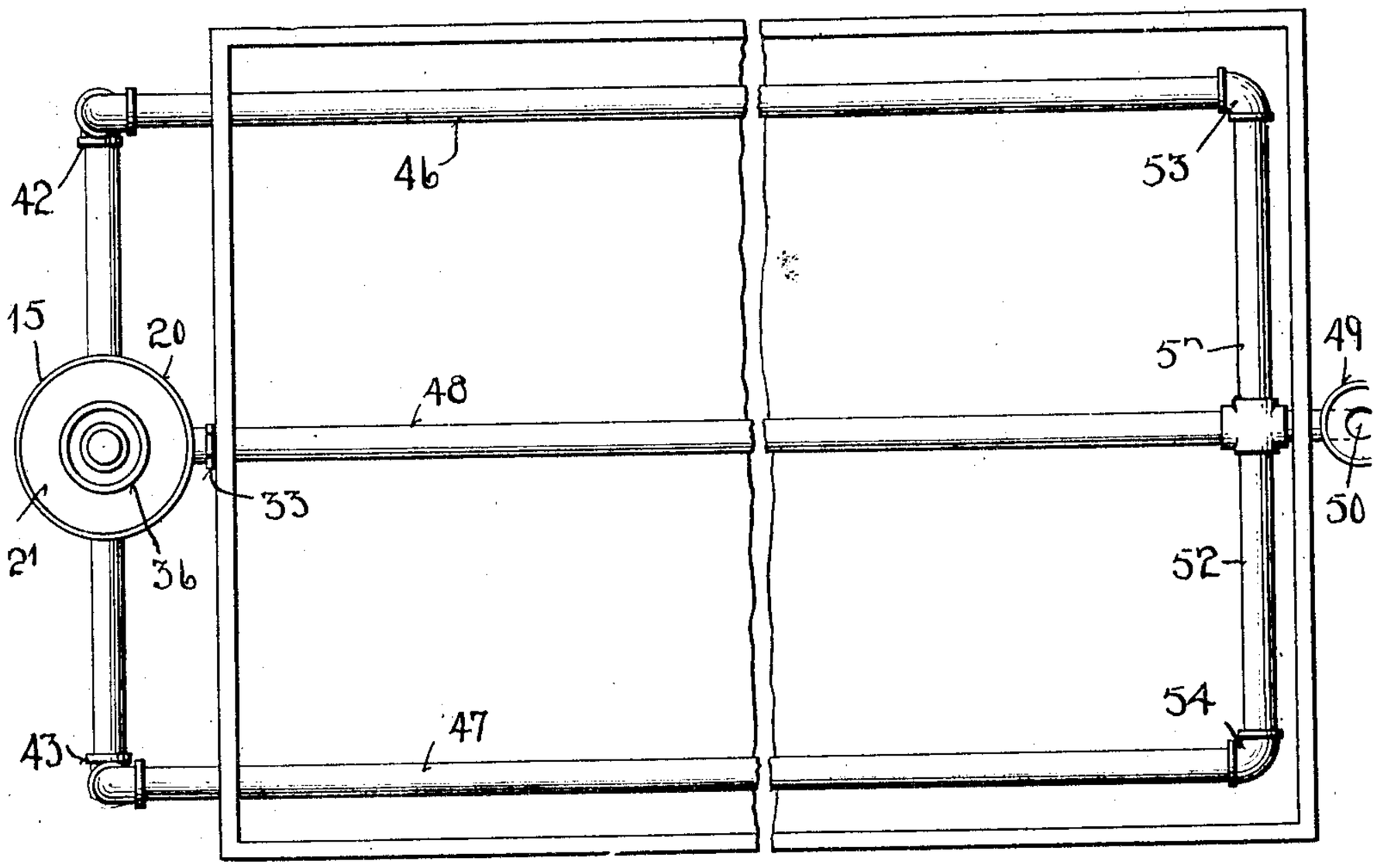


Fig. 6.



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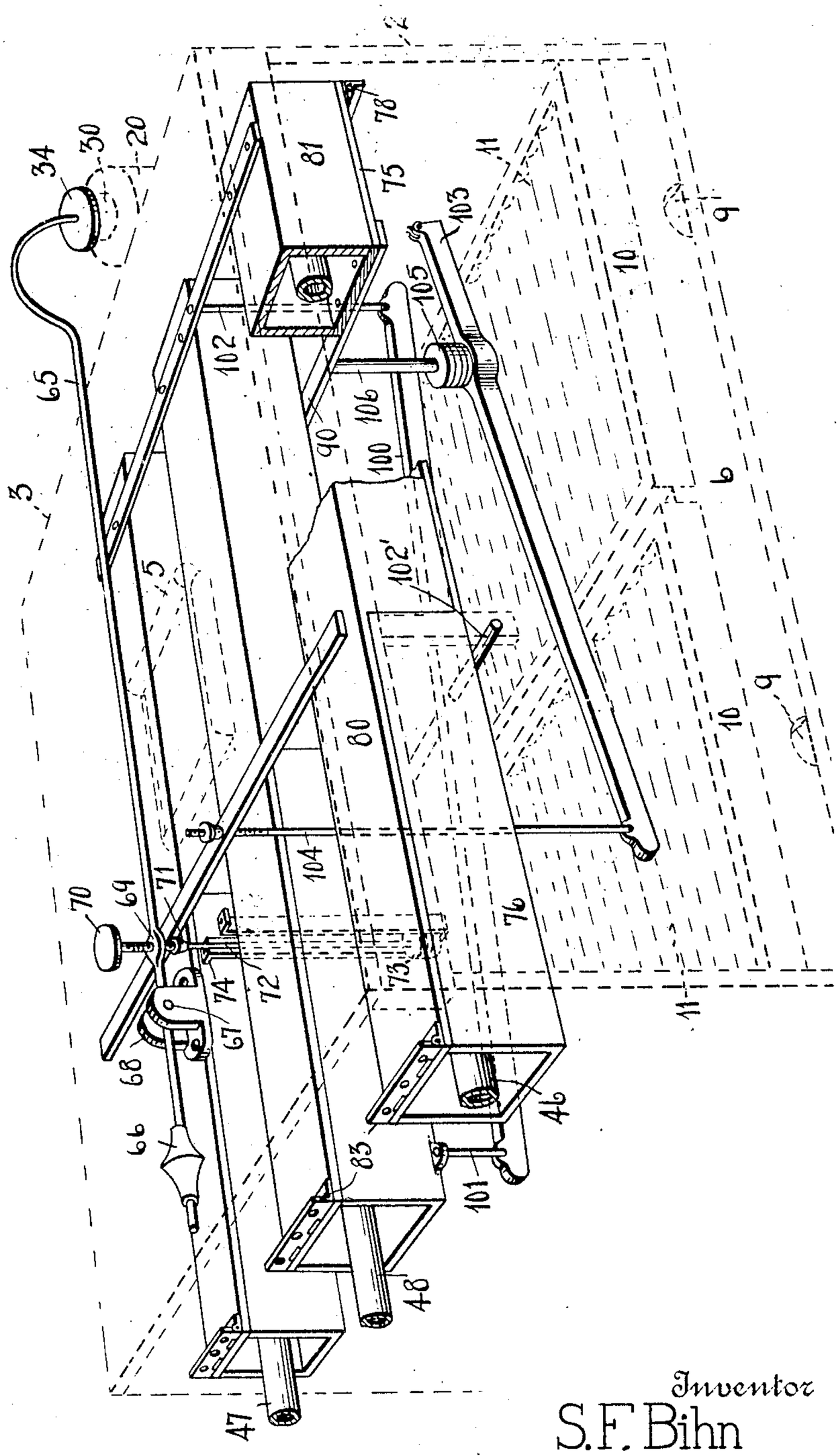
4 SHEETS—SHEET 4.

FIG-10-



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UNITED STATES PATENT OFFICE.

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INCUBATOR.

No. 871,908. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed February 7, 1907. Serial No. 356,186.

To all whom it may concern:

Be it known that I, SYLVAN FRANK BIHN, a citizen of the United States, residing at Petaluma, in the county of Sonoma and State of California, have invented certain new and useful Improvements in Incubators: and I do 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.

This invention relates to improvements in incubators.

The object of the invention is to provide a continuous incubator having a plurality of compartments heated from the same source whereby the daily care, adjusting and cleaning of many lamps or heaters is dispensed with and the time and labor required for running the incubator reduced to a minimum.

Another object is to provide means for regulating the temperature in the various compartments, independently of each other to provide for the differences in temperature of the several compartments caused by the variations in the heat produced by the embryo in its various stages of development.

Another object is to provide improved means for turning the eggs in bulk without injuring them and without removing them from the incubator.

Still another object is to provide means for properly cooling the eggs during the process of incubation without removing them from the incubator and thereby avoiding uneven cooling of the eggs, whereby some are chilled, while others are not cooled sufficiently when they are removed from the incubator to cool them.

Figure 1 of the accompanying drawings represents a perspective view of this improved continuous incubator with the lid of one compartment partly raised and with the side door open to show the interior thereof; Fig. 2 represents a perspective view of the portable tray holder for the incubator; Fig. 3 represents a perspective view of a corrugated tray for holding the eggs during the process of incubation; Fig. 4 represents a side view of the incubator showing the heater at one end and the heat regulating device on the top thereof; Fig. 5 represents a side elevation partly in perspective of the hot water device, the expansion cup and the heater detached and in position ready to be connected with the incubator; Fig. 6 represents a top plan view of the incubator showing the heater at one end and the expansion cup at the other and with the top removed; Figs. 7 and 8 represent side elevations of an insulator for the hot water device at the upper part of the incubator being shown open in Fig. 7 and closed in Fig. 8: Fig. 9 represents a perspective view of one of the insulator or enveloper members detached; Fig. 10 represents a perspective view of one of the incubator compartments showing the operative relations of the different heating and regulating devices.

In the embodiment of the invention herein illustrated, a continuous incubator 1 is shown composed of a plurality of individual compartments as 2, preferably disposed in longitudinal alinement to provide for the arrangement therein of a hot water heating device in the simplest manner; they may however be arranged in any other suitable or desired position.

All of the compartments 2 are supplied with heat from a single plant or heater hereinafter described. The compartments 2 being all alike, one only will be described. Each of these compartments 2 constitutes an incubator chamber and is provided with a hinged top 3 which tightly fits on said chamber when closed to prevent the escape of heat therefrom and adapted to be opened to admit fresh air to the eggs to cool them during the period of incubation without necessitating their removal from the chamber whereby some are liable to be chilled and others not cooled sufficiently owing to the fact that the eggs have heat of their own and lying close together will heat by contact and when removed from the incubating chamber into a low outside temperature, the eggs on the outside of the tray will chill while those in the center will not be sufficiently cool, causing the hatches to vary some days.

With this improved incubator, when it is desired to cool the eggs, the lid 3 is propped open at the desired height causing a slow even cooling of the eggs and producing even hatches and a high percentage of healthy strong chicks. Each lid 3 has a ventilating aperture 4 therein closed by a slide 5 which may be opened any desired width to properly ventilate the chamber giving a direct means for the carbonic-acid gas to escape without creating a draft. Carbonic-acid gas which

is thrown off by the eggs during the process of incubation is present in larger quantities at the top of the egg chamber as when heated carbonic-acid gas is lighter than air, while when cold it is heavier.

Each chamber or compartment 2 is provided with a portable tray holder 6 which consists of a frame corresponding in shape to the shape of the chamber and it rests and slides on the bottom of the compartment. It is preferably large enough to hold four egg trays. This holder 6 is preferably provided with flanges 8 for the trays to rest and slide upon and it obviates the necessity of using a table to set the trays on as with this tray holder, it is only necessary for the operator to draw the holder 6 containing the filled trays hereinafter described partly from the chamber 2 with its outer end resting on the knees of the operator and the eggs may then be turned in bulk as hereinafter described. This tray holder is preferably provided with two hand-holds as 9 for withdrawing it. The egg trays 10 are preferably made as shown in Fig. 3 with parallel corrugated grooves as 11 so arranged that the eggs laid in the corrugated grooves will slightly overlap each other and the eggs are so placed in each groove that those in one groove will be a little past those in the other groove and project up out of the groove sufficiently high so that the largest circumference of one egg in this groove will fit in the cavity between the two eggs in the adjacent grooves, thus if the eggs in the groove are laid lengthwise with the large ends one way and the small ends the other, the operator by placing his arm across the tray directly against the small ends of the eggs to hold them firmly together, may then raise the other end of the tray up rather quickly, which will cause the upper layer of eggs to commence to turn, then by giving away gently at the lower or smaller end of the eggs they will all turn over smoothly and at the end of the incubation period give as a result a less percentage of loss than if they had been turned by hand in the old way. The incubator chambers 2 are each provided with a front or side door 12 which opens to permit the tray holder to be moved in and out.

All of the compartments 2 are heated by a single heater 15 which preferably consists of an outside circular shell or jacket 20 which has a circular top or cap 21 fitting tightly inside thereof, so that the heater may be closed when needed. This heater has a radiating flue 30 projecting through the top thereof. In the outside jacket 20 near its top and on a level with the hot water space and directly back of radiating flue 30 is a one inch hole 32 for a solder nipple 33 which is connected to inside shell of the heater and passes through the hole in outside jacket 20 and has on its outer end screw threads for a union to be screwed on so that the hot water pipe 48 may be screwed into the other end of the union, thus connecting the hot water space with the supply pipe 50. Near the bottom of the heater in outside shell or jacket 20 on each side is a one inch hole, for nipples which have screw threads on the outer ends just outside of jacket 20 to receive unions screwed thereon, and the short pieces of pipe from elbows 42 and 43 may be screwed into the other end of the two unions on each side of the heater. These two short pieces of pipe extend far enough out from each side of heater and are connected with the pipes 44 and 45 which connect the lower end of the hot water reservoir in the heater with the return pipes 46 and 47. The outside jacket 20 extends below elbows 42 and 43 sufficiently to leave a one inch space for heat. Thus if the heater be connected to hot water pipes 46, 47, and 48 as shown in Fig. 5, the receiving cup 49 at upper end of perpendicular pipe 50 be filled with water the water will descend and make turns at elbow 51, pass into end pipes 52; here it is divided into pipes 46, 47, and 48 passing through pipes 46 and 47 at elbows 53 and 54 and entering the heater through the short pipe beyond elbows 42 and 43 and also through flow pipe 48 into the reservoir in the heater at its top, thus filling up the hot water space inside the heater. A lamp (not shown) is disposed in the radiating flue 30 and the heat therefrom will rise straight up through the radiating flue 30 and escape therefrom, if the damper 34 on top of the radiating flue 30 be open (see Fig. 4). If the damper be closed, the heat with the fumes will pass out the holes in the side of the radiating flue 30 and fill up the hot air space around the radiating flue 30, thus heating all hot air surface on the inside thereof.

In Fig. 4 is represented a side view of a continuous incubator showing the regulating device for regulating the heat from the gasolene heater. It shows the damper 34 placed directly over the opening in the upper end of radiating flue 30. This damper is connected to the curved end of a lever 65. This lever 65 has at its other end an adjustable sliding weight or knob 66 and the lever works on a pin 67 in the bracket 68, which is fastened to the top of the incubator in the first compartment 2. The lever 65 is pivoted in the bracket 68 with its longest part towards the heater and the sliding weight or knob 66 may be adjusted so that the damper connected end will be slightly heavier and thereby will be closed until the expander in the incubator raises it from the top of the radiating flue 30. Near the fulcrum on the side next to the heater the lever 65 has a small hole 69 with screw threads cut in it

to receive the set screw 70 which is screwed through the lever 65 and rests in a little cup 71 on the upper end of a perpendicular rod 72 which extends down through a hole in the top of the incubator, and has an expander 73 on its lower end. The expander 73 is preferably composed of three or more waverdisks arranged one above the other in close proximity and is preferably made of spring copper. This expander 73 is fastened to the bottom of a bracket 74 which has side braces extending up on each side of the expander which are fastened to the under side of the top of the incubator casing. If the waverdisks in the expander 73 be filled with some volatile liquid or gases which when heated will expand, and push up on rod 72 causing its cup 71 to bear against the lower end of the set screw 70 in lever 65, this lever 65 will lift the damper 34 from the opening in the top of radiating flue 30 and allow the heat that is not needed to escape. The expander 73 in its bracket is preferably arranged just above the eggs in the corrugated tray inside the incubator so that the added heat from the eggs when they are in the course of incubation will also have its effect on the expander 73 to open the damper.

An insulating device for each of the hot water pipes 46, 47 and 48 is shown in Fig. 8 and consists of two flat pieces or plates 75 and 80 of non-conducting material of sufficient width to span the pipe to which it is applied and each provided with flanges 76 and 77 and 81 and 82, along each side for about one-half the length thereof. Each plate with its flanges is made exactly like the other, the plate 75 designed to be placed on the under side of a hot water pipe with its flanges turned upward and the plate 80 to be placed on top of a hot water pipe with its flanges on the reverse end and turned down, so that when they are closed together, the part of the hot water pipe between them will be completely enveloped. The plates 75 and 80 are hinged to the end walls of the compartment in which they are placed at 78 and 83 respectively. There is a pair of these envelopers provided for each of the hot water pipes in each compartment of the continuous incubator. The three envelopers as 75 are connected together at each end by cross pieces, as 90, thus forming the lower half of the insulator into a frame of sufficient length to reach from one end of a compartment along pipes 46, 47 and 48 to the other end with all flanges turned up at right end; three envelopers as 80 are formed in a frame to be placed on top of hot water pipes 46, 47 and 48 with all their flanges turned down at right hand end of compartment. The top enveloper frame is hinged to the left hand end of the wall of the compartment, or end of incubator, and the right hand end of enveloper is connected to right hand end of bars 100 by bars 101. The other enveloper frame is hinged to right hand end below pipes inside wall of incubator and is connected by rods 101 to left hand end of bars 100. These bars 100 are fastened exactly in their middle between their ends and about one and one-half feet apart to a rod 102. Rod 102 with its pin at each end fits in a hole in the brackets that are fastened at the middle inside walls of the incubator, and above the center of the tray-holder as shown in Fig. 1 as it will be placed across the width of the tray holder in each compartment of the continuous incubator. The expander lever 103 is hinged to the right hand end wall of the compartment of the incubator between bars 100 and passes a little below rod 102 a short distance and is connected by a perpendicular rod 104 at its left hand end to a cross piece just to the left of the flanges on top of enveloper 80 and has a set screw on the upper end of rod 104 for raising or lowering the left hand end of the expander lever 103 so that the operator may regulate the heat from the hot water pipes 46, 47 and 48.

The expander lever 103 has fastened near its hinged end an expander 105. This expander 105 is composed of three or more wafer disks one above the other disposed in close proximity and preferably made of spring copper and thus can be filled with some volatile liquid or gases which when heated will expand and push upward. Directly above this expander is a rod 106 which is fastened at its upper end to underside of the cross piece of enveloper frame 75 and extends down directly over the expander 105 with a flat base at its lower end spaced a short distance from the top of the expander 105. Thus if the expander 105 be filled with some volatile liquid or gases which will expand or contract according to the heat of the incubator, and this heat is of the required amount it will cause expander 105 to expand against the base on the lower end of the base rod 106 and thus push up against the under side of the cross piece that is across the right hand underside of enveloper frame 75. And the flanges on the left end of enveloper frame 75 being pushed up on each side of hot water pipes 46, 47 and 48 and up against the underside of the flat piece of left end of enveloper frame 80, thus enveloping this part of hot water pipes 46, 47 and 48. When expander 105 has expanded and pushed up against the underside of the flat piece on the right hand end of enveloper frame 75, thus causing the left hand end of enveloper frame 75 to pull up the left hand end of bars 100 and the right hand end of bars 100 to pull down the right hand end of enveloper frame 80 to the flat part of the left hand end of enveloper 75 thereby finishing the closing process and enveloping of the hot water pipes 46, 47 and 48.

Therefore the radiating heat of the hot water pipes 46, 47 and 48 is retained within the envelopers as 75 and 80 in this compartment of the continuous incubator until the temperature in this compartment has sufficiently lowered, causing the expander to contract, and lowering down from the base on the lower end of base rod 106 relieving the pressure from the same, thereby causing enveloper frame 75 which is slightly heavier than the enveloper frame 80 to drop down and away from the hot water pipes. Thus when enveloper frame 75 drops down it pushes down on the left hand end of bars 100 causing right hand end of these bars 100 to push up the right hand end of enveloper frame 80 thereby uncovering the hot water pipes and letting out into this compartment all the retained radiating heat that was held in the previous closing process. Thus the heat from the hot water pipes running through the different compartments of the continuous incubator can be regulated for each compartment by the set screw on the upper end of perpendicular rod 104 by the operator reaching down through the slide opening in the lid. Thus if each compartment of the continuous incubator be provided with this automatic insulator, and the temperature being different in each compartment owing to the different stages of eggs in incubation, these different temperatures in the different compartments of this continuous incubator may all be equally adjusted by the set screw under the slide opening in the lid or cover for each compartment of this continuous incubator when said lid or cover is closed down.

I claim as my invention:—

1. In an incubator, the combination of a plurality of compartments, water supply and return pipes passing through said compartments and a water heater disposed adjacent to said incubator and having the reservoir thereof connected with said pipes and each compartment having means for enveloping the pipes passing therethrough for regulating the temperature therein independently of the other compartments.

2. In an incubator, the combination of a plurality of compartments, water supply and return pipes passing through said compartments, means for heating the water passing through said pipes and means disposed in each compartment for enveloping the pipes passing therethrough and regulating the heat therein independently of the other compartments.

3. In an incubator, the combination of a plurality of compartments, water supply and return pipes passing through said compartments, means for heating the water passing through said pipes, means for enveloping the pipes in each compartment, and means operated by the temperature in said compartment for opening and closing said pipe-enveloping means for shutting off and admitting the heat radiated from said pipes to said compartment, whereby the heat in one compartment may be regulated independently of the others.

4. In an incubator, the combination of a plurality of compartments, heating means therefor, means for regulating the temperature in each compartment independently of the others and means for regulating the temperature in all of the compartments.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

SYLVAN FRANK BIHN.

Witnesses:
GEO. C. YOUNG,
FRED. A. CREED.