

Sept. 12, 1933.

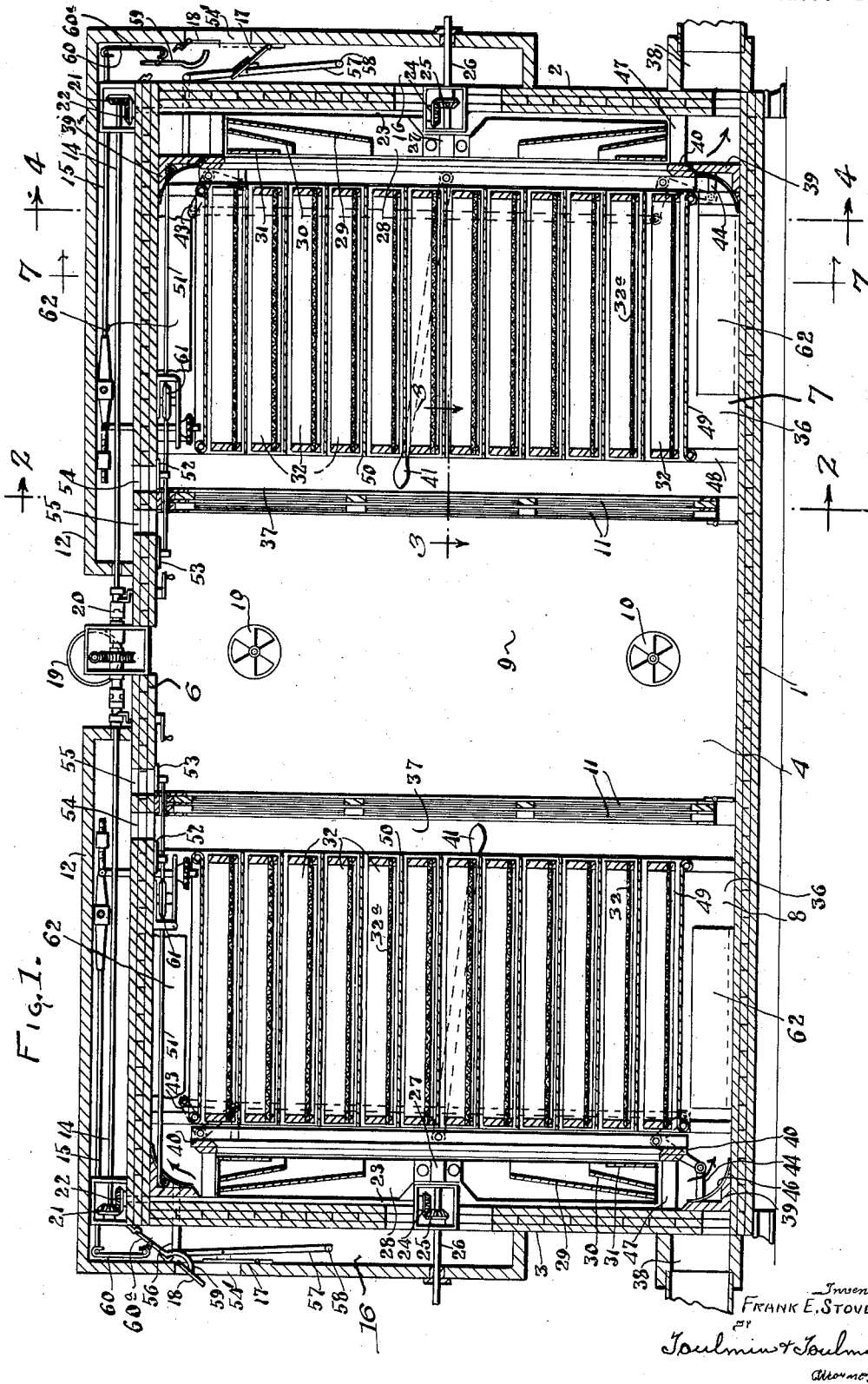
F. E. STOVER

1,926,464

INCUBATOR

Filed June 20, 1929

4 Sheets-Sheet 1



Sept. 12, 1933.

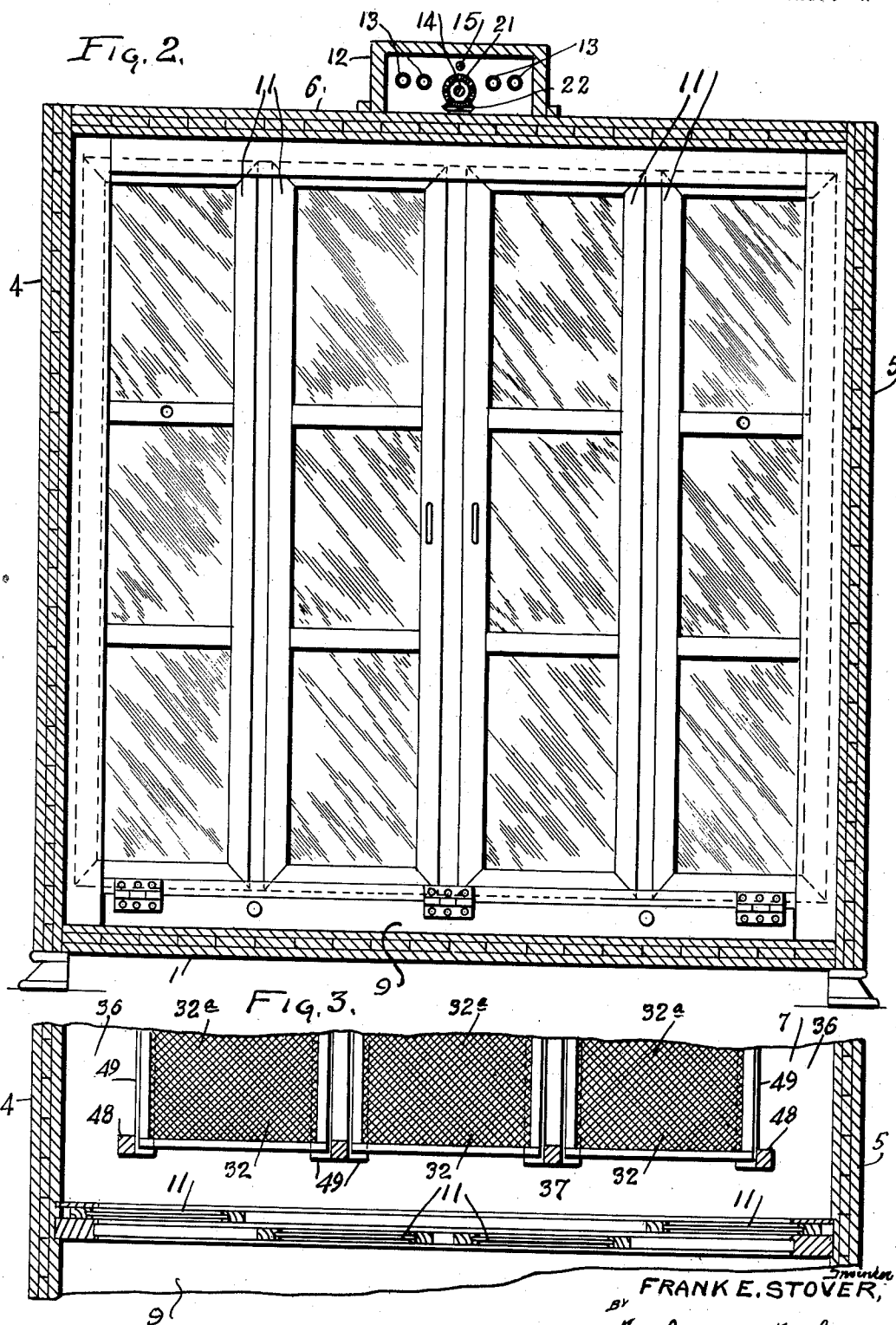
F. E. STOVER

1,926,464

INCUBATOR

Filed June 20, 1929

4 Sheets-Sheet 2



FRANK E. STOVER,
BY *Toulmin + Toulmin*
ATTORNEYS

Sept. 12, 1933.

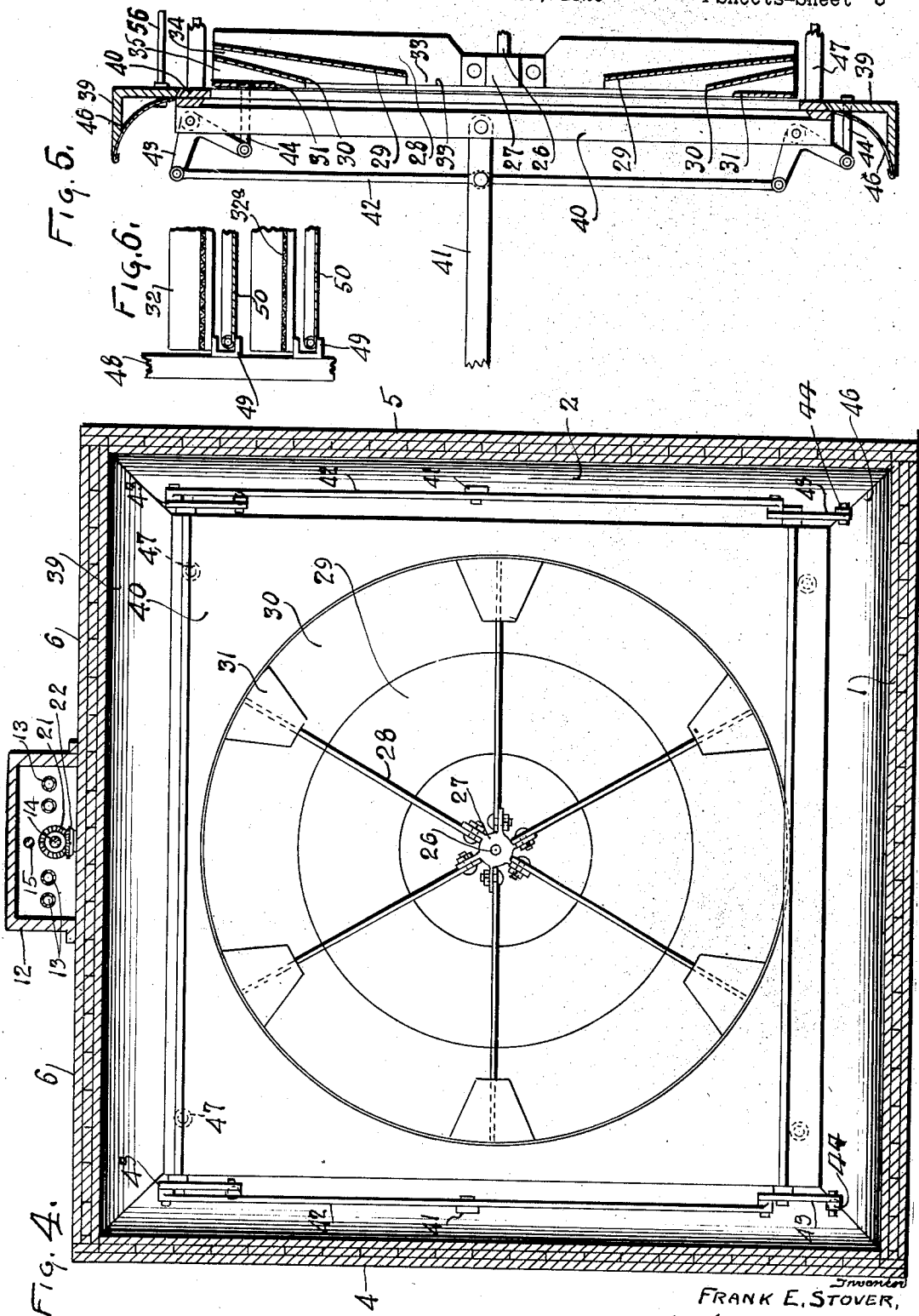
F. E. STOVER

1,926,464

INCUBATOR

Filed June 20, 1929

4 Sheets-Sheet 3



FRANK E. STOVER,
Toulmin & Toulmin
ATTORNEYS

Sept. 12, 1933.

F. E. STOVER

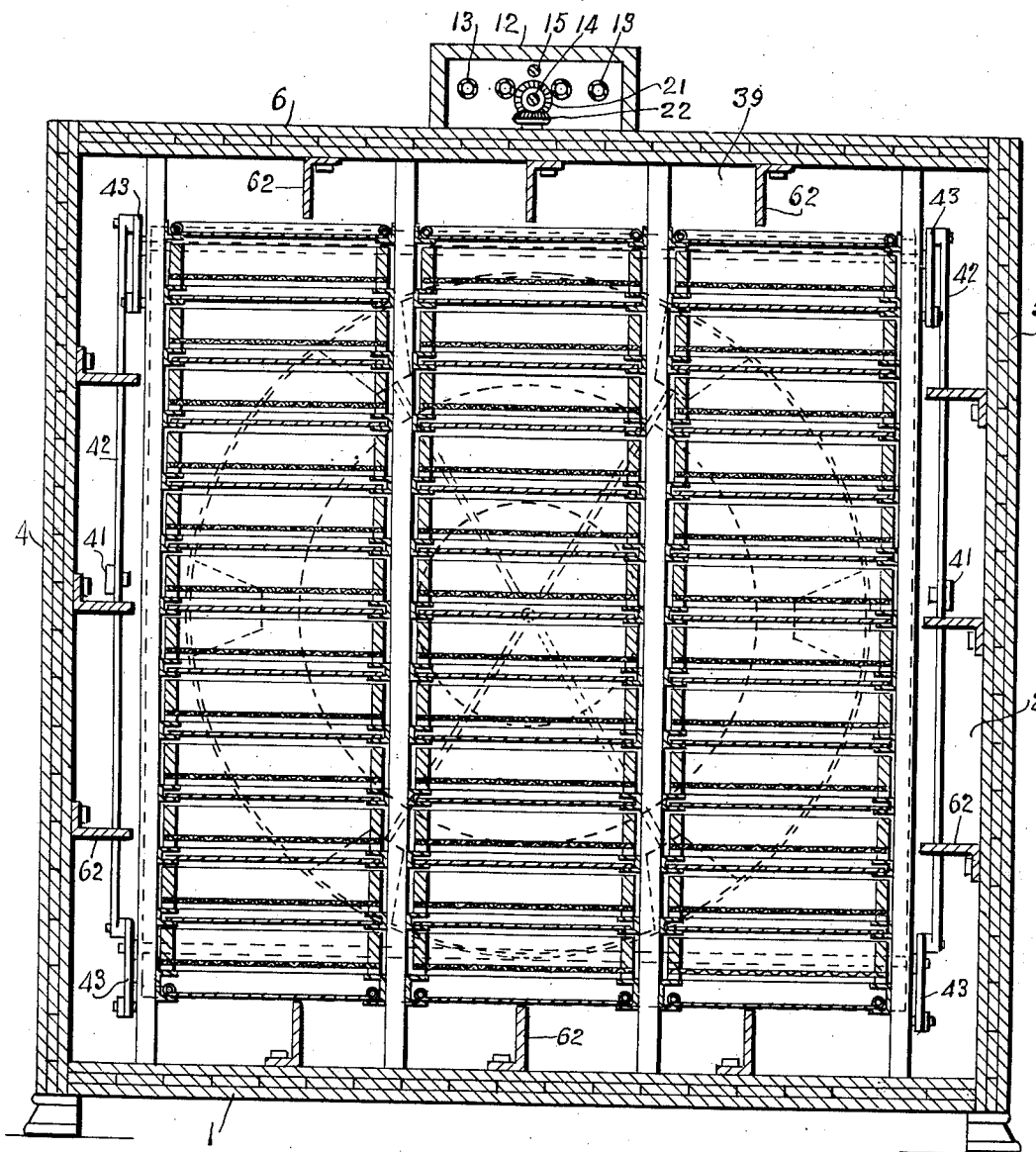
1,926,464

INCUBATOR

Filed June 20, 1929

4 Sheets-Sheet 4

Fig. 7.



FRANK E. STOVER,
BY *Toulmin + Toulmin*
Attorneys

UNITED STATES PATENT OFFICE

1,926,464

INCUBATOR

Frank E. Stover, Springfield, Ohio

Application June 20, 1929. Serial No. 372,255

22 Claims. (Cl. 119—35)

My invention relates to incubators.

It is an object of my invention to provide an incubator in which the air will be drawn over the trays uniformly.

5 It is a further object of my invention to provide for the drawing of air over the trays and the discharging of it to the outside air so that there will be no recirculation of air which will carry disease.

10 It is a further object to provide means for separately controlling in the same compartments the hatching and incubating stages and for providing for recirculation within the same compartments or for intake and direct ejection of air at the pleasure of the operator.

15 In particular, it is an object of my invention to provide means for circulating the air so arranged as to apply the centrifugal rim force over the face of the wheel to thereby equalize the temperature throughout the compartment.

20 It is a further object to draw the air through the trays containing the eggs and thence to the air to the front of the trays around the sides of the trays, thereby completely enveloping the stacks of trays. This is particularly necessary for the incubation period.

25 It is an object to provide means for simply adjusting the incubator during the hatching period to prevent the recirculation of air and to open direct communication with the outside air for the evacuation of all down and foul air out of the incubator building.

30 It is a further object to provide a conditioning compartment through which the new heated air may be directed or delivered to the front of the trays through which it is drawn by the air recirculating means and ejected from the incubator.

35 It is a further object to provide means for the cutting off of this compartment from the tray chamber when recirculating during the incubation period.

Referring to the drawings:

40 Figure 1 is a section through the incubator showing the use of baffles, pipes 13 being omitted from this figure;

Figure 2 is a section on the line 2—2 of Fig. 1, showing the sliding doors;

45 Figure 3 is a section on the line 3—3 of Fig. 1, showing the arrangement of trays and the sliding doors;

Figure 4 is a section on the line 4—4 of Fig. 1, showing front elevation of the fan and the sliding partition;

50 Figure 5 is a detail section through the fan and sliding partition;

Figure 6 is a detail section through the hatching trays and deflecting plates;

55 Figure 7 is a section on the line 7—7 of Figure 1 showing the arrangement of baffles.

Referring to the drawings in detail, I provide a cabinet having a bottom 1, side walls 2 and 3 and a rear wall 4 and a front wall 5; 6 designates the top of the cabinet. This cabinet is provided with tray compartments 7 and 8 between which is located an air conditioning compartment 9, which is supplied with outside air through the ventilators 10. The compartments 7 and 8 are separated from the conditioning compartment 9 by a plurality of overlapping sliding glass doors 11.

65 Over the top of the cabinet are formed horizontal chambers 12. In these chambers are located the heating pipes 13, the power shafts 14 and the thermostat control rods 15. At either end vertical passageways or chambers 16 are provided for housing certain thermostatic controls for dampers. In the air inlets 54' in the vertical walls of the passageways 16 there is a damper 17 and air inlet trap door 18 and a control damper 60a.

70 A motor 19 drives through a suitable clutch 20 the operating shaft 14 which in turn through the bevel gears 21 and 22 operates the horizontal fan operating shaft 23, which in turn through the bevel gears 24 and 25 operates the fan shaft 26.

75 This fan is comprised of a hub 27 on which are mounted a plurality of blades 28, whose faces are in line with the axis of the shaft 26 and are in line with the direction of the air flow.

80 These blades 28 have formed between them in spaced relationship concentric diagonal rings 29 and 30 which are generally disposed at right angles to the incoming line of flow of air. Over the free ends of the blades 28 and suitably attached thereto are triangularly shaped plates 31 which likewise are disposed at right angles to the incoming line of flow of air.

85 In operation, as the fan wheel revolves the air is equally distributed over the stack of hatching trays 32 by the suction of the fan wheel. Instead of having the major suction at the periphery of the fan, by providing the baffle plates 29, 30 and 31, I am able to distribute this suction so that a portion of air passes out freely through the space 33, another portion passes out the passageway 34 and another portion passes out through the passageway 35, throwing rim force or suction over the peripheral face of the wheel at a given point.

90 Thus I am enabled to get an equal draft or suction by my fan wheel, the delivery from the fan being radial. The air is discharged at the tips of the fan blades 28 and either passes back along the sides of the stack of trays, as at 36, and thence from the back of the trays into passageway 37 over the trays again, or it may be directly discharged outwardly through one or more exit passageways 38.

This depends upon the position of the sliding frame 39 which is rectangular in shape, slides within the casing and may engage on its inner edge the fan frame 40 which is stationary.

5 This frame 39 is moved through the lever 41, connecting bar 42, bell cranks 43 mounted on 40 and the push rods 44 connecting the bell cranks to the frame 39. The interior of the frame 39 which is right angular in section is provided with
10 a curved baffle wall 46. The fan frame 40 is supported from the ends 2 or 3 by the position rods 47.

The trays are carried on the usual uprights 48 having ledges 49 for supporting the trays 32 with their perforated bottom of wire netting 32a.
15 Between adjacent trays is a slidable metal plate 50.

The sliding air deflecting frame 39 has connected to it a link 51 which controls two slides 20 52 and 53 which in turn control the openings 54 and 55 from the heating chamber 12 to a tray compartment or the air conditioning compartment respectively. These slides are so arranged that only one of the openings will be open at a
25 time while the other will be closed.

Hence when the slide 39 is in position to cause recirculation of air, the heated air will be drawn directly into the tray compartment back of the wheel, while if the air is being ejected from the
30 tray compartment directly to the outside then the heated air will be drawn in from the conditioning compartment over the trays and thence make its exit out through the passageway 38 to the outside atmosphere. The heated air is
35 drawn in from the passageway 16 by the fan wheel to heat the egg compartment.

In this passageway 16 the damper 17 is controlled through the link 56 and the link 57, which latter link is pivoted at 58. When the slide 39 is
40 in its recirculating position this damper is closed while when the slide is in its air ejecting position this damper is open.

The trap doors 18 are thermostatically controlled by the finger 59 attached to the damper 45 60a which is actuated by the link 60, thermostat rod 15 and thermostat 61, which is located in each of the tray compartments, thus giving independent air inlet depending upon the temperature of the compartment. The temperature
50 is controlled by the damper 60a.

Method of operation

In operation, if the eggs are being incubated, the air will be recirculated and the parts will be
55 in position as shown in the tray compartment at the left hand side of Fig. 1. Air will be drawn out of the egg compartment through the opening 54 in the chamber 12, reheated and drawn down the chamber 16 to the opening into the egg compartment at the center of the fan wheel.
60

If the compartment becomes too hot, the thermostat 61 will close the damper 60a and if the compartment temperature should rise a fraction of a degree it will cause the finger 59 to open
65 the damper 18 allowing the induction of fresh air.

When the eggs are hatching as in the right hand tray compartment, then the air can be taken in from the conditioning compartment,
70 with any fresh air introduced through the openings 10, as the doors 11 will be opened. The heated air enters through the opening 55 into the conditioning compartment. The air is drawn through the trays and discharged radially into
75 the exit passageway 38.

In hatching position, the damper 17 is open which closes the duct 16 so that the air cannot get to the fan wheel, but is drawn up into the heater tunnel and down into the condition compartment through the opening 55 of the tray
80 chamber. If the air is too warm the thermostat 61 will close the damper 60a causing more cold air to be drawn in through the damper 10 shown in the drawing.

Baffles 62 may be employed to direct the air
85 longitudinally of the trays. These baffles break up the revolving air currents caused by the rotation of the fan wheel. Thus, the air directed longitudinally of the trays is equally distributed and the temperature is uniform. The centrifugal
90 force on the air due to the action of the fan wheel is converted into linear motion of the air.

It will be understood that I desire to comprehend within my invention such modifications as
95 may be necessary to adapt it to varying conditions and uses.

Having thus fully described my invention, what I claim is new and desire to secure by Letters Patent, is:

1. In an incubator, a cabinet having a conditioning compartment, a tray compartment, and an air heating chamber above said compartments, means forming a communication between said
100 compartments and the air heating chamber, and means for controlling the introduction of heat into said conditioning compartment and tray compartment.
105

2. In an incubator, a cabinet having a conditioning compartment, a tray compartment, and an air heating chamber above said compartments, means forming a communication between said
110 compartments and the heating chamber, means for controlling the introduction of the heated air into said conditioning compartment and tray compartment, and means for inducing the flow of
115 cold air into said tray compartment.

3. In an incubator, a cabinet having an air conditioning compartment, tray compartments having communication with the air conditioning
120 compartment, means adjustable for communication for completely separating and sealing said compartments from one another, air heating chambers adapted to communicate with either a tray compartment or the conditioning compartment, there being a heating chamber for each
125 tray compartment.

4. In an incubator, a cabinet having an air conditioning compartment, tray compartments having communication with the air conditioning
130 compartment, means adjustable for communication for completely separating and sealing said compartments from one another, air heating chambers adapted to communicate with either a tray compartment or the conditioning compartment, there being a heating chamber for
135 each tray compartment, means for moving the air in said tray compartments and means for determining whether the air will circulate in said tray compartments or be drawn through and ejected to the outside atmosphere.
140

5. In an incubator, a cabinet having an air conditioning compartment, tray compartments having communication with the air conditioning
145 compartment, means adjustable for communication for completely separating and sealing said compartments from one another, air heating chambers adapted to communicate with either a tray compartment or the conditioning compartment, there being a heating chamber for
150 each tray compartment, means for moving the

air in said tray compartments, means for determining whether the air will circulate in said tray compartments or be drawn through and ejected to the outside atmosphere and means connected with the last said means for determining whether the heated air from the heating chamber will be delivered to the air conditioning compartment or the tray compartment.

6. In an incubator, a cabinet having an air conditioning compartment, tray compartments, air heating chambers adapted to communicate with either a tray compartment or the conditioning compartment, there being a heating chamber for each tray compartment, means for moving the air in said tray compartments, means for determining whether the air will circulate in said tray compartments or be drawn through and ejected to the outside atmosphere, means connected with the last said means for determining whether the heated air from the heating chamber will be delivered to the air conditioning compartment or the tray compartment and sliding closure means adapted to either completely separate or establish communications between the conditioning compartment and a tray compartment.

7. In an incubator, a cabinet having an air conditioning compartment, tray compartments having communication with the air conditioning compartment, means adjustable for communication for completely separating and sealing said compartments from one another, air heating chambers adapted to communicate with either a tray compartment or the conditioning compartment, there being a heating chamber for each tray compartment, means for moving the air in said tray compartments, means for determining whether the air will circulate in said tray compartments or be drawn through and ejected to the outside atmosphere, means connected with the last said means for determining whether the heated air from the heating compartment will be delivered to the air conditioning compartment or the tray compartment, air inlet means to said heating compartments and thermostatic means located in each tray compartment for controlling the opening and closing of said air inlet means.

8. In an incubator, a cabinet having an air conditioning compartment, tray compartments having communication with the air conditioning compartment, movable means adjustable for communication for completely separating and sealing said compartments from one another, air heating chambers adapted to communicate with either a tray compartment or the conditioning compartment, there being a heating chamber for each tray compartment, means for moving the air in said tray compartments, means for determining whether the air will circulate in said tray compartments or be drawn through and ejected to the outside atmosphere, means connected with the last said means for determining whether the heated air from the heating compartment will be delivered to the air conditioning chamber or the tray compartment, air inlet means to said heating compartments, thermostatic means located in each tray chamber for controlling the opening and closing of said air inlet means, additional air inlet means in said heating compartments and means controlling said air inlet means connected to the means for controlling the delivery of heated air to either the conditioning compartment or the tray compartment.

9. In combination, a cabinet having an air outlet, a stack of trays therein, means for intro-

ducing air to said trays, means for moving the air therethrough and closure means for said air outlet surrounding said air moving means slidably mounted with respect thereto for determining whether the moving means will recirculate said air or deliver it directly through the air outlet to the atmosphere after having passed over the trays once.

10. In combination, a cabinet having an air outlet, a stack of trays therein, means for introducing air to said trays, means for moving the air therethrough, closure means for said air outlet surrounding said air moving means slidably mounted with respect thereto for determining whether the moving means will recirculate said air or deliver it directly through the air outlet to the atmosphere after having passed over the trays once, a frame rigidly mounted with respect to said air moving means and said trays and means on said frame for moving said slidable means.

11. In combination, a cabinet, a stack of trays and an air inlet on one side thereof, a fan on the other side thereof, a stationary frame around said fan to one side thereof, a slidable frame between the stationary frame and the cabinet adapted to be positioned on one side or the other of said fan and an air exit opening controlled thereby leading to the outside atmosphere.

12. In combination, a cabinet, a stack of trays and an air inlet on one side thereof, a fan wheel on the other side thereof, a stationary frame around said fan wheel to one side thereof, a slidable frame between the stationary frame and the cabinet adapted to be positioned on one side or the other of said fan wheel, an air exit opening controlled thereby leading to the outside atmosphere and means connected to said sliding frame for controlling the introduction of air into said cabinet.

13. In combination, a cabinet having a heating compartment and a conditioning compartment, a stack of trays and an air inlet on one side thereof, a fan wheel on the other side thereof, a stationary frame around said fan wheel to one side thereof, a slidable frame between the stationary frame and the cabinet adapted to be positioned on one side or the other of said fan wheel, an air exit opening controlled thereby leading to the outside atmosphere, means connected to said sliding frame for controlling the introduction of air into said cabinet and another means connected to said sliding frame for controlling remotely the introduction of air to said heating compartment and said conditioning compartment for supplying air to the cabinet through the means controlled by said sliding frame.

14. In combination, a cabinet having an air outlet, a stack of trays, a stationary frame, a fan wheel adjacent said frame, a moving frame outside of the stationary frame adapted to be positioned on either side of said fan wheel, a lever pivoted on the stationary frame and link mechanism connected to the moving frame pivoted on the stationary frame for sliding the moving frame within said cabinet to open or close the air outlet.

15. In an incubator, a fan comprising a shaft, a plurality of blades disposed parallel to the line of flow and the axis of said shaft, a plurality of plates spaced from one another between said blades disposed at an angle thereto and to the line of flow of air whereby passageways are formed between said overlapping spaced plates between the blades, a stack of trays mounted parallel to said fan, a

compartment enclosing said fan and trays, an air inlet opening into the said compartment on the side of the compartment away from the fan and an outside air exit opening adjacent the periphery of the fan.

16. In an incubator, a fan comprising a shaft, a plurality of blades disposed parallel to the line of flow and the axis of said shaft, a plurality of plates spaced from one another between said blades disposed at an angle thereto and to the line of flow of air whereby passageways are formed between said overlapping spaced plates between the blades, a stack of trays mounted parallel to said fan, a compartment enclosing said fan and trays, an air inlet opening into the said compartment on the side of the compartment away from the fan, and an outside air exit opening adjacent the periphery of the fan and means slidable with respect to said trays and fan located beyond the periphery of said fan adapted to control said exit opening whereby the position of the slidable means will determine whether the air will recirculate in the compartment or be ejected to the outside atmosphere.

17. In an incubator, a fan comprising a shaft, a plurality of blades disposed parallel to the line of flow and the axis of said shaft, a plurality of plates spaced from one another between said blades disposed at an angle thereto and to the line of flow of air whereby passageways are formed between said overlapping spaced plates between the blades, a stack of trays mounted parallel to said fan, a compartment enclosing said fan and trays, an air inlet opening into the said compartment on the side of the compartment away from the fan, and an outside air exit opening adjacent the periphery of the fan, means slidable with respect to said trays and fan located beyond the periphery of said fan adapted to control said exit air opening, whereby the position of the slidable means will determine whether the air will recirculate in the compartment or be ejected to the outside atmosphere and means connected to said slidable means for controlling the inlet opening into said compartment.

18. In an incubator, a fan comprising a shaft, a plurality of blades disposed parallel to the line of flow and the axis of said shaft, a plurality of plates spaced from one another between said blades disposed at an angle thereto and to the line of flow of air whereby passageways are formed between said overlapping spaced plates between the blades, a stack of trays mounted parallel to said fan, a compartment enclosing said fan and trays, an air inlet opening into the said compartment on the side of the compartment away from the fan, and an outside air exit opening adjacent the periphery of the fan and means slidable with respect to said trays and fan located beyond the periphery of said fan adapted to control said exit opening, whereby the position of the slidable means will determine whether the air will recirculate in the compartment or be ejected to the outside atmosphere, means connected to said slidable means for controlling the inlet opening into said compartment, an air conditioning compartment, slidable means for separating the tray compartment and the air conditioning compartment, an air inlet opening into the conditioning compartment and means connected to said slidable means for closing it when the air inlet into the tray compartment is open.

19. In an incubator, a fan comprising a shaft,

a plurality of blades disposed parallel to the line of flow and the axis of said shaft, a plurality of plates spaced from one another between said blades disposed at an angle thereto and to the line of flow of air whereby passageways are formed between said overlapping spaced plates between the blades, a stack of trays mounted parallel to said fan, a compartment enclosing said fan and trays, an air inlet opening into the said compartment on the side of the compartment away from the fan, and an outside exit opening adjacent the periphery of the fan and means slidable with respect to said trays and fan located beyond the periphery of said fan adapted to control said exit opening, whereby the position of the slidable means will determine whether the air will recirculate in the compartment or be ejected to the outside atmosphere, means connected to said slidable means for controlling the inlet opening into said compartment, an air conditioning compartment, slidable means for separating the tray compartment and the air conditioning compartment, an air inlet opening into the conditioning compartment, means connected to said slidable means for closing it when the air inlet into the tray compartment is open, a compartment communicating with said openings having heating means therein and air inlet thereto and a thermostat in the tray compartment controlling said air inlet.

20. In an incubator, a cabinet having a conditioning compartment, a pair of tray compartments, air heating chambers, means forming a communication between said compartments and the air heating chambers, means for controlling the introduction of heated air into said conditioning compartment and tray compartments, means for inducing the flow of cold air into said tray compartments, and means for determining which of said compartments the heated air will be delivered to.

21. In an incubator, a cabinet having a conditioning compartment, a pair of tray compartments, air heating chambers, means forming a communication between said compartments and the air heating chambers, means for controlling the introduction of heated air into said conditioning compartment and tray compartments, means of inducing the flow of cold air into said tray compartments, and means of determining which of said compartments the heated air will be delivered to, said means for inducing the flow of air into the said tray compartments being arranged for distribution of air throughout the compartments as it is drawn through over the trays.

22. In an incubator, a cabinet having a conditioning compartment, a pair of tray compartments, air heating chambers, means for forming a communication between said compartments and the air heating chambers, means for controlling the introduction of heated air into said conditioning compartment and tray compartments, means of inducing the flow of cold air into said tray compartments, means for determining which of said compartments the heated air will be delivered to, said means for inducing the flow of air into the said tray compartments being arranged for distribution of air throughout the compartments as it is drawn through over the trays, and means for determining whether the air in said tray compartments shall be recirculated or ejected into the outside atmosphere.

FRANK E. STOVER.