(No Model.) 3 Sheets—Sheet 1.

F. ROSEBROOK.

ELECTRIC REGULATOR AND ALARM FOR INCUBATORS.

No. 271,991. Patented Feb. 6, 1883.

Fig. 1

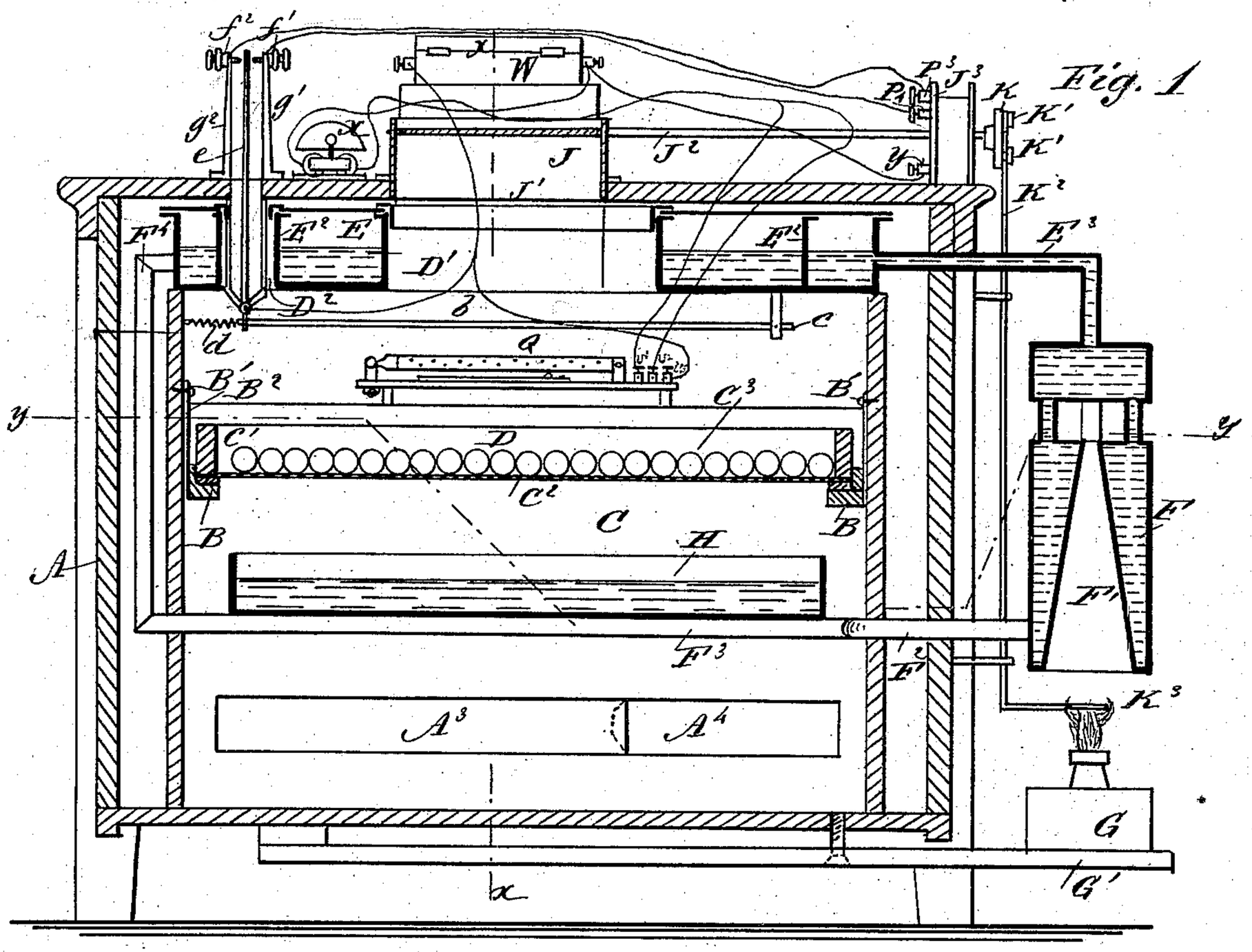
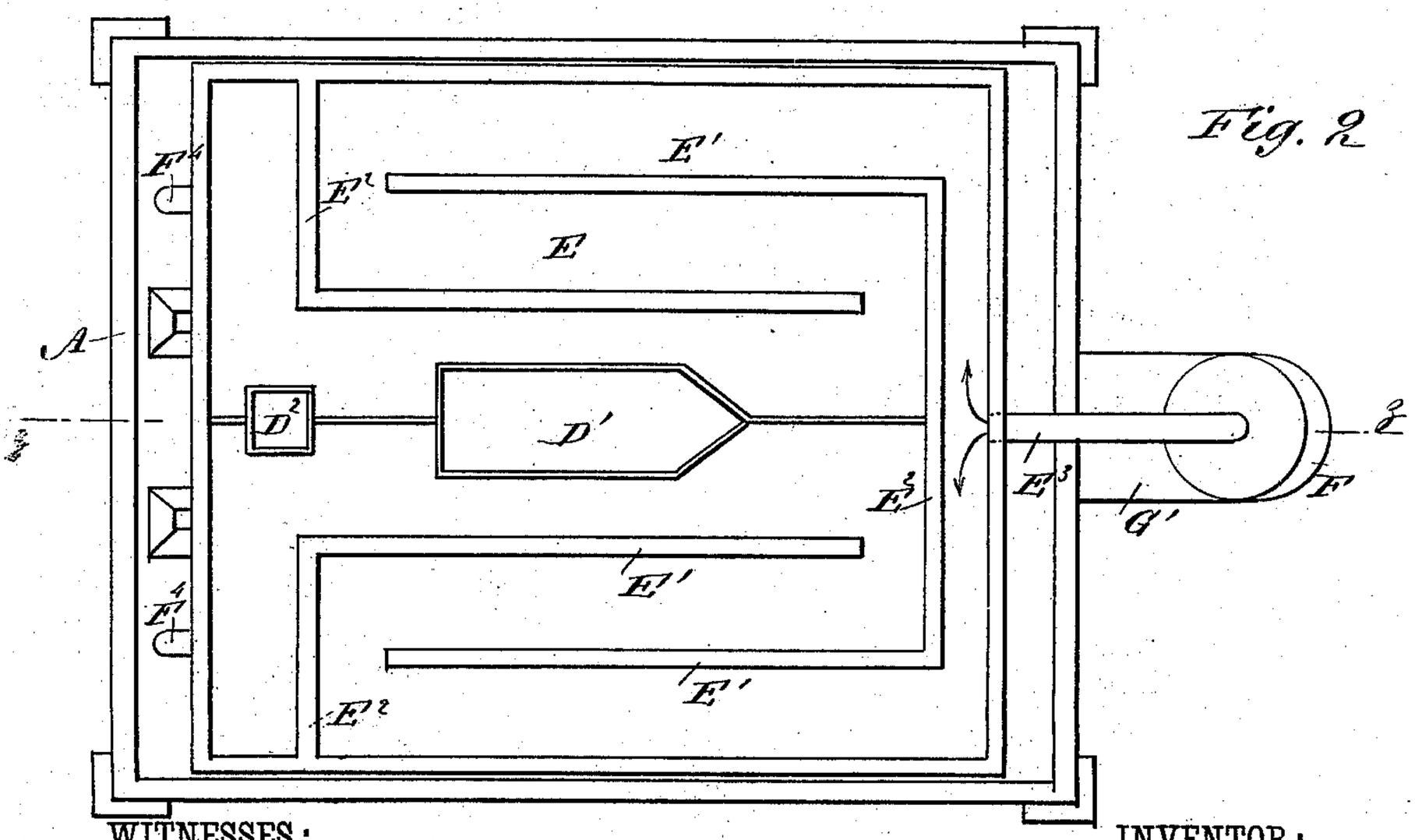


Fig. 2



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ELECTRIC REGULATOR AND ALARM FOR INCUBATORS.

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Fig. 3

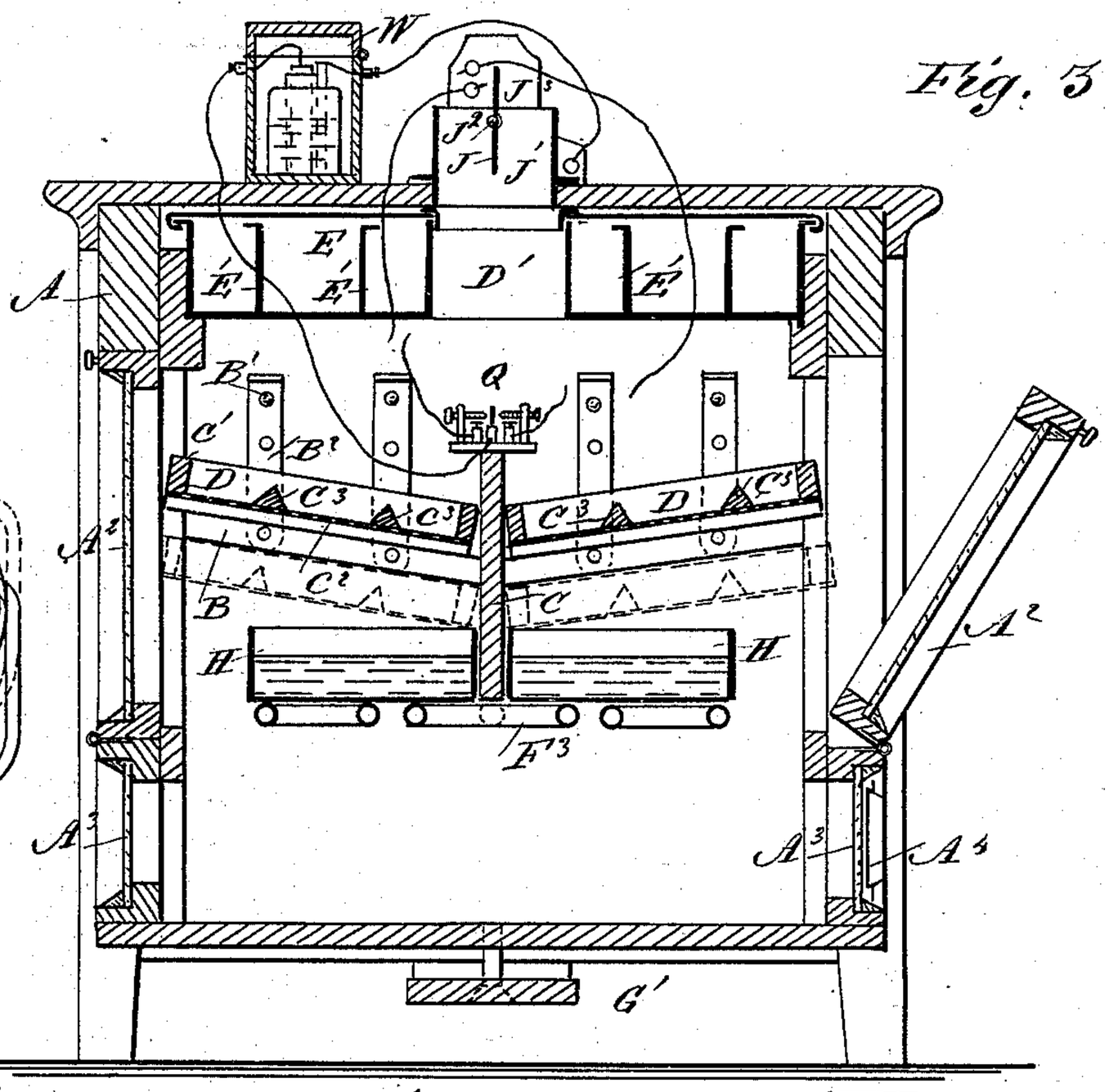


Fig. 12

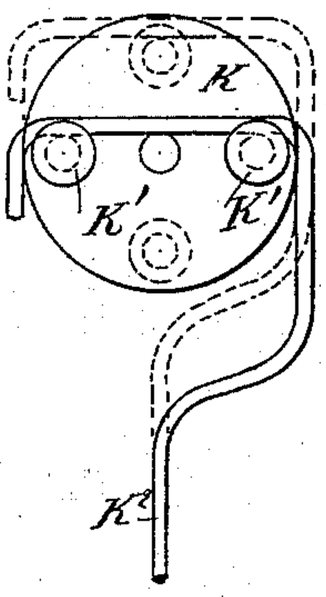
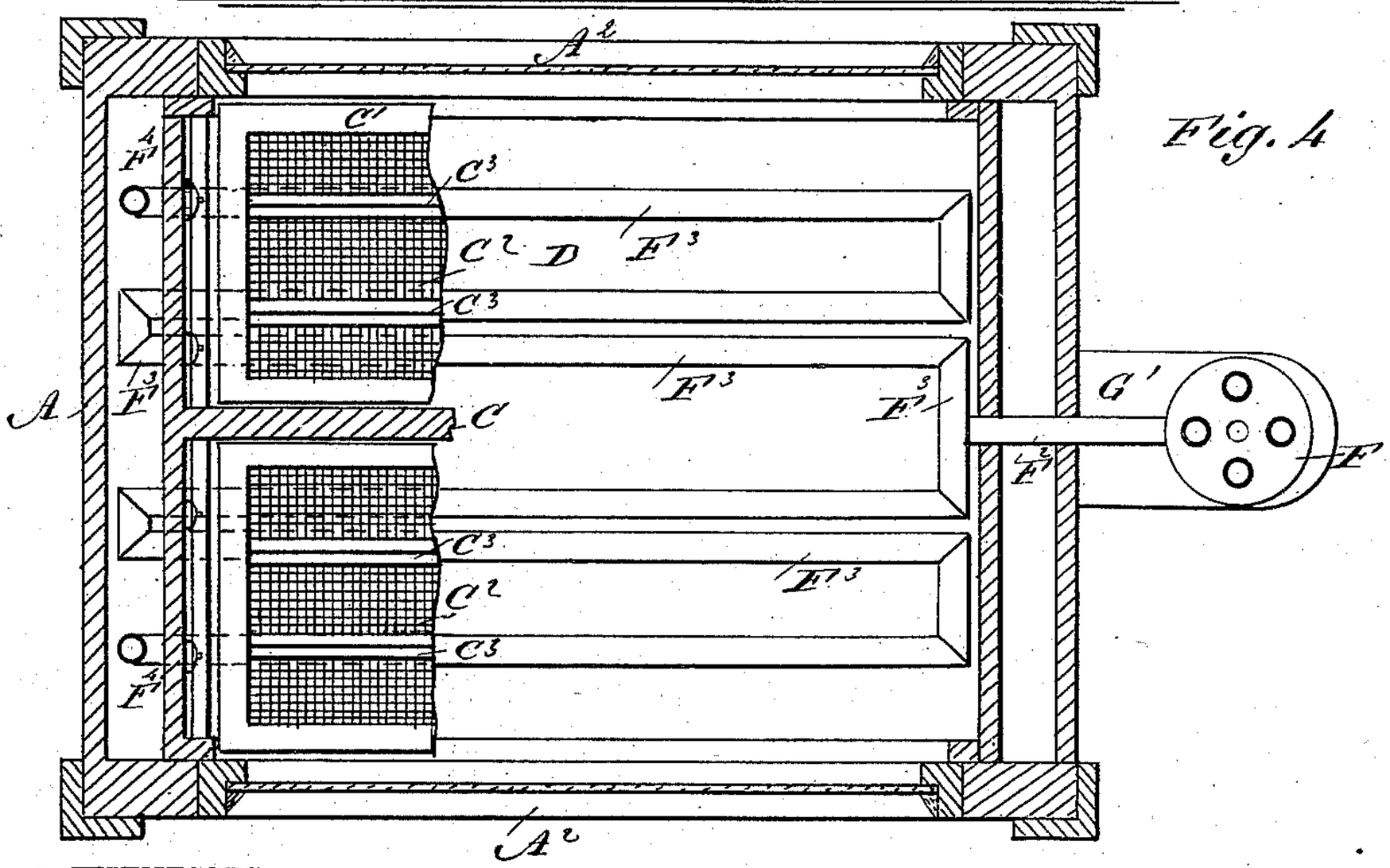


Fig. 4



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No. 271,991 Patented Feb. 6, 1883.

Fig. 5

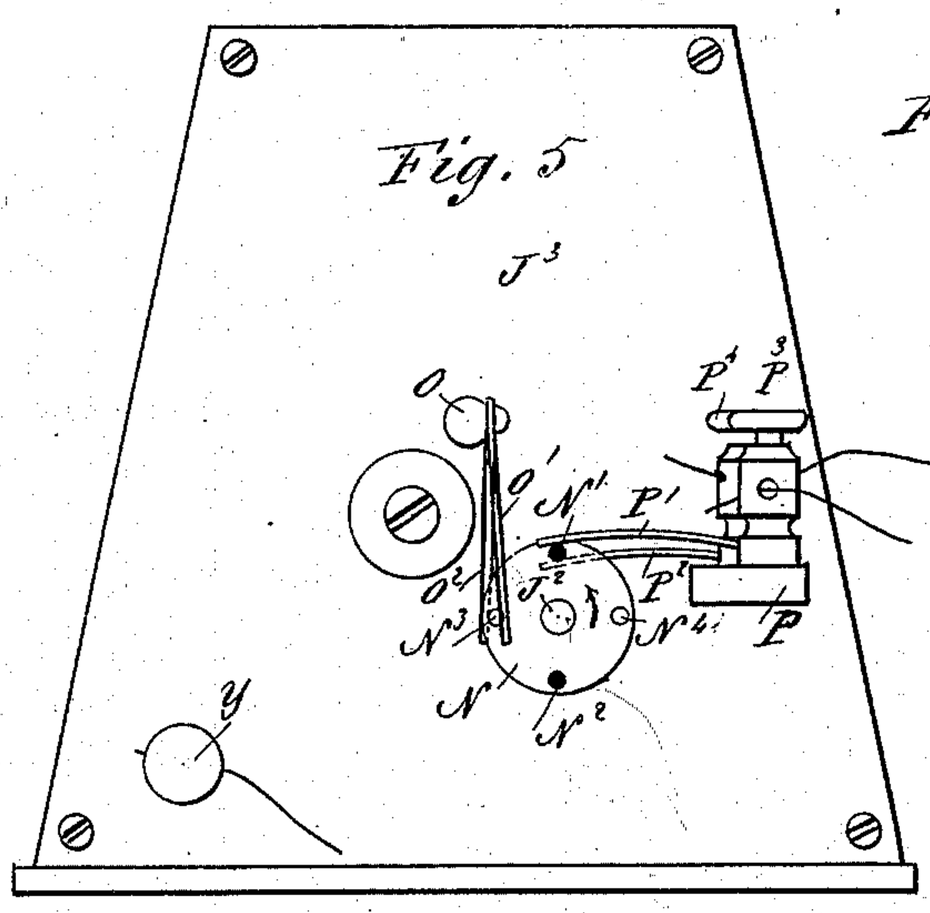


Fig. 6

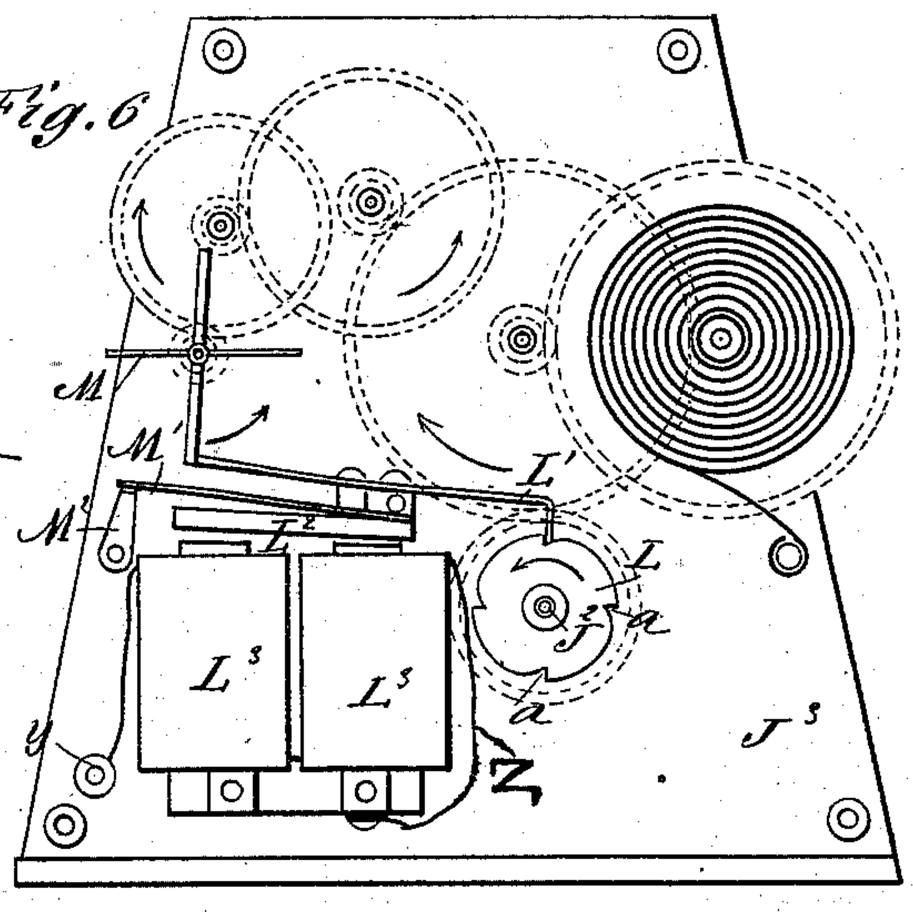


Fig. 7

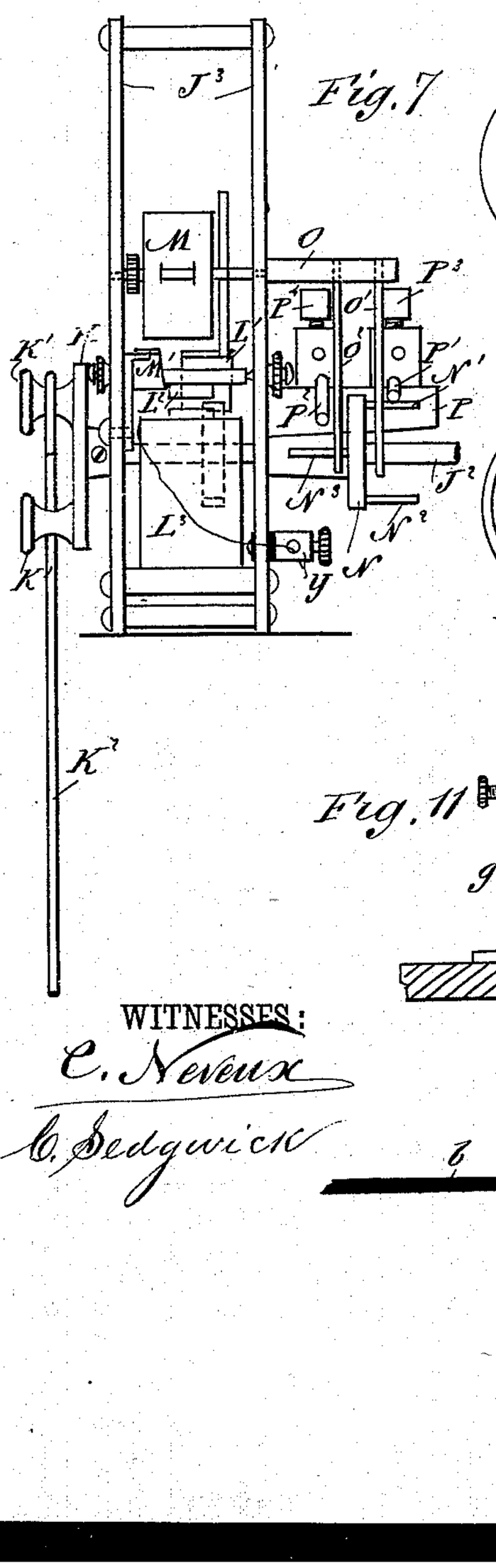


Fig. 8

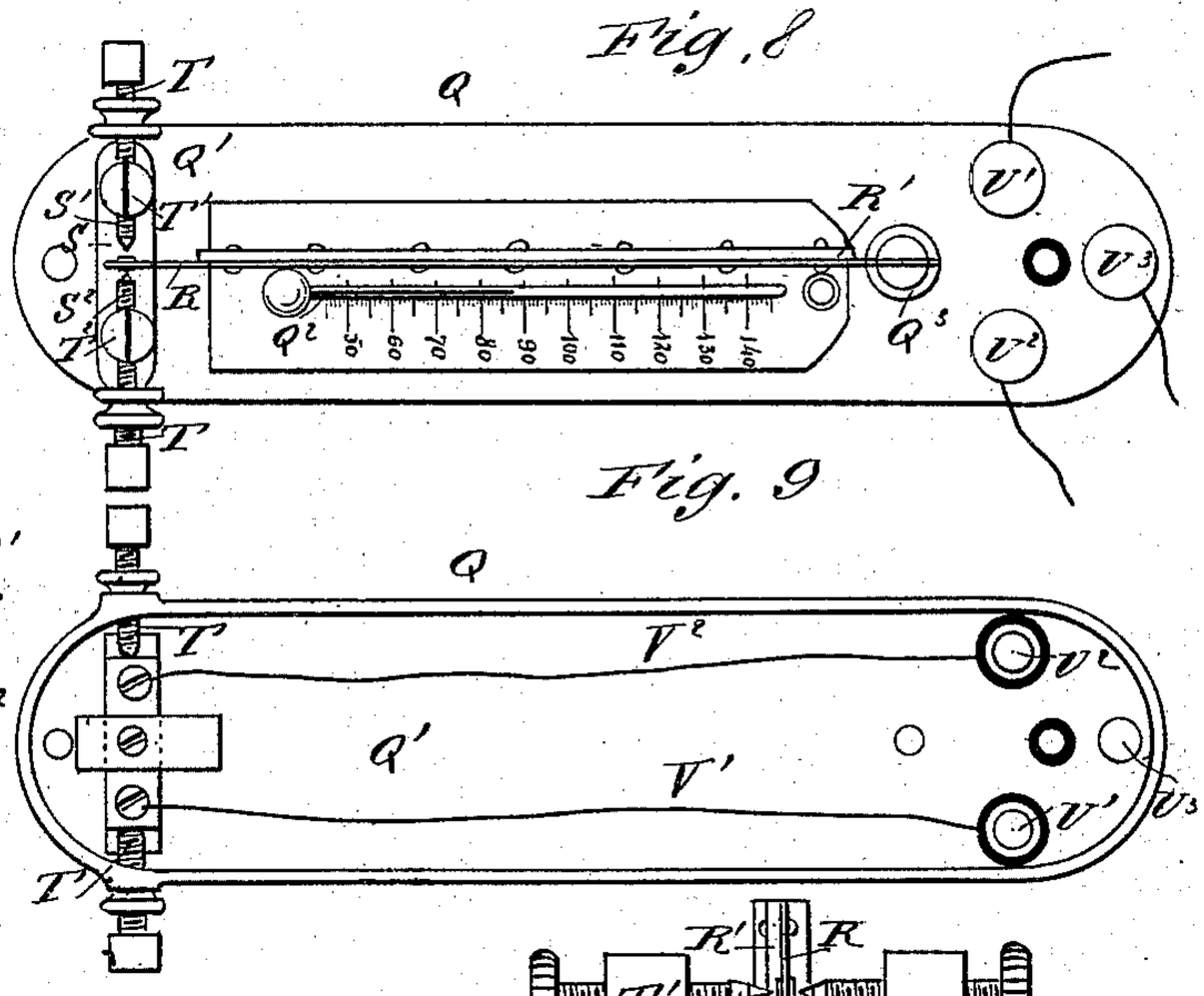


Fig. 9

Fig. 10

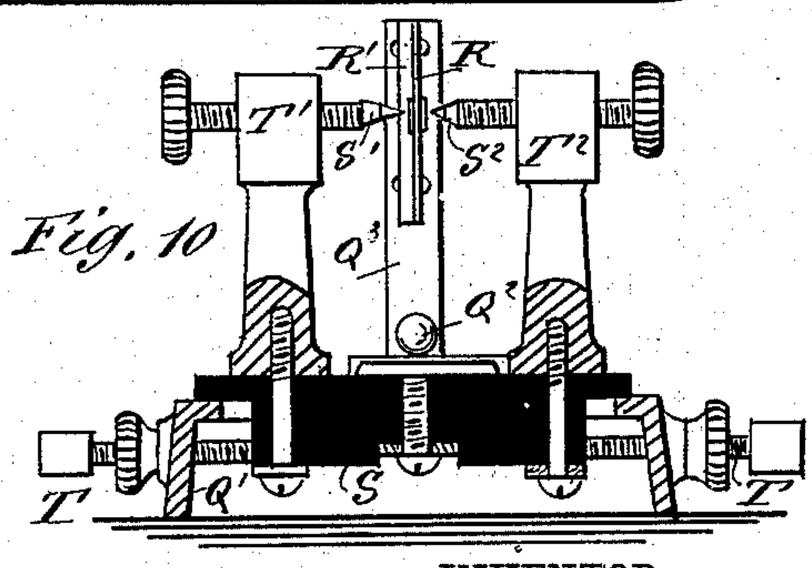
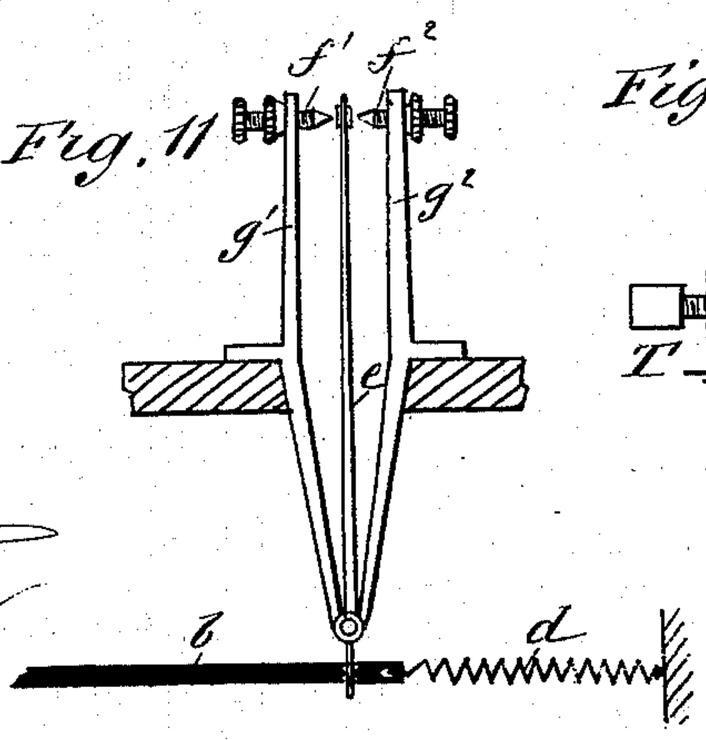


Fig. 11



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UNITED STATES PATENT OFFICE.

FRANK ROSEBROOK, OF ELMIRA, NEW YORK.

ELECTRIC REGULATOR AND ALARM FOR INCUBATORS.

SPECIFICATION forming part of Letters Patent No. 271,991, dated February 6, 1883.

Application filed August 3, 1881. (No model.)

To all whom it may concern:

Be it known that I, FRANK ROSEBROOK, of Elmira, in the county of Chemung and State of New York, have invented a new and Improved Heat-Regulator for Incubators, of which the following is a specification.

The object of my invention is to facilitate hatching eggs in an incubator, and to provide accurate and automatically-operating devices for regulating the heat and ventilation, so as to prevent the destruction of the eggs or embryo.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of my improved incubator on the line *z z*, Fig. 2. Fig. 2 is a plan view of the upper part of the boiler, showing the top plate removed. Fig. 3 is a cross-sectional elevation of my improved incubator on the line *x x*, Fig. 1. Fig. 4 is a horizontal sectional view of the same on the line *y y*, Fig. 1. Fig. 5 is a side elevation of the clock-work, showing the arrangement of the brushes or springs and contact-studs. Fig. 6 is a longitudinal elevation of the clock-work. Fig. 7 is an end elevation of the same. Fig. 8 is a plan view of the alarm-thermostat. Fig. 9 is a plan view of the under side of the same. Fig. 10 is a detail cross-sectional elevation of the same. Fig. 11 is a side elevation of the pivoted lever of the thermostat for closing the circuit for operating the valve-regulating mechanism. Fig. 12 is an end elevation of the plate at the end of the valve-operating rod.

Similar letters of reference indicate corresponding parts.

The incubator-casing A is made of wood, with hollow walls, which may be lined with paper, felt, &c., or may be filled with some suitable non-conductor of heat. The casing A is provided with hinged or sliding doors A^2, and below these it is provided with longitudinal windows A^3, one end of each of which is open, but can be closed by means of a slide, A^4. These openings are provided for the purpose of admitting fresh air into the incubator. Cleats B are hung on pins B′ on the sides of the casing A by means of hangers B^2, in such a manner that they will be slightly inclined from the outside toward the middle longitudinal partition C. So that these cleats B can be adjusted higher or lower, the hangers B^2 are provided with two or more apertures through which the pins B′ can pass. The egg-carrying drawers D rest and slide on these cleats B, and consist of a frame, C′, with a wire-netting or perforated or slatted bottom, C^2, which is divided into a series of compartments or spaces by longitudinal strips C^3, each compartment being of such size as to receive one row of eggs. The egg-drawers D are so located that they can be passed into the casing A when the doors A^2 are opened.

The hot-water tank consists of a flat vessel, E, resting on the upper part of the casing A, and subdivided by longitudinal and transverse partitions E′ E^2 into a series of channels in which the hot water circulates. This tank is provided with an opening, D′, for the ventilation-flue, and a smaller opening, D^2, for the lever for closing the electrical circuit for operating the damper-valve. By means of a pipe, E^3, this flat tank E is connected with the top of the upright cylindrical vessel, F, provided with a longitudinal conical flue, F′, below which a lamp, G, gas-burner, or other suitable source of heat rests upon a bracket, G′. A pipe, F^2, leads from the lower part of the cylindrical vessel F to a serpentine water-pipe, F^3, in the casing A, which pipe is connected at the opposite end with the flat tank or vessel E by means of pipes F^4, so that the hot water can circulate in the vessel E, the pipe E^3, the vessel F, and the pipes F^2, F^3, and F^4, whereby a large radiating-surface is obtained and the air in the casing A will be heated thoroughly and uniformly. Flat vessels H, containing water, are placed upon the serpentine pipes F^3, so that the water in these vessels will be evaporated, thus producing the moisture required in the casing.

A valve or damper, J, fitting in the ventilating-flue J′, is mounted on a rod, J^2, journaled in the sides of this flue, and in the casing J^3 of a clock-work on the casing or box A, the wheels of which clock-work engage with a wheel mounted on the rod J^2, whereby this rod J^2 is revolved and the valve or damper J will be operated to open or close the flue J′.

A disk, K, with two opposite studs, K′ K′, is mounted rigidly on that end of the rod J^2 projecting over the edge of the casing or box A, above the vessel F. The rectangularly-

bent upper end of a rod, K^2, suitably guided on the sides of the casing, rests upon the studs K' K' of the disk K, and the lower end of this rod K^2 is provided with a damper-plate, cap, &c., K^3, which is held a short distance above the flame of the lamp G. A wheel, L, with four notches, *a*, is mounted on the rod J^2 within the clock-work casing. The bent or hooked end of a spring, L′, attached to the pivoted armature L^2 of an electro-magnet, L^3, rests upon this wheel L. The front end of the spring L′ catches against the flier M of the clock-work, when the armature L^2 is raised by means of the spring M′, resting on a stud, M^2, of the clock-work casing, and attached to the armature L^2.

A disk or wheel, N, is rigidly mounted on the rod J^2, adjoining the casing of the clock-work, and this wheel has two studs, N^3 N^4, projecting toward the casing J^3 of the clock-work, and has two studs, N' N^2, projecting in the opposite direction, the studs being separated from each other the distance of a quadrant, and the two studs of the same side being separated the distance of half the circumference. A short arm, O, projects from the casing J^3, to which is connected the wire Z of the electro-magnet L^3 in any suitable manner, and from this arm O two brush-wires, O' O^2, project downward—one at each side of the wheel or disk N. A short insulated bracket, P, projects from the casing J^3, and is provided with two brush-wires, P' P^2—one at each side of the disk or wheel N—the brush-wires O' O^2 and P' P^2 being so located that their ends will come in contact with the studs N' N^2 N^3 N^4 of the disk when the same rotates. The binding-screws P^3 P^4 serve to connect the brush-wires P' P^2 with the circuit-wires. To complete the circuit, one outer brush—that is to say, a brush on that side of the disk N from the casing J^3—must be in contact with an outer stud. One inner brush-wire—that is, a brush-wire on the side of the disk N toward the casing J^3—must be in contact with an inner stud, forty-five degrees from the outer stud in contact with the outer brush. The electro-magnet L^3, contained within the casing J^3 of the clock-work, is connected with the battery W, located on the top of the casing A, by a wire held by the insulated binding-screw Y of the casing J^3.

The thermostat Q, which is placed on the partition C and as near the egg-drawers as possible, consists of a base, Q′, provided with a thermometer, Q^2, to facilitate adjusting the thermostat, and with a standard, Q^3, to which a sheet-iron strip, R, is fastened, this strip of sheet-iron having a strip, R′, of hard rubber, riveted firmly to its sides. The free end of iron strip R is located between the points of two screws, S' S^2, in standards T' T^2, on a block, S, of insulating material, which slides in a transverse groove in the base Q′, and can be adjusted in position by means of the set-screws T T. The standards T' T^2 are connected with the insulated binding-screws U' U^2 by the wires V' V^2, and the binding-screws U' U^2 are connected with the magnet of an alarm-bell, X, by suitable wires. The non-insulated binding-screw U^3 serves for connecting the base Q′ with the battery W. A hard-rubber bar, *b*, is held rigidly at one end at *c*, and the other end is attached to a spiral tension-spring, *d*, and to a pivoted lever, *e*, which swings between two contact-screws, f' f^2, at the upper ends of the standards g' g^2, connected with the battery W, and with the binding-screws P^3 and P^4 of the casing of the clock-work. The several parts herein described as being operated by means of electricity should be properly insulated from the other parts of the incubator.

The operation is as follows: The eggs are warmed mainly by the radiant heat of the under side of the flat vessel E, and for this purpose the egg-drawers must be as near this vessel as possible, and must gradually be moved from the source of heat, and to enable this I have provided the hangers B^2 with a number of apertures. The lower water-pipes, F^3, serve to complete the circulation in the tank E and to evaporate the water contained in the pans H for producing the necessary quantity of moisture. As but very little moisture is required the first week of the incubation, about two-thirds of the top of the pans are closed by covers, which are gradually removed as the incubation progresses, so that more moisture will be produced from the now larger surface of water. If the eggs are to be turned, one drawer is placed inverted upon the drawer containing the eggs, and the two drawers are held firmly together and turned one hundred and eighty degrees. The eggs will then be in the drawer that was placed upon the filled drawer, and the drawer that was formerly filled will now be empty. In this way the eggs can be turned without danger and very rapidly and conveniently. The eggs are to be turned every eight hours. There are two series of drawers, as shown in dotted lines in Fig. 3, and the eggs must be changed from an upper to a lower drawer every eight hours; but a single drawer may be used as well, the eggs being only turned every eight hours. The screws f' f^2 are so adjusted that the lever *e* will touch one or the other at certain temperatures. For instance, the machine shall be so adjusted that the temperature shall not rise above 104° and not fall below $103\frac{3}{4}$°. For this purpose the screw f' is so adjusted that it touches the end of the lever *e* at 104°, and the screw f^2 is so adjusted that it touches the lever *e* after the heat is decreased one-fourth of a degree from 104°. If the heat rises to 104°, or the point at which the heat is to be checked, the rubber rod *b* will be lengthened sufficiently to cause the lever *e* to come in contact with the pin f', whereby the electric circuit is closed and the electro-magnet L^3 attracts its armature L^2, thereby overcoming the power of the spring M′, and when the armature L^2 is attracted by the magnet the outer end of the spring L′ is

drawn downward, thereby releasing the flier M, and the bent end of the spring L′ is raised out of the notch *a*, thereby releasing the wheel L, which is turned in the direction of its arrow; but a moment after the bent end of the spring L′ is raised out of the notch *a* the circuit is broken, in a manner that will be described hereinafter, and the armature is released; but this spring L′ cannot raise this armature, as the bent end of the spring L′ rests on the circumference of the wheel or disk L, and is thus held in a raised position. When the wheel L has made a quarter of a revolution the bent end of the spring L′ snaps into one of the notches *a*, (of which there are four in the circumference of this wheel,) whereby the wheel L is locked in position, and the outer end of the spring L′ is raised sufficiently to catch the flier M. By this quarter-turn of the wheel L the rod J^2 has been turned likewise, and the valve or damper J, which was closed, is opened, whereby a draft is created, the air entering the casing A through the ventilation-openings A^3 and passing off through the flue J′. By this quarter-revolution of the rod J^2 the disk K has also been revolved a quarter-revolution, and the studs K′ K′ will be on a horizontal line, and as the upper bent end of the rod K^2 rests on these studs, it is evident that the rod K^2 will be lowered, as shown in full lines in Fig. 12, and the plate K^3 will be lowered and will spread the flame of the lamp or burner G, thereby decreasing the heating-power of the same; or the rod K^2 can act upon the gas-cock or wick-ratchets of the lamp or burner G in such a manner as to decrease the flame. If the ventilator-valve J is opened and the flame of the lamp or burner G is decreased, the temperature in the casing will drop in a short time, thus causing a contraction of the rod *b*, whereby the end of the lever *e* comes in contact with the screw f^2, thus closing the circuit. The armature L^2 of the magnet L^3 is attracted, the flier M released, and the rod J^2 is rotated a quarter-revolution in the manner described above, and by this quarter-revolution the valve J closed again, and the rod K^2 is raised, as shown in dotted lines in Fig. 12, the flame of the burner or lamp is increased, and the temperature in the casing A will rise. In this manner the temperature is regulated automatically.

If this device should fail to operate and the heat rises above 104° or drops below $103\frac{3}{4}$°, the thermostat Q will operate the alarm-bell X. This thermostat is adjusted in the following manner: The screw S^2 is so adjusted that it will be in contact with the strip R at a temperature a trifle above 104°, and the screw S′ is so adjusted that it will be in contact with the strip R at a temperature a trifle below $103\frac{3}{4}$°. If the strip R is in contact with the screw S^2, the electric circuit will be closed, and as follows: from the battery W to post U^3, the base Q′, standard Q^3, strip R, screw S^2, wire V^2, post U^2, bell X, and the battery. If the strip R is in contact with the screw S′, the circuit will be similar, as is clearly understood. If the screws S′ S^2 have been adjusted for a certain variation of temperature, but the indications of these variations are to take place at a different temperature from that at which the screws S′ S^2 were adjusted, the screws must not be readjusted, but the insulating-block S is moved to the right or left as much as may be required. For instance, if the thermostat is to indicate variations in temperature of one-fourth of a degree, and is so adjusted that the maximum temperature will be 104° and the minimum $103\frac{3}{4}$°, and it is desired that this thermostat is to indicate variations of one-fourth of a degree, with 98° as a maximum and $97\frac{3}{4}$° as a minimum temperature, the block S is moved toward the left by means of the screws T T until the strip R rests against the screw S^2 at a temperature of 98°, but the positions of the screws S′ S^2 in relation to each other are not varied.

When the valve or damper J is open the brush-wire P′ rests upon the pin N′ of the wheel N and the inner wire, O^2, rests on the pin N^3, and if the circuit is closed by means of the lever *e* these wires form a connection of the circuit through the wheel N. Now, if this wheel turns in the direction of its arrow, the pins N′ and N^3 pass from under the ends of the wires P′ and O^2 and the circuit is broken, even if the lever *e* is still in contact with the corresponding contact-screw with which it has closed the circuit; but as the wheel N completes its quarter-rotation the pins N^4 and N′ pass under the wires P^2 and O′, with which they remain in contact, thus forming a circuit through the wheel N. Now, if the lever *e* comes in contact with the opposite contact-screw, the circuit will again be closed and the clock-work will be released, and so on. This circuit is completed by the wires P^2 and O′ and the pins N′ N^4, and after the next quarter-revolution by the wires P′ and O^2 and the pins N^2 and N^4, and so on. The lever *e*, as we have seen, alternately comes in contact with the pins *f′* and f^2 as the temperature rises and falls. I thus arrange a double electric circuit in combination with the clock-work, both of which circuits are opened and are closed by the lever acted upon by a thermostat, and by means of the wires and pins described above.

The space below the serpentine pipes F^3 in the casing is used as a temporary nursery for the young chickens.

The matter in the above specification relating to the incubator proper will be made the subject of a subsequent application for patent.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with a clock-work, of the rotating rod J^2, the notched wheel L, the spring L′, resting thereon, the armature L^2, attached to the spring L′, the electro-magnet L^3, and the spring M′, substantially as herein

shown and described, and for the purpose set forth.

2. The combination, with the hard-rubber rod *b*, of the spring *d*, the standards *g' g²*, and the lever *e*, pivoted thereto and acted upon by the rod *b*, substantially as herein shown and described, and for the purpose set forth.

3. The combination, with the valve-operating mechanism, of the hard-rubber rod *b*, bracket *c*, spring *d*, vibrating lever *e*, standards *g' g²*, and adjusting contact-screws *f' f²*, the circuit extending through *f'*, binding-post P⁴, brush-wire P², disk N, binding-post Y, battery W, and lever *e*, and the circuit extending through *f²*, binding-post P³, brush-wire P', disk N, binding-post Y, battery W, and lever *e*, whereby the two separate circuits are closed respectively at maximum and minimum temperatures, substantially as specified.

4. In an incubator, the combination, with the valve-operating mechanism, of the rotating rod J², carrying the valve or damper J, the disk K, provided with pins K', and the rod K², provided with regulator K³, whereby the effective heat of lamp G or its equivalent is diminished and restored, substantially as shown and described.

5. The combination of the hard-rubber rod *b*, bracket *c*, spring *d*, vibrating lever *e*, standards *g' g²*, and adjusting-screws *f' f²*, substantially as shown and described.

6. In a valve-regulator, the combination, with a series of pairs of contact-studs projecting from a disk mounted on the rotating valve-rod, of a series of pairs of brush-wires connected with the battery and an electro-magnet by suitable devices, and clock mechanism for rotating said rod J², substantially as herein shown and described, and for the purpose set forth.

7. In a valve-regulator, the combination, with the clock-work casing J³, of the arm O, the insulating-bracket P, the binding-screws P³ P⁴, the brushes P' P² O' O², the valve-rod J², the disk N, provided with studs N' N² N³ N⁴, the electro-magnet L³, and clock mechanism, substantially as herein shown and described, and for the purpose set forth.

8. The combination, with the base Q', of the insulated block S, sliding in a groove in the end of the base of the standards T' T², the thermostat-plate R R', and the wires V' V², connecting the lower ends of the standards with the binding-screws U' U², substantially as herein shown and described, and for the purpose set forth.

9. The combination, with a clock-work or like motor, of the rod J², the notched disk L, the electro-magnet, a device for connecting the electro-magnet with the disk, the damper or door, and the circuit-closer, substantially as shown and described.

10. The combination, with two separate electric circuits and a thermostat, of a damper or door secured to an oscillatory rod, J², and mechanism for oscillating said rod, substantially as shown and described.

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