(No Model.)

J. W. CAMPBELL.

THERMOSTATIC REGULATOR FOR INCUBATORS.

No. 351,494. Patented Oct. 26, 1886.

Fig 2.

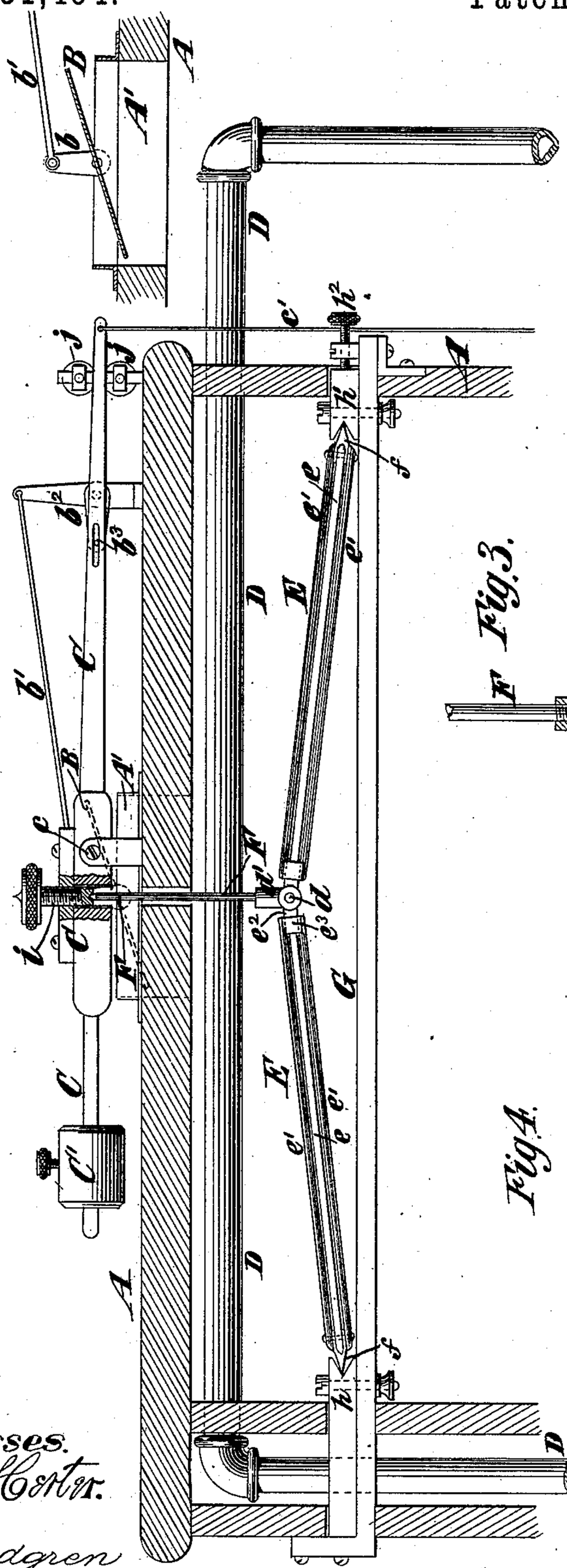

Fig. 1.

Fig. 3.

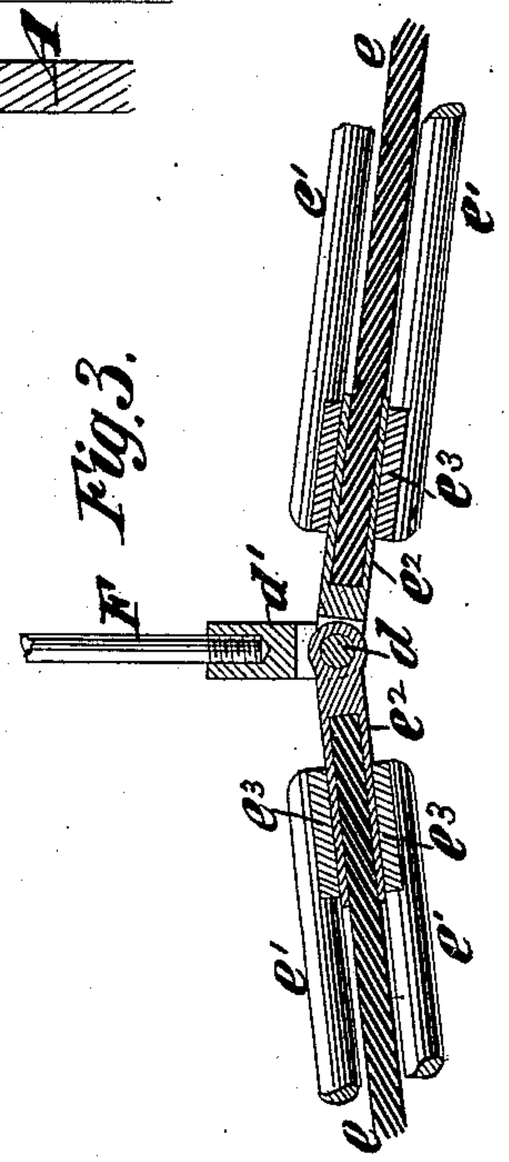

Fig. 4.

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UNITED STATES PATENT OFFICE.

JAMES W. CAMPBELL, OF GERMANTOWN, NEW YORK.

THERMOSTATIC REGULATOR FOR INCUBATORS.

SPECIFICATION forming part of Letters Patent No. 351,494, dated October 26, 1886.

Application filed May 21, 1886. Serial No. 202,846. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. CAMPBELL, of Germantown, in the county of Columbia and State of New York, have invented a new and useful Improvement in Thermostatic Regulators for Incubators, &c., of which the following is a specification.

My invention is applicable for controlling the ventilators and heat-controlling devices of incubators, and it may also be employed in performing like functions in other apparatus where it is desired to maintain constantly a very nearly uniform degree of temperature.

The invention relates to that class of thermostatic regulators in which two thermostatic bars are jointed together at their one end and are thence inclined in opposite directions to rigid supports, against which the outer ends of the bars rest. When the thermostatic bars elongate or extend by heat, the joint which connects their inner ends is either raised or lowered, according to whether the bars are inclined downward from or toward this joint.

An important object of my invention is to enable long and thin flat bars to be employed without danger of their buckling or bending when extended by heat, and particularly to enable bars of hard india-rubber, which is a material having a great degree of expansion by heat, to be used.

One feature of my invention consists in the combination, with two thermostatic bars jointed together at their one end and inclined in opposite directions, of a base-piece or rigid support provided with bearings for the outer ends of the bars, one at least of said bearings being adjustable to vary the inclination of said bars, a balance-beam through which motion is to be transmitted, and a connection between the joint of the thermostatic bars and said beam, as more fully hereinafter described.

The invention also consists in a composite thermostatic bar composed of a flat and thin strip or bar, and strengthening-rods arranged on opposite sides and extending lengthwise of the strip to prevent its buckling, and having a sliding connection with the strip, so as not to interfere with its extension by heat or contraction by a diminishing temperature. The thin strip or bar and its strengthening-rods, which lie on opposite sides of and very close to it, are preferably rigidly secured together at their one end by rivets or otherwise, and at their other end the thin strip or bar may be inserted in a socket-piece and the strengthening-rods may be soldered or otherwise secured to a band or collar which slides over this socket-piece. By this construction the buckling of the thin thermostatic strip or bar is prevented, and at the same time its free expansion and contraction is not interfered with or counteracted by the strengthening-rods.

The invention will be hereinafter more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of the upper portion of an incubator embodying my invention. Fig. 2 is a sectional view, upon a plane parallel with the plane of Fig. 1, showing more clearly the ventilator or damper, which is controlled by the thermostatic regulator. Fig. 3 is a sectional view, upon a larger scale, illustrating the adjacent end portions of the two composite thermostatic bars where they are jointed together and connected with a rod through which they transmit motion; and Fig. 4 is a transverse section of one of the composite thermostatic bars upon the same scale as Fig. 3.

Similar letters of reference designate corresponding parts in all the figures.

A designates the upper portion of the incubator-chamber, which may be of any suitable construction, and which has at the top a ventilator-opening, A′, controlled by a ventilator or damper, B.

C designates a beam, which is fulcrumed at *c*, and may be balanced by an adjustable weight, C′, and this beam at its farther end may be connected by a rod, *c′*, with the flame-controlling device of the lamp, whereby the incubator is heated, as shown in my application for United States Letters Patent No. 194,205, filed March 6, 1886. This rod *c′* may serve to shift any heat-controlling device connected with the heater for operating the incubator, and such heater may maintain the temperature of the incubator through hot-water-circulating pipes, D in the drawings representing a portion of the hot-water-circulating pipes. As here represented, the ventilator

or damper B has an arm, *b*, projecting from its fulcrum, and this arm is connected by a rod, *b'*, with a bell-crank lever, b^2, having a slot-and-pin connection, b^3, with the beam C; hence by any movement of the beam the heat-controlling device will be shifted and the ventilator or damper B will be opened or closed.

E E designate composite thermostatic bars, from which motion is derived for shifting the beam C by variations in temperature, and such motion is transmitted through a rod, F, from the joint *d*, connecting the adjacent ends of the bars E. The construction of these bars forms an important element of my invention. Each bar E consists of a flat and comparatively thin strip, *e*, which may be of metal or of hard india-rubber, and strengthening-rods *e'*, which extend parallel with and on opposite sides of the strip *e*, and lie very close thereto throughout their length. I have represented the strip *e* and strengthening-rods *e'* as secured together and to a knife-edged fulcrum-piece, *f*, at their ends which are distant from the joint *d*, and at their adjacent ends the strip *e* is inserted within a socket-piece, e^2, while the strengthening-rods *e'* are soldered or otherwise secured to a band or collar, e^3, which slides upon the outside of the socket-piece e^2. By the joint *d* the two socket-pieces e^2 of the composite bars are pivotally connected together, and with a coupling-piece, *d'*, and the rod F, through which motion is transmitted, is screw threaded into the coupling-piece *d'*.

G designates a bar which extends across the incubator, and is provided at one end with a fixed bearing, *h*, for the fulcrum-piece *f* of one bar, and at the other end with a bearing, *h'*, for the fulcrum-piece *f* of the opposite bar, E, said bearing being adjustable by a screw, h^2, to vary the inclination of the bars E.

As here represented, the connection between the rod F and beam C is formed by a screw, *i*, which is adjustable in the beam, and in the end of which is a conical recess receiving a conical end of the rod F.

Whenever the temperature within the incubator-chamber rises above the desired point, the abnormal extension of the composite thermostatic bars E will raise the rod F, and by tilting the beam C will shift the ventilator B, and will also shift the heat-controlling device through the rod *c'*. The screw-threaded connection of the rod F with the coupling-piece *d'*, provides for first adjustment at the time of assembling the parts, and the screw *i* provides for adjustment at any time to vary the temperature maintained in the incubator.

The construction of the composite bars E is very desirable. They can be made of considerable length and of little thickness, so as to be easily affected by heat, and the round strengthening-rods serve to prevent the buckling of the strips or bars *e* without materially protecting them against the heat in the chamber. This construction enables me to employ for the thermostatic strips *e* hard india-rubber, which has a high degree of expansion by heat.

The upward and downward movement of the balanced beam C may be limited by means of adjustable stops *j*.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with two thermostatic bars jointed together at the ends and inclined in opposite directions, of a base-piece or rigid support provided with bearings for the outer ends of the bars, one of said bearings being adjustable to vary the inclination of said bars, a balanced beam through which motion is to be transmitted, and a connection between the joint of the thermostatic bars and said beam, substantially as herein described.

2. The composite thermostatic bar herein described, consisting of a flat and thin strip or bar, and strengthening-rods arranged on opposite sides of and extending lengthwise of the strip to prevent its buckling, and having a sliding connection with the strip, so as not to interfere with its extension, substantially as herein set forth.

3. The composite thermostatic bar herein described, consisting of a comparatively thin strip, and strengthening-rods extending on opposite sides of and connected at one end with the strip, and a collar or band with which the opposite ends of the rods are connected, and which has a sliding connection with the strip, substantially as herein set forth.

4. The composite thermostatic bar herein described, consisting of the india-rubber strip or bar *e*, fitting a socket, e^2, at one end, and strengthening-rods *e'*, extending on opposite sides of the strip or bar, and rigidly secured thereto at one end, and at the other end secured to the band or collar e^3, sliding upon the socket e^2, substantially as herein set forth.

5. The combination of composite bars jointed together at the end and inclined in opposite directions, each bar consisting of a thin strip having upon each side strengthening-rods which prevent buckling of the strip and have a sliding connection therewith, so as not to interfere with its extension, and a rod or connection whereby motion is transmitted from the joint between the bars, substantially as herein described.

6. The combination, with the thermostatic bars E and a coupling-piece, *d'*, to which they are pivoted at one end, of the beam C, which receives motion by the expansion of the bars, a rod, F, screwed into the coupling-piece *d'*, to provide for first adjustment, and the screw *i*, on which the end of the rod F bears, and which is adjustable in the beam to vary the temperature maintained by the thermostatic bars, substantially as herein described.

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