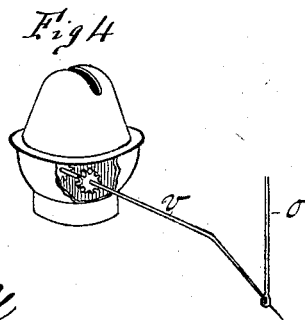
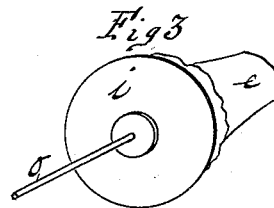
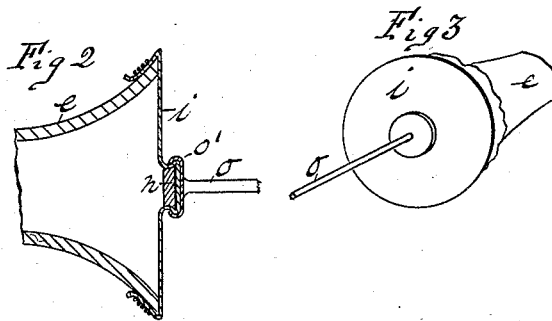
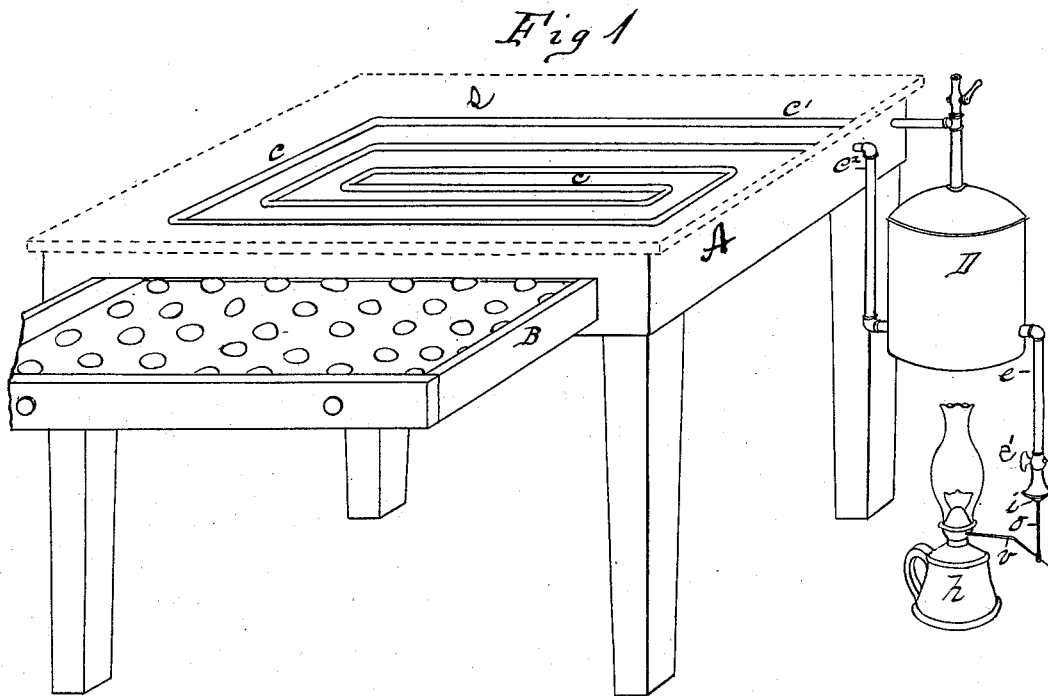


(No Model.)

J. W. HANNUM.  
INCUBATOR.

No. 264,284.

Patented Sept. 12, 1882.



Witnesses  
J. D. Garfield  
C. S. Starkhurst

Inventor  
James W. Hannum  
By Henry A. Chapin  
Att'y

# UNITED STATES PATENT OFFICE.

JAMES W. HANNUM, OF LUDLOW, MASSACHUSETTS.

## INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 264,284, dated September 12, 1882.

Application filed February 26, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES W. HANNUM, a citizen of the United States, residing at Ludlow, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Incubators, of which the following is a specification.

My invention relates to the details of construction of heat-regulating devices connected with a heating-boiler, the object being to cause the heat to be regulated directly by the variations of heat in the water-boiler and in the circulating-pipes.

In the drawings forming part of this specification, Figure 1 illustrates an incubator having its top removed, showing the pipes therein, and having attached to said pipes a boiler provided with my improved heat-governing devices. Fig. 2 is a sectional view of an elastic diaphragm and the end of a pipe leading from the boiler of the incubator. Fig. 3 is a perspective view of the parts shown in Fig. 2. Fig. 4 is a view of the burner of lamp *h* detached therefrom and having its side broken away to show the ordinary mechanism therein for raising and lowering the lamp-wick.

In the drawings, *A* is the incubator-box, inclosing a suitable heating-chamber, *s*.

*B* is an egg-drawer, adapted to slide into and be inclosed in said chamber.

*c* are heating-pipes, *c'* carrying the water from the boiler and *c''* returning it to the boiler.

*D* is the boiler.

*e* is a pipe extending downward from the boiler *D*, provided with a stop-cock, *e'*, and having its lower end covered with an elastic diaphragm, *i*. Attached to said diaphragm centrally is a connecting-rod, *o*, which is attached to the arm of the wick-raising shaft *v*, the latter having its end bent at right angles to form an elbow-lever. Said shaft *v* is provided with the usual toothed wheels to operate against the wick of the lamp.

The dotted lines in Fig. 1, around the top of the incubator-chamber, represent the position of the cover to said chamber when in place thereon.

The heating-pipes *c* are arranged in the chamber *s*, either in such position that the egg-drawer will lie under or over them, as may be preferred.

The operation of my improved incubator is as follows: The stop-cock upon the end of the pipe standing vertically on the boiler *D* is opened, and by any convenient means the boiler and the pipes *c* are filled with water, as well as pipe *e*, which runs downward from said boiler, and has its lower end covered by the elastic diaphragm *i*. Said stop-cock is closed after the lamp *h* has been lighted and the water in the boiler has become somewhat warmed, and as the heat increases the water begins to circulate in the usual manner through pipes *c*, flowing from the boiler through pipe *c'*, and thence following the lines of said pipes to the center of the coil and back and out from said chamber through pipe *c''* into the lower part of the boiler.

The arrangement of the diaphragm *i* upon the lower end of pipe *e* is such that when the water in boiler *D* is cold said diaphragm will extend across the lower end of pipe *e* in a straight line, or nearly so; but when the water in said boiler becomes heated to a certain degree said diaphragm will, by the expansion of the water by heat, assume a convex form, moving the rod *o* downward, carrying with it the arm on the wick-raising shaft *v*, and operating to turn down the wick of the lamp and decrease the heat which it imparts to the boiler and the water therein, and when the heat in the boiler is decreased to a certain extent said diaphragm *i* will move in an opposite direction, causing an opposite action in shaft *v*, and raise the wick of the lamp to reheat the water. Thus by a proper adjustment of the connecting-rod *o* to the lever *v*, to produce the requisite raising and lowering of the wick of the lamp, the desired heat, with but little variation, can be maintained in boiler *D* and in circulating-pipes *c*.

The devices herein shown for regulating the heat, and which are applied to the boiler—that is, the expanding and retracting elastic diaphragm *i*—provide new and simple means for regulating the heat within the incubator-chamber, and apply the heat-governing devices directly to the heating medium, so that their action by the variations in the heat of the water is more direct and positive than they would be when operated, as is usually the case, by variations of the temperature of the air within the chamber, and in this way the desired uniform

temperature within the incubator-chamber can be easily secured.

The stop-cock *e'* is inserted in pipe *e* to provide means for shutting off the water when it becomes necessary to remove, replace, or repair the diaphragm *i*.

To provide means for securing the rod *o* to diaphragm *i*, without perforating said diaphragm and causing leaks therein, the device shown in Fig. 2 is preferably employed, which consists in folding the central portion of the diaphragm around the edges of a disk, *n*, and inclosing said disk and a portion of the diaphragm passing around it within the bent edges of a disk or plate *o'*, attached to the upper end of the rod *o*. Diaphragm *i* is secured to the lower end of pipe *e*, which pipe is made slightly of bell-shape, as shown, to increase its area at that point by wiring said diaphragm thereon, as shown, or by other suitable means.

It is obvious that either a lamp, as shown, or a jet of gas may be employed for heating the water in boiler *D*, and that through suitable connections with the diaphragm *i* and rod *o* the stop-cock of such a gas-jet will be operated by the expansion and contraction of the water in said boiler, to increase and decrease the volume of said gas-jet. Also, such lamps as are constructed with an extinguish-

ing-tube arranged to slide vertically over the lamp-wick, to vary the size of the flame, may be used instead of those made with the ordinary rolling toothed wick-raiser. When the former are used the lever *v* may be made straight, or nearly so, one end being connected to said sliding tube, its opposite end to the rod *o*, and a proper fulcrum-bearing be provided near the burner on the lamp, to which said lever may be attached at a point between its ends, so that said wick-tube would be slid up and down on the wick by the action of the diaphragm, and thereby the flame be increased and diminished, as above described.

What I claim as my invention is—

1. In an incubator, the combination of the boiler *D*, the coil of water-pipes *e*, and the pipe *e*, entirely filled with water, the diaphragm *i*, rod *o*, connected to said diaphragm, lamp *h*, and the wick-raising shaft *v*, substantially as set forth.

2. In combination, the diaphragm *i*, disk *n*, and the rod *o*, having the plate *o'* on its upper end, substantially as and for the purpose set forth.

JAMES W. HANNUM.

Witnesses:

H. A. CHAPIN,  
J. D. GARFIELD.