(No Model.)

G. B. & M. JOHNSON.

ELECTRICALLY HEATED VACUUM PAN.

No. 403,110. Patented May 14, 1889.

Fig. 1

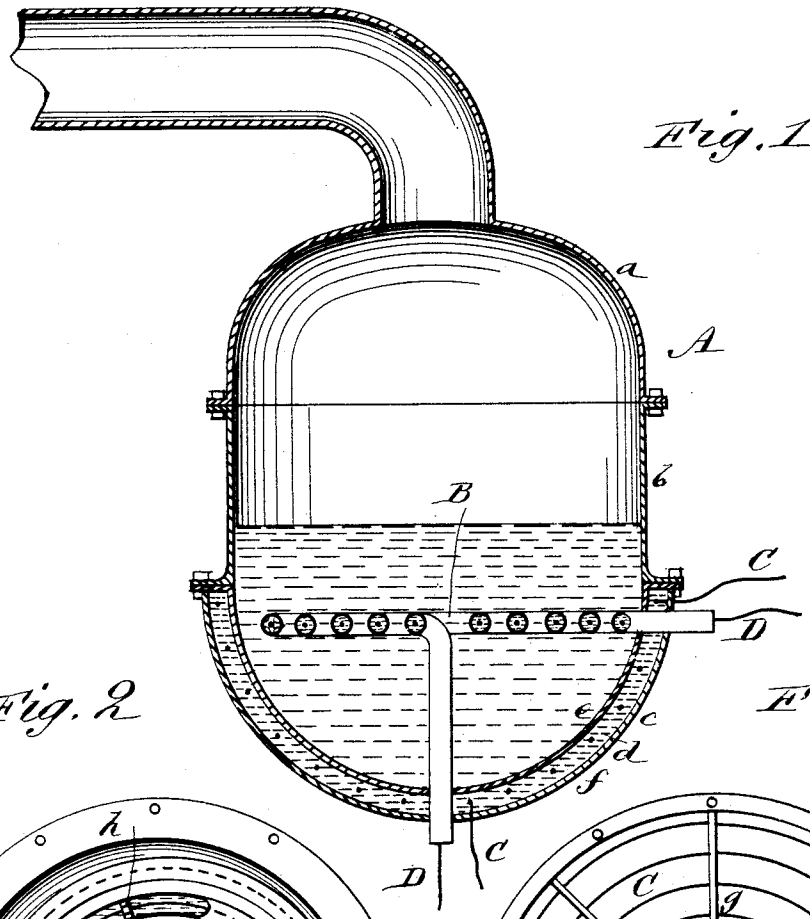


Fig. 2

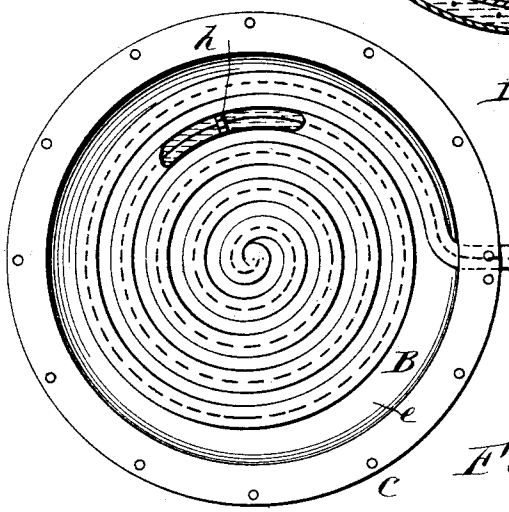


Fig. 3

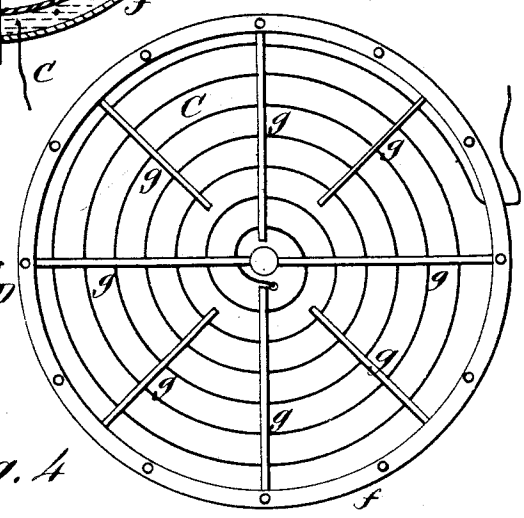
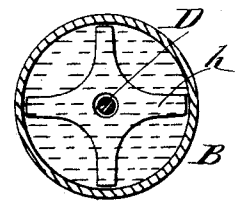


Fig. 4



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UNITED STATES PATENT OFFICE.

GAIL B. JOHNSON AND MILBANK JOHNSON, OF ELGIN, ILLINOIS.

ELECTRICALLY-HEATED VACUUM-PAN.

SPECIFICATION forming part of Letters Patent No. 403,110, dated May 14, 1889.

Application filed June 1, 1888. Serial No. 275,729. (No model.)

To all whom it may concern:

Be it known that we, GAIL B. JOHNSON and MILBANK JOHNSON, both of Elgin, in the county of Kane and State of Illinois, have invented a new and Improved Electrically-Heated Vacuum-Pan, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a vertical transverse section of a vacuum-pan to which our improvement has been applied. Fig. 2 is a plan view of the jacketed portion of the vacuum-pan. Fig. 3 is a plan view of the same with the top removed, and Fig. 4 is a transverse section of the coil-pipe and the electrical conductor.

Similar letters of reference indicate corresponding parts in all the views.

Our improvement is applicable to vacuum-pans used for concentrating liquids of various kinds; but as it is more especially designed for use in condensing milk, it will be described with special reference to this use.

In condensing milk by means of the ordinary vacuum-pan employing steam as the heating agent it is extremely difficult to maintain the necessary uniform temperature. An undue increase of temperature injures the product, and a diminution of the heat below a certain fixed temperature renders the completion of the process uncertain. To avoid these difficulties and to furnish a vacuum-pan in which a uniform temperature may be readily maintained throughout the entire process is the object of our invention.

Our invention consists in the construction and arrangement of parts, as will be hereinafter fully described and claimed.

The vacuum-pan A is of the usual construction, being formed of the dome *a*, the waist *b*, and the jacketed bottom *c*, provided with the space *d* between the inner wall, *e*, and the outer wall, *f*. Within the vacuum-pan is supported a coil, B, of copper pipe, one end of which extends through the side of the pan, and the other projects downwardly through the bottom of the pan.

In the jacketed bottom *c*, between the inner and outer walls, *e f*, is placed a wire, C, arranged in a spiral and supported by insulating-bars *g*, so as to occupy a central position in the space in the jacket. The wire C has sufficient resistance to cause it to be heated by an electric current when placed in a suitable circuit. One terminal of the wire C passes through the side of the jacket and the other terminal through the bottom thereof, the said terminals being connected with a suitable electric generator, with electrical regulating devices of known construction applied to the circuit for controlling the current passing through the wire. The space *d* within the jacket surrounding the wire C is filled with a substance which is an insulator of electricity and a conductor of heat, such as oil or plaster-of-paris.

In the coil B is inserted a wire, D, which is supported in a central position in the coil by means of spiders *h*, of porcelain or other insulator of electricity, the said spiders being arranged at frequent intervals to prevent the contact of the wire with the coil. The space in the coil B surrounding the wire, like the space in the jacket, is filled with a substance which is an insulator of electricity and a conductor of heat. The wire D may be placed in the circuit with the wire C, or in a separate circuit, as may be desired.

The current is regulated by any of the well-known methods. By driving the dynamo which furnishes the current at a uniform speed the current may be closely regulated, so as to produce exactly the temperature required, the heat of the wires C D being transmitted through the substance surrounding the wires to the interior of the jacket and to the coil.

To prevent the radiation of heat from the exterior of the jacketed bottom of the pan, the said bottom may be protected by a coating of felt, plaster, or any good non-conductor of heat.

In the present case we have shielded the electrical conductor from the material being evaporated in the pan; but in some cases the electrical conductor may be in direct contact with the liquid. Therefore we do not limit ourselves to the exact arrangement of conductors herein shown and described.

When the electrical conductors are embedded in plaster-of-paris, they will need no additional support, and the supporting spiders and bars may be omitted.

Having thus described our invention, we claim as new, and desire to secure by Letters Patent—

1. The combination, with a jacketed vacuum-pan, of electric resistance-wires within the liquid-containing part of the pan and also around the lower part of the same, substantially as set forth.

2. The combination, with the vacuum-pan A, having its rounding bottom provided with a jacket, of an insulating heat-conducting material within the jacket, an electric resistance-wire passing spirally around the jacketed space and inclosed in said material, a horizontal coil of pipe within the liquid-containing part of the pan and having its ends extending through the pan, and an electric resistance-coil within said pipe and insulated therefrom, substantially as set forth.

3. The combination, with the heating-coil B and the wire D, arranged within the said coil, of the spiders *h*, adapted to support the wire in a central position in the coil, substantially as specified.

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Witnesses:
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F. M. FILLMORE.