No. 636,887. Patented Nov. 14, 1899.

L. BELL.

COOLING APPARATUS.

(No Model.) (Application filed Feb. 1, 1898.)

Fig. 1

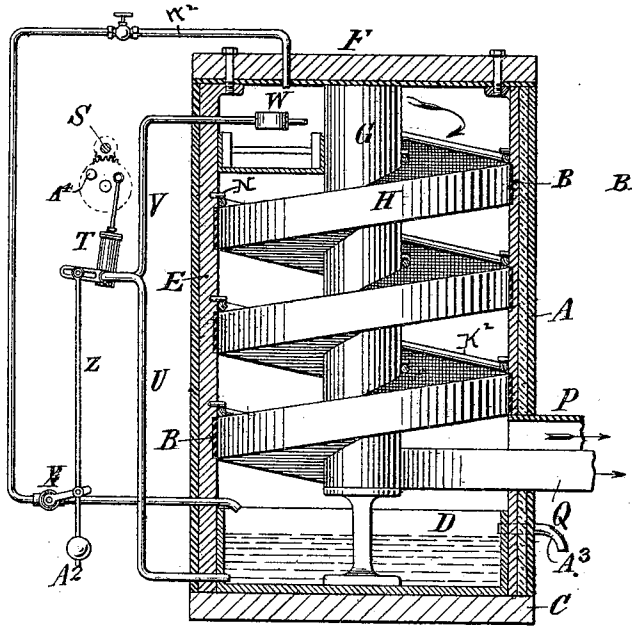


Fig. 3

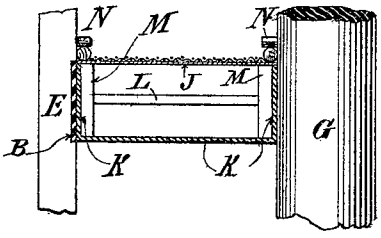


Fig. 4

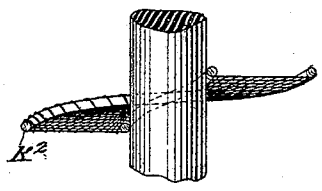


Fig. 2

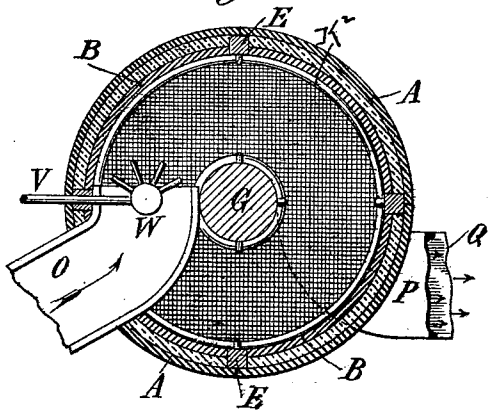
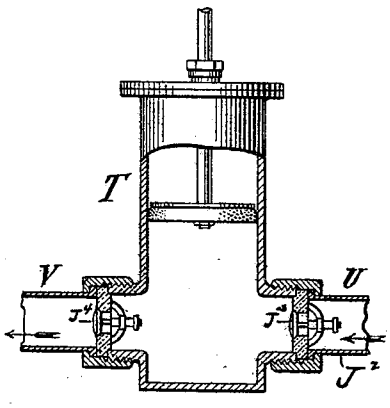


Fig. 5



Witnesses:
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UNITED STATES PATENT OFFICE.

LOUIS BELL, OF NEWTON, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE BELL HOUSE COOLING COMPANY, OF NEW YORK, N. Y.

COOLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 636,887, dated November 14, 1899.

Application filed February 1, 1898. Serial No. 668,725. (No model.)

To all whom it may concern:

Be it known that I, LOUIS BELL, a citizen of the United States, residing at Newton, county of Middlesex, and State of Massachusetts, have invented certain new and useful Improvements in Cooling Apparatus, of which the following is a specification, reference being made to the accompanying drawings.

My invention relates to cooling apparatus of the kind described in a copending application of mine wherein a current of air in a tube or duct having a wall composed of a film of copper is cooled by the evaporation of water in a containing or adjoining duct or chamber separated therefrom by the said copper film and traversed by a second current of air having a pressure sufficiently near the pressure of the first current to prevent injury to the film. I have used with success a film of four-thousandths (.004) of an inch in thickness, and while not intending to limit myself to this particular thickness of film I desire to be understood to mean by the term "film" as used in this specification a conducting-wall thinner than the sheet-metal walls heretofore used in this art.

My present invention consists in forming the cooling-duct in a spiral contained in a casing of heat-insulating material, the successive turns of the spiral serving to form between them a second coaxial duct through which passes the evaporating-blast. The axis of the spiral is vertical, and the particular advantage of it is that but a single drip-nozzle or group of nozzles at the head of the incline is required for moistening the entire mantle, which covers the top wall of the spiral duct, and also that it presents no sharp turns to obstruct the air-current, effecting thereby a saving in power. The supply-nozzle is placed at the top of the spiral, and the water therefrom is conducted by gravity down the incline of the spiral to its lower end, where it escapes into the drip-tank.

My present invention embraces also certain other features of improvement in apparatus of this kind which will be hereinafter described.

Referring to the accompanying drawings, Figure 1 is a vertical section of the casing, showing the spiral duct and other interior features. Fig. 2 is a plan view with the cover removed. Fig. 3 is a detail drawing of a section of the duct. Fig. 4 shows in detail the method of applying the detachable mantle, the parts being shown as slightly separated to more clearly disclose their relation. Fig. 5 is a cross-section of a pump which I propose to use.

In the drawings, A represents a cylindrical inclosing case of galvanized iron covered outside with roofing-felt, wood, or other heat-insulating substance and made in four separate pieces, which can be separately applied to make up the complete cylinder.

C is a base-plate forming a part of the casing, and above it is a tank D, of cast-iron, from which rise four upright bars E, which at their upper ends are attached to a cover F by suitable bolts or screws.

G is a central newel-post attached at its upper end to the cover F and supported at its lower end from the bottom of the tank. Between the newel-post G and the uprights E is placed the spiral cooling-duct H, formed as shown in Fig. 3 and insulated electrically from the casing by a strip of rubber B. In this figure, K K are the side walls and bottom of the duct, made of substantial material, and forming, with the post G and the uprights E, a support for the copper film J, which is attached to the edges of the copper trough K K and forms the top wall of the duct. Within the duct I place at intervals bolts L, provided with end plates M M, which may be of wood or of metal. On the upper wall of the duct and outside thereof I place a spiral strip of very fine meshed netting of unsized cotton or linen fabric, with its outer and inner edges attached to a spiral ratan rod or a spring brass wire K^2. When the mantle thus formed is to be put in place, the ratan edges of succeeding sections are sprung underneath lugs N N on the uprights E and post G, so that the mantle is held taut in good contact with the surface of the spiral film J.

A blast of air is provided by any suitable blower and motor therefor, which is conducted to the inlet-pipe O, Fig. 2, whence it is delivered partly into the cooling-duct and partly into the exterior evaporating-duct. The latter portion of the air emerges at the

lower part of the apparatus through the outlet-tube P and the former emerges at the same point through the outlet-pipe Q, from which it is conducted to the apartment to be cooled. The blast may, if desired, be introduced at the bottom and taken out at the top of the apparatus.

Any suitable means may be employed to supply a suitable amount of water to the absorbent mantle, and I illustrate herein one such method, although not claiming it in this case as my invention.

Referring to Fig. 1, S represents the shaft of a suitable motor employed for driving the blower which supplies the air-blast. This shaft acts through suitable reducing-gears to drive the small slow-moving oscillating pump T, which draws water from the tank D by the pipe U and delivers it by the pipe V to the distributing-head W at the upper end of the spiral duct, from which, by means of several short radiating tubes, it falls on the mantle covering the upper surface of the duct. At the same time each stroke of the pump acts through a rod Z to open a cock X, which is connected therewith, and admit a small amount of fresh water to the tank D to compensate for the loss by evaporation. The amount of water admitted to the tank at each stroke can be adjusted by sliding the upper end of the rod Z to or from the pivotal point of the pump in the slot provided in the crank-arm for the reception of the end of the rod. In Fig. 5 a section of the pump is shown, from which it will be seen that the hollow trunnions T^2, on which the pump oscillates, serve, respectively, as inlet and outlet ports for the pump-cylinder, each being provided with a valve T^3 and T^4, respectively, and each being loosely seated in the end of one of the pipes U and V, so as to be capable of oscillating therein. The water drawn in through the valve T^3, opening from pipe U on the upward stroke of the pump, is forced out through the valve T^4, opening into pipe V on the downward stroke. The advantage of this method of supplying the water is that the cooling energy which is absorbed by the water in its passage over the mantle to the drip-tank is not wasted, but is practically all recovered by sending it repeatedly over the mantle, while by the periodical injection of the water it is not necessary to graduate the flow by means of small drip-nozzles, which are apt to become clogged by any impurities in the water, this matter having proved a source of much annoyance in practice. It will also be observed that the flow of the water is parallel with the axis of the pipe, so that by this feature, even if the duct has a form other than the spiral one shown, a fewer number of nozzles and longer ones may be employed than are required if the water-flow were transverse to the length of the duct. The weight A^2 also closes the cock X when the motor is not running, so that there is no flow of water except when the machine is in operation. The cock X is operated by a lever X^2, whose outer end is suitably jointed to rod Z. This may be supplemented by a much smaller weight A^4, which prevents stopping on a dead-center. A suitable overflow-pipe A^3 for the drip-tank is also provided. I also provide a pipe W^2, leading directly from the water-supply pipe to the head of the spiral and provided with a stop-cock. By opening the cock in this pipe the mantle can be flushed at any time, and also at starting the cock will be turned to wet the mantle at once without waiting for the slow restricted action of the regular water-feeding device.

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

1. In a cooling apparatus, an air-duct adjoining an evaporating-duct, but separated therefrom by a film and formed with an inclined surface for receiving liquid to be evaporated, combined with means for supplying such liquid at the top of the incline, substantially as described.

2. In a cooling apparatus, an air-duct adjacent to an evaporating-duct, but separated therefrom by a film having an inclined surface, combined with an absorbent mantle upon said inclined surface, and means for delivering the liquid to be evaporated at the top of the incline, substantially as described.

3. In a cooling apparatus, an air-duct formed by rigid sides, between which is stretched a metallic film forming the separating-wall between the said duct and an adjacent evaporating-duct, combined with means for supplying and evaporating a liquid in the said evaporating-duct, substantially as described.

4. In a cooling apparatus, an air-duct adjoining an evaporating-duct, but separated therefrom by a metallic film transversely horizontal, but longitudinally inclined, substantially as described.

5. In a cooling apparatus, an air-duct adjacent to an evaporating-duct, but separated therefrom by a metallic film, formed in a spiral and provided with an absorbent mantle, combined with means for delivering liquid to said mantle and evaporating the same, substantially as described.

6. In a cooling apparatus, an air-duct adjoining an evaporating-duct and having a flat spiral wall formed of a film of copper, covered with a mantle of absorbent material and separating the said air-duct from the evaporating-duct, substantially as described.

7. In a cooling apparatus, an air-duct adjoining an evaporating-duct and having a wall of metallic film transversely horizontal, but longitudinally inclined in a spiral path, substantially as described.

8. In a cooling apparatus, an air-duct adjoining an evaporating-duct, formed in a spiral with its upper surface provided with an absorbent mantle and having a water-inlet at its upper end, and a receiving-tank at its lower end, whereby the received water may pass

down the spiral incline along the said mantle from top to bottom of the spiral, substantially as described.

9. In a cooling apparatus, the combination with a spiral air-duct adjoining an evaporating-duct and separated therefrom by a metallic film, of a cylindrical inclosing case of heat-insulating material, substantially as described.

10. In a cooling apparatus, the combination with a suitable casing, of a spiral air-duct having confining-walls one of which is a film of material and forming by its successive turns a coaxial, spiral, evaporating-duct within the said casing, substantially as described.

11. In a cooling apparatus, an air-duct having a wall formed as a film or membrane and a detachable absorbent mantle, provided at its edge with a retaining strip or rod, substantially as described.

12. In a cooling apparatus, an air-duct adjoining an evaporating-duct and separated therefrom by a metal film, said ducts being surrounded by a sectional and adjustable casing, substantially as described.

13. In a cooling apparatus, an air-duct formed of upper and lower confining-walls arranged as a flat spiral and provided with central and peripheral supports, one of said walls being formed as a metal film substantially as described.

14. In a cooling apparatus, a spiral air-duct formed of upper and lower retaining-walls and provided with a central post G and peripheral uprights E, one of said walls being formed as a metal film substantially as described.

15. In a cooling apparatus, the combination with a suitable casing, of an air-duct having upper and lower confining-walls, one of which is a metallic film, such walls being spirally arranged and forming by their convolutions a parallel evaporating-duct, a mantle of absorbent material on the evaporating side of one of said walls, and means for supplying said mantle with liquid to be evaporated, substantially as described.

16. In a cooling apparatus, the combination with a suitable casing, of a spiral air-duct having an upper wall of a copper film and forming by its convolutions a coaxial evaporating-duct, a mantle of unsized textile material upon said wall and means for supplying thereto the liquid to be evaporated, substantially as described.

17. In a cooling apparatus, the combination with a metallic casing, of a spiral air-duct having a wall of metal film said duct being electrically insulated from said casing and forming therewith a coaxial spiral evaporating-duct, substantially as described.

18. In a cooling apparatus, a sinuous air-duct adjacent to an evaporating-duct and separated therefrom by a metal film, of an absorbent moisture-distributing mantle thereon and liquid-supplying devices at one end of said duct for producing a flow of said liquid along the mantle in a direction parallel with the length of the duct, substantially as described.

19. The combination with a sinuous air-duct having an upper side formed of metal film and an absorbent mantle on its upper side, of a single source of liquid-supply for said mantle, placed at the top of the incline, substantially as described.

20. An air-cooling apparatus comprising in combination a closed spiral duct having a wall of metal film and means for passing through it a current of air to be cooled, an inclosing case forming with the separated turns of the spiral air-duct a parallel evaporating-duct, an absorbent distributing-mantle placed on the outside of the closed air-duct and a source of water-supply delivered to the said mantle at the top of the incline so that it may be distributed over the mantle and allowed to work along the same by gravity, substantially as desired.

In witness whereof I have hereunto set my hand, before two subscribing witnesses, this 27th day of January, 1898.

LOUIS BELL.

Witnesses:
ARTHUR E. THAYER,
EUGENE GUELPA.