

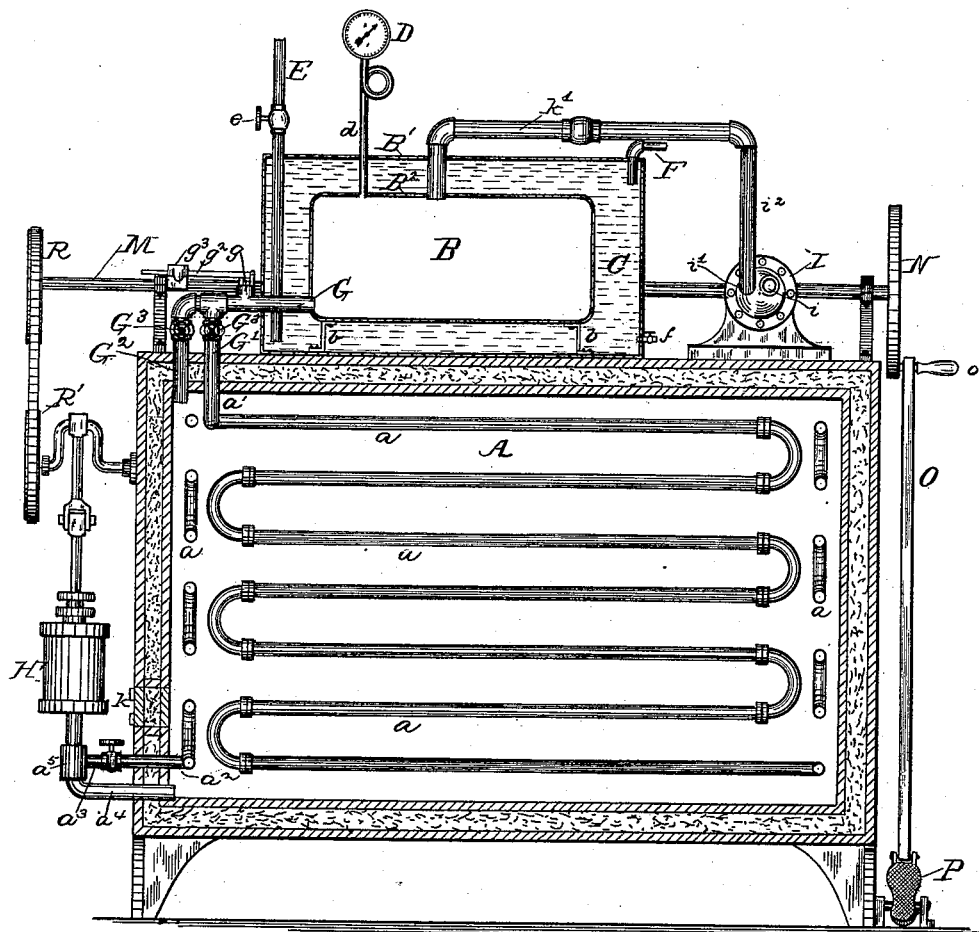
E. KAUFFELD.

COOLING AND REFRIGERATING APPARATUS.

No. 343,035.

Patented June 1, 1886.

Fig. 1



Witnesses
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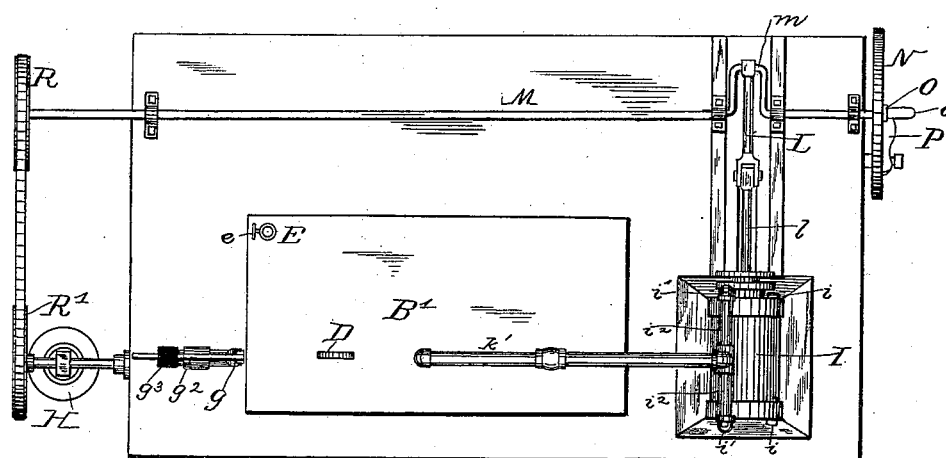
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Fig. 2



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UNITED STATES PATENT OFFICE.

ELIAS KAUFFELD, OF PITTSBURG, PENNSYLVANIA.

COOLING AND REFRIGERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 343,035, dated June 1, 1886.

Application filed September 9, 1885. Serial No. 176,575. (No model.)

To all whom it may concern:

Be it known that I, ELIAS KAUFFELD, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Cooling and Refrigerating Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to cooling or refrigerating apparatus, and has for its object the provision of a comparatively simple and inexpensive apparatus which may be applied to ice-boxes or other cooling-chambers now in use, and which will, by the mechanical compression of air and the subsequent cooling and expansion of the same, and with the expenditure of but little power, quickly reduce the temperature of an ice box, vessel, or chamber with which it is connected.

In carrying my invention into effect I propose to force the atmospheric air into a box or vessel having a surrounding water-jacket, and, having produced a sufficient degree of pressure within said vessel, allow the compressed and cooled air to escape suddenly and expand either directly into the chamber or vessel which is to be cooled or into suitable pipes arranged within the same. As an additional means for securing the desired reduction of temperature in the refrigerating chamber, I propose to cause an attenuation of the air within the refrigerating chamber or vessel or in the air-conducting pipes arranged therein, and to this end I apply to the exit of such chamber, or the pipes therein, a suction-pump of suitable construction.

Having the above objects in view, my invention consists in the novel construction, combination, and arrangement of parts hereinafter fully described and claimed.

Referring to the accompanying drawings, Figure 1 is a vertical sectional view of a refrigerating-chamber with my improved air-cooling apparatus connected therewith; Fig. 2, a top view of the same.

A designates the refrigerating-chamber, which may be of any desired or suitable form—as, for instance, an ordinary cooling-box, a re-

frigerator-car, or, in fact, any form or design of chamber wherein articles or materials are to be cooled. Around three sides of the chamber A, the door of the chamber being on the fourth side, I place a continuous line of serpentine pipes, *a a a*, which enter the chamber at *a'* and leave the same at *a''*. Connected to the exit end *a''* of the pipe *a* is a suction-pump, H, which may be of any desired form and operated either by hand or power, as may be found most desirable.

B designates the air-cooling chamber, which may be arranged at any desirable point in the vicinity of the refrigerating-chamber, but which for facility of illustration I have shown as being placed upon the top of said chamber. Said box consists of two shells, B' B'', placed one within the other, the outer shell, B', being of iron or other suitable material, and the inner shell, B'', being for the purpose of securing a rapid conduction of the heat from the air, of copper or other good conductor of heat, and having rounded corners, as shown, so as to withstand the pressure of the air. The inner shell is mounted upon legs *b b*, leaving a water-space, C, all around, and is connected to a pressure-gage, D, by a pipe, *d*.

E designates a water-supply pipe leading into the space C, and F an overflow-pipe at the opposite end of the water-space, the former pipe dipping down nearly to the bottom of said water-space, while the latter has its mouth near the top of the same, so as to secure a proper circulation of water around the shell B'. A drain-cock, *f*, is placed near the bottom of the water-space, so as to permit of drawing off the water when for any reason it is desired to empty the shell B', a suitable cock, *e*, being placed in the water-supply pipe E, so as to shut off the supply when necessary.

G designates a pipe which leads from the interior of the shell B'' through the water-space C, and outside the latter is divided into two branches, G' G'', each provided with a cut-off valve or cock, G. The branch G' is connected directly with the pipe *a*, while the branch G'' leads directly into the interior of the refrigerating-chamber.

Upon the pipe G a governor-valve, *g*, having a lever, *g'*, and weight *g''*, is arranged, and by means of said governor-valve the amount of

pressure desired is obtained and maintained in the interior of the shell B².

The exit end of the pipe *a* is suitably divided into branches *a*³ *a*⁴, which join together at *a*⁵ and lead to a suction-pump, H.

From the above description it will be seen that the air entering the refrigerating-chamber A can either be passed through the pipe *a* or dispersed throughout the chamber, or both simultaneously, in either case being attenuated and drawn off by means of the suction-pump H. A small door, *k*, is arranged near the bottom of the chamber A, for the purpose of permitting the entrance of a small amount of the external atmosphere should the temperature within the chamber A become too low.

Upon the top of the chamber A, and near the water-box, is placed a small double-acting air-pump, I, having ingress-valves *i* and egress-valves *i'* at each end. The egress-valves *i'* *i'* lead into pipes *i*² *i*², which both connect with a pipe, *k*, which leads directly into the interior of the shell B².

L designates the pitman of the air-pump, connected at one end to the piston-rod *l* and at the other to a crank, *m*, upon a shaft, M. Said shaft carries at its outer end a fly-wheel, N, to which is attached the rod O of a treadle, P. A handle, *o*, is also secured upon the same pin as the treadle, so as to allow of the fly-wheel being turned by hand or foot power, or both.

The suction-pump H can be operated by a similar device as that by which the force-pump is operated, or either or both pumps may be operated by steam or gas engine or other available power; but in the drawings I have shown the suction-pump operated by means of a belt-connection from a wheel, R, on the shaft M to a wheel, R', on the crank-shaft of the suction-pump.

Having described my invention, what I desire to claim, and secure by Letters Patent, is—

1. In a refrigerating or cooling apparatus, the combination, with a force-pump and an air-reservoir connected thereto, said air-reservoir

having a two-branched pipe, one of said branches leading directly into a cooling-chamber and the other branch being connected to a coil of pipes inclosed in said cooling-chamber, of an exhaust-pump having a two-branched connection leading, respectively, from said cooling-chamber and the coil of pipe contained in it, substantially as shown and described.

2. In a refrigerating apparatus, the combination, with a force-pump and an air-reservoir having double walls, and water inlet and outlet pipes leading thereto, and a pipe leading from the interior of said reservoir to a refrigerating-chamber, of a pressure-regulating valve on the air-pipe between the air-reservoir and the refrigerating-chamber, a line of pipe within the refrigerating-chamber, and a suction-pump connected to the extremity of said last-named pipe, substantially as described.

3. In a refrigerating apparatus, the combination, with a force-pump, an air-reservoir, and a pipe leading therefrom and provided with a pressure-regulating valve, of branches leading from said air-pipe to a refrigerating-chamber, one of said branches opening directly into said chamber, while the other is connected with a line or coil of pipe arranged within the chamber, substantially as described.

4. In a refrigerating or cooling apparatus, the combination, with the force-pump I, the double-walled air-reservoir B, having a water-jacket completely around it, the air-pipes G' G², and the governor-valve *g*, of the refrigerating-chamber A, the line of pipe *a*, arranged therein, and the suction-pump H, connected to said line of pipe, all constructed and arranged substantially as described.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 5th day of September, A. D. 1885.

ELIAS KAUFFELD.

Witnesses:

JOHN F. ATCHESON,
A. A. MOORE.