

UNITED STATES PATENT OFFICE.

JOHN GORRIE, OF NEW ORLEANS, LOUISIANA.

IMPROVED PROCESS FOR THE ARTIFICIAL PRODUCTION OF ICE.

Specification forming part of Letters Patent No. 8,080, dated May 6, 1851.

To all whom it may concern:

Be it known that I, JOHN GORRIE, of the city of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Machine for the Artificial Production of Ice and for General Refrigeratory Purposes, of which the following is a full, clear, and exact description, reference being had to the annexed drawings of the same, making part of this specification, in which—

Figure 1 is a perspective view of the machine. Fig. 2 is a vertical longitudinal section, taken through the condensing-pump and expanding-engine, for the purpose of showing more clearly their internal structure and arrangements. Fig. 3 is a vertical transverse section through the expanding-engine and its appendages, showing, also, the section of the reservoir. Fig. 4 is a similar section, taken through the condensing-pump. Fig. 4 $\frac{1}{2}$ is a perspective view of the vessel in which the ice is formed, removed from the refrigerating-chamber. Fig. 5 is a top view of the apparatus. Fig. 6 is a vertical longitudinal section of the machine modified in the structure and arrangement of some of its parts; and Figs. 7 and 8 are, respectively, vertical transverse sections of the same through the expanding-engine and condensing-pump.

The same letters indicate the same parts in all the figures.

It is a well-known law of nature that the condensation of air by compression is accompanied by the development of heat, while the absorption of heat from surrounding bodies, or the manifestation of the sensible effect, commonly called "cold," uniformly attends the expansion of air, and this is particularly marked when it is liberated from compression.

The nature of my invention consists in taking advantage of this law to convert water into ice artificially by absorbing its heat of liquefaction with expanding air. To obtain this effect in the most advantageous manner it is necessary to compress atmospheric air into a reservoir by means of a force-pump to one-eighth, one-tenth, or other convenient and suitable proportion of its ordinary volume. The power thus consumed in condensing the air is, to a considerable extent, recovered at the same time that the desired frigorific effect is produced by allowing the air to act with its

expansive force upon the piston of an engine, which, by a connection with a beam or other contrivance common to both, helps to work the condensing-pump. This engine is constructed and arranged in the manner of a high-pressure steam-engine having cut-offs and working the steam expansively. When the air, cooled by its expansion, escapes from the engine, it is made to pass round a vessel containing the water to be converted into ice, or through a pipe for effecting refrigeration otherwise, the air while expanding in the engine being supplied with an uncongaleable liquid whose heat it will absorb, and which can in turn be used to absorb heat from water to be congealed. By this arrangement I accomplish my object with the least possible expenditure of mechanical force, and produce artificial refrigeration in greater quantity from atmospheric air than can be done by any known means.

The apparatus for producing the refrigeratory effects before stated consists, essentially, of a large double-acting force-pump, A, with its jet-pump D, Figs. 1 and 4, condensing-tub R, and worm P, as represented in the drawing No. 4, a reservoir, B, made of such metal in the manner of a steam-boiler, a double-acting expanding-engine, C, provided with cut-offs, a jet-pump, E, a tub, I, and worm H, for cooling water, the engine C and the chamber G above it being inclosed in an insulating-box, F, which box, together with the worm and tub H, are inclosed in a second insulating room or chamber, K. The pumps, engine, and other moving parts are provided with the necessary mechanical appliances for putting and keeping them in motion and connecting them with the prime mover, which may be either a steam-engine or other available power.

It is believed that the precise nature of my invention and discovery, and the manner in which the refrigerating effects are produced, can be more clearly and fully set forth by describing the construction and operation of the apparatus in connection. I shall therefore adopt that plan in the remainder of the specification.

In the apparatus represented in Figs. 1, 2, 3, 4, and 5 the piston-rods of the pump A and engine C are attached to cross-heads *d d*, which are connected by rods *e e e e* with the cranks