B. F. SHAW.

Liquid-Coolers.

No. 165,430. Patented July 13, 1875.

Fig. 5.

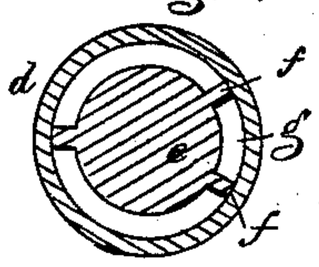


Fig. 2.

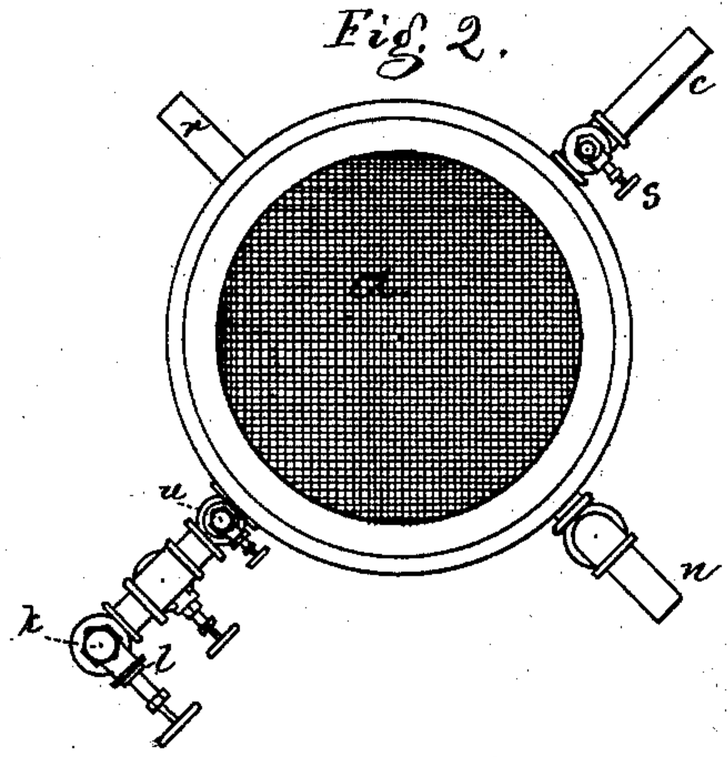


Fig. 4.

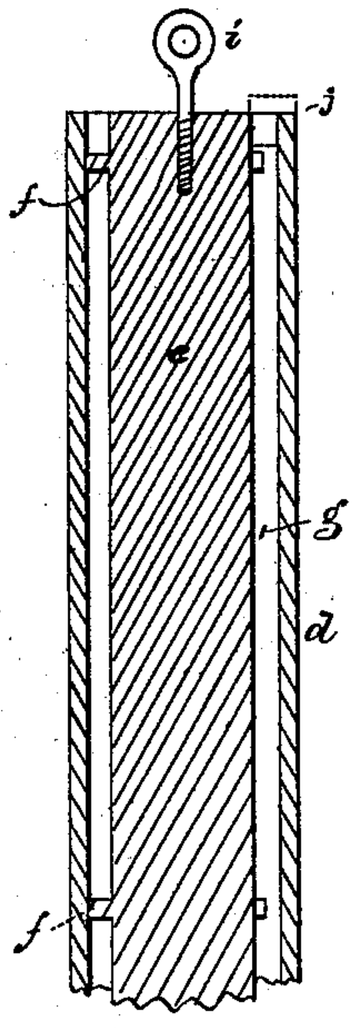


Fig. 1.

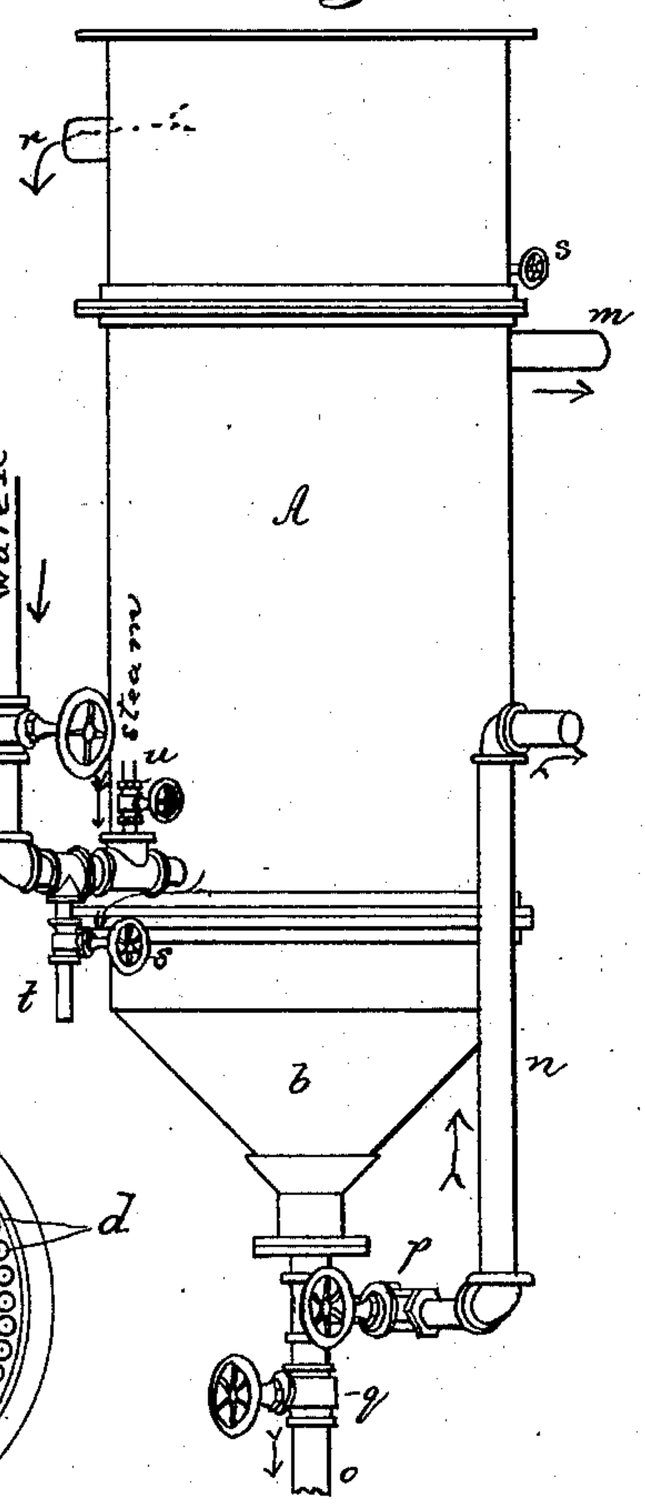


Fig. 3.

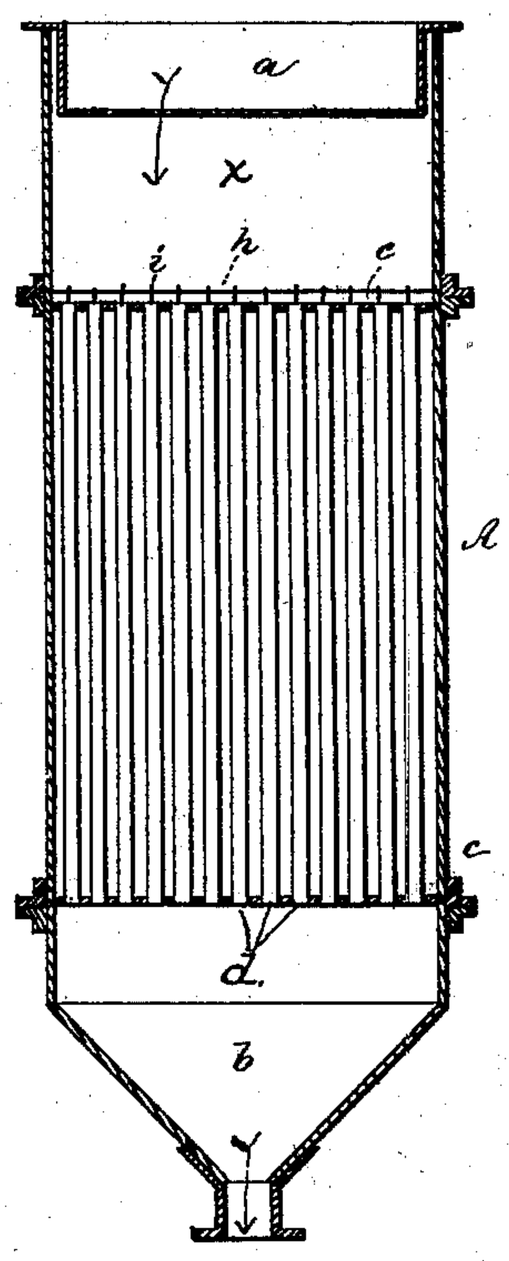
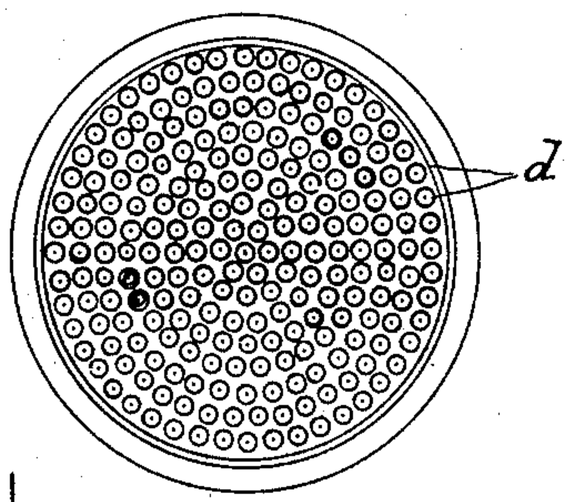


Fig. 6.



Witnesses.

L. H. Latimer.

Wm Pratt.

Inventor.

Benjamin F. Shaw

PER Crosby & Gregory Attys.

UNITED STATES PATENT OFFICE.

BENJAMIN F. SHAW, OF CAMBRIDGE, MASS., ASSIGNOR TO HIMSELF, EDWARD KENDALL, AND GEORGE B. ROBERTS, OF SAME PLACE.

IMPROVEMENT IN LIQUID-COOLERS.

Specification forming part of Letters Patent No. **165,430**, dated July 13, 1875; application filed April 14, 1875.

To all whom it may concern:

Be it known that I, BENJAMIN F. SHAW, of Cambridge, Middlesex county, Massachusetts, have invented an Improved Apparatus for Cooling Liquids, of which the following is a specification:

This invention relates to improvements in apparatus for cooling liquids, and specially melted lard, tallow, &c.; and this invention consists in an apparatus, substantially as hereinafter described, composed of a cylinder having a capacious upper part for the reception of the hot liquid, and a discharging-outlet, and provided in its interior with a series of tubes having cores, the latter so filling the tubes as to leave only annular spaces of small capacity. The melted liquid passes from the receptacle at the top of the cylinder through the annular passages left between the tubes and the cores, and by the action of a current of water circulating through the cylinder and about the tubes the liquid is cooled during its passage through the apparatus.

Figure 1 is a perspective view of this improved liquid-cooling apparatus. Fig. 2 is a top view thereof. Fig. 3 is a section through a cylinder, provided with tubes and cores. Fig. 4 is an enlarged section of a tube and core. Fig. 5 is a cross-section of Fig. 4, and Fig. 6 is a top view of the cylinder, showing the tubes and cores.

A is the cylinder of the liquid-cooler, open at its upper end to receive a strainer, *a*, and contracted at its lower end *b* to facilitate the complete discharge of the liquid. Within the cylinder are heads *c c*, to which are attached the upper and lower ends of the tubes *d*, the connection between the tubes and heads being steam and water tight. Cores *e*, preferably of wood, and provided with centering projections *f*, are placed or suspended within the tubes *d*, leaving annular spaces *g* of small capacity between each tube and core. In this instance of the invention the cores are suspended from cross-bars *h* passing through eyes *i* projecting from the cores. Instead of suspending the cores in this way the projections *f* might be formed as shown at *j* in dotted lines, Fig. 4, and the shoulders thereon would rest on the tops of the tubes or on the heads *c*, and instead of attaching the projections to the cores they might project from the tubes. The water or other cooling agent employed is led to the cylinder through a pipe, *k*, the quantity being regulated by an adjustable inlet or valve, *l*, and after circulating about the tubes, flows away through the pipe *m*. The liquid to be cooled is poured into the receptacle *a*, Figs. 2 and 3, and, passing through the strainer having holes preferably smaller than the spaces in the tubes, it flows into the tubes about the cores into the portion *b* of the cylinder, and thence through the pipe *n*, provided with an adjustable outlet or valve, *p*. The cooling effect depends on the quantity of water used and its temperature, and the time which the liquid to be cooled occupies in passing through the tubes. The flow of water is regulated by valve *l*, and the flow of the lard or other liquid to be cooled by valve *p*. Usually, the lard will be run into the receptacle *a*, and then into the receiving-chamber or portion *x*, until it fills the tubes and the lower chamber *b*, and remains in the cylinder above the head supporting the upper end of the tubes, the water in the meanwhile, say, at about 50° Fahrenheit, moving slowly through the cylinder, and then the valve *p* is partially opened to give it outlet, and by controlling the flow of the water and of the liquid to be cooled, the latter may be cooled much or little, as desired. The water may be allowed to move about the tubes, and yet be effective, at a rate which will not allow the water at its discharge-outlet to rise to a temperature lower than about 20° Fahrenheit below the temperature of the lard. In case the supply of lard, which it is preferred should be continuous, exceeds the quantity delivered through the discharge-pipe, then such lard escapes through a pipe, *r*, which may lead to a suitable vessel, or be returned by the action of a pump or otherwise to the supplying-source. The lard may be supplied to the cylinder by a pump, or from a vessel situated above the cylinder, and in this last case a valve, operated by a float and lever, may be used to shut off the supply of lard when the cylinder is sufficiently full. In case the lard or other liquid is cooled too rapidly, and the tubes become clogged, the supply of

liquid to be cooled will be stopped, so also the flow of water, and the latter, the vent *s* being open, is drawn through pipe *t* from the cylinder, and steam will then be admitted through a valve, *u*, and pipe connected preferably with the water-pipe, the steam escaping at the vent *m*, and in the passage through the cylinder melts all the lard or other congealed material in the tubes. After this the material or substance so melted is drawn off through the pipe *o*, supplied with a valve, *q*. The pipe *n* might be dispensed with, if desired, and the lard or other liquid be drawn through pipe *o*. The cores may be removed to clear them or the tubes.

In an apparatus substantially as described, having four hundred tubes forty inches in length, I present to the action of the cooling medium sufficient liquid to be cooled to equal a sheet of liquid about one-eighth of an inch in thickness, and spread over a surface three hundred square feet in area, and at the same time the duration of contact of the hot liquid with the cooling-surfaces is governed by regulating the outflow of the liquid to be cooled, while the intensity of the cooling influence is increased or modified by regulating the inflow of the cooling liquid.

It is therefore apparent that any desired degree of refrigeration not below the temperature of the cooling medium, and the point of solidification of the liquid to be cooled, can be attained in this apparatus by the adjustment of the two valves. The melted liquid moves through the cylinder and tubes by gravity alone, and all mechanical appliances for moving the melted liquid, such as have been heretofore used, are dispensed with.

This apparatus may be employed to cool liquid glue, tallow, lard, beer, or any other hot liquid. The cylinder A may be of any desired shape, but is preferably round.

I claim—

1. The combination of the cylinder or outer vessel of a cooling apparatus and strainer, with tubes, and cores within the tubes, forming annular passages of small capacity to operate in connection with the liquid to be cooled, and with the cooling medium, substantially as described.

2. The combination of the strainer, the cylinder or outer vessel A, vertical cylindrical tubes and removable cores, with a liquid-receiving chamber or portion, *x*, and a chamber, *b*, for the reception of the cooled liquid, substantially as described.

3. The combination of the strainer, and cylinder or outer vessel A, and tubes and cores for conducting the melted liquid, with a pipe and adjustable inlet or valve to regulate the flow of the cooling liquid, and an adjustable outlet or valve, and pipe to regulate the flow of the liquid to be cooled, substantially as described.

4. The combination of a cylinder containing the cooling medium, and internal tubes for the passage of the liquid to be cooled, with a chamber for the reception of the liquid to be cooled, and provided with an outlet for the overflow of the liquid to be cooled, substantially as described.

5. The combination, with the strainer and the cylinder to contain the cooling medium, of internal tubes for the passage of the melted liquid to be cooled, pipe and valve to control the flow of the cooling medium, and a pipe and valve to control the admission of steam into the cylinder, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

BENJAMIN F. SHAW.

Witnesses:

G. W. GREGORY,

S. B. KIDDER.