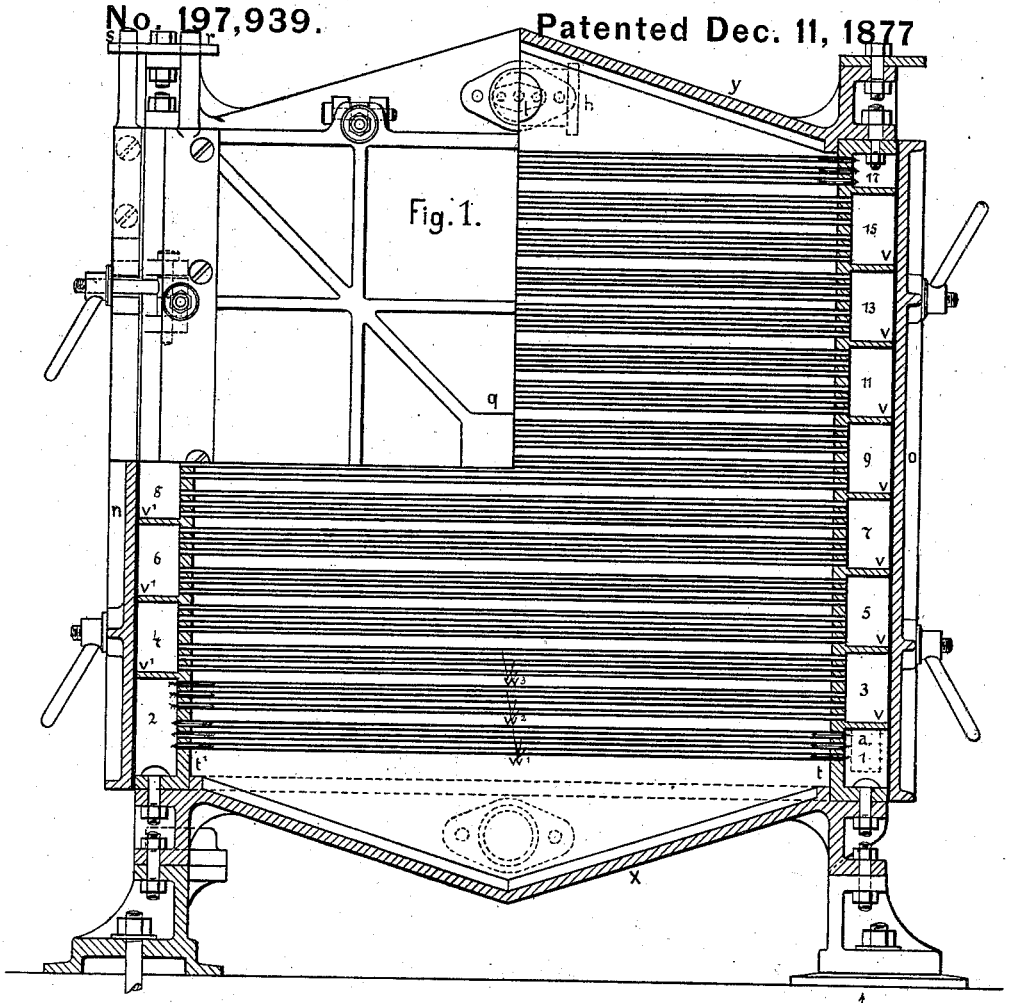
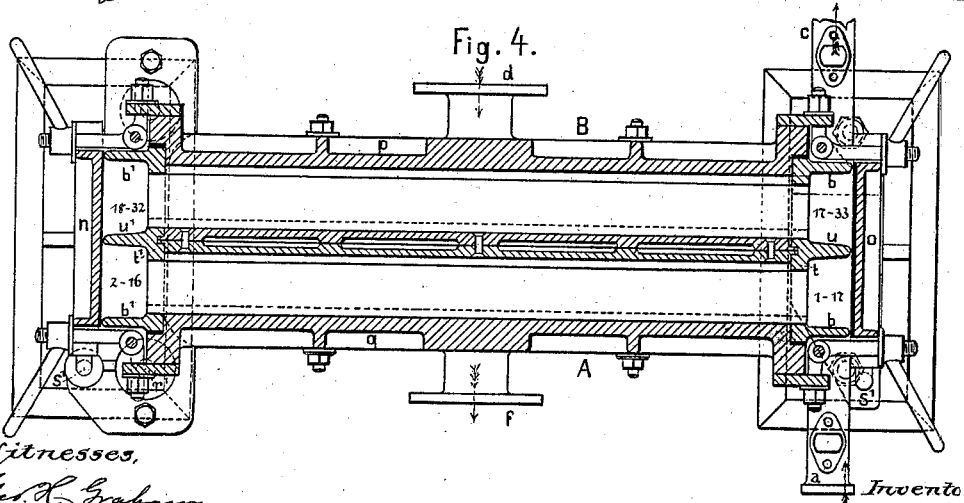
2 Sheets—Sheet 1.

J. P. LIPPS.
Beer-Cooler.

No. 197,939. Patented Dec. 11, 1877





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D. R. Ely.

Inventor;
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by Munn & Philipp
Attorney

2 Sheets—Sheet 2.

J. P. LIPPS.
Beer-Cooler.

No. 197,939. Patented Dec. 11, 1877

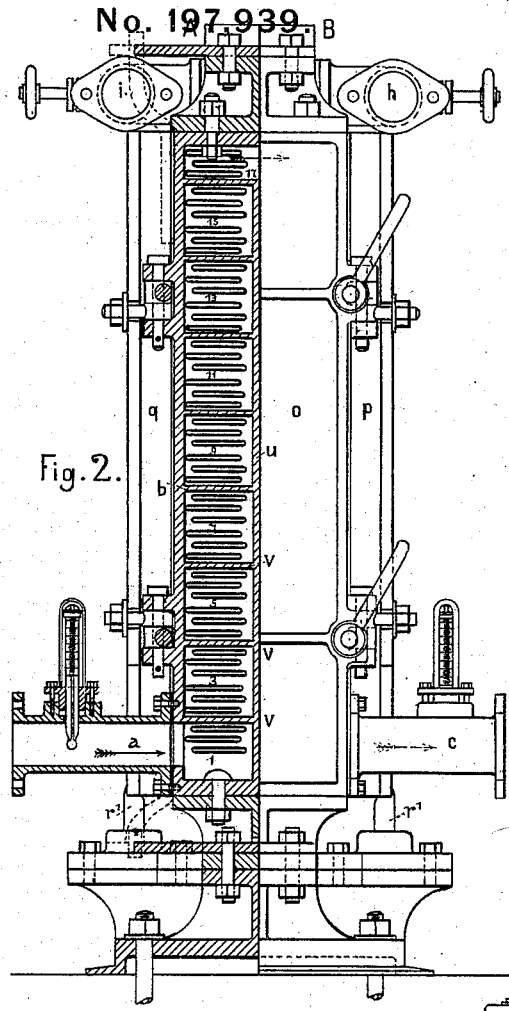

Fig. 2.

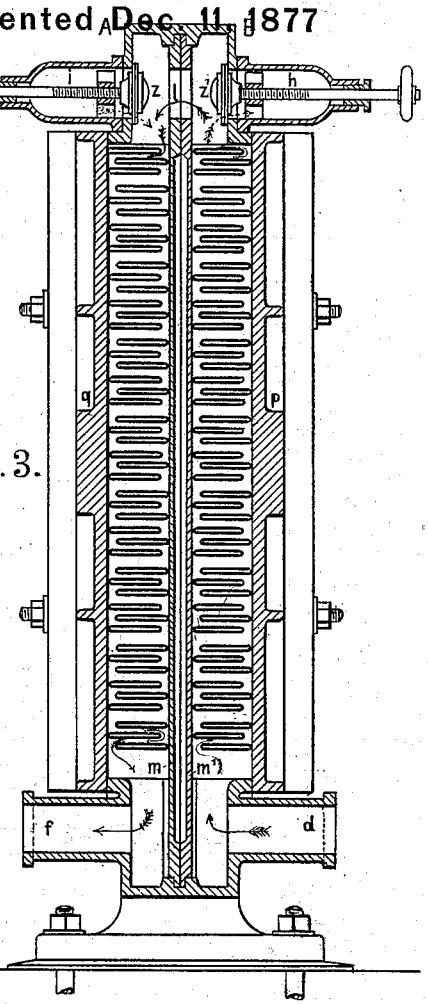

Fig. 3.

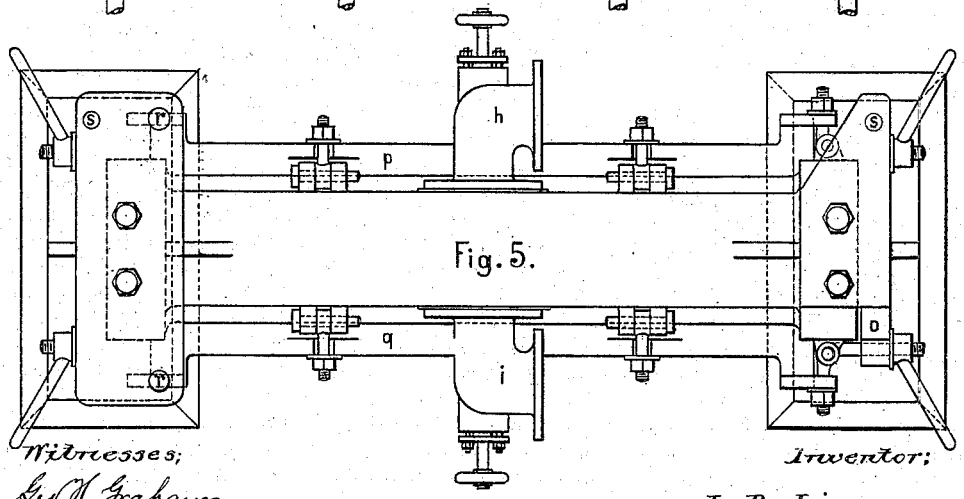

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOHANN PHILIPP LIPPS, OF DRESDEN, SAXONY.

IMPROVEMENT IN BEER-COOLERS.

Specification forming part of Letters Patent No. **197,939**, dated December 11, 1877; application filed November 6, 1877.

To all whom it may concern:

Be it known that I, JOHANN PHILIPP LIPPS, of Dresden, Kingdom of Saxony, have invented an Improved Beer-Cooler, of which the following is a specification:

This invention relates to an apparatus by which beer and other liquids may be cooled more perfectly and economically than has hitherto been possible, and which may be thoroughly cleaned with facility.

On the annexed sheet of drawings this apparatus is represented in a double arrangement.

Figure 1 is a vertical longitudinal section with part of exterior view. Fig, 2 is partly an end view and partly a section of Fig. 1 through the chambers 1, 3, 5, &c. Fig. 3 is a vertical cross-section through center of apparatus; Fig. 4, a horizontal section; and Fig. 5, a top view.

Each of the two parts or divisions, A and B, of the apparatus represented consists of a series of flat refrigerating-tubes placed horizontally and arranged in a vertical tier, and having their ends soldered into the tube-plates *t t'*. These plates are provided on their outer face with flanges *b b'* and with horizontal ribs or partition-walls *v v'*, forming a number of chambers, which are closed on the outside by the doors *n o*, lined with india-rubber. The said partition-walls *v v'* are shifted with regard to each other, so that a wall of one plate is opposite to the center of a chamber of the other.

In the double apparatus shown by the drawing each of the tube-plates must also have a vertical central partition-wall, *u u'*. Instead of being cast together with the tube-plates, the flanges *b b'* and the ribs *u v u' v'* might, however, be attached to the doors *o* and *n*.

In the division A the described chambers on the right-hand side of Fig. 1 communicate with those on the left-hand side by the refrigerating-tubes in such a manner that the beer or other liquids to be cooled, entering at *a* into chamber 1, passes through three tubes, *w'*, into chamber 2, thence through the next set of three tubes into chamber 3, thence into chamber 4, and so on until it arrives in the top chamber 17.

In an apparatus consisting of the division A only the outflow-pipe would have to communicate with this chamber; but in the double apparatus the liquid passes into the other division B, and, flowing through the chambers 17 to 33 and the corresponding tubes, gradually descends and runs off in a cooled state at *c*. I prefer to establish communication between the chambers by sets of three tubes, as stated; but, instead of these, single tubes or sets of two or four, &c., may be used. The number of chambers may be varied, if desired.

The tube-plates are connected at the top and the bottom by the parts *y* and *x*. The back plates *m* and *m'*, forming the partition-wall of the double apparatus, are bolted together and made water-tight at the edges, and the long sides of the apparatus are provided with the doors *p* and *q*, which, upon being opened, allow a free access to all the tubes. These doors, as well as the doors *n* and *o*, swing respectively on the pivots *r r'* and *s s'*, and can easily be opened by releasing the bolts by which they are made tight.

The cooling-water flows around the outside of the tubes, and, for the purpose of causing its perfect circulation, the tubes are laterally shifted with regard to each other, so that they are alternately in contact with the fixed back plate and with the corresponding door *p* or *q*, thereby leaving spaces on the opposite sides for a serpentine course of the water in the direction of the arrows shown in Fig. 3.

In the double apparatus the cooling-water enters through the pipe *d* into the division B, rises within the same, passes through the opening *l* into the division A, where it descends, and whence it flows off through pipe *f* at a temperature raised by the heat extracted from the beer, &c. In an apparatus consisting of division A only it would have to enter at the top. The cooling-water thus circulates at right angles to the tubes, but in a direction contrary to the general current of the liquid to be cooled.

The refrigerating-tubes may be placed one above the other without being laterally shifted; but in this case the back plate and the corresponding door would have to be provided with alternating horizontal grooves, so as to form spaces for the circulation of the water.

The doors *p* and *q* are lined with an india-rubber packing at their edges only, as a water-tight fit on the alternating tubes is not required; the execution should, however, be sufficiently accurate to allow but a very small

quantity of water to pass between the door, respectively, the back plate, and the contiguous tubes. A packing may, however, be introduced between these parts.

The top of the apparatus is provided with two valves, *z* and *z'*, by which either the two pipes *i* and *h* or the center opening *l* may be closed. In the first case the cooling-water circulates through both divisions, as has been described. In the second case, the divisions A and B may be separately supplied with water from different sources—for instance, water from a well may be introduced at *i*, and drawn off at *f*, while ice-water enters at *d*, and finds its exit at *h*. The former being pure, and leaving the apparatus at a raised temperature, may with advantage be used for other brewery purposes, &c., while the less pure ice-water, which has been but slightly warmed by the small amount of heat left in the beer, &c., upon entering into the second division, may again be pumped into the ice-tank for repeated use in the apparatus.

The arrangement of the apparatus affords a great facility for cleaning it. The refrigerating-tubes can be brushed out inside, and the chambers 1 2 3 4, &c., cleaned, after the doors *n* and *o* have been opened, while the outer surface of the tubes is accessible upon the opening of the doors *p* and *q*.

The apparatus may be modified by arranging a single division, A or B, on the circumference of a cylinder. The refrigerating-tubes should be made of drawn copper pipes without seam, tinned inside and outside. A suitable size for the same is one-fourth inch in height, three inches in breadth, and from three to four feet in length. The tube-plates are, by preference, made of brass or gun-metal, while the other parts may mainly consist of cast-iron.

By means of this apparatus, and with a quantity of cold water equal to one and one-half time the quantity of hot beer, &c., to be treated, the latter may be cooled from the highest temperature occurring to 2° Fahrenheit above the temperature of the former, while in other cooling apparatuses, as, for instance, in that of Lawrence, the quantity of cooling-water required is equal to three and one-half times the quantity of beer, if the same effect is to be attained. At a trial with my apparatus, for instance, beer of a temperature of 185° Fahrenheit was reduced to 48° by water of 46°, which, on leaving the apparatus, was raised to 140°, the differences being respectively 137° and 94°, or about in the proportion of one and one-half to one, which is the inverse proportion of the quantities of the liquids to which these differences appertain.

In case water from a well and ice-water are used separately in my apparatus, the beer may be cooled by the former to about 52°, and has then only to be reduced about eight degrees or ten degrees by ice-water.

The advantages of this apparatus are the following:

First, its refrigerating power is greater than that of any other cooling apparatus, so that by its use the quantity of ice required for cooling is reduced by forty or fifty per cent.

Second, the apparatus being completely closed, the beer or other liquid passes the same under pressure, and does not come in contact with the air, consequently its foaming, which is not only inconvenient, but also causes a loss of liquid, is entirely obviated. The apparatus may, therefore, be placed anywhere between the brewing-copper and the fermenting-tuns, and no repeated pumping of the beer is required.

Third, the refrigerating-tubes may be cleaned inside and outside speedily and with facility. This is the most important advantage of the present apparatus, as in other apparatuses in which the two liquids flow in contrary directions, the cleaning of the tubes, especially on the outside, is difficult, and with some arrangements altogether impossible, so that the sediments accumulating on the tubes impair their refrigerating effect in a high degree. The described apparatus may be completely cleaned and its doors screwed on in an hour or an hour and a half.

Fourth, any leak in the tubes can be easily detected after the doors *n* and *o* have been opened, if there is water-pressure on the outside of the tubes, and such leak may generally be repaired without difficulty after the opening of the corresponding door *p* or *q*.

I claim as my invention—

1. In a cooling apparatus, the flat refrigerating-tubes, soldered with their ends into the tube-plates *t t'*, and shifted, with respect to each other, laterally, so that they are as closely as possible in contact alternately with the back-plate *m* or *m'*, and with the corresponding door *q* or *p*, as and for the purpose described.

2. In a cooling apparatus, the tube-plates *t t'*, in combination with the doors *n* and *o*, the flanges *b b'*, and the ribs or partition-walls *v v'*, with the ribs or partition-walls *u u'*, as and for the purpose specified.

3. In a cooling apparatus, consisting of the two divisions A and B, the valves *z* and *z'*, in combination with the branch pipes *i* and *h*, and with the opening *l* in the partition-plates *m m'*, as specified, and for the purpose stated.

4. In a cooling apparatus, the tube-plates *t t'*, in combination with the doors *n* and *o*, the flanges *b b'*, and the ribs or partition-walls *v v'*, substantially as described.

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

JOHANN PHILIPP LIPPS.

Witnesses:
H. SPRINGMANN,
PAUL KASTEN.