R. WHITAKER.

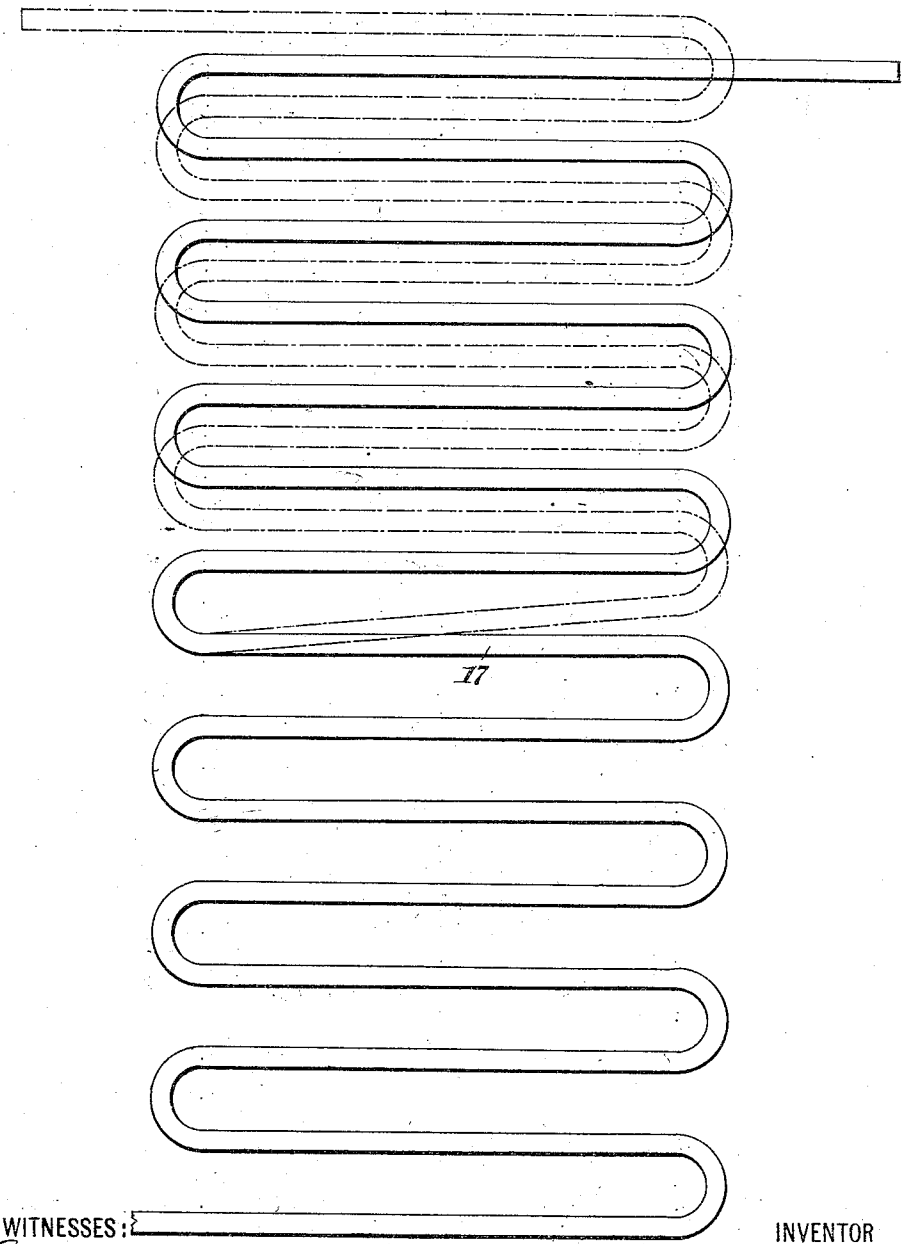
EXPANSION COIL FOR REFRIGERATING AND ICE MAKING PLANTS.

APPLICATION FILED JULY 1, 1907.

943,725. Patented Dec. 21, 1909.

2 SHEETS—SHEET 1.

*Fig. I.*




WITNESSES:

Gustave Dieterich.

Edwin H. Dieterich.

INVENTOR

Richard Whitaker

BY Munn & Co.

ATTORNEY

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2 SHEETS—SHEET 2

Fig. 3.

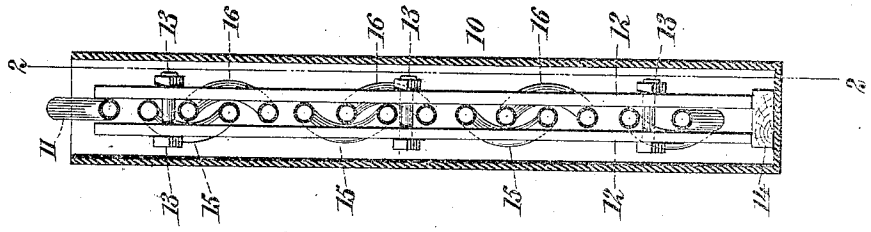



Fig. 2.

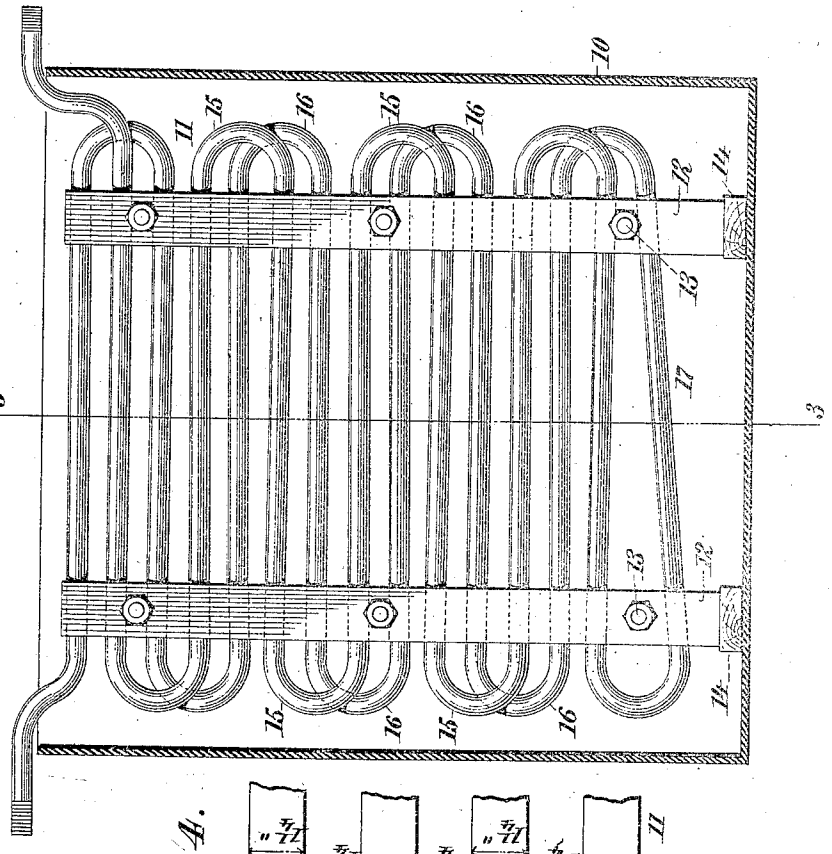
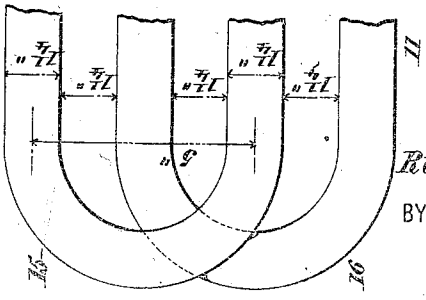



Fig. 4.




WITNESSES:

Gustave Dieterich.

Edwin W. Dieterich.

INVENTOR

Richard Whitaker

BY Smith Bros & Co.

ATTORNEY

# UNITED STATES PATENT OFFICE.

RICHARD WHITAKER, OF NEW BRUNSWICK, NEW JERSEY, ASSIGNOR TO THE BRUNSWICK REFRIGERATING COMPANY, OF NEW BRUNSWICK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## EXPANSION-COIL FOR REFRIGERATING AND ICE-MAKING PLANTS.

943,725. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed July 1, 1907. Serial No. 381,640.

*To all whom it may concern:*

Be it known that I, RICHARD WHITAKER, a citizen of the United States, and a resident of New Brunswick, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Expansion-Coils for Refrigerating and Ice-Making Plants, of which the following is a specification.

The invention relates to improvements in expansion-coils for refrigerating and ice-making plants, and it consists in the novel features hereinafter described, and particularly pointed out in the claims.

The object of the invention is to simplify, render more efficient and lessen the cost of the manufacture of expansion-coils, and at the same time to secure the requisite length of pipe in the coils without the latter occupying greater space than that required for expansion-coils as heretofore constructed.

It has heretofore been customary to manufacture expansion-coils with separate lengths or pieces of one-inch pipe arranged on the same vertical plane and connected at their ends by steel heads to form a coil, the steel heads being necessary to complete the passage through the coil and to enable the lengths of pipe to be placed sufficiently close together to afford the requisite pipe-length, within the limited space permitted, for efficiently carrying out the purposes of the coil. It has been impossible to coil the one-inch pipe back and forth in one continuous piece with the immediate continuous horizontal members sufficiently close together to secure in the completed coil the requisite pipe-length within the limited space permitted, it being well understood that the one-inch pipe had to be coiled on not less than five-inch centers and that this would not permit the coil to afford the requisite pipe-length within desired limits. The steel heads connecting the lengths or pieces of pipe of coils as heretofore constructed have long been recognized as necessary and also as objectionable in that they are expensive and result in the coil having many joints (where the ends of the pipes enter said heads) and increase the labor-cost of manufacture due to the necessity of properly connecting the ends of the pipes with the heads.

In accordance with my invention I dispense entirely with the necessity of making coils from separate lengths of pipe connected at their ends by steel heads, and produce a coil having the requisite pipe-length and entirely devoid of joints, the coil being preferably formed from one continuous piece of pipe properly coiled on five-inch centers and affording the requisite pipe-length and the desired close relation of the parallel members of the coil with one another, whereby the coil of my invention is adapted to occupy about the same space as that required for the coils of the prior art.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which:

Figure 1 is a view showing the preferred method of manufacturing the coil of my invention, the pipe being coiled back and forth throughout its entire length on five-inch centers and then doubled over at about its middle portion, as shown by dotted lines, to place the lower half of the entire initial coil against the upper half thereof and position the horizontal lengths of said lower half on lines intermediate the lengths of the upper half, whereby the lengths of the completed coil become arranged in close relation to one another and afford within a limited space the requisite pipe-length; Fig. 2 is a central vertical longitudinal section, on the dotted line 2—2 of Fig. 3, of a brine-tank containing a completed expansion coil constructed in accordance with and embodying my invention; Fig. 3 is a vertical transverse section of the same on the dotted line 3—3 of Fig. 2, and Fig. 4 is an enlarged view indicating the correct bending of an inch pipe in forming the coil of my invention.

In the drawings, referring to Figs. 2, 3 and 4, 10 designates a customary form of brine-tank and 11 the coil of my invention therein, said coil being in one continuous piece of pipe and having its horizontal parallel members secured on the same vertical plane by means of vertical bars 12 applied to opposite sides of the end portions of the coil and connected together and to the coil by means of bolts 13. The lower ends of the bars 12 preferably rest upon wooden blocks 14, which prevent said ends from injuring the bottom of the tank 10. The coiled or curved ends of the stretches or lengths of the coil overlap one another in

pairs and the members 15, 16, of each pair of overlapping ends are oppositely transversely bowed, as more clearly indicated in Fig. 3, so that the parallel lengths of the coil may stand in the same vertical plane and the coil as a whole occupy the minimum space in the tank 10 or other location. At the points at which the curved bowed ends of the stretches of the coil cross each other, said ends may be secured together by soldering or otherwise if deemed desirable, but obviously the clamping bars 12 may be relied upon for effectually preserving the due relation to one another of the two vertical parts of the coil.

The method of forming the coil 11 is partly illustrated in Fig. 1, in which the solid lines denote that I coil a one-inch pipe back and forth on a serpentine line, on five-inch centers, to form a coil of about twice the height of the finished coil represented in Fig. 2, after which I heat one of the middle horizontal members, as 17, of the coil and bend the lower section of the coil on the line of said member 17 upwardly against the upper section thereof or to the position indicated by dotted lines in Fig. 1, thereby producing a coil of about one-half the length of the original coil and of proper height for use in the tank 10. In the bending of the lower half or section of the original coil upwardly against the upper half or section thereof I deflect or incline the heated member 17 upwardly, as denoted by the dotted lines, so that the horizontal members of said lower section may, when said section is folded upwardly, stand on lines midway between the horizontal members of the upper section of said coil, the horizontal members of the two halves of the original coil being thus brought in close relation to one another or in the relation the horizontal members of the coils of the prior art had to one another when steel heads were used to connect them and to permit of their being brought close together. After the lower half of the original coil has been folded against the upper half thereof, to the position indicated by dotted lines in Fig. 1, the curved ends of the horizontal members of the coil, where they cross one another in pairs, are oppositely bowed, as shown in Fig. 3, so that all of the horizontal members of the completed coil may stand on the same vertical plane.

My invention dispenses entirely with the steel-heads of the prior art and all the disadvantages arising from their use, and affords an expansion-coil devoid of joints and having the requisite pipe-length within the limited space such coils must occupy.

I do not limit my invention strictly to the formation of the entire coil in one piece, since many of the advantages of the invention would be realized if the two vertical parts of the coil were each in a separate piece and secured together at the bottom of the coil by a union. Preferably, however, the entire coil will be in one piece and formed in the manner hereinbefore described.

What I claim as my invention and desire to secure by Letters-Patent, is:

1. An expansion-coil comprising two substantially corresponding parts of piping coiled back and forth in opposite directions and on corresponding radii, the lengthwise members of one part being between and on the same plane with the corresponding members of the other part and said parts forming a continuous passage through them from one terminal to the other of the coil; substantially as set forth.

2. An expansion-coil comprising two substantially corresponding parts of piping coiled back and forth in opposite directions and on corresponding radii, the lengthwise members of one part being between and on the same plane with the corresponding members of the other part and said parts forming a continuous passage through them from one terminal to the other of the coil, and the curved ends of the members of said parts where they cross one another being oppositely bowed; substantially as set forth.

3. An expansion-coil comprising two substantially corresponding parts of piping coiled back and forth in opposite directions and on corresponding radii, the lengthwise members of one part being between and on the same plane with the corresponding members of the other part and said parts forming a continuous passage through them from one terminal to the other of the coil, combined with clamping bars applied to opposite sides of the coil and connected together; substantially as set forth.

4. An expansion-coil comprising two substantially corresponding parts of piping coiled back and forth in opposite directions and on corresponding radii, the lengthwise members of one part being between and on the same plane with the corresponding members of the other part and said parts forming a continuous passage through them from one terminal to the other of the coil, and the curved ends of the members of said parts where they cross one another being oppositely bowed, combined with clamping bars applied to opposite sides of both end portions of the coil and connected together; substantially as set forth.

5. An expansion coil comprising two substantially corresponding side by side parts of piping coiled back and forth in opposite directions on parallel lines and corresponding radii, the lengthwise parallel members of one part alining with the spaces between the lengthwise parallel members of the other part and said parts forming a continuous passage through them from one terminal to

the other of the coil, both of said terminals being at the same end of the coil; substantially as set forth.

6. An expansion coil comprising two substantially corresponding side by side parts of piping coiled back and forth in opposite directions on parallel lines and corresponding radii, the lengthwise parallel members of one part alining with the spaces between the lengthwise parallel members of the other part and said parts forming a continuous passage through them from one terminal to the other of the coil, both of said terminals being at the same end of the coil, and both parts of the coil being in one integral continuous piece of piping; substantially as set forth.

7. An expansion-coil comprising two substantially corresponding parts of piping coiled back and forth in opposite directions and on corresponding radii and all in one continuous piece, the lengthwise members of one part being between and on the same plane with the corresponding members of the other part, and the curved ends of the members of said parts where they cross one another being oppositely bowed; substantially as set forth.

8. An expansion-coil comprising two substantially corresponding parts of piping coiled back and forth in opposite directions and on corresponding radii and all in one continuous piece, the lengthwise members of one part being between and on the same plane with the corresponding members of the other part, and the curved ends of the members of said parts where they cross one another being oppositely bowed, combined with clamping-bars applied to opposite sides of the coil and connected together; substantially as set forth.

Signed at New York city, in the county of New York and State of New York, this 28th day of June A. D. 1907.

RICHARD WHITAKER.

Witnesses:

CHAS. C. GILL,

ARTHUR MARION.