

No. 653,388.

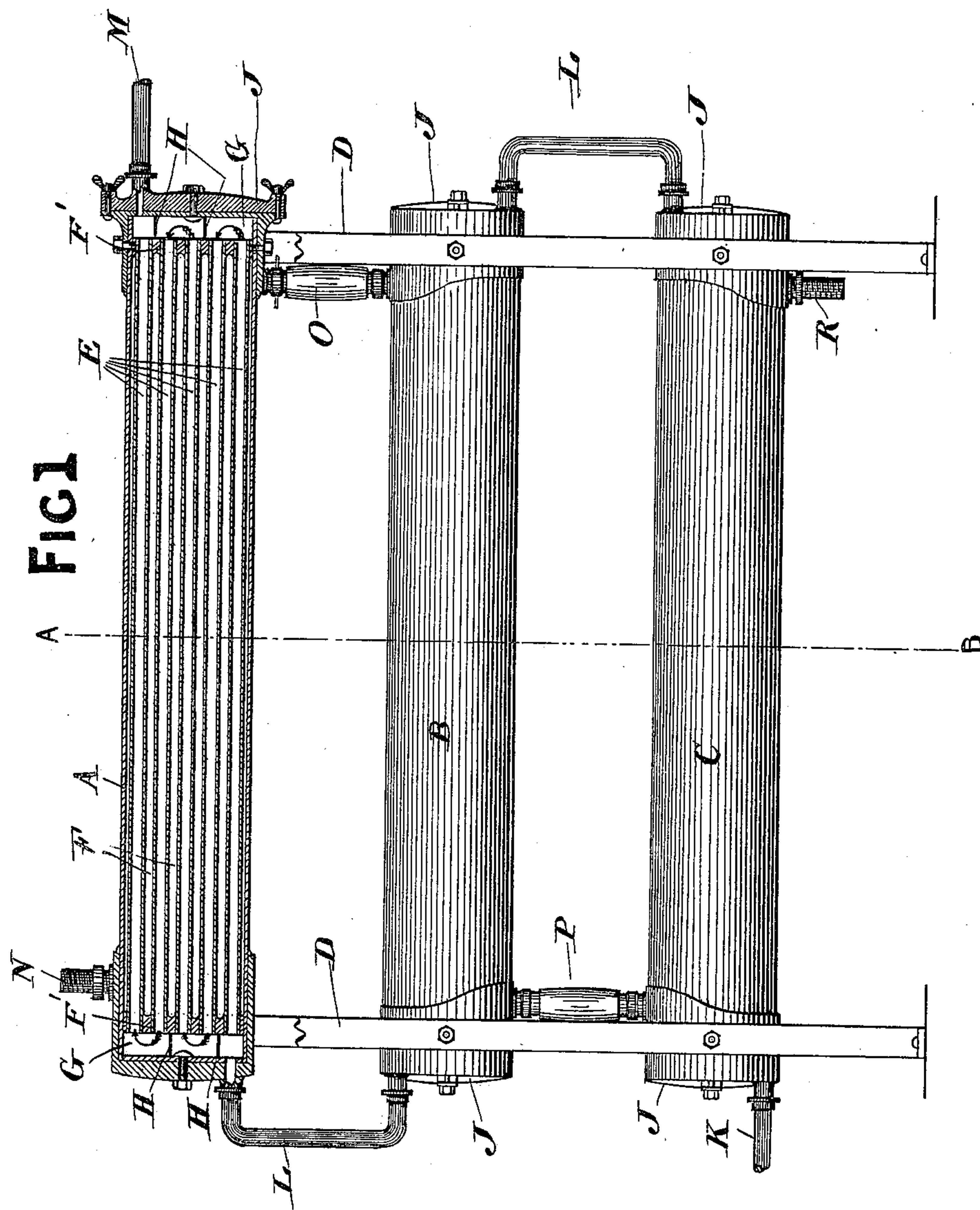
Patented July 10, 1900.

A. D. W. KING.  
CLOSED REFRIGERATOR.

(Application filed Dec. 5, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:  
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*Arthur W. King*

INVENTOR  
*Anthony Duncan Williamson King*  
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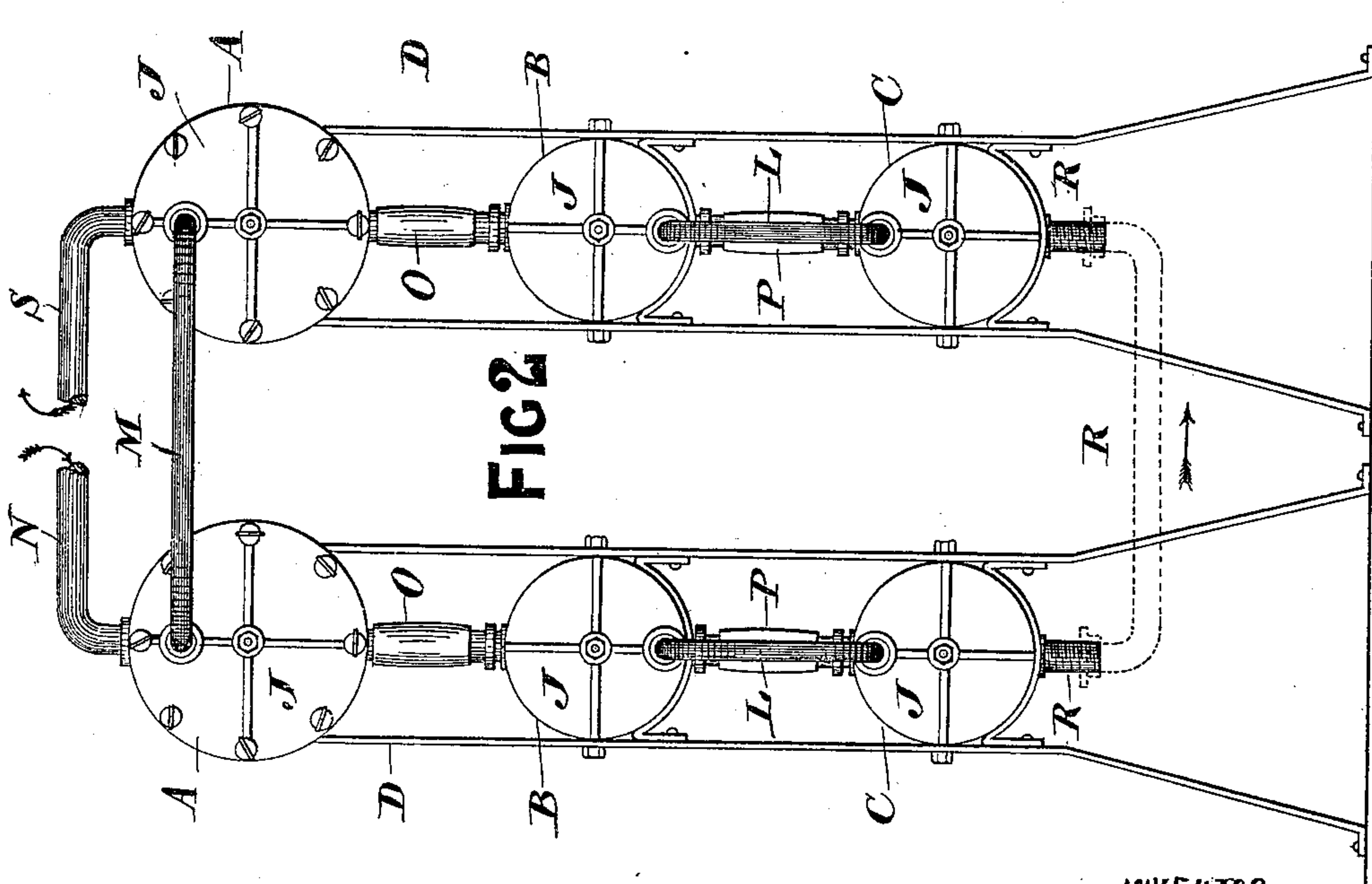
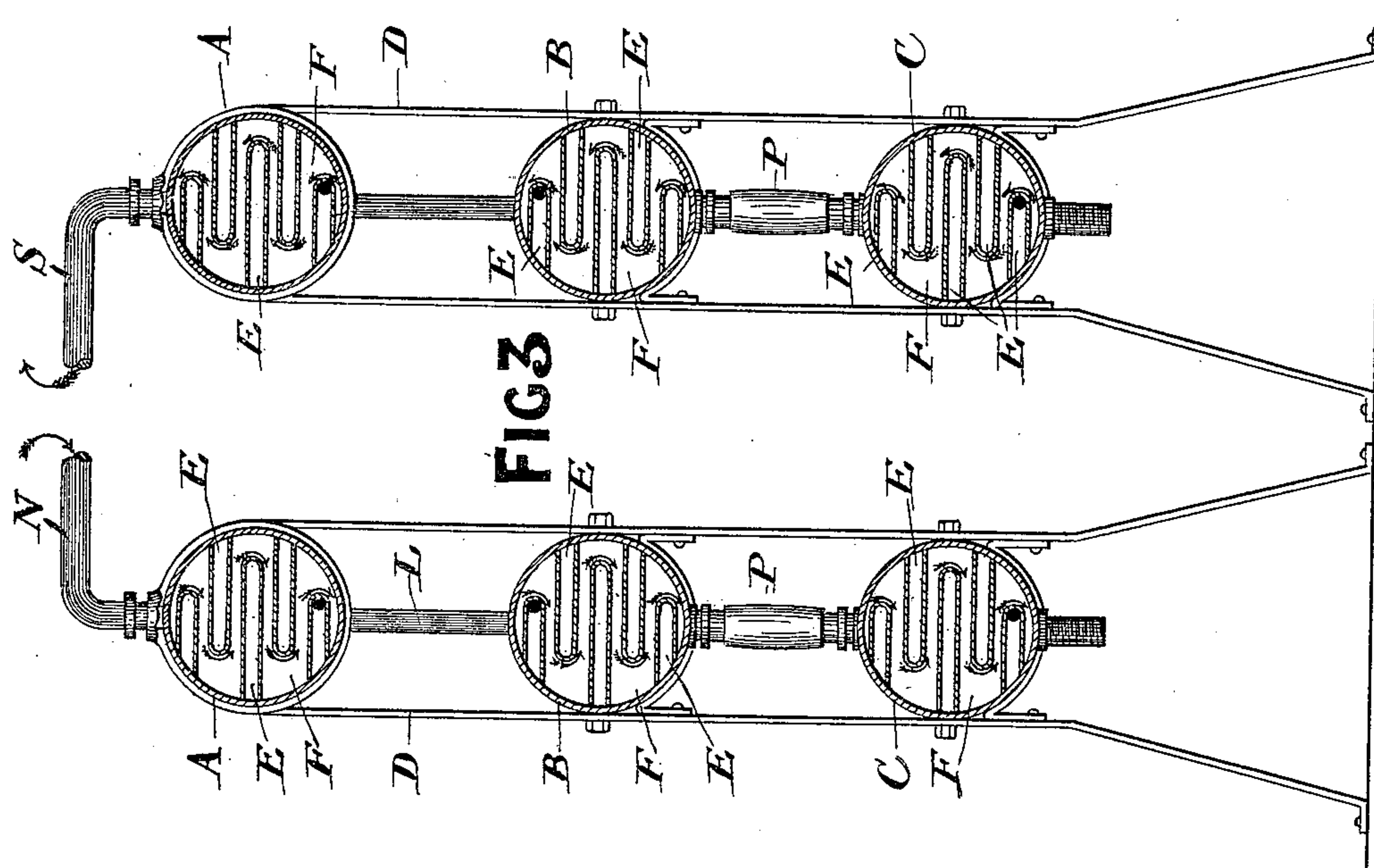
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2 Sheets—Sheet 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

ANTHONY DUNCAN WILLIAMSON KING, OF LONDON, ENGLAND, ASSIGNOR  
OF ONE-HALF TO JAMES HENRY HOWELL, OF BRISTOL, ENGLAND.

## CLOSED REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 653,388, dated July 10, 1900.

Application filed December 5, 1899. Serial No. 739,293. (No model.)

*To all whom it may concern:*

Be it known that I, ANTHONY DUNCAN WILLIAMSON KING, a subject of Her Majesty the Queen of Great Britain, residing at 42 Charlesville road, Kensington, London, W., England, have invented a new and useful Improved Closed Refrigerator, (for which I have applied for a patent in Great Britain, No. 22,483, dated November 10, 1899,) of which the following is a specification.

My invention relates to a new or improved closed refrigerator for cooling wort, milk, wines, condensed engine-water, and other hot liquids, the objects of which are, first, to provide a maximum area of cooling-surfaces in the smallest possible space; secondly, to so arrange the said cooling-surfaces as to be easily cleaned; thirdly, to so arrange the said cooling-surfaces as to be capable of easy removal for the purpose of cleaning, and, fourthly, the entire exclusion of dust and dirt from the said liquor while being cooled.

My invention consists of flat metallic tubes as passages for the cold or iced water being used as the cooling medium, these being arranged in series of five, or thereabout, each series being placed within and inclosed by a hollow metallic or other cylinder in such a way that the cooling medium is caused to flow from one to the other in each of the said series, and by preference I employ the said hollow cylinders in sets of three, each set being so arranged that the cooling medium flowing from the last of the series of cooling-tubes in the first cylinder is led to the first of the series of tubes in the second cylinder and in like manner from the second to the third cylinder, and when two or more sets of cylinders are employed the water flowing from the last of the first set of cylinders would enter the first of the second set of cylinders, and so on, whatever number of cylinders may be employed. The wort, milk, or other hot liquor to be cooled is led into the last of the set of cylinders and flows beneath, around, and over the said series of flat cooling-tubes and exudes from the said cylinder through a closed conduit to the second cylinder, and after passing beneath, around, and over the series of cooling-tubes in the second cylinder is in like manner led from the second to the

first cylinder, and so on for the whole series of cylinders, whatever may be their number, and during the whole process of refrigeration the liquor being cooled is inclosed within the said cylinders and does not come in contact with the outside atmosphere or the slightest sign of dust or dirt from the commencement to the finish, and always flows in a direction opposite to that of the cooling medium.

Each series of cooling-tubes in each cylinder are borne at their ends in suitable perforated plates, so that each series of tubes can be bodily removed from their respective cylinders and be then thoroughly washed and cleaned and replaced in a very short space of time, the distance between one tube and its neighbor being such as to permit the insertion of a brush or other scouring medium, while the formation and arrangement of each set of tubes provides a cooling area nearly, if not quite, equal to that of a spiral cooling-passage, while the facilities for removal, cleansing, and replacing afford a distinct advantage over such spiral passages.

In order that my said invention may be more clearly understood, I have hereunto appended two sheets of drawings, of which—

Figure 1, Sheet 1, is a side elevation, partly in section, of a set of three cylinders according to my invention, Figs. 2 and 3, Sheet 2, being an end elevation of Fig. 1 and a section upon the line A B of same, respectively.

In carrying my invention into effect I construct my improved refrigerator of one, two, or more sets of three metallic cylinders A B C, each set mounted upon a stand or frame D. Each cylinder is provided internally with any number, preferably five, of flat water-passages F, the ends of which are borne in frames F', the length of each series of tubes being slightly less than their respective cylinder, so that a space G exists at each end of the said series of tubes, Fig. 1, the said spaces being divided by fixed horizontal partitions H, by means of which the iced or other water passing through the tubes E is caused to flow from one to the other in the direction of the arrows, Fig. 1. Each set of tubes E would be slid into their respective cylinders until their initial end abuts against the fixed partitions H, when the final end would be se-



cured by placing in position the plate holding the partition H of the final end, this being secured in position by the fixation of plate or cover J, from which it will be clearly understood the ease by which the said series of tubes E in each cylinder may be removed, cleaned, and replaced.

The iced or other water intended to circulate through the tubes E is caused to enter the lower cylinder C of the series (or first series, as the case may be) by means of a conduit K, and as the water flows through the said tubes in the direction of the arrows, Fig. 1, the same would exude from the cylinder C and be led into the cylinder B by a conduit L and after flowing through the tubes E therein in like manner would pass therefrom by a like conduit L into the cylinder A and exude through the conduit M; but where a second or more series of cylinders are employed to form the said refrigerator the said conduit M may be extended to lead to the upper A of the second series of cylinders and exhaust from the cylinder C thereof or be conveyed to the cylinder C of the next series, and so on. The wort, milk, or other hot liquor to be cooled would enter at N of the cylinder A of the first series and flow over, around, and under the tubes E therein and exude and be conveyed from A to B by a conduit O and after passing in like manner over, around, and under the tubes in B would exude and be conveyed by a conduit P to the cylinder C and exude from C at R; but when a second or more series of three cylinders is employed, as in Figs. 2 and 3, the outlet R may be extended to join the inlet of the lower cylinder of the next series, as suggested by dotted outline in Fig. 2, in which case the hot liquor would flow upwardly through the second set of three cylinders and exhaust at S,

to be conveyed therefrom to the next series of cylinders, if such be used, and so on. It will therefore be understood that according to my invention the flow of the cooling medium is in a direction opposite to that of the flow of the liquor being cooled, and it is obvious that although I have described and shown the cooling medium entering at R and flowing upward, while the hot liquor enters at N and flows downward, this arrangement may be reversed without prejudice to the system of the liquids flowing in opposite directions to each other.

Having now fully described my invention and the manner in which the same is to be employed for the purposes stated, what I claim, and desire to secure by Letters Patent, is—

A refrigerator apparatus for beer comprising a series of cylinders suitably supported, pipes connecting the cylinders leading through the sides of the same, independent pipes L connecting the cylinders leading through the heads of the same, flat tubes projecting from the sides of the cylinders in staggered relation, said tubes extending longitudinally of the same and terminating a distance from the cylinder-heads, heads supporting said tubes and forming a chamber at each end of the cylinder between the ends of the tubes and the main cylinder-heads and partitions dividing said chambers, said pipes L communicating with said chambers, the beer flowing outside of said tubes and the cooling medium inside, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ANTHONY DUNCAN WILLIAMSON KING.

Witnesses:

GEORGE THOMAS HYDE,  
HENRY CONRAD HEIDE.