

J. C. MACK.  
Refrigerating Apparatus.

No. 227,553.

Patented May 11, 1880.

Fig. 1

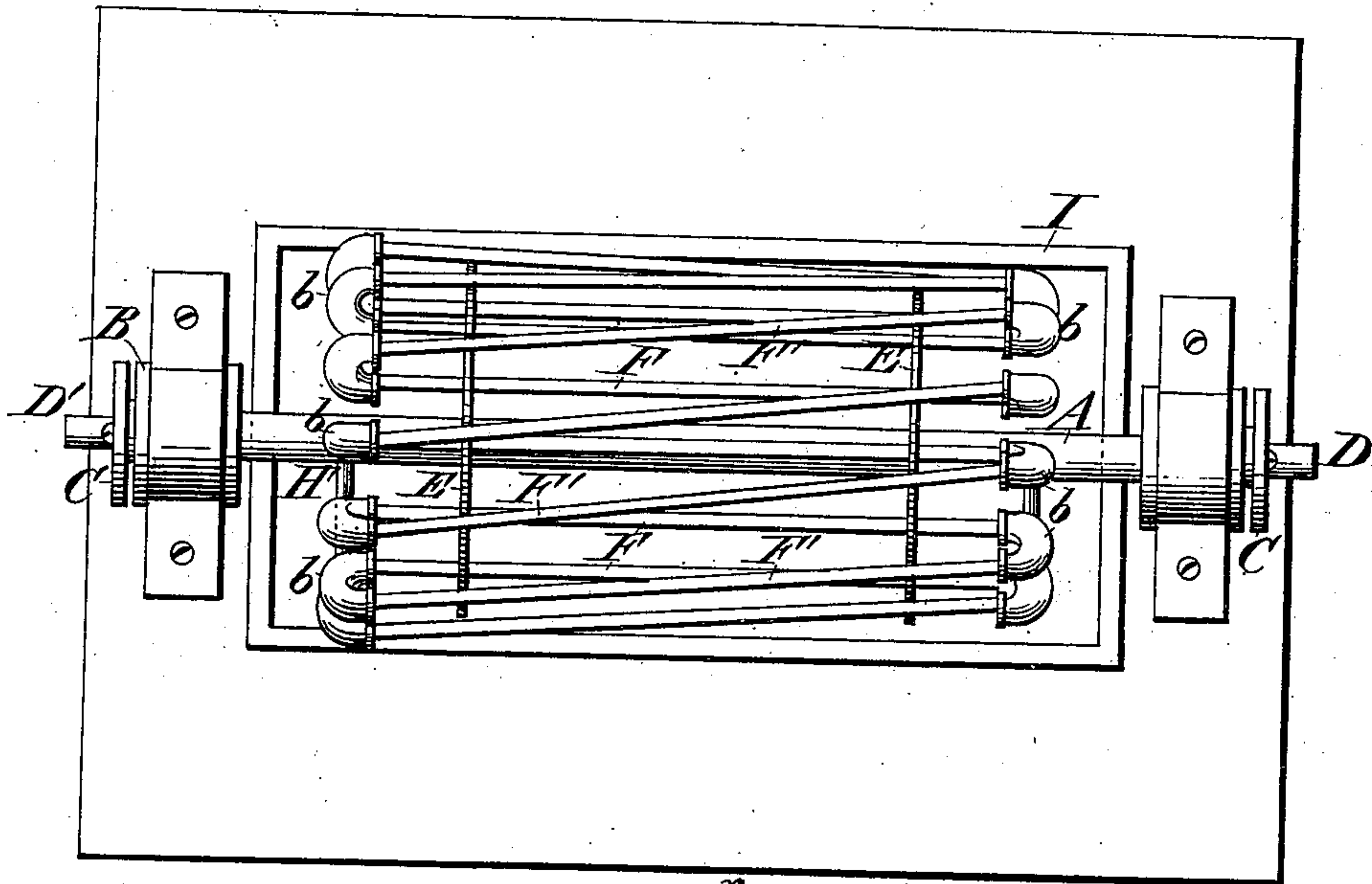


Fig. 2.

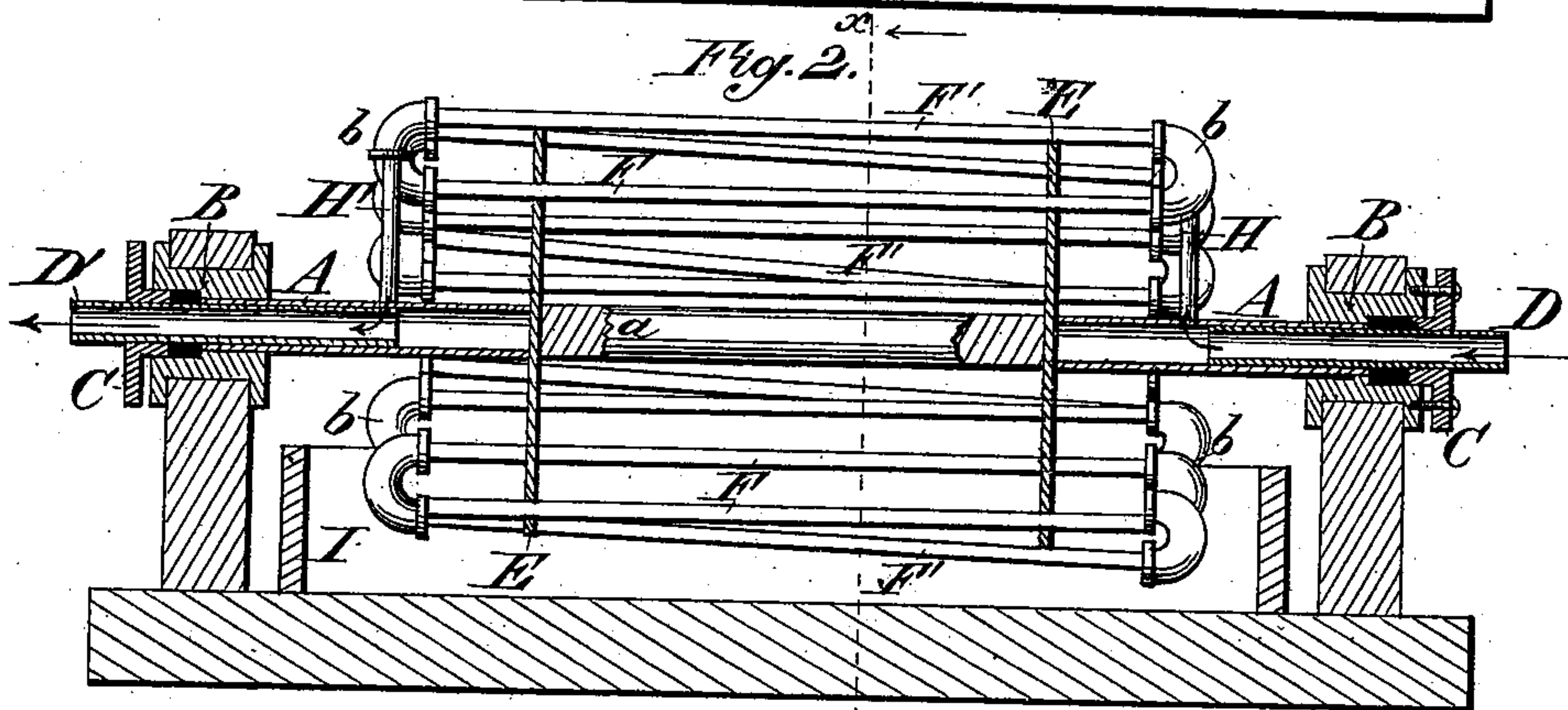
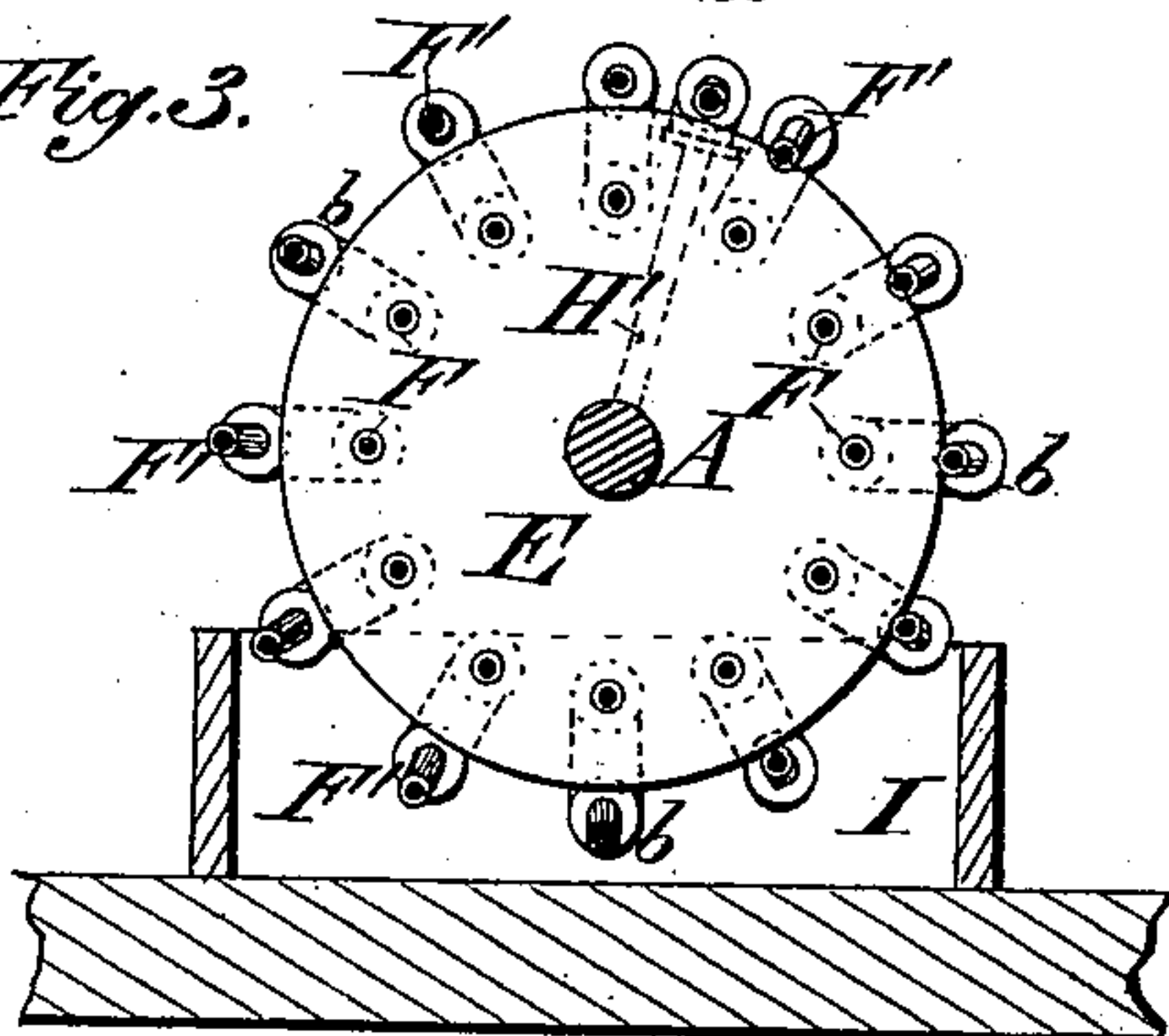


Fig. 3.



Attest:

J. H. Schott.  
D. P. Lowe

Inventor:

James C. Mack



# UNITED STATES PATENT OFFICE.

JAMES C. MACK, OF BROOKLYN, NEW YORK.

## REFRIGERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 227,553, dated May 11, 1880.

Application filed August 27, 1879.

*To all whom it may concern:*

Be it known that I, JAMES C. MACK, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Refrigerating - Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to an improvement in that class of machines employed in refrigerating or cooling air; and it consists in the arrangement and combination of the tubular shaft A, circular heads E, tubes F and F', and connecting-pipes H H'; also, in the construction and combination of the longitudinal tubes, arranged to form two continuous circles of piping for the purpose of increasing the refrigerating-surface, as will hereinafter be more particularly described.

In the drawings, Figure 1 is a plan view of the machine. Fig. 2 is a longitudinal section of the machine, taken through its center. Fig. 3 is a cross-section on the line *xx* of Fig. 2, looking toward the right hand, and showing a cross-section of the pipes and trough.

Similar letters denote like parts in all the figures.

In the drawings, A represents a shaft, tubular at both ends for a part of its length, having a solid part, *a*, as shown in Fig. 2, which prevents all direct circulation through the same. B B are hollow journals, made of suitable metal and fastened by screw-threads or flanges to the shaft A, for the purpose of supporting said shaft and forming the journals upon which it revolves. The journals B B and ends of shaft A are made hollow, so as to form a free passage through them for gases or other liquids.

C C are the glands of the stuffing-boxes, constructed in the usual manner, which serve the purpose of packing the pipes D D', that pass through them, to prevent leakage. These pipes D D' are hollow, of a suitable diameter, and enter the ends of the shaft A through the journals B B, for the purpose of conducting the flow of volatile refrigerants used into and

from the apparatus, as will hereinafter be more fully described.

E E are heads or disks secured to the shaft A for the purpose of holding the conducting pipes or tubes F and F' in place, as shown. These tubes are formed of suitable metal, and the inner series, F, placed horizontal and nearly parallel to each other, and supported by the heads E E. They are connected to the outer series of slightly diagonal tubes, F', by return-bends *b*, so as to admit of a steady flow of the volatile refrigerant used to pass through them back and forth. For the purpose of increasing the vaporizing surface or surfaces these tubes are made, as shown, to return in the form of a double row a short distance apart, thus forming two circles of different diameters around the shaft A, the return-bends *b*, of suitable metal, connecting the pipes F F' at their ends for the purpose of returning the contents of the tubes back and forth upon the circumference of the heads E, thus forcing the refrigerating-fluid to travel a long distance before leaving the machine.

H is the inlet-connection pipe, secured at the end in a suitable manner to the shaft A, and at the other to one of the tubes, F', for the purpose of allowing the flow of volatile refrigerant to enter the tubes.

H' is the outlet-connection, secured in the same manner to one of the pipes F and to the shaft, for the purpose of allowing the volatile refrigerant, after parting with its refrigerant qualities, to pass into the passage in the hollow shaft A at the opposite end from which it entered the machine.

I is a shallow trough, made of metal or other suitable material, and placed under the shaft A, for the purpose of holding an uncongealable solution, into which the tubes are intermittently immersed by the rotation of the shaft A.

The operation of the machine is as follows: The shaft A is caused to rotate slowly by any suitable mechanical arrangement of gearing or pulleys. (Not shown in the drawings.) The trough I being supplied with a proper quantity of an uncongealable solution, which may be a saturated solution of common salt and water, or of any known uncongealable compounded liquid, the volatile refrigerant enters through the pipe D in the direction indicated by the arrows into the hollow shaft A,



then through the inlet-connection pipe H into the tubes F and F', where, after performing its frigorific effects, it passes out of the tubes by the outlet-pipe H' into the hollow part of shaft A, upon the opposite end from which it entered, and thence into the pipe D', and is withdrawn from the machine by the action of the pump employed for producing the circulation of the volatile refrigerant, which is then liquefied by the ordinary process of pressure and condensation, (the mechanism for which is not shown.) After this it passes back in a liquefied state, and again through the machine continuously.

By the rotation of the shaft A the tubes F and F' are made to pass through the uncongealable solution in the trough I, thereby intermittently moistening them and preventing the formation of rime upon their surfaces. The solution contained in the trough I will in time become poor by reason of the accumulation of the moisture extracted from the atmosphere and deposited in the trough, making it necessary to add from time to time a small quantity of the salts, alkalies, or other substance used to strengthen it.

A part of the poor solution having been taken from the trough, the machine may be situated in any part of the isolated space intended to be refrigerated; or it may be enclosed in a small separate room, in which case a fan will be required to withdraw the cold air after it has been in contact with the congealing-surfaces, and to force it into the space intended to be cooled, thus keeping up a continuous circulation.

It will be apparent that, if desired, the machine may be used for the purpose of a condenser of volatile gases, in which case water at a normal temperature is used in the trough instead of an uncongealable solution.

I am aware that a rotating coil of pipe containing a non-congealable liquid has been used in connection with a tight cylinder partly filled with a volatile liquid into which the coil dipped in its rotation; but this arrangement was used for the purpose of cooling the non-congealable liquid within the coil of the pipe, and forms no part of my invention.

I am also aware that in refrigerating-machines revolving radial coils and tubular cylinders having hollow or tubular journals have been used; but owing to the fact that in such machines at least one-half of their surface is covered by the liquid, their efficiency is to a great extent destroyed.

Also, I am further aware that a hollow air-tight cylinder suspended on a tubular shaft has been employed for cooling liquid by revolving therein.

Having thus described my invention, I claim, and desire to secure by Letters Patent, the following:

1. The combination of the tubular shaft A, circular heads E, tubes F and F', and connecting-pipes H and H', in the manner and for the purpose specified.

2. In a refrigerating-machine, the combination of two rows of longitudinal tubes connected together at their ends, and forming two continuous circles of piping of different diameters, one circle within the other, for the purpose of increasing the refrigerating-surface, as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand.

JAMES C. MACK.

Witnesses:

E. A. DICK,  
F. H. SCHOTT.