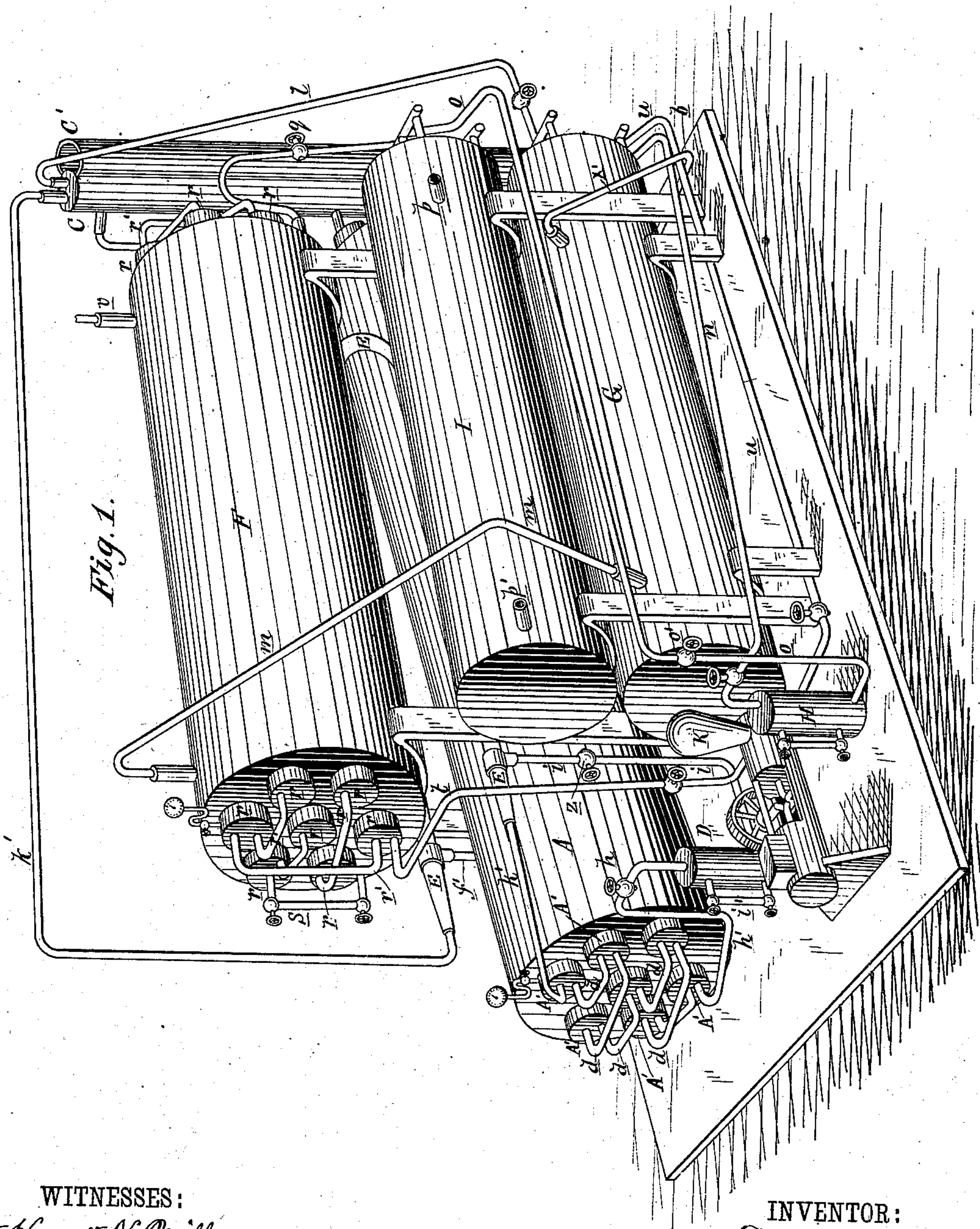


T. L. RANKIN.
Ice Machine and Refrigerator.
No. 239,591. Patented March 29, 1881.



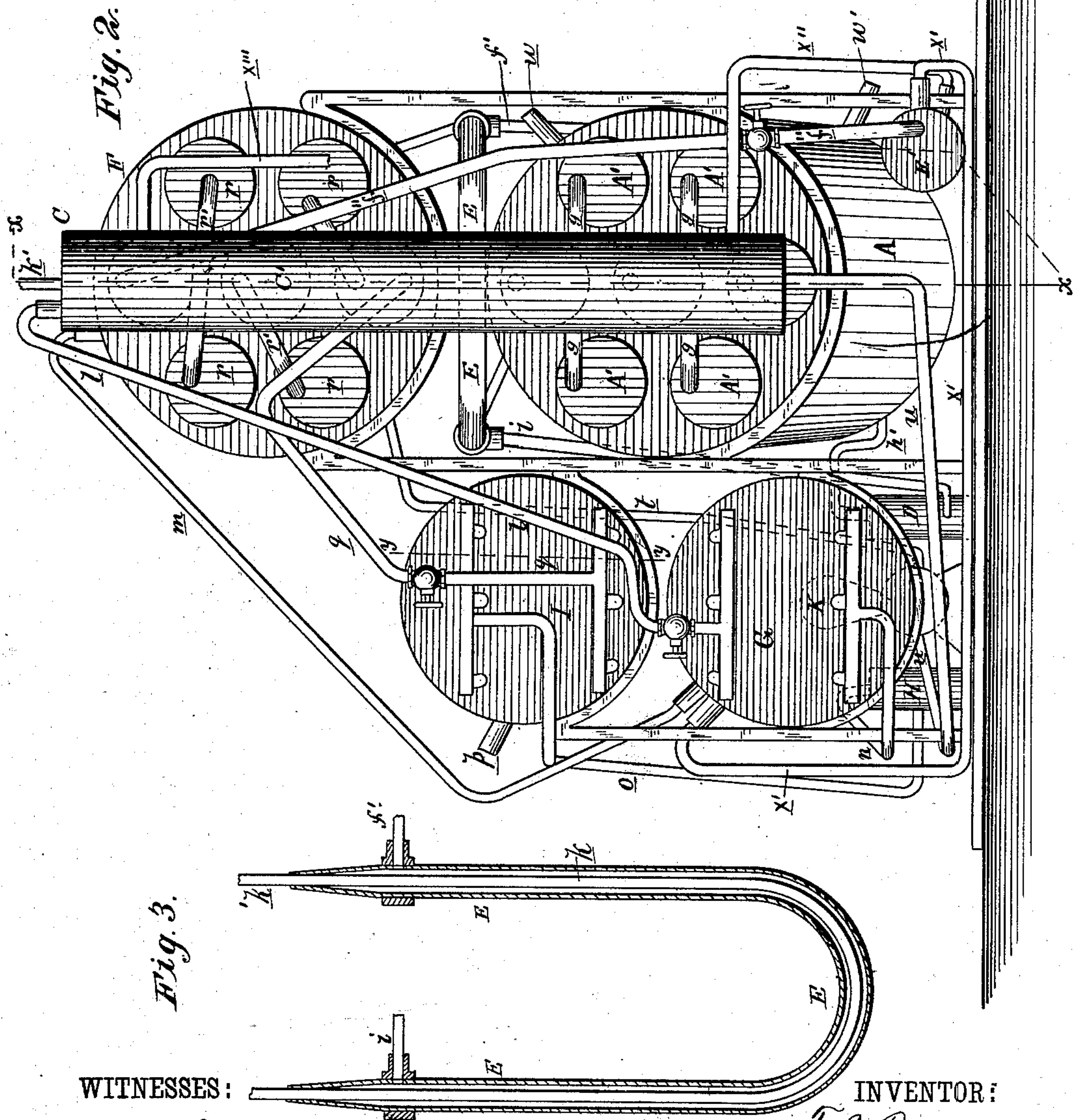
WITNESSES:
Henry N. Miller
C. Sedgwick

INVENTOR:
T. L. Rankin
BY *Henry Ho*
ATTORNEYS.

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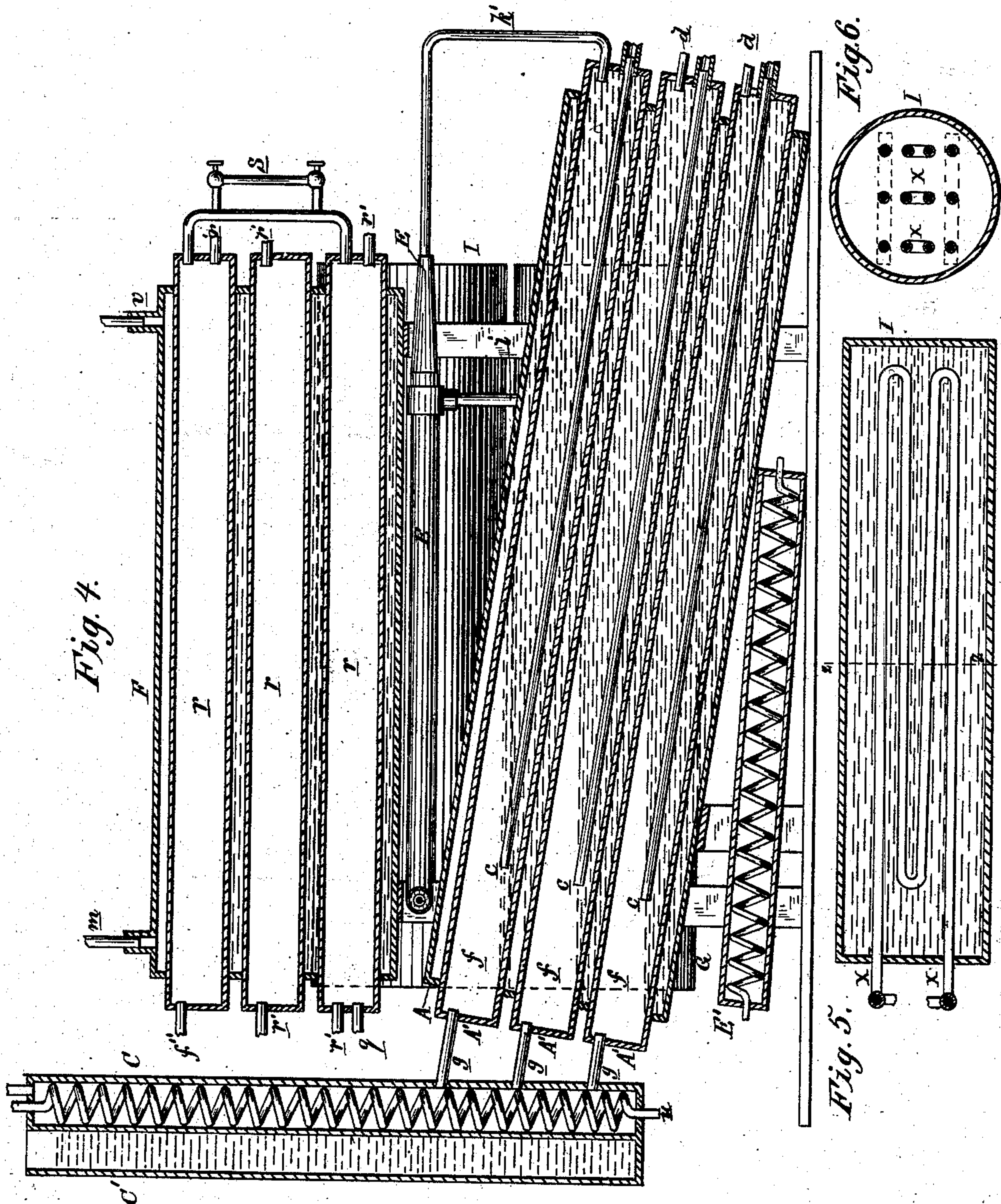
INVENTOR:

T. L. Rankin

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INVENTOR:
T. L. Rankin
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UNITED STATES PATENT OFFICE.

THOMAS L. RANKIN, OF NEW YORK, N. Y.

ICE-MACHINE AND REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 239,591, dated March 29, 1881.

Application filed February 21, 1880. (Model.)

To all whom it may concern:

Be it known that I, THOMAS L. RANKIN, of the city, county, and State of New York, have invented a new and Improved Refrigerator, of which the following is a specification.

Figure 1 is a perspective view of the refrigerator. Fig. 2 is an end elevation of the same. Fig. 3 is a sectional plan of the equalizer. Fig. 4 is a sectional side elevation on line *x x*, Fig. 2. Fig. 5 is a longitudinal sectional elevation on line *y y*, Fig. 2. Fig. 6 is a transverse sectional elevation on line *z z*, Fig. 5.

Similar letters of reference indicate corresponding parts.

The object of this invention is to provide a compact, durable, and effective apparatus for refrigerating breweries, packing-houses, vessels carrying meats, &c.

The invention consists in extending the ammonia-tubes at both ends and through both heads of the boiler, to bring the joints and connections on the outside, in combining with the ammonia-tubes shorter tubes passing through the heads and having suitable connections, in combining an equalizer of particular construction with the ammonia-tubes, and in a general combination of the essential elements of the refrigerator, all as hereinafter described.

In the drawings, A represents the boiler, set at an inclination of ten or fifteen degrees, or thereabout, from a horizontal line, through which boiler A the ammonia still or tubes A' extend longitudinally through both heads of the said boiler, so that the joints and connections of said still or tubes A' are all outside of the boiler A and are accessible.

The boiler A may be used with water in it and a fire under it, after the manner of an ordinary boiler, thus furnishing steam for heating the ammonia still or tubes A', as well as for operating the pumps, &c.; or it may be used by turning steam into it from another boiler; or it may be supplied with steam from an engine-exhaust.

Each ammonia-tube A' has solid heads welded on each end, and screwed into the front ends, preferably by means of nipples, are the pipes *c*, that extend upward to within about eighteen inches of the rear ends of the said ammonia-tubes A', so that the liquid forced

through the equalizer E into the ammonia-tubes A' rises until it covers the end of the upper pipe, *c*, and then flows through said pipe *c* and the outside pipe-connections, *d*, to the next tube A', and through its pipe *c*, and so on until the said liquid reaches the lower tube, A'; and by this arrangement it will be seen that a nearly triangular or wedge-shaped clear space, *f*, is left at the highest points of the said tubes A', giving a high boiling-point for the ammonia-gas to pass off freely from each tube A', as though they were independent of each other. As the ammonia-gas passes independently from each tube A' to the aqueous-vapor condenser C through the pipes *g*, the ammonia-water becomes weaker and weaker as it reaches a lower level in the said ammonia-tubes, and finally passes off under the gaseous pressure in the tubes A', through the cock *h*, pipe *h'*, weak-water receiver D, and pipe *i*, into the outer pipe, *k*, of the equalizer E. This weak-water receiver D is provided with a gage, (represented at *i*,) for showing the amount of weak water passing from the tubes A' to the equalizer E, and thence by pipe *f'* through cooling-coils in the cylinder E', by pipe *f''* to the absorber F.

The water-jacket C' of the aqueous-vapor condenser C assists in condensing any steam that may pass from the ammonia still or tubes A', said condensed steam flowing back to the said still or tubes A' through suitable pipes, while the ammonia-gas passes up and out through the pipe *l* to the condenser G, and in this condenser G the gas liquefies and flows into the liquid-receiver H through the pipe *n*, whence it expands through the pipe *o* and valve *o'* into the refrigerating-cylinder I, where it (the expanding gas) cools the brine or non-congealing liquid that is introduced into said refrigerating-cylinder I through the inlet-pipe *p*, and that flows out through the outlet-pipe *p'*, said refrigerated brine or other non-congealing liquid being then passed through suitable pipes, tubes, or other vessels, to cool the room or apartment and the contents thereof, in which said pipes, tubes, &c., are placed. From the condenser G the cooling-water flows through the pipe *x'* to the cylinder E', from which cylinder it flows through the tube *x''* to the water-back C', and finally flows to waste

through the pipe x''' . From the refrigerating-cylinder I the gas flows through the pipe and valve q to the lower tube of the absorber F, which absorber F is of like construction with the combined boiler and still A A', excepting that the tubes r are connected only by outside pipes r' , so that the flow is continuous, in at one end and out at the other of the said tubes r . This absorber F is supplied with water for cooling the contents thereof, for carrying off the heat of absorption through the inlet-pipe v , which water escapes through the outlet-pipe m into the condenser G. In the refrigerating-cylinder I are coils, in which the liquefied ammonia is expanded for cooling the non-congealing liquid or brine that is pumped through it. The cold strong water that has been formed in the absorber F by the mingling of the weak water from the tubes or still A' and the gas from the refrigerating-cylinder I is taken from the lower tube of the said absorber F (the said absorber being furnished with a gage, S, to show the amount of water in it) by the pump K through the pipe t , and thereby forced into and through the coil u of the aqueous-vapor condenser C, and thence through the inner pipe, k' , of the equalizer E, there to receive heat from the weak water that is passing through the outer pipe, k , and thence to the still or tubes A' again for renewed action and circulation. This cold strong water passing through the coil u operates, in combination with the water-jacket C', to condense any steam coming from the still or tubes A'.

The pipes $k k'$ of the equalizer E are tapered and welded together at their ends, in the manner indicated in the drawings, for the purpose of securing tight joints.

The advantages of this combination of boiler and still are, that thereby an equal temperature is secured to all the still-tubes, and that the said tubes cannot be burned, and are consequently safer than if exposed directly to a fire, and the apparatus can be operated by a fire under the boiler or by steam introduced

into it—a great advantage where other boilers are in use, as in breweries and on steamships; and a special advantage of the combination is, that steam can be generated in the boiler for working pumps, &c., and evaporating the ammonia at the same time.

The close compact form of this refrigerating apparatus adapts it especially for refrigerating ships, where but small space can be afforded.

When the apparatus is operated by introducing steam into the boiler A, the pipe w serves as the steam-inlet, and w' as the outlet for the condensed steam.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A refrigerator constructed substantially as herein shown and described, consisting of boiler A, still A', aqueous-vapor condenser C, weak-water receiver D, equalizer E, absorber F, condenser G, liquid-receiver H, refrigerating-cylinder I, and pump K, with their respective coils, pipes, tubes, and connections, as set forth.

2. In a refrigerator, the combination, with the ammonia-tubes, of an equalizer, E, constructed of an inner and an outer pipe, $k' k$, respectively, said pipes being tapered and welded at their ends, substantially as herein shown and described.

3. In a refrigerator, the combination, with the ammonia-tubes A', of the pipes c , passing through the heads, made shorter than said tubes, and having connections, as shown, and for the purpose set forth.

4. In a refrigerator, the ammonia-tubes A', extended at both ends longitudinally through both heads of the boiler A, to allow the joints and connections to be made on the outside of the boiler, for the purpose specified.

THOS. L. RANKIN.

Witnesses:

I. I. STORER,
C. SEDGWICK.