J. MERRILL & G. PATTEN.

CONDENSING APPARATUS.

No. 11,485. Patented Aug. 8, 1854.

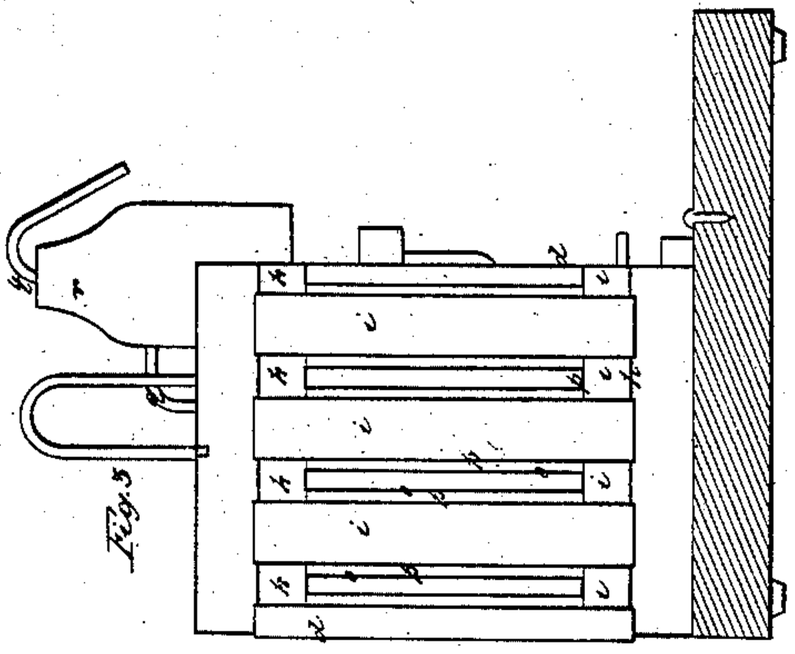
Fig. 3

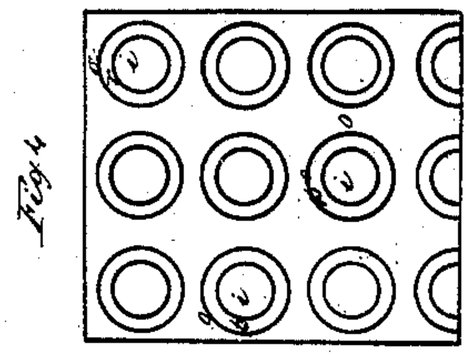
Fig. 4

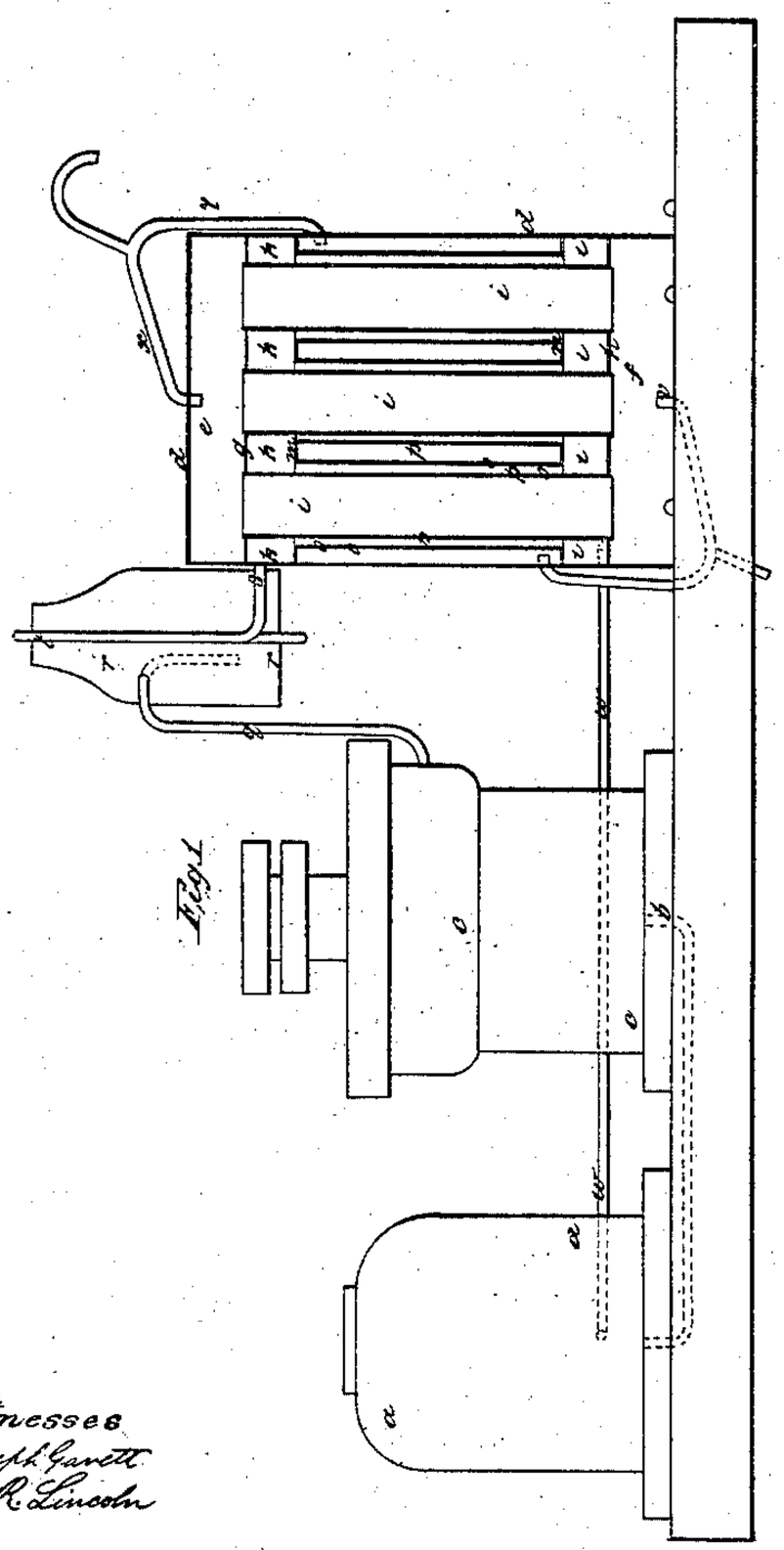
Fig. 1

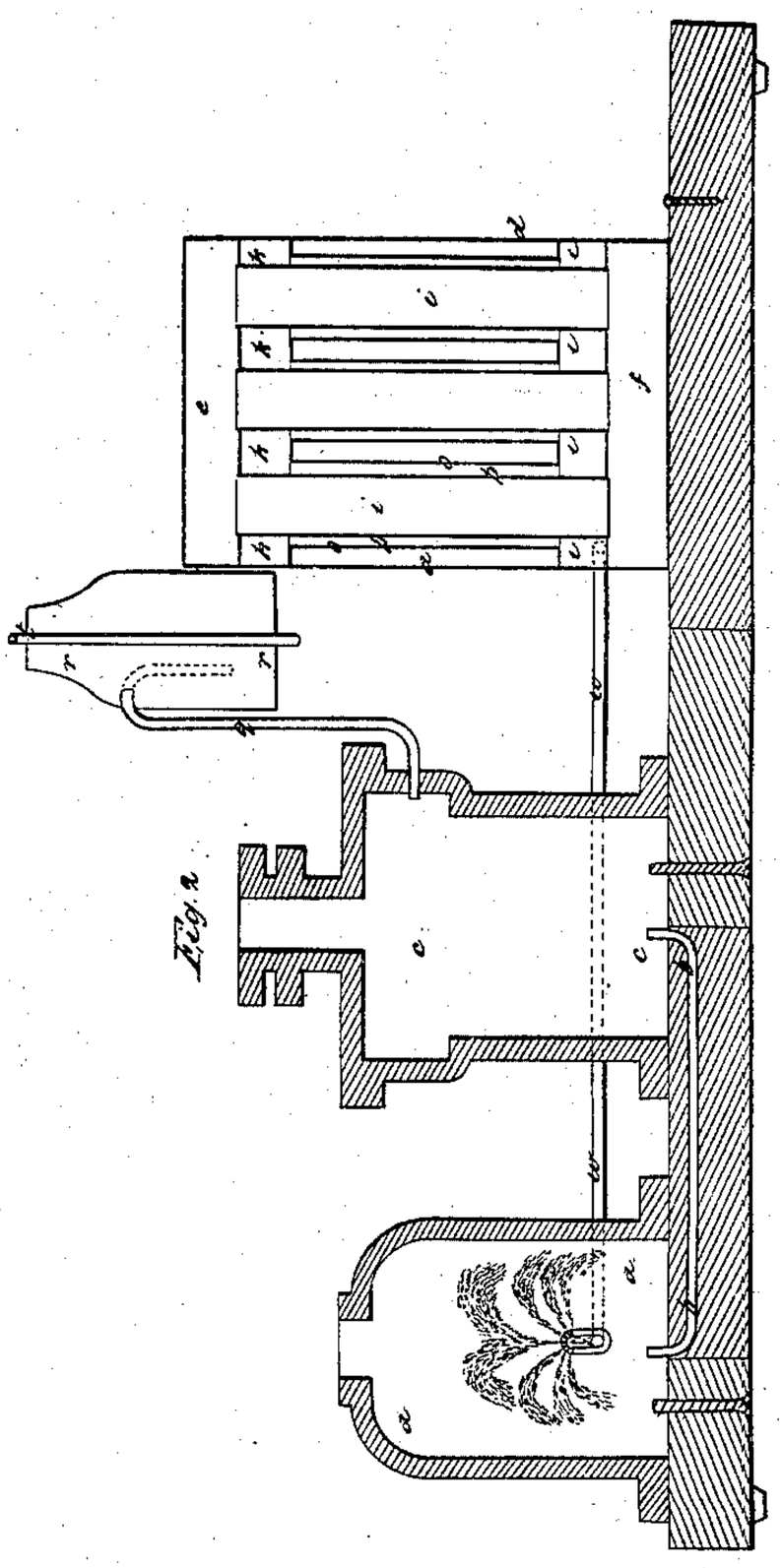
Fig. 2

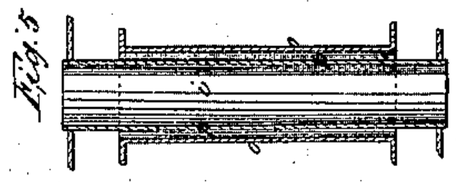
Fig. 5

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UNITED STATES PATENT OFFICE.

JOSHUA MERRILL AND GEO. PATTEN, OF BOSTON, MASSACHUSETTS.

REFRIGERATOR FOR MARINE ENGINES.

Specification of Letters Patent No. 11,485, dated August 8, 1854.

To all whom it may concern:

Be it known that we, JOSHUA MERRILL and GEORGE PATTEN, both of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Condensers for Marine and other Engines, and that the following description, taken in connection with the accompanying drawings, hereinafter referred to, forms a full and exact specification of the same, wherein we have set forth the nature and principles of our said improvements, by which our invention may be distinguished from others of a similar class, together with such parts as we claim and desire to have secured to us by Letters Patent.

The figures of the accompanying plate of drawings represent our improvements.

Figure 1, is a side elevation of an ordinary condenser, with our improvements applied thereto. Fig. 2 is a central longitudinal vertical section of the same. Fig. 3 is a transverse vertical section of our condensing apparatus, taken in the plane of the line A B, Fig. 1. Fig. 4 is a horizontal section of the same, taken in the plane of the line C, D, Figs. 1 and 3. Fig. 5 is a detail view which will be hereinafter referred to.

Before describing the construction of our condensing apparatus in detail, we will proceed to state some of the difficulties to be overcome, and the advantages to be attained by our improvements.

Among the desiderata to be secured by our condensing apparatus, may be mentioned as some of the most important the following: First, effecting the condensation of the steam, without intermingling it with the salt water, which is generally used for condensing in marine engines, by which incrustations are formed on the interior surface of the boilers, and frequent "blowing off," involving a loss of the feed water, rendered necessary. The expansion and contraction of the tubes in the condensing vessel, is also guarded against, as loose joints are occasioned thereby, and consequently the salt water in the outside of the tubes, permitted to mingle with the fresh water in the inside, or that which enters the boiler.

Another improvement which constitutes one of the most essential features of our invention, consists in separating the hot water or condensed steam to be cooled, into a thin film or sheet of water, and surrounding this film with the largest possible amount of cooling surface. In this manner cooling is effected much more rapidly, than by subjecting a denser body of water, to the same amount of cooling surface. We have also made an important improvement, by which the oil which necessarily collects in the condenser, and is drawn off with the water by the air pump, is conveyed to a separate vessel whence it can readily be removed. The presence of oil or other impurities in the fresh water, has proved a serious inconvenience in all surface condensers, which have heretofore been devised. By our improvements this objection is entirely obviated.

Having thus stated the general principles of our invention, and the objects to be attained thereby, we shall now proceed to describe in detail the construction of our apparatus.

a, *a*, in the drawings, represents a condenser or vessel, in which the condensation of the steam, is to be effected, by a jet of cold fresh water. A pipe *b b* connects the condenser with an air pump *c*, constructed in the usual manner.

d, *d*, represents the outer casing of a refrigerator, or water cooling apparatus, by which the condensed steam or hot water, drawn from the condenser *a*, *a*, by the air pump, is to be cooled. This refrigerator is constructed as follows: Two chambers *e*, *f*, are formed at top and bottom, by the horizontal plates *g*, *h*, which serve as supports and heads, to a series of pipes *i*, *i*, vertically arranged, and connecting the chamber *e* at the top, with the chamber *f* at the bottom.

Immediately under the chamber *e*, and over the chamber *f*, but having no direct communication therewith, are two chambers *k*, *l*, formed by the horizontal plates *m*, *n*, and communicating with each other by the cylindrical pipes *o*, *o*, &c., through which the pipes *i*, *i*, connecting the chambers *e*, *f*, pass, as shown in detail in Fig. 5, leaving an annular space *p*, between each pipe *i*, and its outer tube *o*.

Such being the construction of our refrigerator or water cooling apparatus, it now remains to show the manner in which, its operation is connected with that of the air pump and condenser, whereby the effectual cooling of the hot water, and rapid condensation of the steam, is effected. A pipe *q*, connects the air pump with a vessel *r*, from

the bottom of which a siphon or bent tube *s*, leads to the chamber *k*, of the refrigerator. By this arrangement, the injection water and condensed steam, which is drawn by the air pump from the condenser *a*, *a*, first passes into the vessel *r*, and the oil which may be in the water, delivered by the air pump will rise to the top in the vessel *r*, whence it can be removed through the pipe *t*. The oil can thus be removed before entering the refrigerator, as the siphon or bent pipe *s*, which communicates with the chamber *k*, is inserted in the bottom of the vessel *r*. The hot water thus drawn from the condenser, and delivered through the pipe *s*, passes into the chamber *k*, and thence down through the annular spaces *p*, between the pipes *i*, and the outer tube *o*, into the chamber *l*. The cold water for cooling the hot water in the annular spaces *p*, is supplied by a branch pipe *u*, *v*, one branch *u*, communicating with the spaces around the larger pipes *o*, and the other branch *v*, leading to the bottom chamber *f*, which communicates with the smaller pipes *i*. The cold water thus forced in through the pipe *u*, *v*, is by the above described arrangement, circulated through the smaller pipes *i*, and around or about the outer surface of the larger pipes *o*, keeping both sets of pipes at a very low temperature, whereby the hot water which is passing down through the annular spaces *p*, is rapidly cooled and passes into the chamber *l*, thence through a pipe *w*, *w*, back again into the condenser *a*, *a*, where it is used again for condensing the steam, which has been exhausted into the said condenser. The cold water in the refrigerator, after being used for cooling the condensed steam in the annular spaces *p*, passes out through a branch pipe *x*, *y*, one branch leading from the upper horizontal chamber *e*, and the other *y*, from the spaces about the larger pipes *o*.

From the foregoing description it will be seen, that by our refrigerating apparatus, the condensed steam or hot water, is separated into thin films or sheets of water, and conveyed through annular spaces which afford a great amount of cooling surface, and moreover that the surfaces which form the annular spaces are kept constantly cool, so that both sides of these films or sheets of hot water, are brought in contact at the same time with a cold surface, as the cold water passes as herein before explained both through the pipes *i*, *i*, &c., which form one of the surfaces of each annular space, and around the exterior of the pipes *o*, *o*, &c., which form the other surface of the said annular spaces. In this manner the cooling of the hot water is rapidly effected, as a small quantity of heated water is acted upon, and surrounded by the largest possible extent of cooling surface. This desideratum, is also by the arrangement of the pipes and several chambers of the refrigerator, effected in such a manner as to prevent the water used for the cooling medium, from being intermingled with the water jetted into the condenser, the importance of which especially in marine engines where salt water is used will readily be appreciated; as by conducting the condensed steam back to the boilers, we are enabled to use the fresh water in the boilers and in the condenser without any additional supply, except such as may be lost by leakage or otherwise, while the salt water may be used for the cooling medium, without danger of mixing with the fresh water jetted into the condenser.

In contriving our improved refrigerator, we were well aware that the device of conducting any heated fluid to be cooled or condensed between two currents of cold liquid, had been the subject of prior inventions, and that the interstitial space through which the heated fluid was conducted, was secured through the medium of concentric tubes or parallel rectangular chambers, said tubes or chambers being arranged in a zigzag form or convoluted. But in all such instances the steam or fluid to be cooled, has been received out of one single opening and discharged at another and a single opening, so that the length of pipes or convoluted chambers necessary for effectually cooling the same, was very great, and the friction of the currents of water in the pipes or on the side of the chambers very considerable, and the time required for the operation is correspondingly great.

The great purpose of our invention, is to economize time and space in condensing operations, and the distinguishing feature of our improvement that enables us to secure these results is, that we receive the steam to be condensed or liquid to be cooled into a large chamber in the upper part of the refrigerator, and immediately subdivide it into numerous thin films, and conduct them through the annular spaces between the concentric tubes, and condense at once into a chamber in the lower part of the refrigerator. By these peculiar means, the cooling or condensing is effected almost as quickly, as it would be by the steam or liquids intermingled at once with the cooling element, and in a much more rapid way than by any other processes herein above indicated, while the space necessary for the condensing apparatus, is diminished in a very great ratio to that required for the convoluted or zigzag pipes or chambers above referred to.

Having thus described our improvements we shall state our claims as follows:

We do not claim conducting the condensed

steam or hot water through an annular space for the purpose of cooling it, as that has before been done, but

What we do claim and desire to have secured to us by Letters Patent, is—

1. Our improved refrigerator or water cooling apparatus, consisting of the concentric tubes and the chambers above and below the same, combined and arranged as herein above described, whereby the condensed steam or hot water is conducted into annular spaces, separated into thin films, and brought in contact on both sides with cold surfaces, the cold water or cooling medium passing through one set of pipes and around the other as above set forth.

2. We also claim providing a separate vessel or receptacle, through which the injection water drawn from the condenser by the air pump, is made to pass before entering the refrigerator, so as to permit the oil to be separated and drawn off from the water as herein above described.

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