No. 684,749. Patented Oct. 15, 1901.

A. K. FINLAY.

VENTILATING SYSTEM FOR VESSELS.

(Application filed Jan. 21, 1901.)

(No Model.) 2 Sheets—Sheet 1.

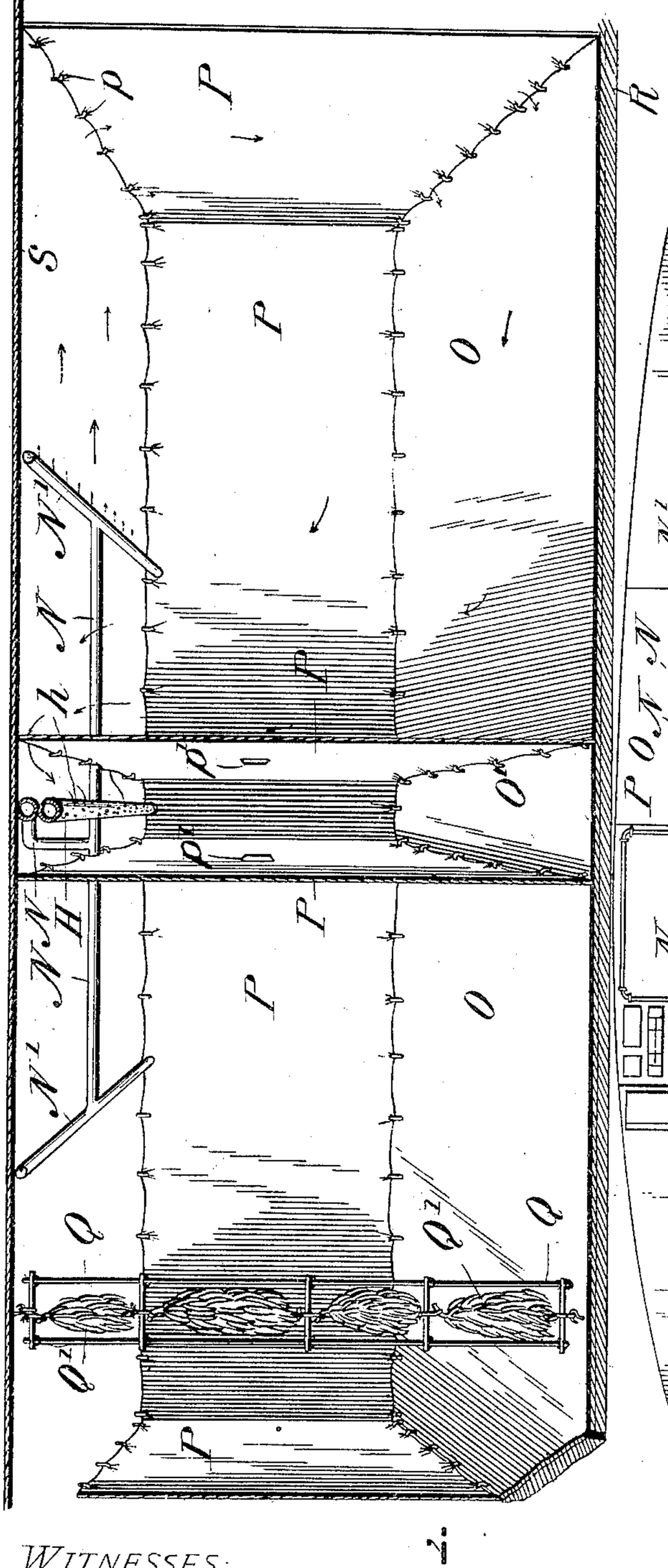

Fig. 1.

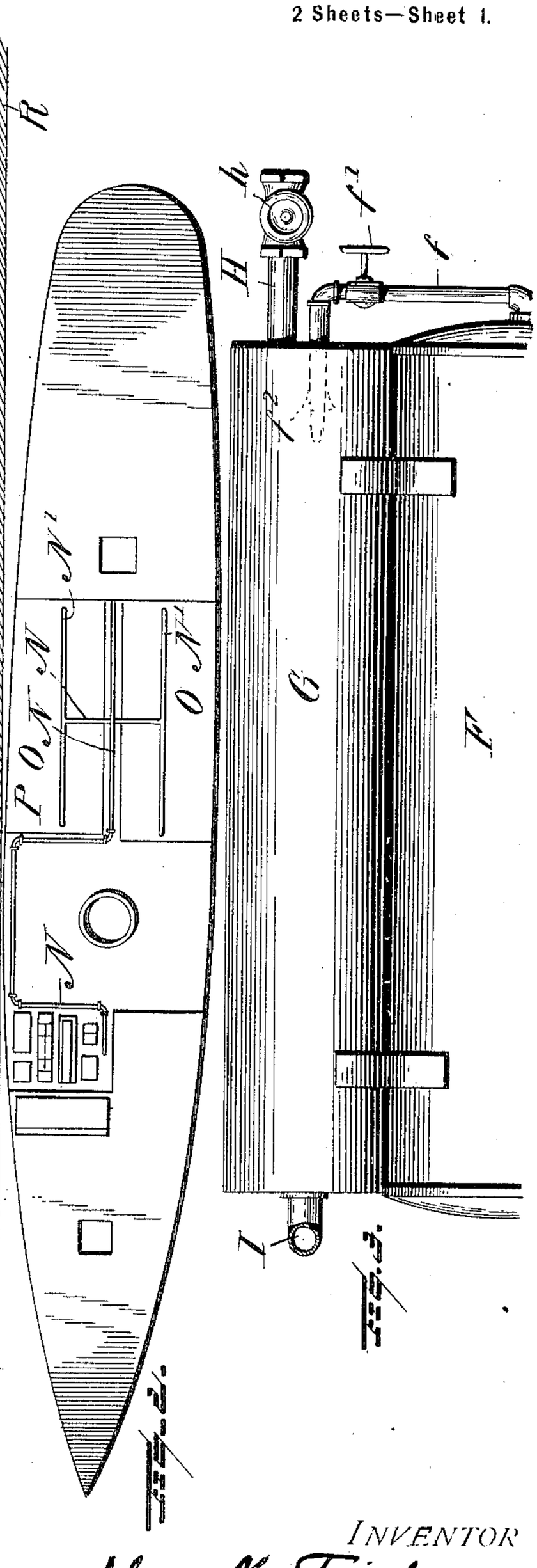

Fig. 2.

Fig. 3.

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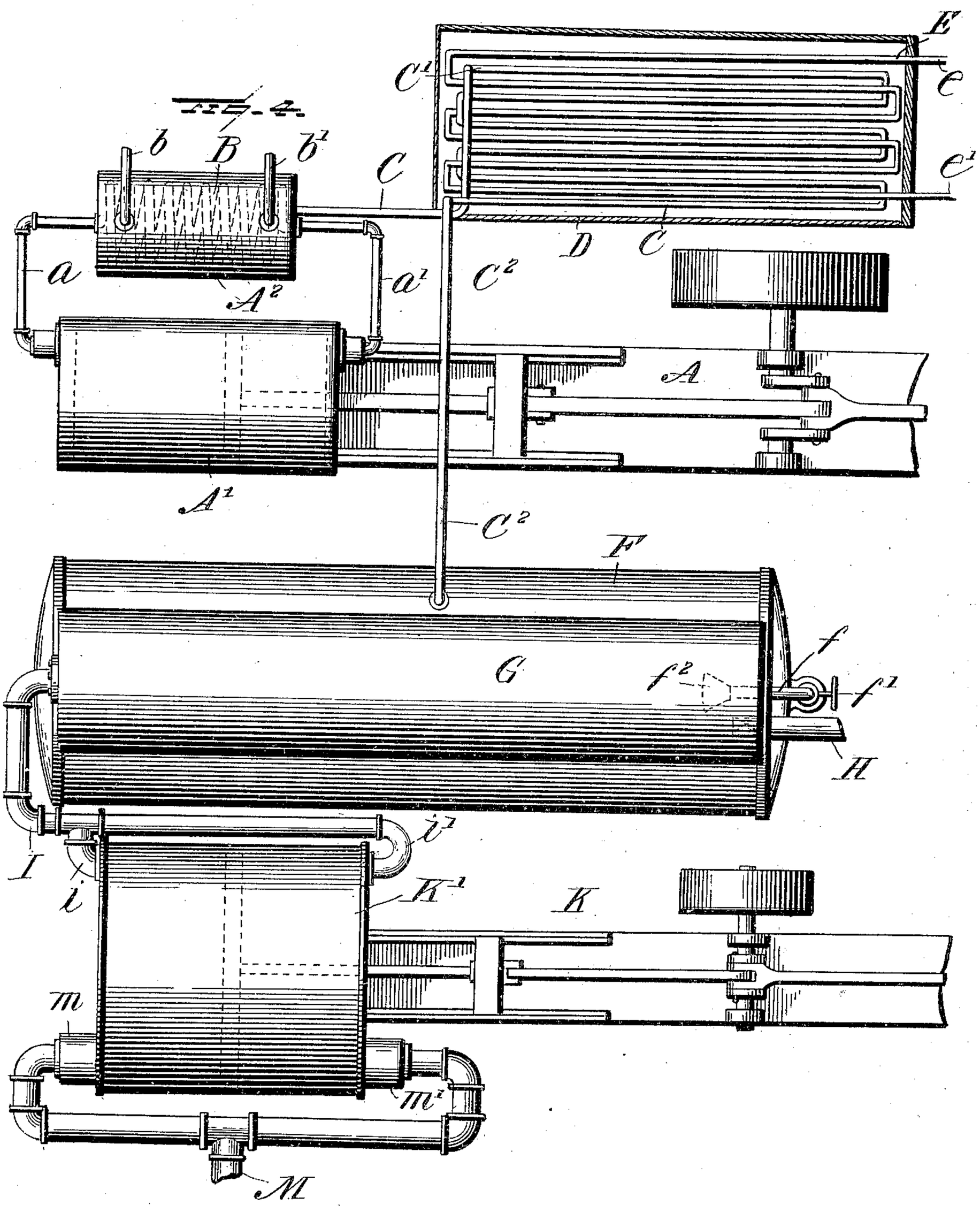

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UNITED STATES PATENT OFFICE.

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VENTILATING SYSTEM FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 684,749, dated October 15, 1901.

Application filed January 21, 1901. Serial No. 44,090. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER K. FINLAY, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Ventilating Systems for Vessels; 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.

The preservation of a cargo of perishable fruit during a long voyage can only be accomplished by the attainment and maintenance in the interior of the vessel of a fixed temperature, as near 60° Fahrenheit as possible. The varying conditions to which a ship is subjected will not admit of a constant temperature in all parts of her interior without special attention. The action of the sun first on one side, again on the other, causes varying degrees of heat, and it will be necessary to exercise a reasonable amount of vigilance to observe and provide for the variations which occur.

There are two or more contingencies which must be duly met, and it is with the view of providing for them that I have devised a method of stowing tropical fruit on shipboard or in freight-cars by suspending it from ceiling to floor. This is preliminary and enables the subsequent part of the system to be carried out. It is only by ventilation and constant circulation of the atmosphere in the hold of a vessel or in the interior of a fruit-carrying freight-car that a constant temperature can be maintained, and the conditions requisite therefor are in some respects analogous to those which are found in the problem of heating or warming a house or a ship. Warming a house or ship in cold weather requires the exclusion of the exterior atmosphere. Therefore the windows and doors of the house and the hatches and ports of the ship are closed in order to succeed. The ship which carries perishable fruit must be hermetically sealed, the only openings permissible in her cargo-spaces being those which permit the entrance of the artificially-cooled atmosphere which is driven through those spaces and the exit for the same after it has performed its duty and undergone the slight warming which may of necessity happen.

Cargoes of perishable material, such as carcasses of sheep and oxen, have been transported for thousands of miles during voyages of many weeks' duration by maintaining a very low temperature in the compartments in which they are stored. Now while a freezing temperature does not injure such material it would be utterly inadmissible with tropical fruit—*e. g.*, bananas, pineapples, alligator-pears, &c. Referring to the first (bananas) especially, it is a well-known fact that a temperature below 50° Fahrenheit chills the banana and kills it. It cannot ripen afterward. Subsequent exposure to a warm atmosphere causes it to blacken and rot and renders it unfit for use.

The exposure of perishable tropical fruit to the prevailing temperature of its habitat for more than a few days means its destruction from overripening and decay. Hence the importance of two conditions—first, that the fruit shipped must not be ripe nor even in the incipient ripening stage when it is bought and loaded. Rank green must be the color of the bunches. A shade of yellow condemns it, and the fruit is either refused or sold at a price far below the regular rate. Now if half-ripe fruit be kept at a temperature which will not chill and kill it, on the one hand, by reason of its coldness and which will not permit its decomposition by reason of its exposure its preservation is achieved for a reasonable period—say two or three weeks.

To meet the requirements, I propose the use of an air-compressor which will produce a supply of very cold air. This very cold air must not be used to lower the temperature of the cargo-spaces directly, because it would chill and kill a portion of or all of the fruit carried. It is used as a means of lowering the prevailing temperature of the exterior air. Just so much of the chilled air as may be found necessary to reduce the temperature of the tropics to 58° or 60° Fahrenheit, and no more, shall be mingled with the ventilating-air to be employed.

The apparatus for carrying out the herein-

before-described method will be better understood after reference to the accompanying drawings, in which—

Figure 1 represents two of the compartments of a vessel fitted in accordance with my invention. Fig. 2 is a diagram showing the connection between the ventilating apparatus and the two chambers shown in detail in Fig. 1. Fig. 3 is a detail view showing a reservoir for cold air and the mixing-chamber connected thereto, and Fig. 4 is a diagram showing the cooling apparatus with the pump for delivering the cooled air to the various storage-compartments.

Referring first to Fig. 4, A represents an air-pump of any suitable type, having a cylinder A′ delivering air through the pipes *a a′* to a coil A^2 in the chamber B, which is supplied with sea-water through the pipes *b*, which sea-water passes off through the pipes *b′*. The purpose of this cooling-chamber B is to carry off the heat developed in compressing the air. The air thus partly cooled passes from the coil A^2 to the pipe C, leading backward and forward through the brine-tank D, which is kept cool by the pipe E, connected to an ammonia ice plant, as by the pipes *e e′*. Any other means of cooling may be adopted, if desired; but an ammonia ice plant would ordinarily be preferred on account of its cheapness. From the pipe C′ in the brine-tank D the cooled air passes to the air-reservoir F, where it is kept stored. This reservoir should preferably be covered with any suitable insulating material. (Not shown.)

The air-reservoir F is connected by means of the pipe *f*, controlled by the valve *f′*, to the mixing-chamber G, and the said pipe *f* preferably terminates in a rose or other spray f^2, whereby the cold air from the chamber F is minutely divided on entering the chamber G. This chamber G is also connected to the return-pipe H, which terminates into the perforated portion *h* (see Fig. 1) and sucks air from the compartments to be ventilated. The mixed air from the reservoir F and from the return-pipe H is drawn from the chamber G through the pipe I and branches *i i′* to the cylinder K′, operated by the delivery-pump K. From cylinder K′ the air is delivered through the branch pipes *m* and *m′* to the delivery-main M, which is connected to the supply-pipes N and branch pipes N′. (See Fig. 1.) These pipes N′ are preferably arranged in the top of each chamber and are preferably perforated at the side, as shown to the right in Fig. 1. There may be any number of these transfer-pipes N′, though only one is shown in each chamber in Fig. 1.

The storage-compartment is preferably divided up into a number of separate chambers O, separated from each other by canvas partitions P, attached by means of eyebolts and lacings or in any other convenient way to the lower deck R and the upper deck S. A passage O′ is preferably left between the various chambers, and glass plates *p′* are provided along this passage to enable the attendants to look through and see one or more thermometers located inside of the cooling-chamber O.

Q represents any suitable device for suspending the bananas or other fruit Q′.

The operation of the device is as follows: The compressed air is forced from the cylinder A′ through the cooling-coil A^2 and then through the brine-tank D to the reservoir F, from which it is drawn through the pipe *f* to the mixing-chamber G. The return air from the system is also sucked from the pipe H into the chamber G, and the two together are forced by the pump K to the pipe M, whence they are delivered to the pipes N and N′, and from the latter they enter the chambers O under pressure. The path of the air going from the pipes N′ follows the direction of the arrows in Fig. 1 and after eddying through the chamber O is sucked off by the perforated portions *h* of the pipe H and is carried back to the mixing-chamber G. The air in the various chambers O being under pressure, there will be more or less leakage from accidental openings, and therefore the whole amount of air delivered to the system does not go back through the pipe H, the deficiency being supplied from the reservoir F. By having the air under pressure in the various compartments and having positive currents set up, as indicated, the cooling-air will pass between and around the fruit and will maintain the desired temperature at all parts of the compartments.

It will be obvious that in cold weather steam may be turned through the pipes E in the tank D, and thus the air may be warmed instead of cooled before it passes into the reservoir F.

In the herein-described system I have endeavored to secure two important conditions—that is, economy and simplicity.

Aside from the refrigerating machinery the expense of fitting a vessel or car is nominal. The permanent part of the ventilating and distributing service being secured to the ceiling of the cargo-spaces will not in any way interfere with the stowage of return cargoes, and the arrangement of divisions when light canvas is used can be rapidly effected. Half an hour suffices to change the ship from a "fruiter" to a "freighter," and vice versa. The suspending cords or wire can be put away in a small place during the return trip. Likewise the bulkheads, which can be rapidly unfastened, may be folded and stored away until again needed. The final ventilating-tubes, consisting of a perpendicular tube screwed onto one of same dimensions permanently attached to the main tube and leading down to the perforated tube lying along the ceiling in the middle of its compartment, can be quickly attached and removed. A check-valve in each of the cross-tubes in the passage-way will serve to increase or diminish the volume

of ventilating-air at will. The escape-tubes from the middle of the ceiling of each compartment can be permanently placed, as they will not be in the way.

It will be obvious that various modifications might be made in the herein-described apparatus which could be used without departing from the spirit of my invention.

The ventilating and cooling system above described can be employed for cooling the passenger-apartments of sea-going vessels and railroad passenger-cars using suitable means for the escape of the air, as the return air must not be used. Fresh air only should be employed for human beings, and it should be drawn from a pipe terminating a short height above the deck of the vessel or car.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A storage system for transporting tropical fruits comprising a closed cargo-space, vertical partitions or bulkheads secured in the cargo-space and dividing the same into separate compartments, an air-compressor, a water-chamber with coil therein receiving the air from said compressor, a cooling-chamber connected to said coil, an air-reservoir, a mixing-chamber connected to said reservoir, and also to said compartments, and an air-pump and pipes delivering air from said mixing-chamber to said compartments, substantially as described.

2. In a storage system for transporting tropical fruits, the combination with a closed cargo-space, of vertical partitions or bulkheads secured in the cargo-space and dividing the same into separate compartments with passages between said compartments, an air-compressor, a water-chamber with coil therein receiving the air from said compressor, a cooling-chamber connected to said coil, an air-reservoir, a mixing-chamber connected to said reservoir, and also to said compartments, and an air-pump and pipes delivering air from said mixing-chamber to said compartments, substantially as described.

3. In a storage system for transporting tropical fruits applicable in marine vessels, the combination with canvas partitions or bulkheads removably secured in the cargo-space and dividing the cargo-space into separate compartments, gangways or passages between said compartments, means for indicating the temperature within the various compartments from said gangways, an air-compressor, a water-chamber with coil therein receiving the air from said compressor, a cooling-chamber connected to said coil, an air-reservoir, a mixing-chamber connected to said reservoir and also to said compartments, and an air-pump and pipes delivering air from said mixing-chamber to said compartments, substantially as described.

4. In a vessel for transporting tropical fruits, the combination with a cargo-space, and bulkheads dividing said space into compartments; of an air-compressor, a cooling-coil through which air from said compressor passes, a refrigerating-coil through which air from said cooling-coil passes, a reservoir adapted to receive the cooled air from said refrigerating-coil, a mixing-chamber connected to said reservoir, a return-pipe from said compartments connected to said mixing-chamber, and an air-compressor connected to said mixing-chamber adapted to supply the cooled and mixed air to said compartments, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER K. FINLAY.

Witnesses:
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F. E. RAINOLD.