

May 12, 1925.

1,537,271

P. STROMBACK

CONDENSER

Filed June 21, 1923

3 Sheets-Sheet 1

Fig. 1.

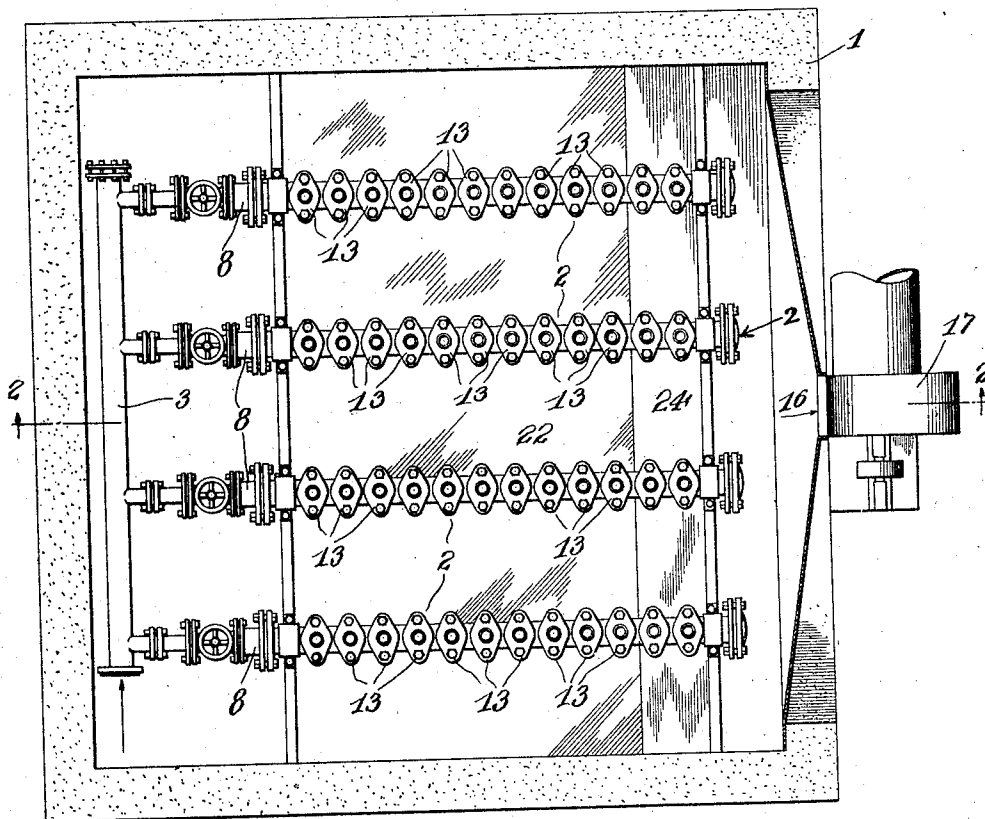
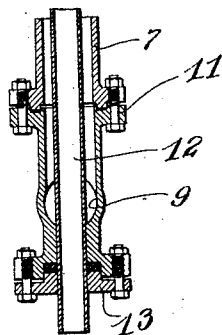


Fig. 4.



WITNESSES:

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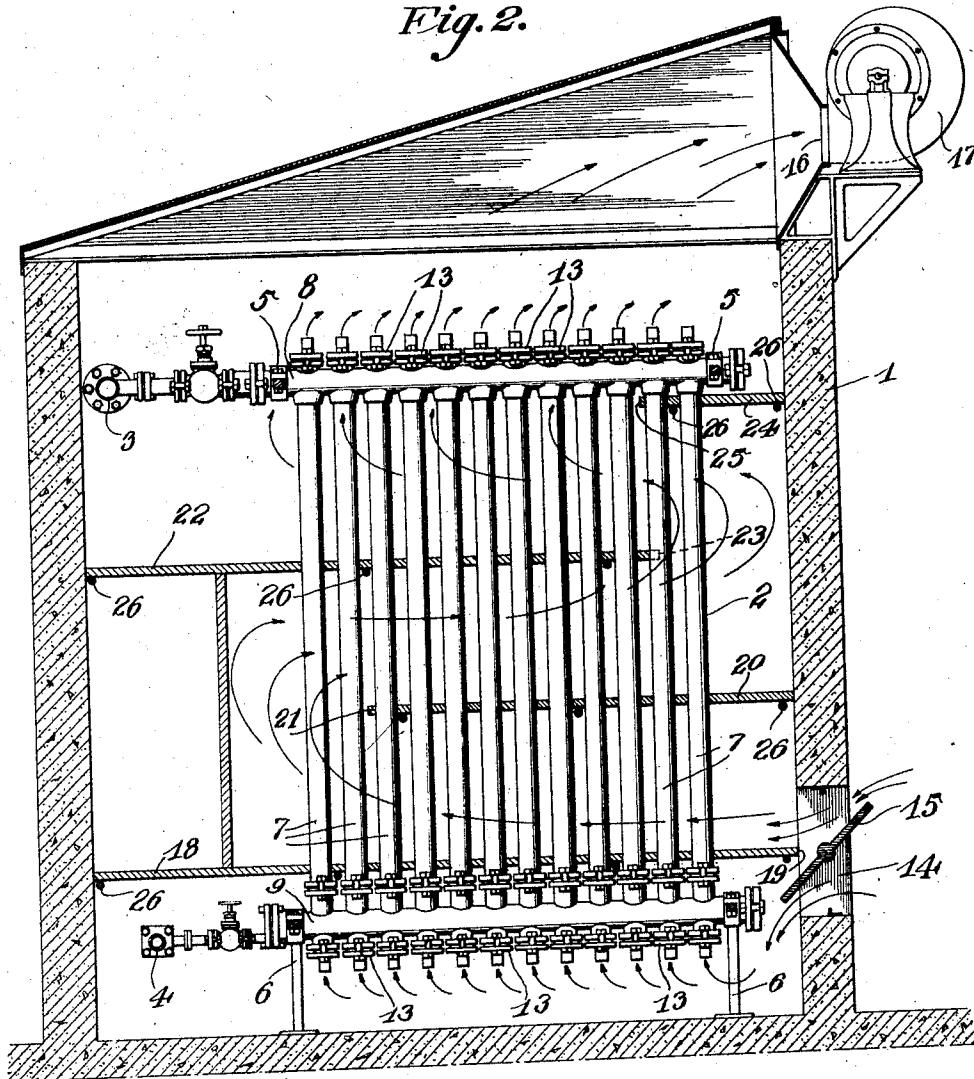
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3 Sheets-Sheet 2

Fig. 2.



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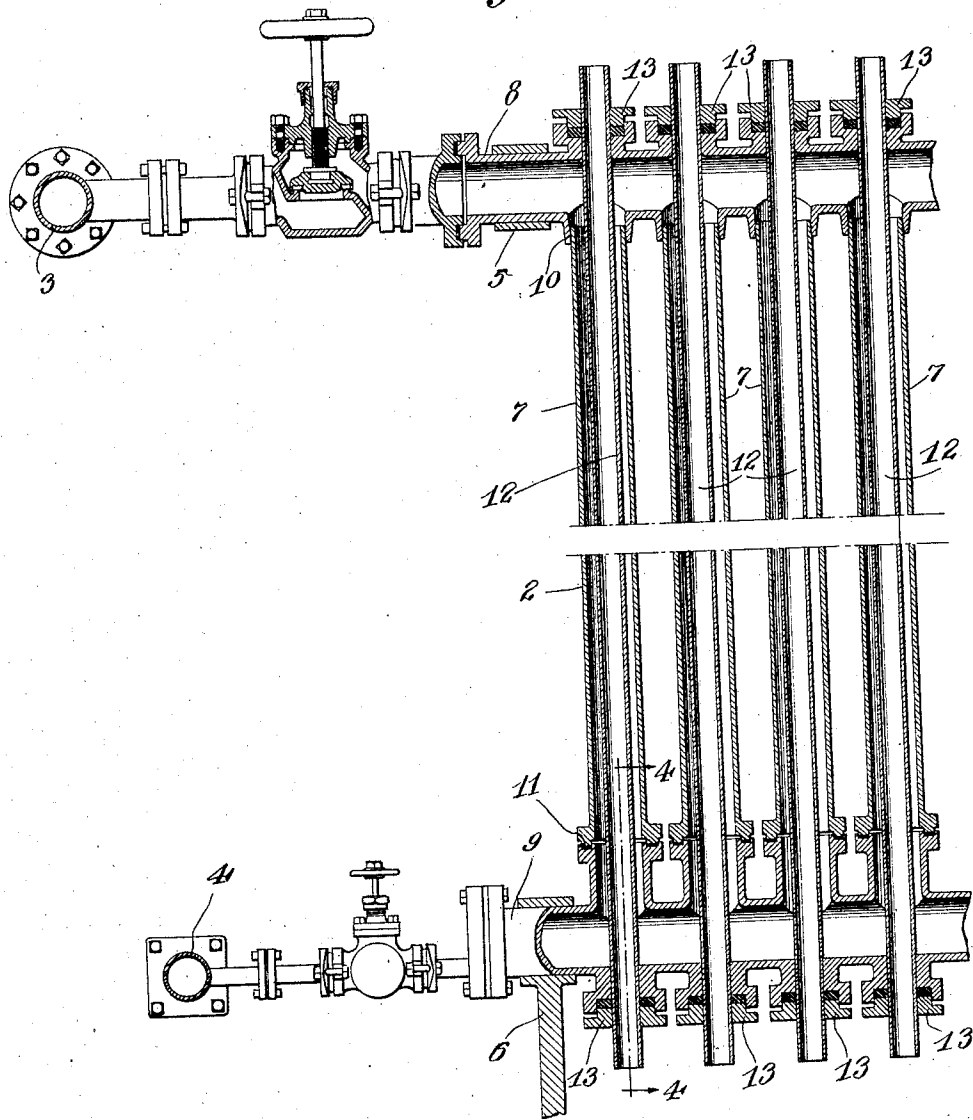
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3 Sheets-Sheet 3

Fig. 3.



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UNITED STATES PATENT OFFICE.

PHILIP STROMBACK, OF PHILADELPHIA, PENNSYLVANIA.

CONDENSER.

Application filed June 21, 1923. Serial No. 646,775.

To all whom it may concern:

Be it known that I, PHILIP STROMBACK, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Condensers, of which the following is a specification.

My invention relates to condensers which are particularly adapted for use in refrigerating apparatus for condensing ammonia or other gases used for refrigeration.

Heretofore in refrigerating apparatus it has been the practice to employ a condenser which used water as a cooling medium. This water circulated through the condenser and after absorbing its quota of heat from the condenser was cooled by air and used again. This cooling of the water and circulating it through the condenser involved considerable consumption of power which was expensive.

The object of my invention is to provide a condenser which will use air directly as the cooling medium; will do away with the water circulating apparatus and thereby reduce the cost of refrigeration; will have a maximum cooling surface in a minimum space; will agitate the air as it passes through the condenser, and embody the economic principle of "counter-current heat exchange."

These objects, and other advantageous ends which will be described hereinafter, I attain in the following manner, reference being had to the accompanying drawings in which—

Figure 1 is a plan view of a condenser constructed in accordance with my invention the cover of the condenser being removed,

Figure 2 a section on line 2—2 of Figure 1,

Figure 3 an enlarged fragmentary central section of the condensing unit shown in Figure 2, and

Figure 4 a fragmentary section on line 4—4 of Figure 3.

Referring to the drawings, 1 indicates a casing which may be of any suitable construction, 2 the condensing units which are similarly constructed and connected at their top to a gas inlet pipe 3 and at their bottom to a fluid outlet pipe 4. The condensing units are mounted on top supports 5 and bottom supports 6. Any number of these units may be arranged in this manner. Each unit comprises vertical outer tubes 7 connect-

ed at their upper ends to a gas inlet manifold 8 and at their lower ends to a fluid outlet manifold 9, the connections being made in any suitable manner such as by threads 10 and flanges 11. Inner tubes 12 pass within the outer tubes and have their ends extending out of the manifolds, the ends being connected to the manifold in any suitable manner, such as by stuffing boxes 13, to prevent gas from leaking out of the manifold. This arrangement forms a gas conduit, between each outer and inner tube, which communicates with the inlet and outlet manifolds so that gas will pass from the inlet manifold 8 down between the outer and inner tubes 7 and 12 where it will be condensed into liquid, and into the outlet manifold 9 from which the condensed gas may pass through the refrigerating apparatus in the usual manner.

The controlling and circulating means for the cooling air comprises an air inlet 14 disposed in the bottom of the casing which has a damper 15 mounted therein for controlling the passage of air therethrough. An air outlet 16 is disposed at the top of the casing and communicates with a blower 17 of any suitable type. A bottom baffle 18 is mounted adjacent the bottom of the casing and forms a partition between the cooling air which circulates through the inner tubes and the air which circulates around the outside of the outer tubes. This partition is disposed so that its edge 19 will be midway of the air inlet 14, thus allowing air to enter above and below the partition as shown in Figure 2. A baffle 20 is disposed above the bottom baffle 18 and has its free edge 21 extending toward the left of the condensing unit. A baffle 22 is disposed above the baffle 20 and has its free edge 23 extending toward the right of the condensing unit. A top baffle 24 has its edge 25 extending toward the left of the condensing unit. This arrangement of the baffles conveys the cooling air around the outside of the outer tubes in an upwardly zig-zagging manner. The baffles may be mounted in the casing in any suitable manner such as by resting them on rods 26 extending across the casing.

When my improved condenser is in use in a refrigerating apparatus, blower 17 is started so that the cooling air will enter through inlet 14 and pass through the inner tubes 12 and zig-zag around the outer tubes 7. The gas to be condensed is passed into the mani-

fold 8 and down between the inner and outer tubes into the outlet manifold 9. During its passage between the inner and outer tubes the cooling air will absorb the heat and condense the gas before it reaches the outlet manifold 9. The liquefied gas will then pass into the fluid outlet pipe 4 from which it will pass into the refrigerating apparatus in the usual manner.

10 A condenser constructed as above described embodies the principle of "counter-current heat exchange," that is, the hot gases entering at the top flow downward while the cold air entering at the bottom flows upward. This keeps the lower parts cool while the upper parts gradually increase in temperature, thus preventing leaks in the condenser. The air, circulating around the outside of the tubes and within the inner tubes, provides a maximum cooling capacity in a minimum space. The horizontal disposition of the baffles causes the cooling air to travel transversely to the tubes, thus agitating the air so that a more effective cooling is obtained. The passage of the amount of air necessary for condensation is controlled by the damper 15.

While I have described my invention as taking a particular form, it will be understood that the various parts may be changed without departing from the spirit thereof, and hence I do not limit myself to the precise construction set forth, but consider that I am at liberty to make such changes and alterations as fairly come within the scope of the appended claims.

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

40 1. A condenser for use in refrigerating apparatus comprising a casing having an air inlet opening adjacent its bottom and an air outlet opening at its top, a fluid inlet manifold and a fluid outlet manifold mounted in the casing and connected by outer tubes, inner tubes passing through the outer tubes and the manifolds and providing independent passages therethrough, a partition dividing off a portion of the casing and having an end crossing the air inlet opening, said inner tubes extending into said divided off portion

of the casing to receive the cooling air inflowing through said inlet opening, and means above the partition for directing the air inflowing above said partition to and about the outer tubes, substantially as described.

2. A condenser for use in refrigerating apparatus comprising a casing having an air inlet opening adjacent its bottom end and an air outlet opening at its top end, a fluid inlet manifold near the top end of the casing, a fluid outlet manifold near the bottom end of the casing, outer tubes connecting said manifolds, a partition across the casing above said outlet manifold and having an end across said air inlet opening, inner tubes passing through the outer tubes and the manifolds and opening below said partition to receive the cooling air inflowing through said air inlet opening, and means above said partition for directing the cooling air inflowing above said partition around said outer tubes.

3. A condenser for use in refrigerating apparatus comprising a casing having an air inlet opening adjacent its bottom and an air outlet opening at its top, a fluid inlet manifold and a fluid outlet manifold mounted in the casing and connected by outer tubes, inner tubes passing through the outer tubes and the manifolds and providing independent passages therethrough, a partition dividing off a portion of the casing and having an end crossing the air inlet opening, said inner tubes extending into said divided off portion of the casing to receive the cooling air inflowing through said inlet opening, means above the partition for directing the inflow of air above said partition around the outer tubes, means for controlling the cooling air inflowing through said air inlet opening, and means for forcing the air out through said air outlet opening, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PHILIP STROMBACK.

Witnesses:

ELIZABETH GARBE,
CHAS. E. POTTS.