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WM. A. LIGHTHALL'S

IMPROVEMENT IN SURFACE CONDENSERS.

PATENTED JUL 4 1871

Figure 1.

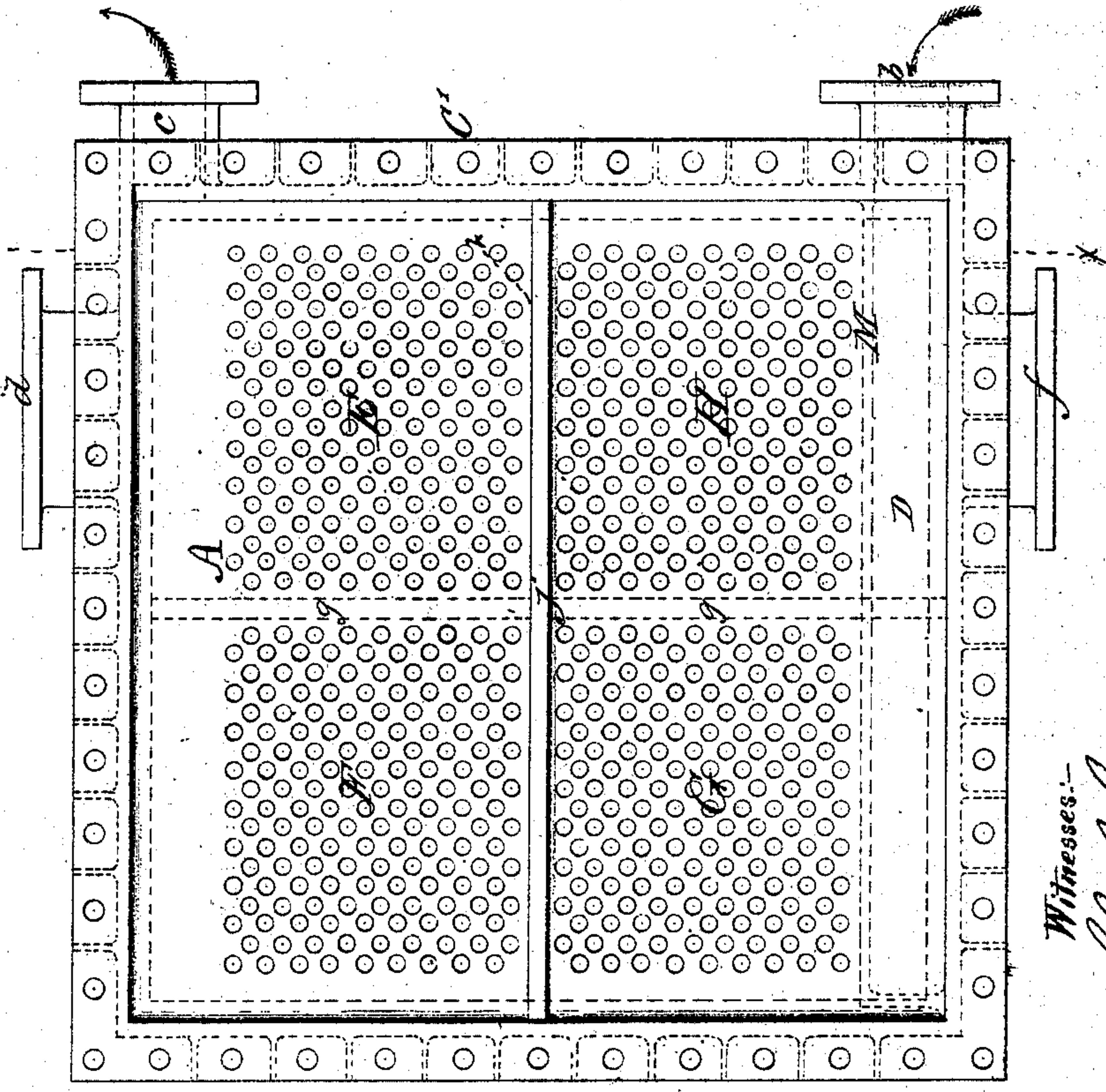
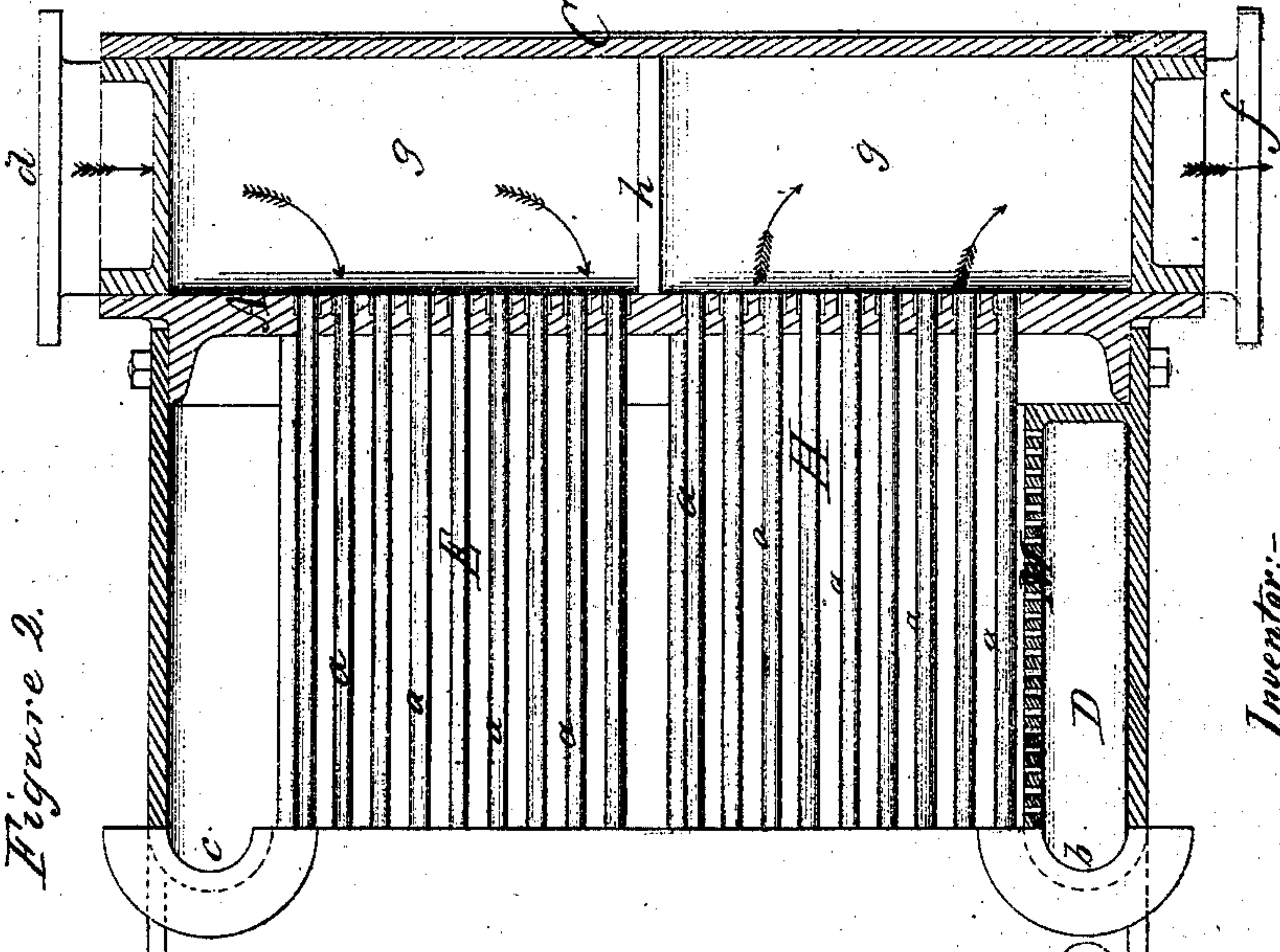


Figure 2.



Witnesses:-

Charles Emery
Wm. H. Lightman

Inventor:-

Wm. A. Lighthall

UNITED STATES PATENT OFFICE.

WILLIAM A. LIGTHALL, OF NEW YORK, N. Y.

IMPROVEMENT IN COMPOUND SURFACE-CONDENSERS.

Specification forming part of Letters Patent No. 116,728, dated July 4, 1871.

To all whom it may concern:

Be it known that I, WILLIAM A. LIGTHALL, engineer, doing business at No. 5 Bowling Green, in the city, county, and State of New York, have invented an Improved Compound Surface-Condenser; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing making a part of this specification.

My invention relates to that form of surface-condenser in which the steam, vapor, or fluid to be condensed or cooled is conducted through the tubes, while the exterior surfaces of the same are exposed to the water, air, or other refrigerating medium. My invention consists: 1st, of a surface-condenser, consisting of a number of tubes exposed externally to a refrigerating medium and combined with partitioned chambers communicating with the interior of the tubes, and arranged in such manner that the steam or vapor to be condensed or the fluid to be cooled is conducted back and forth through different sections of the tubes, and is thereby better distributed over the condensing-surfaces than in the usual method of construction. 2d, of the arrangement of a perforated plate in the case containing the tubes in such manner as to distribute the water, air, or other refrigerating medium equally to all parts of the said case.

In the drawing, Figure 1 represents an end elevation of a surface-condenser for steam-engines, constructed in accordance with my improvements, the outer bonnet of the same being removed to expose to view the ends of the tubes. Fig. 2 represents, in part, a side elevation of the same and, in part, a vertical longitudinal section of the same on the lines *xx* in Fig. 1.

The tubes are designated *a a a*, and are secured at their ends in any approved manner in the tube-sheets A. The whole of the tubes are inclosed in the usual manner in a large chamber or case, B, secured suitably to the tube-sheets, and at each end of the tubes are constructed chambers C C', which communicate with the open ends of the tubes, and are provided with suitable bonnets. At the bottom, preferably, of the case B is arranged a chamber, D, covered by a perforated plate, M. The water, air, or other refrigerating medium is conducted into the chamber D by a suitable pipe, *b*, and passing through the openings in the perforated plate M is distributed

equally to all parts of the case, and rising to the top thereof flows away through a suitable pipe, *c*. The steam or vapor to be condensed is introduced into one of the chambers C, preferably at the top, through a suitable nozzle, *d*, and is conducted back and forth, through different sections of the tubes, to a suitable discharge-opening, *f*, which connects, usually, with the air-pump. The tubes are divided into sections by means of partitions in the chambers C C', so arranged as to direct the steam from one section of the tubes to another, and thus, in effect, form a continuous condensing exhaust-pipe extending from the inlet *d* to the outlet *f*. In the arrangement shown, the chamber C is provided with one long partition, *g*, extending from the top to the bottom of said chamber, and one short horizontal partition, *h*, extending from the partition *g* to the side of said chamber, and the chamber C' is provided with one horizontal partition, *j*, opposite *h* for a portion of its length, extending from side to side of said chamber. The steam entering at *d* passes successively through the tubes in the sections E, F, G, and H, in the order named, and the condensed water and incondensable gases are finally withdrawn through the nozzle *f*. The partitions may evidently be arranged so as to cause the steam to traverse through the condenser any desired number of times.

I am aware that surface-condensers have been made by exhausting the steam through a large number of tubes, but in all such cases the aggregate area of the tubes was so great that the steam was not equally distributed; and I have found by experiment with this kind of condenser that, by reducing the number of tubes through which the steam is required to pass, a much higher rate of condensation per unit of surface is obtained.

In practice I, in most cases, make the area of the tubes in each section equal to or a little greater than that of the exhaust-pipe from the engine. In other cases I so arrange the partitions that the area of the tubes will be greatest in the section to which the steam is first introduced, and gradually diminished in the succeeding sections. The chamber D is provided with suitable hand-holes or other openings, through which mud, sand, or other substances that may be deposited therein, can be readily removed.

It is evident that the apparatus may be used

to condense any vapor or to cool any liquid by passing the same through the tubes in the manner described; so, also, it may be employed to heat air or other gas, or any fluid, by circulating the same by appropriate means through the case B when a heating medium—exhaust or live steam, for instance—is passing through the tubes, as described.

What I claim as new, and desire to secure by Letters Patent, is—

1. The perforated plate M, combined with the receiving-chamber D and tubes *a a a*, substantially as and for the purposes specified.

2. In combination with the above, a compound

surface-condenser, consisting of a number of tubes exposed externally to a refrigerating medium, and combined with partitioned chambers communicating with the interior of the tubes, and arranged in such manner that the steam or vapor to be condensed or the fluid to be cooled is conducted back and forth through different sections of the tubes within one case, when constructed and arranged substantially in the manner and for the purposes specified.

WM. A. LIDTHALL.

Witnesses:

CHAS. E. EMERY,

W. H. WEIGHTMAN.