

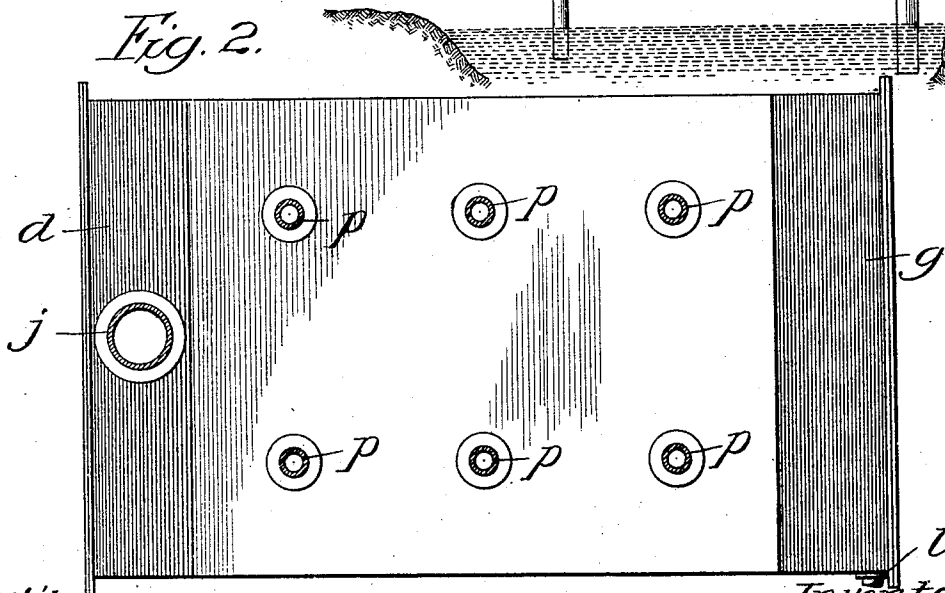
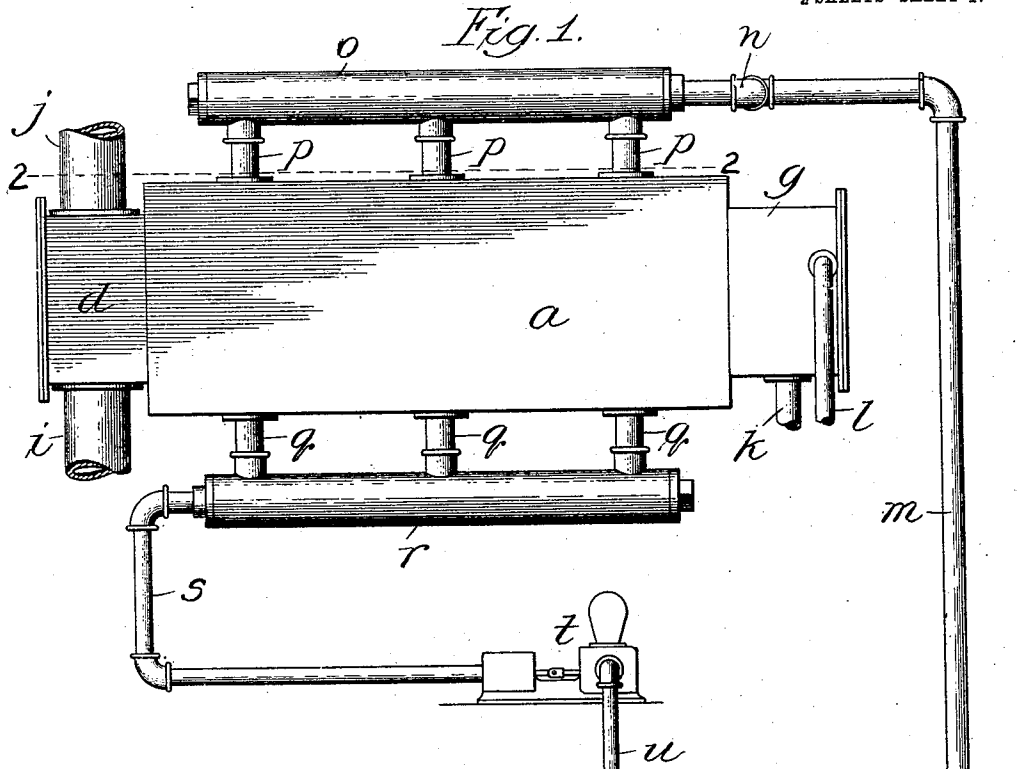
No. 860,620.

PATENTED JULY 16, 1907.

J. M. THOMPSON.  
SURFACE CONDENSER.

APPLICATION FILED AUG. 27, 1906.

2 SHEETS—SHEET 1.

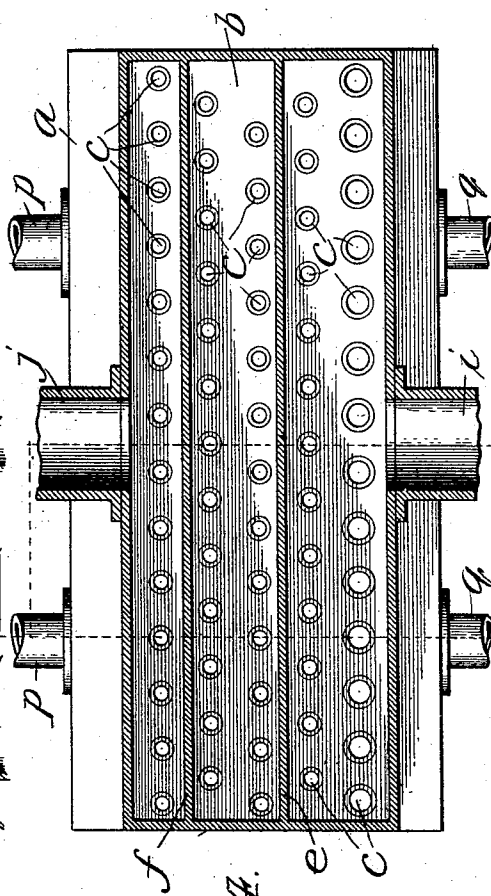
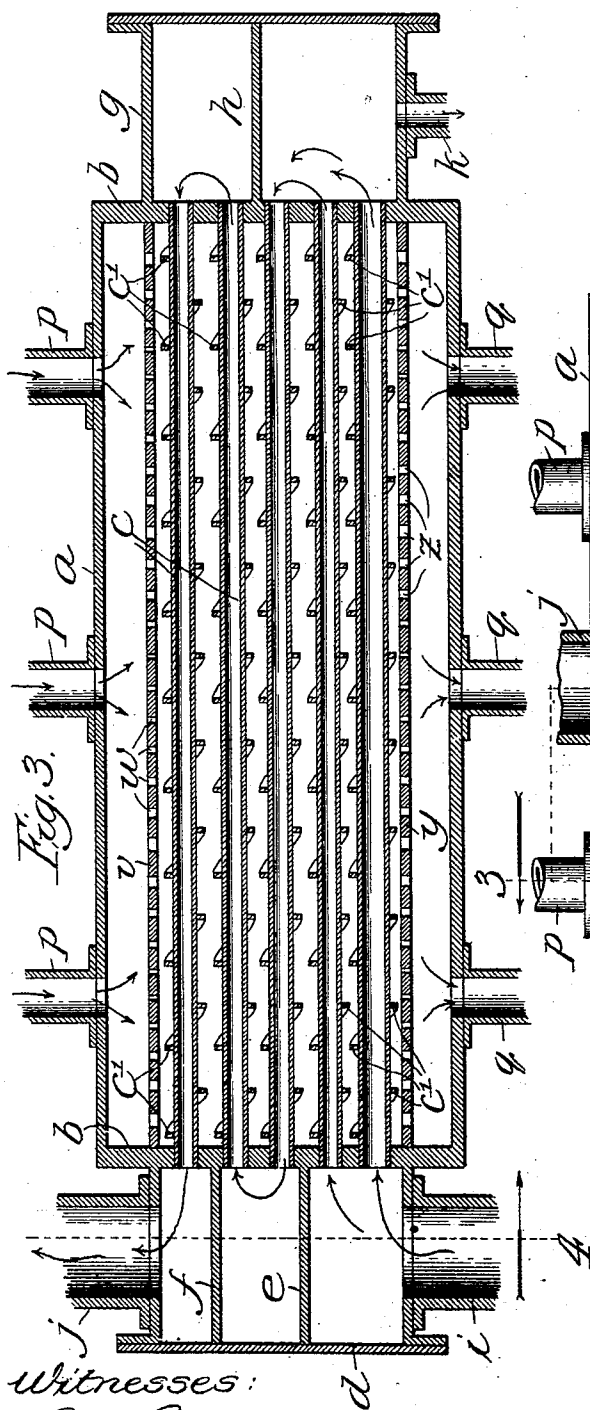


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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

JESSE M. THOMPSON, OF CHICAGO, ILLINOIS.

## SURFACE CONDENSER.

No. 860,620.

Specification of Letters Patent.

Patented July 16, 1907.

Application filed August 27, 1906. Serial No. 332,161.

*To whom it may concern:*

Be it known that I, JESSE M. THOMPSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Surface Condensers, of which the following is a description, reference being had to the accompanying drawings, forming a part of this specification, in which corresponding letters of reference in the different figures indicate like parts.

The object of my invention is to provide a surface condenser for condensing steam or other vapors by means of water, which shall be simple and compact and so constructed as to enable a maximum quantity of vapor to be condensed with a minimum supply of water, by utilizing all the water to the best advantage, whereby the most complete vacuum may be obtained.

To these ends, my invention consists in the combination of elements hereinafter more particularly described and claimed.

In the drawings, Figure 1 is a side elevation of a device embodying the features of my invention, Fig. 2 is a plan view of the condenser taken upon the line 2—, Fig. 1, Fig. 3 is a vertical longitudinal sectional view of the condenser, and Fig. 4 is a vertical sectional view taken upon the line 4—, Fig. 3, viewed in the direction of the arrow there shown.

Referring to the drawings, *a* represents the main body of the condenser, which consists, preferably, of an oblong rectangular casing inclosed upon all sides and having end-plates *b*, Figs. 3 and 4, into which are secured in any well known way a series of substantially horizontal tubes or conduits *c*, said conduits being open at the respective ends as shown. A closed end casing *d* is connected with the end wall *b*, said casing being divided into a series of compartments by means of horizontal baffle-plates *e* and *f*. A similar end casing *g* is connected with the right-hand end plate *b*, which casing is provided with a horizontal baffle-plate *h*.

Communicating with the bottom of the end casing *d* is an induction pipe *i* and at the top an eduction pipe *j*, the former for admitting steam or vapor for condensation, the latter for withdrawing the non-condensable fluids. A pipe *k* leads from the bottom of the end casing *g*, and a pipe *l*, Fig. 1, from the side of said end casing immediately above the baffle-plate *h* to a hot-well or elsewhere for the purpose of removing the water of condensation. A service pipe *m*, Fig. 1, having its lower end in connection with a source of water supply as shown, is extended upwardly and connected by means of a T-union *n*, or in any well known way, with horizontal pipes *o*, one of which is shown in Fig. 1, above the body of the condenser. Each of said last named pipes is connected by means of short pipes *p* with openings in the top plate of the condenser. The bottom plate of said condenser is provided with a series of like openings which are in turn connected by

means of pipes *q* with horizontal pipes *r* communicating by means of a pipe *s* with a pump *t* the eduction pipe *u* of which leads to a well or elsewhere.

Located within the condenser and between the top plate thereof and the upper tier of condensing tubes is a distributing plate *v*, Fig. 3, having a series of perforations *w* therein extending throughout its entire surface, while a corresponding plate *y*, having like perforations *z* therein, is located between the lower tier of tubes and the bottom plate of the casing. The openings in said distributing plates are of varying size, those of the plate *v* nearest the inlet tubes *p* and those of the plate *y* nearest to the outlet pipes *q* being proportionately small, while those farthest therefrom are large, so that the water as it enters and leaves the condenser is evenly distributed throughout the entire area.

In order to cause the heat from the pipes *c* to be radiated as rapidly as possible, I prefer to surround the same with thin ribbons or other projections *c'*, said projections being preferably formed from copper or other metal of high conductivity. In the example shown, the ribbons *c'* are distributed in helical form and soldered or otherwise attached to the tubes, but any other form of projection may answer the purpose.

The operation of my improved condenser is as follows: The steam to be condensed is introduced through the pipe *i* to the lower compartment of the end chamber *d*, whence it is deflected by the baffle-plate *e* into the lower bank of tubes *c*, through which it passes to the lower compartment of the end-chamber *g*. It should here be stated that the condenser should be slightly inclined downwardly towards the right hand, so that all water of condensation will flow into the chamber *g*, that which passes into the lower compartment being discharged through the pipe *k* and from the upper compartment above the baffle-plate *h* through the pipe *l*. The baffle-plate *h* causes the moving vapor to be conveyed back through the middle bank of tubes to the middle compartment of the end casing *d*, from whence it is again deflected by the baffle-plate *f* and conveyed to the upper compartment of the end casing *g*, at which point substantially all of the vapor will have been condensed. The non-condensable fluids pass through the upper tier of tubes to the upper chamber of the end casing *d* and thence through the pipe *j* to any predetermined discharge,—being withdrawn by the action of a suitable pump, not shown, which serves to insure perfect circulation in the condensing pipes. The condensing water is drawn upwardly from a pond, stream, or other source of supply through the pipe *m* by the action of the pump *t*, which causes it to enter the top of the casing *a* preferably under pressure. The openings *w* in the plate *v* are varied in size, as stated, and so distributed that those of the smallest diameter will be located directly opposite to the inlet pipes *p* and those of largest diame-

ter farthest therefrom; the relative size and distribution of said openings being such that, when combined with other factors, such, for example, as pressure, direction of currents, eddies, etc., the discharge over the entire area of the condensing tubes will be approximately uniform. It is also important that the discharge should be subject to similar conditions in order that the water distribution may be substantially uniform over the lower tier of pipes; hence I provide the lower distributing plate *y*, the openings in which are distributed in like manner. Without this latter plate, currents would be formed leading directly towards the discharge openings, in which the water would pass so rapidly as to extract but little heat from the condensing tubes, while eddies would form in the remaining portions in which the water would become excessively hot before being removed. In addition to the distributing plates, the ribbons or radiating projections upon the condensing tubes tend to break up and distribute the condensing water so that all of the particles are brought into direct contact therewith, thereby enabling a given quantity of water to extract the maximum number of heat units. After passing through the openings in the plate *y*, the water is discharged through the pipe *u*.

From the foregoing it will be seen that the water of condensation is removed as rapidly as formed, thereby removing the heat with it, leaving the condensing water to act only upon the remaining uncondensed vapor. Moreover, it is obvious that inasmuch as the coldest water is admitted directly to the upper tier of tubes, in which substantially nothing is present but uncondensable fluids, which are reduced to a temperature as low as that of the condensing water, it follows that the highest possible vacuum may be obtained.

Having thus described my invention, I claim:

1. In a surface condenser, the combination of a plurality of conduits arranged in banks or tiers for the passage

of vapor, chambered end casings communicating with said conduits, means in said chambers for causing said vapors to pass continuously back and forth from a lower to a higher level, means for withdrawing the water of condensation from one of said end casings, means for withdrawing the non-condensable fluids, a casing for inclosing said conduits, means for admitting water to the top of said casing, means for uniformly distributing said water over said conduits, and means for discharging said water.

2. In a surface condenser, the combination of a series of condensing tubes for the passage of vapors to be condensed, means, respectively, for withdrawing the water of condensation as well as the non-condensable fluids, a casing for inclosing the condensing tubes, means for conveying water to and from said casing and a distributing plate within said casing between said tubes and the induction openings leading thereto, said distributing plate having openings therein of varying size, the smaller of which are located nearest the induction openings.

3. In a surface condenser, the combination of a series of condensing tubes for the passage of vapors to be condensed, a casing for inclosing said tubes, means for forcing water under pressure into and out of said casing and perforated distributing plates interposed between said tubes and the induction and eduction openings to said casing, the diameter of the perforations therein being varied with the smallest perforations nearest to and the largest ones farthest from the induction and eduction openings.

4. In a surface condenser, the combination of a plurality of conduits arranged in banks or tiers for the passage of vapor, chambered end casings communicating with said conduits, means in said casings for causing said vapors to pass continuously back and forth from a lower to a higher level, means for withdrawing the water of condensation from the respective compartments of the end casing opposite to that to which the vapor is introduced, means for withdrawing the non-condensable fluids, a casing for inclosing said conduits, means for admitting water to the casing, means for uniformly distributing water over said conduits and means for discharging said water.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses, this 24th day of August 1906.

JESSE M. THOMPSON.

Witnesses:

D. H. FLETCHER,  
CARRIE E. JORDAN.