F. J. LOOMIS.

CONDENSER.

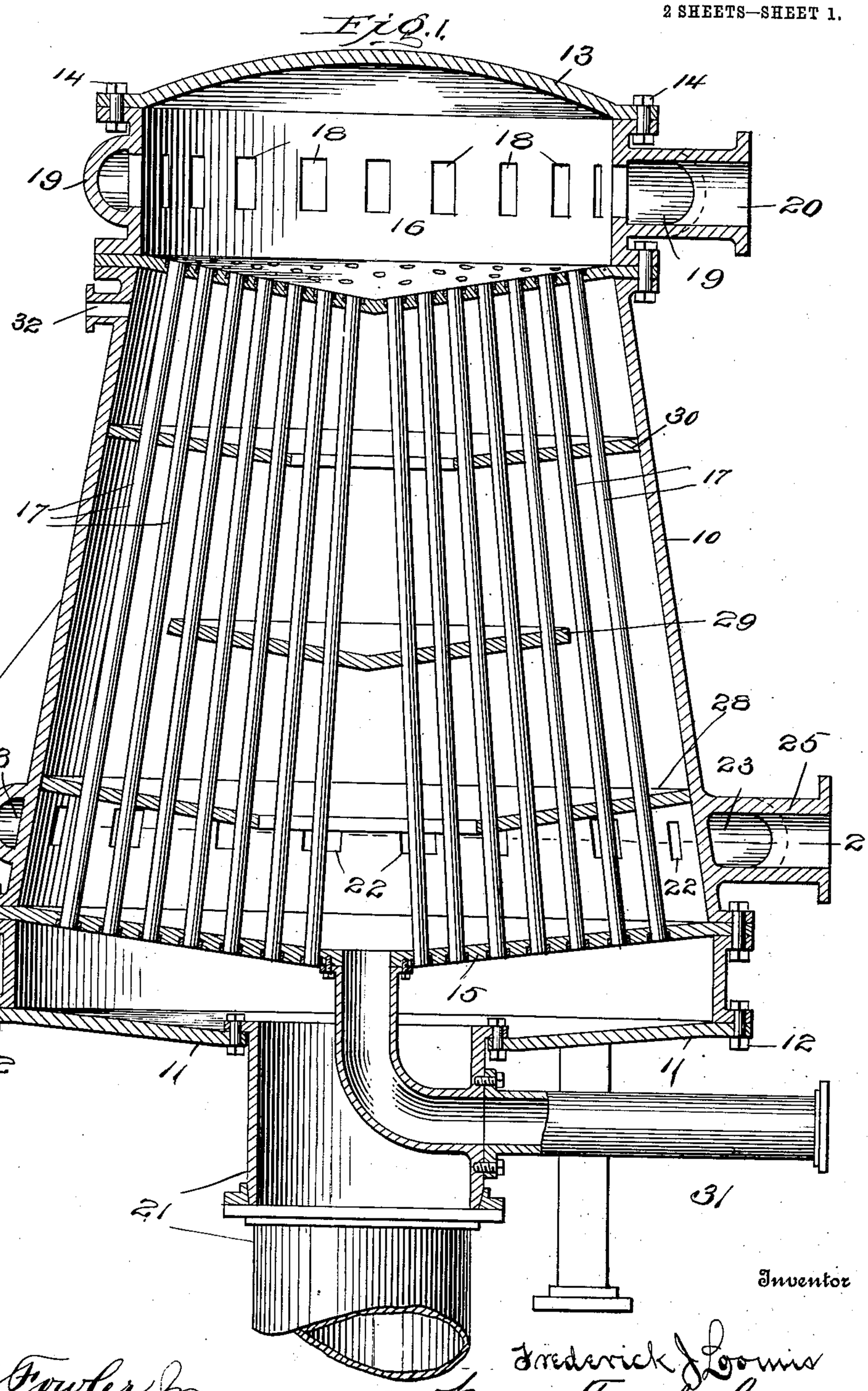
APPLICATION FILED JULY 18, 1908.

946,238.

Patented Jan. 11, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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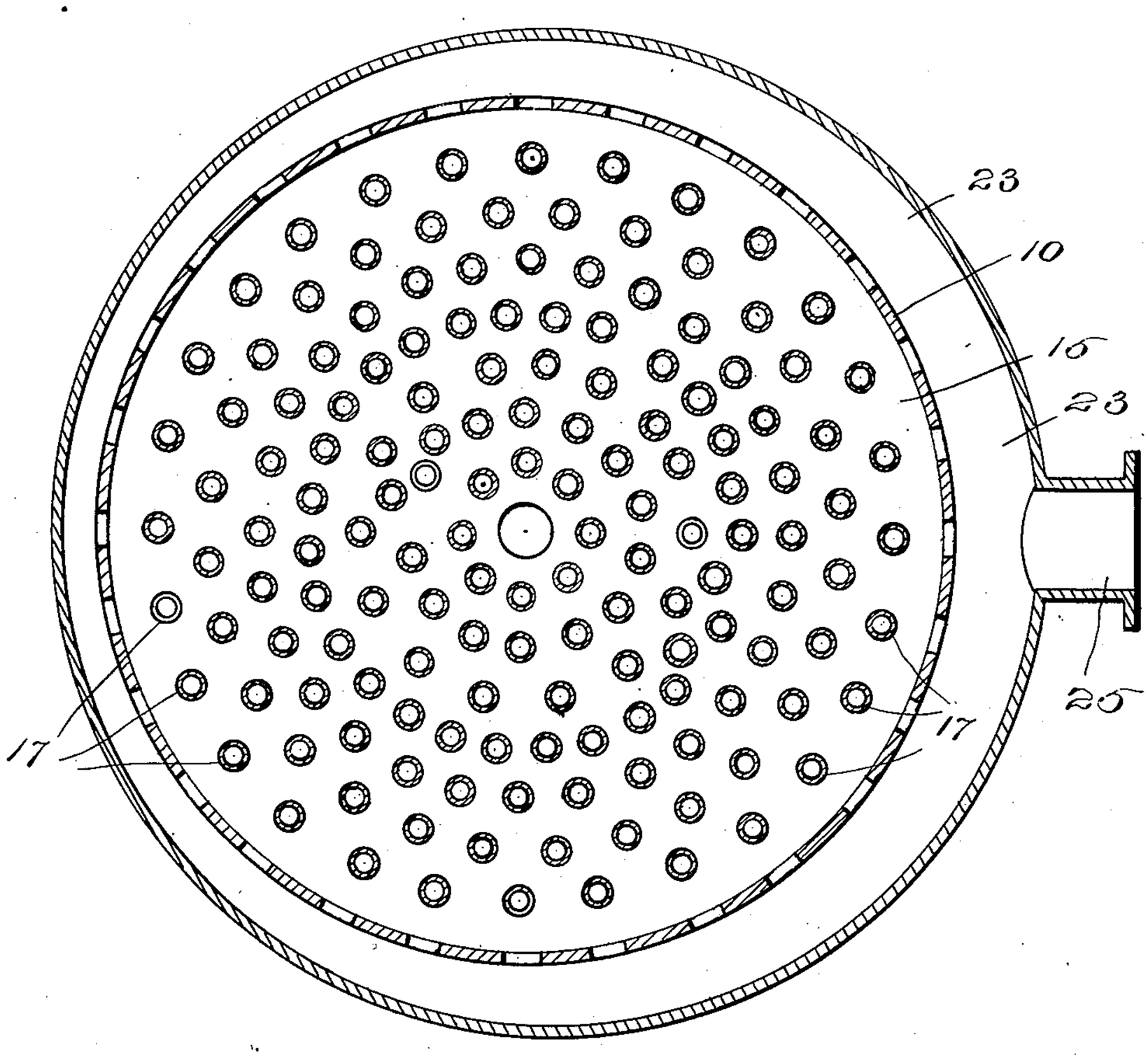
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

FREDERICK JAMES LOOMIS, OF YONKERS, NEW YORK.

CONDENSER.

946,238. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed July 18, 1908. Serial No. 444,214.

To all whom it may concern:

Be it known that I, FREDERICK J. LOOMIS, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Condensers; 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.

This invention relates to condensers, and especially to that class of condensers ordinarily known as surface condensers, and has for an object to provide an upright condenser with vertical tubes by which pitting or electro-voltaic action on said tubes is prevented owing to the fact that vertical tubes will prevent the lodgment of any particles of air, or particles of impurities which may give rise to electrolysis.

A further object is to provide a condenser embodying an unusual amount of condensing surface and so arranged that the volume of steam introduced into the condensers is first provided with space to accommodate such volume and the space diminishing as the volume of steam diminishes under condensation.

A further object of the invention is to provide a condenser wherein the water of condensation is led away at the very highest degree of heat possible with condensation whereby the water is re-used and at a temperature very little lower than steam, thereby economizing fuel consumption in reconverting the condensed water into steam.

A further object of the invention is to provide improved means for supplying cooling medium to the cooling surfaces within the condenser jacket.

A further object of the invention is to provide baffle plates within the condenser jacket whereby the steam is brought successively into contact with several portions of the same cooling surfaces.

With these and other objects in view, the invention comprises certain novel constructions, combinations and arrangements of parts, as will be hereinafter fully described and claimed.

In the drawings;—Figure 1 is a view in vertical, diametrical section of the improved condenser. Fig. 2 is a transverse, horizontal, sectional view of the improved condenser taken on line 2—2 of Fig. 1.

Like characters of reference designate corresponding parts throughout the several views.

The improved condenser forming the subject matter of this application comprises a jacket 10 composed of cast or sheet material formed frusto-conically and supported upon a base 11 to which it is secured in any usual and well known mechanical manner as by the bolts 12 shown at Fig. 1. The jacket is also provided with a head 13 secured on the upper end of the jacket by any usual and improved means as the bolts 14. Within the jacket 10 the lower tube sheet 15 is secured, preferably, though not essentially, dished centrally, and the upper tube sheet 16 is secured adjacent the upper end and also similarly dished. Between the lower tube sheet 15 and the upper tube sheet 16 numerous tubes 17 are erected inclined to a vertical with the lower ends of the said tubes relatively spaced farther apart than the upper ends whereby both the upper and the lower portions of the conical jacket are occupied by tubes. Between the head 13 and the tube sheet 16 numerous openings 18 are formed through the jacket 10 and a feeder 19 is secured externally of the jacket in communication with the openings 18 and also communicating with a pipe 20 by which water or other cooling agent is supplied between the head 13 and the tube sheet 16 and to the tubes 17. The water passing downwardly through the tubes 17 is received in the space between the tube sheet 15 and the base 11 and passes out through the pipe 21 and is discharged. Adjacent to the lower end of the cone and above the tube sheet 15 numerous openings are provided communicating with the passage 23 formed about the cone by the chamber 24. This latter chamber is provided with a pipe 25 by which exhaust steam from the prime mover, as an engine of any type, is received, and passes into a chamber 23 and through the opening into the base of the cone about the base of the tube 17.

It is desirable to bring the steam into contact with the tubes 17 as often as possible and for such purposes baffle plates 28, 29 and 30 are employed, 28 and 30 preferably engaging the inner periphery of the jacket 10 and provided with central openings while the baffle 29 is centrally closed and its periphery spaced away from the inner periphery of the jacket so that

steam coming into contact with the baffle 29 will be spread and passed about the edges of such baffle plate, thence above the baffle 29 and through the central openings of the baffle 30 and again into contact with the pipe 17 above such baffle, provided the steam has not, prior to that time, been fully condensed. The water of condensation flows out through the pipe 31, thence to the air pump and hot well and is then fed to the boiler to be reconverted into steam.

To prevent the possible accumulation of air and incondensable vapors in the upper part of the conical jacket 10 and also to assist in the formation of the vacuum for the introduction of the steam, pipes 32 are provided which may be connected with any convenient source of exhaust as the dry air pump.

Condenser tubes, as ordinarily used, are made of brass, bronze or copper, or other metal, and are placed in a condenser in a horizontal position. On account of the low velocity of the water and because the water contains natural and foreign substances, a solid incrustation forms particularly on the lower half of the inside of the tubes and gaseous bubbles adhere to the upper inside surface. This incrustation, and the gases contain substances which cause what is known as pitting, or dezincification. This invention will help to overcome electro-voltaic action due to deposited particles, or gases, because the tubes being vertical, gravity will tend to prevent them adhering to the inside of the tubes and will also assist in giving greater velocity of flow to the cooling liquid and then wash them away.

In condensers of common construction the water of condensation as it flows down through the condenser is brought in contact with cool water until it is finally removed after passing through the lowest nest of tubes containing the coldest circulating water. As a result it leaves the condenser at a temperature considerably lower than the entering exhaust steam. In my invention the water of condensation travels against the entering steam, air and incondensable vapors instead of with them and meets when leaving the condenser the entering steam so that it is at a high temperature and gives good economy as boiler feed water. If high ranges of vacuum are required a "dry" air pump can be connected to the pipes 32 and the air and incondensable vapors can be drawn off in cool condition, as they come in contact with the coldest water, and hence are in the best condition to be compressed and discharged at atmospheric pressure.

What I claim is:

1. In a condenser of the character described, a frusto-conical steam chamber, a water chamber located at the top of the steam chamber, diaphragms, with central openings, located adjacent to the top and bottom of the steam chamber, an intermediate diaphragm of less area than the first named diaphragms, a water circulating chamber encircling the said water chamber and communicating therewith through apertures in the walls of the water chamber, means for admitting water to the water chamber, a water discharge chamber located at the bottom of the steam chamber, inclined water circulating cooling tubes having their ends connected with the upper and lower chambers, a circulating chamber encircling and communicating with the lower end of the steam chamber, and means for admitting steam to the circulating chamber and the lower end of the steam chamber.

2. In a condenser of the character described, a frusto-conical steam chamber, a number of inclined water circulating cooling tubes having their upper and lower ends mounted in the top and bottom of said steam chamber, a water receiving chamber at the top of said steam chamber communicating with said tube, a water circulating chamber encircling said water chamber, and having a number of openings communicating with said chamber, means for supplying water to said encircling chamber, a water discharge chamber located at the bottom of said steam chamber and communicating with said water circulating tubes, a water discharge pipe communicating with the bottom of said steam chamber, and upper and lower diaphragms in said steam chamber each having an opening, an intermediate diaphragm of less area than the upper and lower diaphragm, a steam circulating chamber extending about the lower end of said steam chamber and having openings communicating therewith, and a steam inlet pipe connected with said steam circulating chamber.

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

FREDERICK JAMES LOOMIS.

Witnesses:

ROBERT T. ROBERTS,

HAROLD K. BEACH.