

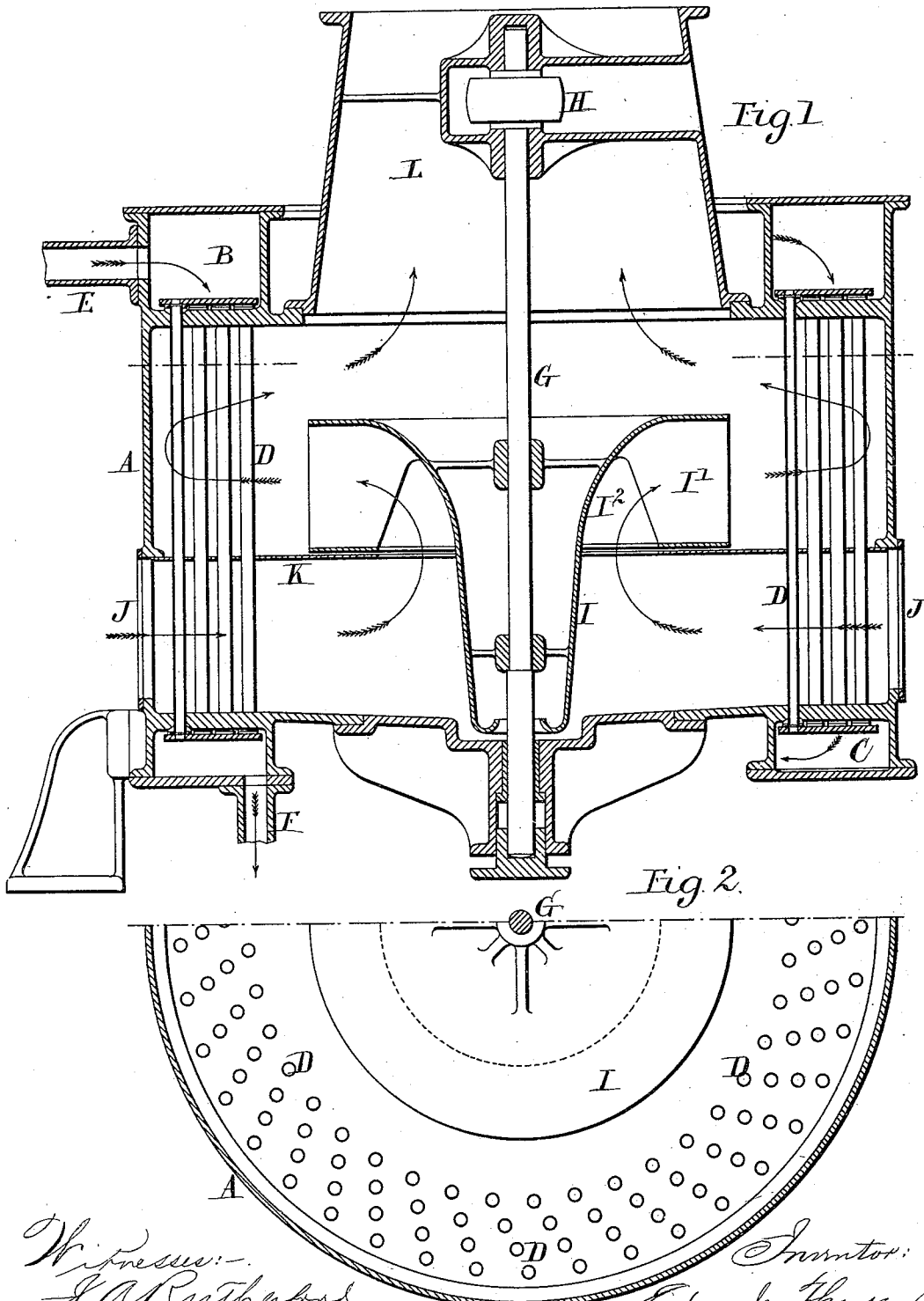
(No Model.)

3 Sheets—Sheet 1.

E. THEISEN.
APPARATUS FOR CONDENSING STEAM.

No. 463,467.

Patented Nov. 17, 1891.



Witness:
J. A. Ruthford
Robert Everett

Inventor:
Edward Theisen
By James D. Norris.
Attorney

(No Model.)

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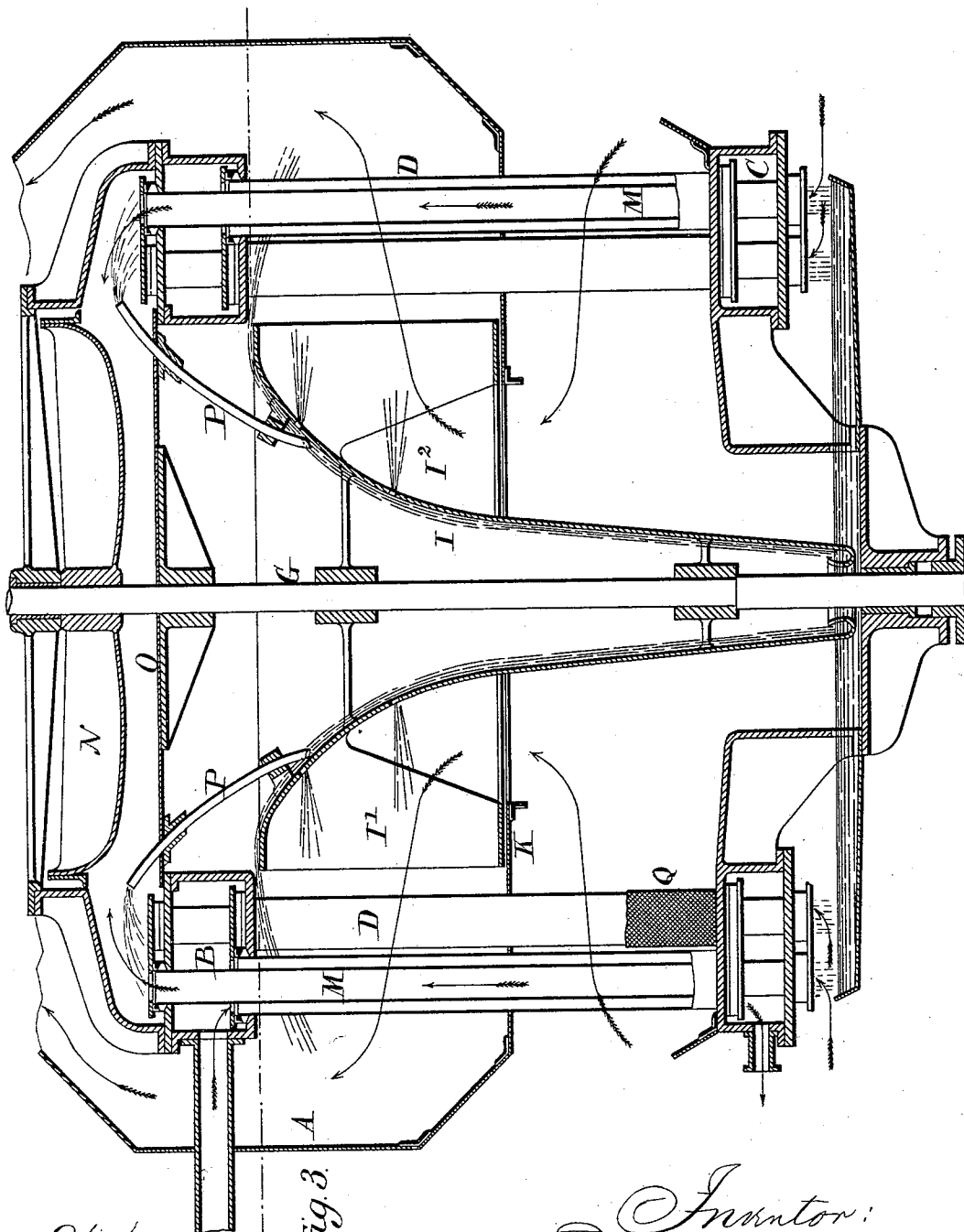


Fig. 3.

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(No Model.)

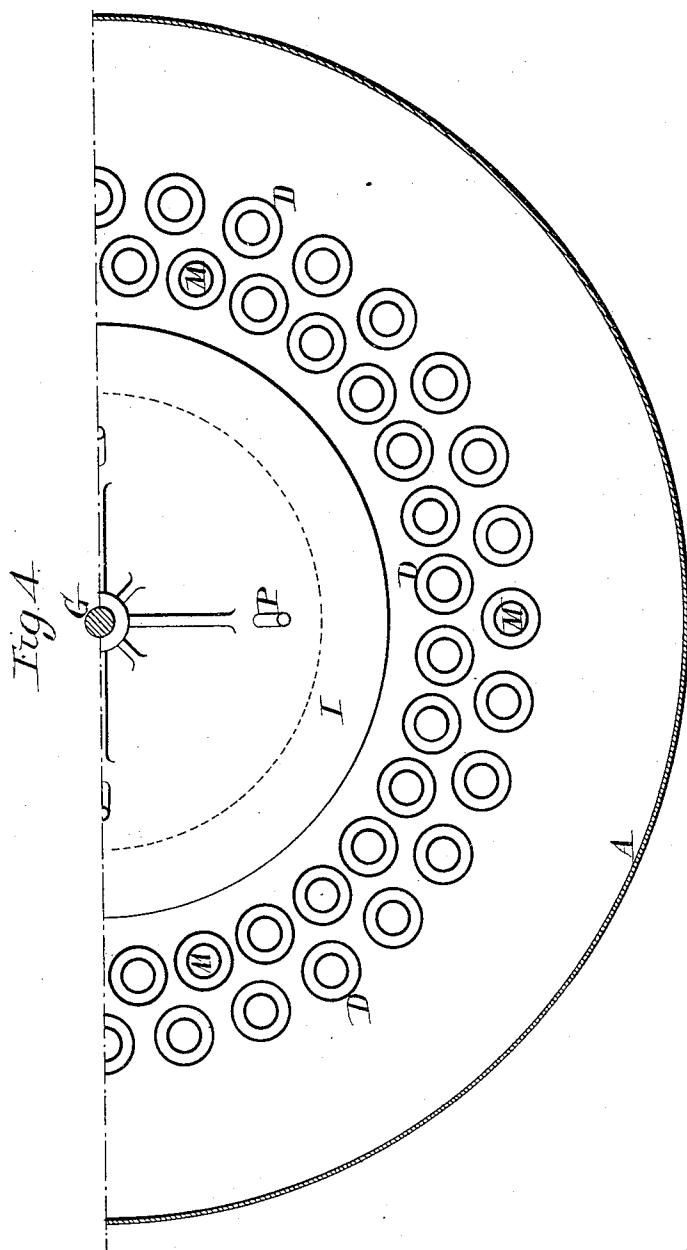
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Patented Nov. 17, 1891.



Witnesses:
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UNITED STATES PATENT OFFICE.

EDUARD THEISEN, OF SINZIG, GERMANY.

APPARATUS FOR CONDENSING STEAM.

SPECIFICATION forming part of Letters Patent No. 463,467, dated November 17, 1891.

Application filed July 9, 1891. Serial No. 398,967. (No model.)

To all whom it may concern:

Be it known that I, EDUARD THEISEN, a citizen of the United States, residing at Sinzig on the Rhine, in the German Empire, have invented new and useful Improvements in Apparatus for Condensing Steam and other Condensable Vapors, of which the following is a specification.

In the specification to my patent, No. 445,096, dated January 20, 1891, was described an apparatus for condensing steam and other condensable vapors, wherein the exhaust-steam was made to pass into a series of horizontal tubes arranged round a central fan by which air-currents were propelled against the outer surfaces of the said tubes, while at the same time water was also propelled by centrifugal action onto the tubes from pipes or receptacles revolving with the fan, thereby effecting the condensation of the steam by the rapid evaporation of the thin films of water flowing over the tubes.

According to my present invention, instead of arranging the said tubes into which the exhaust-steam is made to pass in a horizontal position, I arrange them vertically, for which purpose I construct the said apparatus as follows:

I will proceed to describe with reference to the accompanying drawings, in which—

Figure 1 shows a vertical section, and Fig. 2 a sectional plan, of one arrangement.

A casing A has annular chambers B and C formed at its upper and lower ends, which chambers are connected together by annular rows of tubes D D, so that exhaust-steam or vapor entering the upper chamber B through a branch pipe E will pass down through the tubes D to the lower chamber C, which is connected by a pipe F with the air-pump or exhaust.

Centrally in the casing is a vertical shaft G, driven at its upper end by a pulley H and belt from any suitable motor, and on which is fixed a trumpet-mouthed shell I, having its lower end curved inward to form an annular cup situated within a central recess of the bottom of the casing, while the upper end has wings or vanes I' fixed or formed on its under side, so as to constitute a fan into the central annular opening I' of which air is drawn and from the circumference of which it is propelled onto the outer surfaces of the tubes.

For the admission of the air supply-openings J are formed in the lower part of the casing, and from the side of the latter, just above such openings, a partition K extends to the opening of the fan. Thus the air entering through the openings J passes in contact with the part of the tubes D situated below the partition on its way to the fan, thus taking up heat from the tubes, and is then thrown in contact with the upper parts of the tubes. At the same time water introduced through a pipe into the bottom of the casing is caught up by the cup-shaped bottom of the shell I, which may also contain scoops to assist in raising the water, and this is then raised up by centrifugal action on the surface of the shell, from the upper edge of which it is thrown onto the pipes, down which it flows and from which it is partially evaporated by the air-currents, thus producing the requisite cold for condensing the steam within the tubes. The resulting water of condensation flows into the chamber C, from which it is drawn by the air-pump, while the air charged with aqueous vapor passes off from the casing through the tube L. Holes can be made in the shell I at different heights, through which a portion of the water rising along the shell would be thrown on to intermediate points of the tubes.

Fig. 3 shows a vertical section, and Fig. 4 a part sectional plan, of a modification, in which the steam-tubes D are made of larger diameter and have inner tubes M passing through them. These inner tubes pass right through the upper and lower chambers B and C, above which they are open to the casing, which in this case is extended beyond the chambers B and C.

In the upper extension is placed an exhaust-fan N, such as a Blackman air-propeller, also fixed on the shaft G; and between this fan and the lower one I' is a disk-shaped partition O, carried by and revolving with the fan. By this means the fan N is made to draw the outer air up through the tubes M, while at the same time water is made to flow into the upper ends of these tubes from a pipe P, passing through the partition O, the lower end of which pipe takes up water from the surface of the shell I, and which in revolving with the shell throws the water by centrifugal action into the tubes M. The

outer surface of the outer tubes D, as also, if required, the inner surface of the inner tubes M, may be covered with wire-gauze or coiled wire, as indicated at Q, which has the effect
 5 both of insuring the uniform wetting of the whole surface of the tube and also of offering increased evaporative surface, and consequently greater condensing power.

Having thus described the nature of my invention and the best means I know for carrying the same into practical effect, I claim—

1. In an evaporative surface condenser, the combination of a casing having upper and lower annular chambers connected, respectively,
 15 with a supply of exhaust-steam or other vapor and with an exhaust or air pump, vertical tubes connecting the said upper and lower chambers and arranged in concentric circular series between the same, a vertical
 20 revolving shaft situated centrally within the space inclosed by said tubes, and a trumpet-mouthed shell carried by said shaft and provided on its outer surface with blades or vanes by which air is propelled by centrifugal action
 25 against the said vertical tubes, while the inner surface of the shell serves to raise water by centrifugal action and to throw the same from its upper edge onto the said tubes, substantially as described.

2. In an evaporative surface condenser, the combination of a casing with upper and lower annular chambers connected, respectively,
 30 with the supply of exhaust-steam or other vapor to be condensed and with an exhaust or air pump, circular rows of tubes connecting
 35 said upper and lower chambers, which tubes have their outer surface covered with wire-gauze or equivalent device, and means for propelling both air-blast and water by centrifugal action from the center of the casing
 40 onto the said outer surfaces of the tubes, substantially as described.

3. In an evaporative surface condenser, the

combination of the casing A, having openings J for the supply of air, the annular chamber
 45 B, connected with a supply of exhaust-steam or other vapor to be condensed, the annular chamber C, connected with an exhaust or air pump, vertical tubes D, connecting said chambers B and C and arranged in concentric
 50 circular series between the same, a vertical shaft G, arranged centrally in the space inclosed by said tubes, the shell I and fan I', carried by said shaft for supplying water and air by centrifugal action onto the vertical
 55 tubes D, and the partition K for directing the air-supply to the center of the fan, substantially as described.

4. In an evaporative surface condenser, the combination of the casing A, having upper
 60 and lower chambers B and C connected, respectively, with a supply of exhaust-steam or other vapor to be condensed and with an exhaust or air pump, the vertical tubes D, connecting the said upper and lower chambers
 65 and arranged in concentric circular series between the same, the inner tubes M, passed through the chambers B C and tubes D, the central vertical shaft G, the shell I and fan I', carried by shaft for the purpose of supplying
 70 water and air by centrifugal action onto the vertical tubes D, and the exhaust-fan N, attached to the upper end of said shaft, substantially as described.

In testimony whereof I have signed my
 75 name to this specification, in the presence of two subscribing witnesses, this 27th day of June, A. D. 1891.

EDUARD THEISEN.

Witnesses:

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