(No Model.)

N. A. CHRISTENSEN.

CONDENSING APPARATUS.

No. 502,922. Patented Aug. 8, 1893.

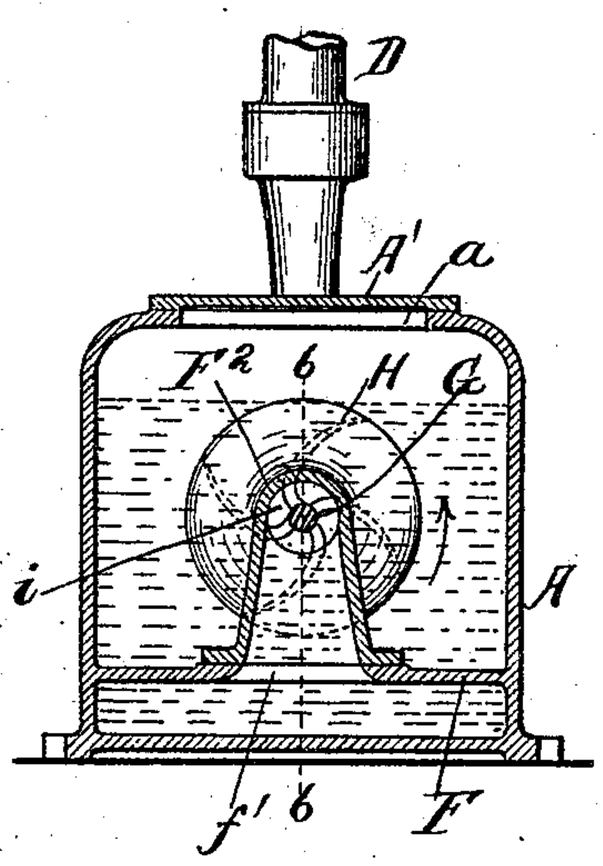

Fig 3

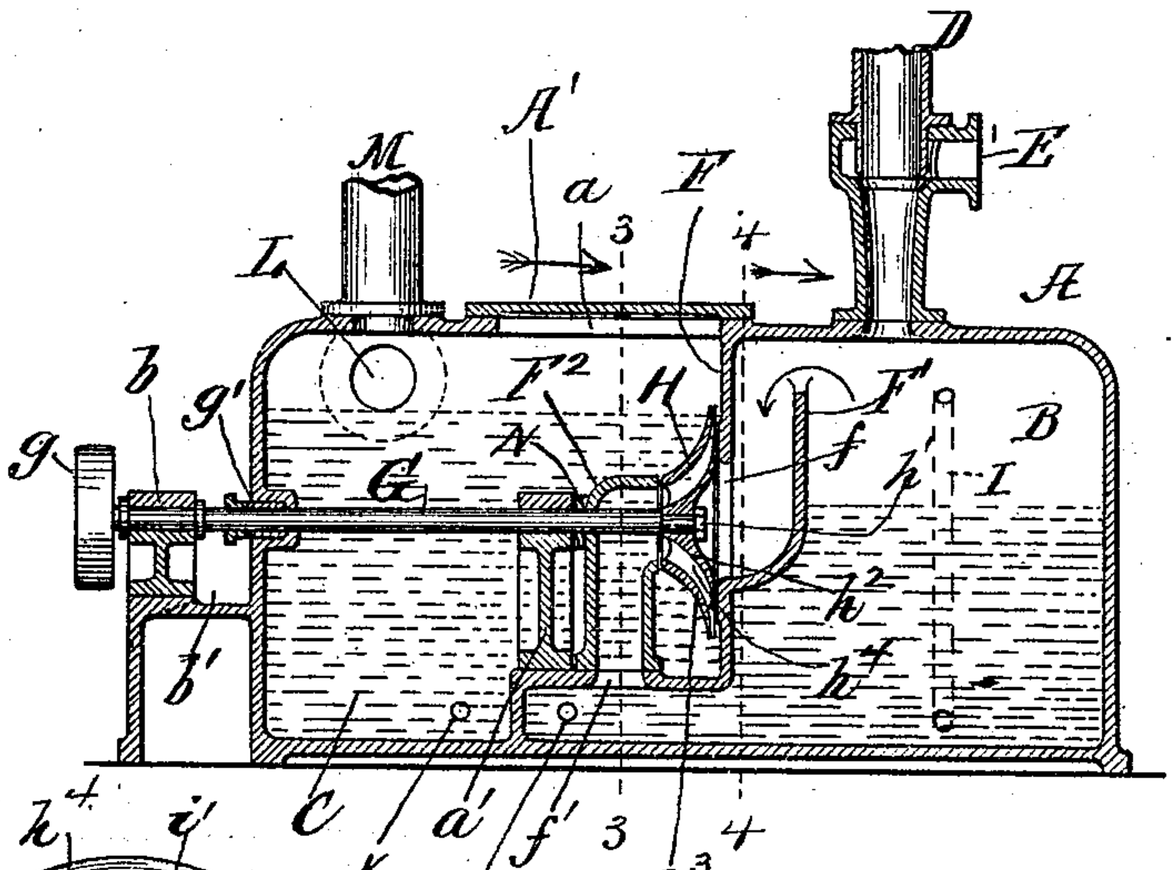

Fig 2

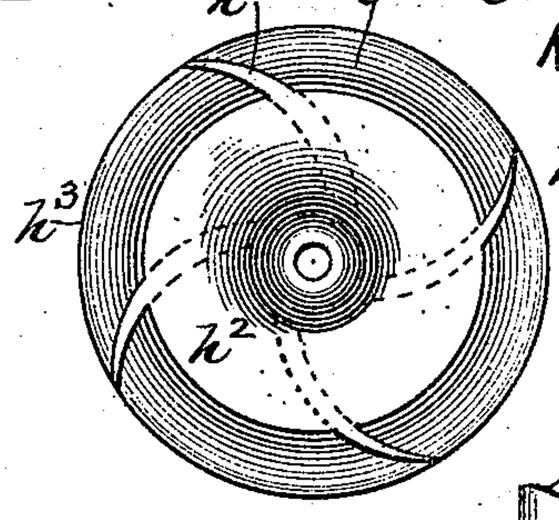

Fig 5

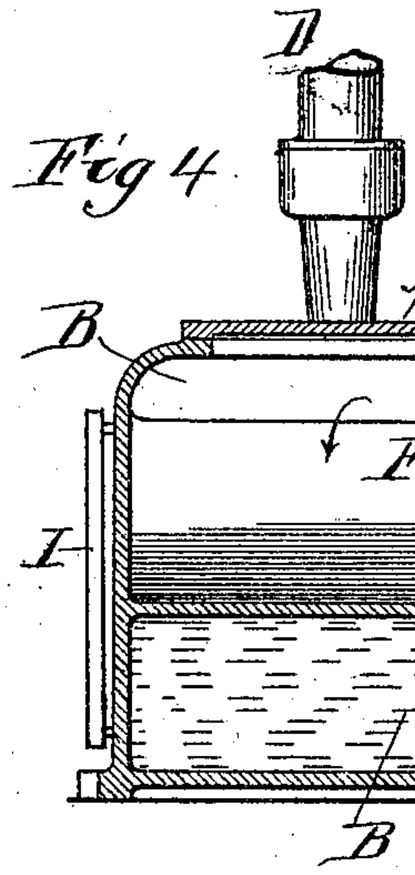

Fig 4

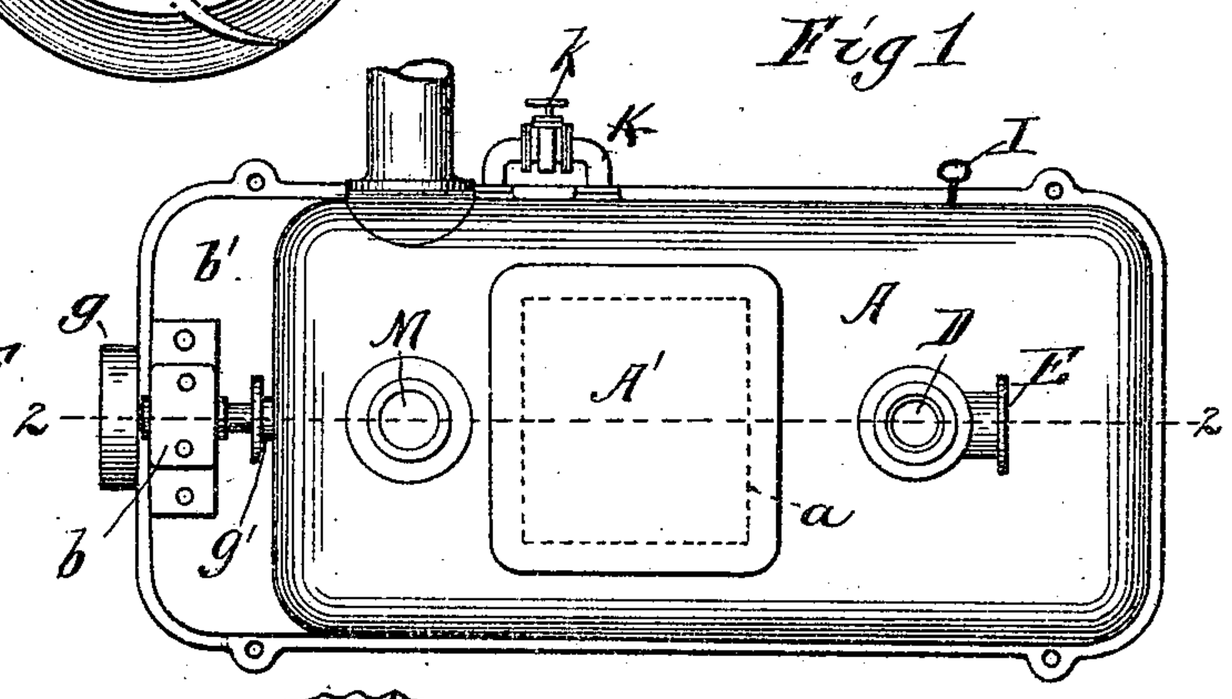

Fig 1

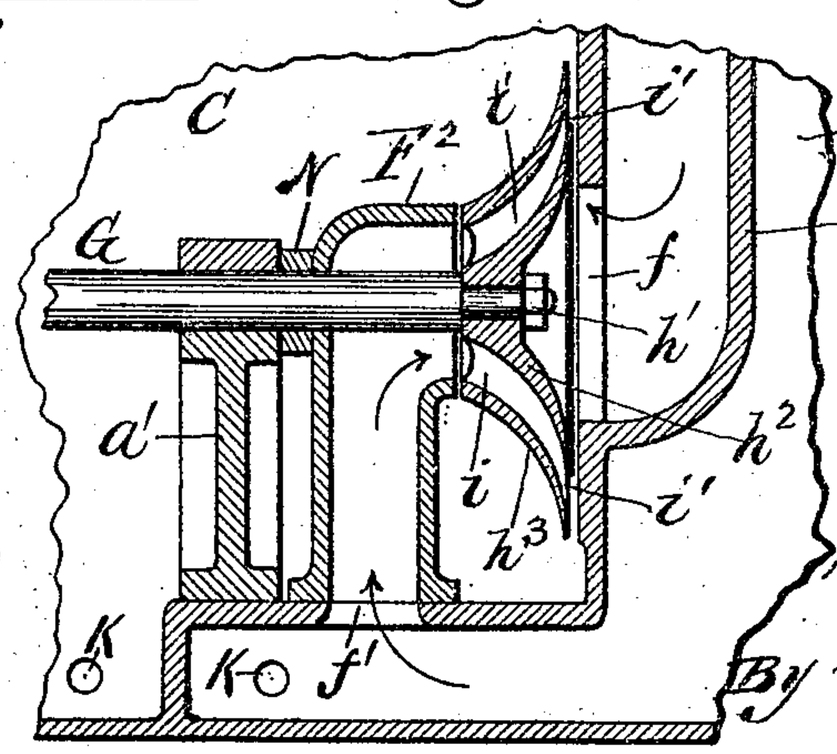

Fig 6

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UNITED STATES PATENT OFFICE.

NIELS ANTON CHRISTENSEN, OF CHICAGO, ILLINOIS.

CONDENSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 502,922, dated August 8, 1893.

Application filed May 31, 1892. Serial No. 434,895. (No model.)

To all whom it may concern:

Be it known that I, NIELS ANTON CHRISTENSEN, a subject of the King of Denmark, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Condensing Apparatus, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of my improved condensing apparatus, embodying my invention. Fig. 2, is a vertical longitudinal section of the same, taken on the line 2—2, of Fig. 1. Fig. 3, is a detail cross-section of the same, taken on the line 3—3, of Fig. 2, and looking in the direction of the arrow. Fig. 4, is a detail cross-section, taken on the line 4—4, of Fig. 2, and looking in the direction of the arrow. Fig. 5, is a rear elevation of the double disk or shell, detached; and Fig. 6, is a detail section of the shell and the central partition. Figs. 5 and 6 are on an enlarged scale.

My invention relates to improvements in centrifugal pumps for exhausting steam from engines, or vacuum pans in distilleries, or from any machine using steam where it is desirable that the steam should be exhausted; and my improvement consists in the arrangement in a chamber of the pump of a double disk or shell, cone-shaped, with its inner surfaces converging as they extend outwardly, in such a manner as to leave a thin wedge-shaped opening between the inner and outer disks of the shell at their outer edges, with partitions between the disks also curving and secured to the inner surfaces of the disks and holding them in their proper position, the whole forming a kind of turbine-wheel acting inversely, so that instead of obtaining power by water falling on the wheel, water may be raised by applying a power to the shell, so that condensed steam or water may be thrown from the condensing chamber into an adjoining chamber, in which the air or gas and water being completely separated, the water flows out through a discharge pipe and the air escapes through a ventilator connected with said chamber.

My invention consists further in the arrangement of inlet steam pipes with cold water pipes, so arranged as to flow into the first chamber in the pump at the same time; and in various walls or partitions in said pump, so separating the different sections that the water and air or other gases can be withdrawn by the action of the blades arranged in the disks as hereinafter stated, and my invention consists of other devices hereinafter described.

In the drawings, A represents the outer casing of a centrifugal pump containing my invention. This chamber A is divided into two compartments B—C.

D is a steam inlet pipe, broken at the top. It is directly connected with the chamber containing the steam which is to be exhausted.

E is a pipe connected with a cold water-pipe and which opens by means of a suitable valve controlled by the operator into the steam pipe D, for the purpose of condensing the descending steam by a stream of cold water flowing into it. The chamber B receives the condensed steam.

F is a partition or wall dividing the chambers B and C. This partition has openings *f*—*f'* through which the water and air with other gases are drawn from the chamber B into the chamber C, as hereinafter stated.

All the different parts are of metal, preferably iron or steel. The pump case A has an opening, *a*, in its surface. This opening is covered by the removable cap, A', and is for the purpose of obtaining access to the interior of the casing and the devices therein contained.

F' is a diaphragm or division plate with its lower end attached to and extending in a curve a short distance from the partition F at the lower part of the opening *f* and thence vertically until it reaches a point between the upper end of the opening *f* and the casing A, as clearly shown in Fig. 2. The casing A, partition F and diaphragm F' may be cast in one piece.

F^2, is a hood attached to and supported by the partition F as shown in Fig. 3. The water from the chamber B rises into the hood F^2 through the opening *f'* in the partition F until it reaches the double disk, or wheel, H, by which it is forced into the chamber C by centrifugal force, as hereinafter described.

G, is a shaft, having a bearing at its inner end in the pedestal, *a'*, which rests upon and is secured by any suitable means to the partition F. The shaft G at its outer end ex-

tends through the stuffing box, g', in the casing A and has a bearing at its outer end in the bearing box, b, which is rigidly secured to the platform, b', at the end of the casing A, as shown in Fig. 2. The shaft G is driven by a pulley, g, as shown in Fig. 2, or it may be actuated by any suitable means.

On the inner end of the shaft G is mounted the double disk or shell H, which is rigidly secured by any suitable means to it. This shaft is reduced in size and forms a shoulder to assist in holding the shell H in position. The end of the shaft is screw-threaded and adapted to receive a nut, h', and the shell H is secured between the shoulder and the nut h'. The shell H is composed of two disks, which may be designated as an inner disk, h^2, and an outer disk, h^3, which are connected with each other by partitions, h^4. Both disks and the partitions are, or may be cast in one piece, as shown in Fig. 2. The inner disk h^2 is directly mounted on the shaft G and the outer disk h^3 is held in its position by the partitions h^4, which separate the disks and are at right angles to each disk at any given point. The disks h^2 and h^3 are separated from each other at their inner edges or ends, the distance being regulated by the size of the shell required and each disk curves outwardly from its inner edge on different curves, so that there is only a thin wedge-shaped opening between the two disks at their outer edges through which water is, or may be thrown. Both disks are concave on their upper surfaces. There may be any number of partitions h^4; I have shown four in the drawings. The partitions h^4 conform in their shape to the curved surfaces of the outer and inner disks of the shell H, being wider at their inner ends and gradually coming to a point at their outer ends. The inner end of the shaft G is placed at such a distance from the partition F, and the shell or wheel H is so mounted on its shaft, that whatever the size of the shell or wheel may be, the outer edges of the disks h^2 and h^3 will extend very near to the inner end of the partition F, leaving only a small opening, i', as shown in Fig. 6, for the passage of the air and other gases, which are drawn or sucked by the action of the shell H over the diaphragm F', (which does not extend to the top of the casing A) and into the opening f from which it is drawn off by the water that is thrown out by the shell or wheel, as before stated, into the chamber C. As before stated the water which rises into the hood F^2 is drawn from thence or sucked into openings i between the disks h^2 and h^3 of the shell or wheel H and is thrown out of the shell or wheel H between the outer edges of the disks and into the chamber C.

A waste pipe, L, is provided in the chambet C through which all surplus water, accumulated in this chamber, will, after it reaches a certain height, pass off out of the pump.

M is also a pipe opening from the chamber C through which the air and other gases, thrown into the chamber C, may be conducted out of the pump.

I is a water gage secured to the chamber B which indicates the height of water in the chamber.

K is a by-pass or pipe leading from the chamber B to the chamber C. This pipe is outside of the chambers, as seen in plan in Fig. 1, and is located near the bottom of the chambers, with each of which it connects, as seen in Figs. 2 and 6, where the openings of this pipe into the respective chambers are shown and marked with the said letter K; there is also in this pipe, outside of the chambers, a valve, or gate, k. Said gate valve k is for the purpose of keeping the proper normal water level in the chamber B and whenever the water gets below a certain level in the chamber B, the valve k is opened and the water is allowed to flow from the chamber C into the chamber B; the exact amount of opening of the valve k will soon be found by experiments.

N is a rubber washer mounted on the shaft G between the pedestal a and the hood F^2 and is for the purpose of preventing water from escaping, either from the hood or from the chamber C.

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

1. In a condensing apparatus, a shaft mounted on suitable bearings, a cone-shaped shell composed of an outer and inner disk, curved outwardly on different curves and separated from each other by a space gradually diminishing in width outward to a thin slit extending around their outer edges, and partitions dividing the space between the disk curved to a point, in combination with a chamber for receiving and condensing steam, and a chamber for receiving the condensed steam with gases, said chambers being so arranged with reference to each other and with reference to said shell that the water may be taken from the first chamber into said shell and thrown by the revolution of said shell into the second chamber, substantially as described.

2. In a condensing apparatus, an outer casing separated into two compartments with suitable openings in the same, an inlet pipe leading from a steam compartment to be exhausted into one of said chambers with a cold water pipe leading in said inlet pipe, and a cone-shaped shell composed of an outer and inner disk curved outwardly on different curves and separated from each other at their inner edges with a space gradually diminishing in width to a thin slit at their outer edges, and partitions dividing the space between the disks also curved to a point, the inner disk being concave on its inner surface, and the outer disk being concave on its outer surface, the said disks and partitions being cast in one piece, and a shaft on which said shell is mounted with suitable means for actuating

said shaft, the said shell and shaft being so arranged as to receive the condensed steam from one chamber and throw it into the second chamber, exhausting the condensed steam from the first chamber, and suitable waste pipes for the water thrown into said chamber, substantially as described.

3. In a condensing apparatus the shaft G, having bearings a', b' and the pulley g for actuating said shaft and the shell H mounted on the shaft G and composed of two disks h^2, and h^3 curving outwardly on different curves, and gradually approaching each other, so as to leave a thin slit at their outer edges and the casing A having the partition F, the chambers B and C, with the hood F^2 so arranged with reference to the chamber B as to admit water into the shell H, when the shell H is revolved by the shaft G, substantially as described.

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Witnesses:
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