

No. 641,561.

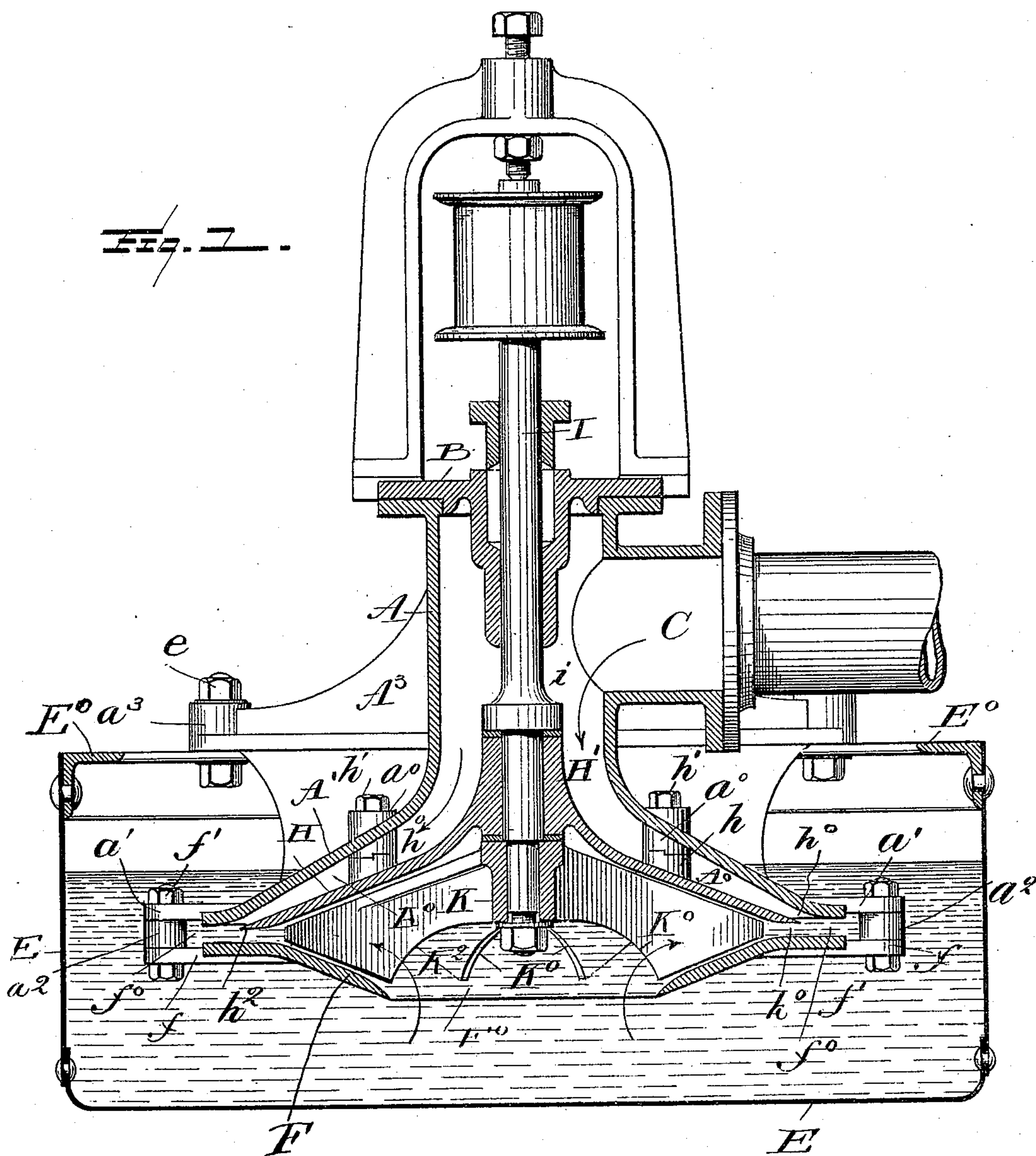
Patented Jan. 16, 1900.

B. THOENS.
CENTRIFUGAL VACUUM PUMP.

(Application filed June 16, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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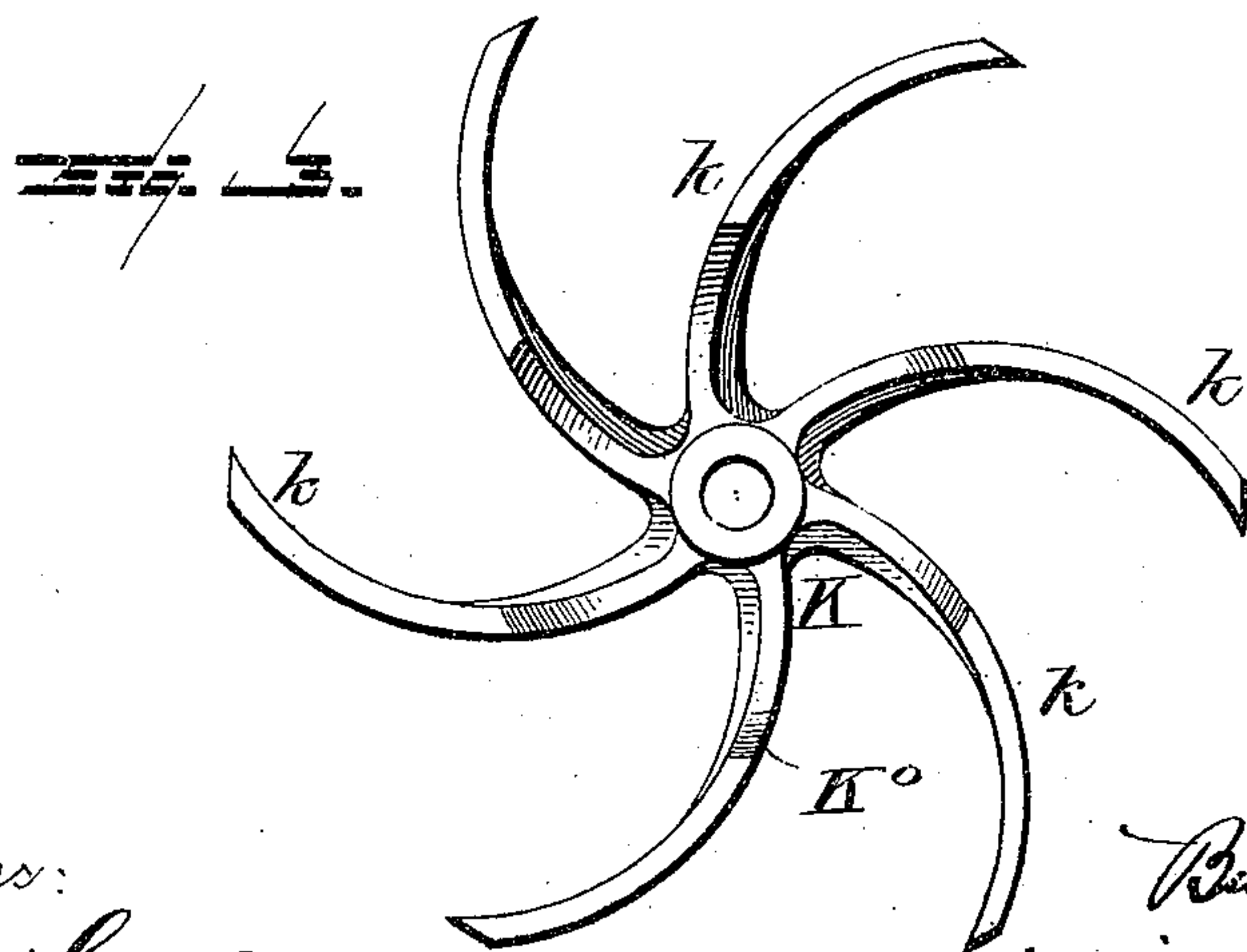
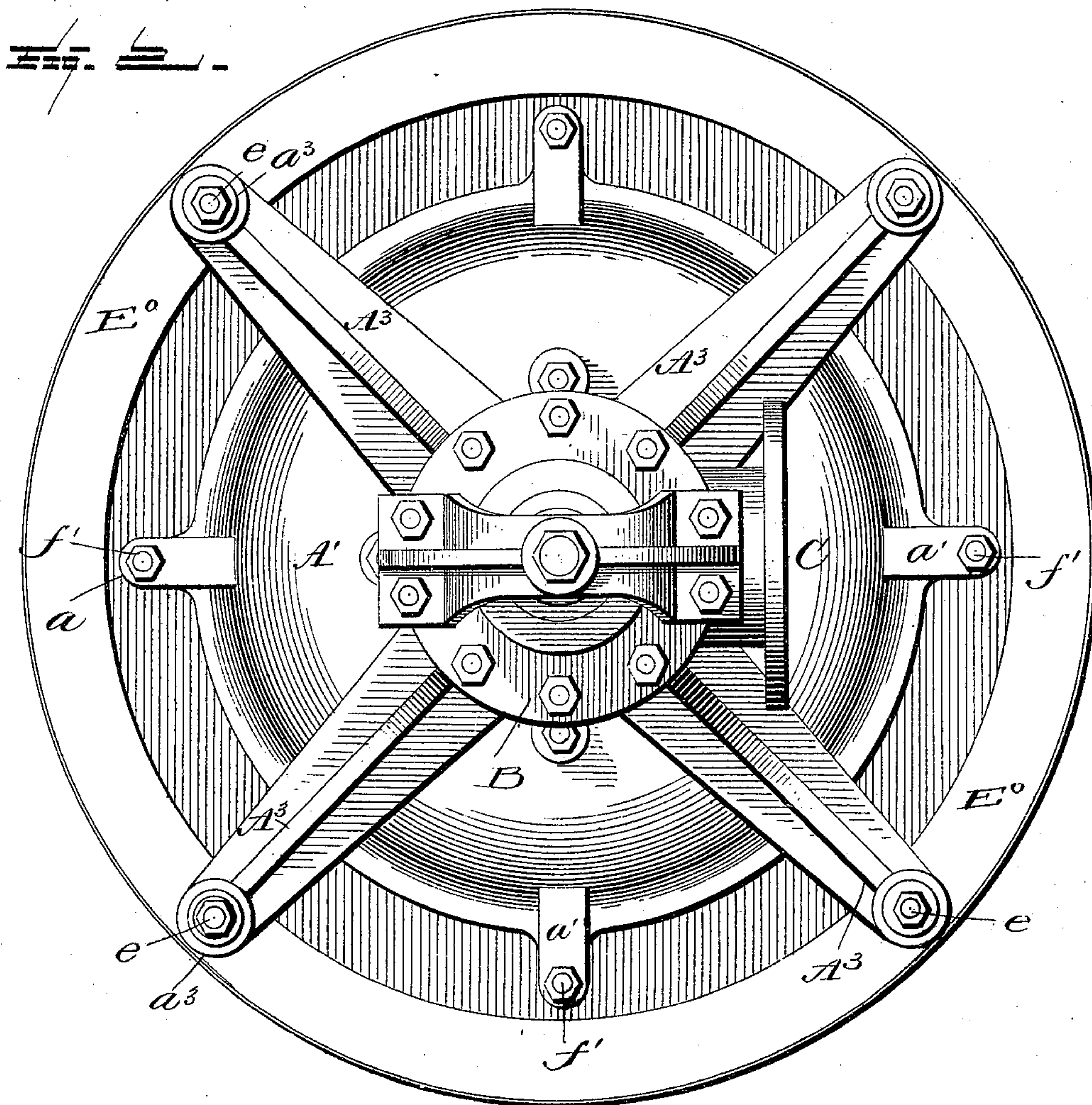
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(No Model.)

2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

BURCHARD THOENS, OF NEW ORLEANS, LOUISIANA.

CENTRIFUGAL VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 641,561, dated January 16, 1900.

Application filed June 16, 1899. Serial No. 720,832. (No model.)

To all whom it may concern:

Be it known that I, BURCHARD THOENS, a subject of the Emperor of Germany, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Centrifugal Vacuum-Pumps; 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.

My invention relates to improvements in vacuum-pumps, the common object of which is to exhaust the air or other gas from a vessel in order to diminish the pressure for various purposes, such as boiling or evaporating liquids or solutions at a reduced temperature, or for compound condensing-engines, &c. My vacuum-pump may be used to advantage for impregnating intimately and uniformly liquids with gases, such as sugar solution with fumes of sulfur or carbonic-acid gases, &c.

In principle my pump differs from vacuum-pumps ordinarily employed. The principle I employ to obtain these results is well known. I take advantage of the fact that a liquid at a high velocity imparts that velocity to the air or other gas through which it flows and carries such air or gas along with it by induced currents.

Reference is had to the accompanying drawings, wherein the same parts are indicated by the same letters throughout the several views.

Figure 1 represents a vertical central section of my invention. Fig. 2 represents a top plan view of the same, and Fig. 3 represents an inverted plan view of the centrifugal pumping-wheel.

A represents a cylindrical pump-casing closed at its top by means of a cover B and having a flaring or bell-shaped bottom end A'. A lateral opening provided with a connection C is provided upon one side of the cylindrical portion of the pump-casing A for the attachment of a suction-pipe from the vessel or other point to be exhausted or from which the air or gas is to be drawn by the action of the pump. The pump-casing is provided with radial ribs A³, having perforated lugs a³ at their outer ends, by means of which the

said casing is supported upon the flange E⁰ of an open liquid-tank E by means of bolts e, which pass through the said perforated lugs upon the ribs A³ and through perforations in the said flange E⁰ upon the upper edge of the tank E.

F represents a concavo-convex circular plate having a central circular opening F⁰ and having a plurality of radial lugs f extending from its periphery and perforated for the passage of bolts. The periphery of the flaring lower end of the pump-casing is likewise provided with a plurality of radially-extending lugs a', also perforated for the passage of bolts, and the concavo-convex plate F is secure by means of the said lugs beneath and concentric with the flaring end A' of the pump-casing and spaced at a short distance therefrom about their peripheries by means of perforated spacing-blocks a², through which and the said perforated lugs a' and f bolts f' pass and secure the said plate to the said flaring lower end of the pump-casing, thus forming a narrow annular space f⁰, as seen most clearly in Fig. 1. The concavo-convex plate F is arranged with its concave side uppermost, forming the bottom of the pump-chamber, the central opening in the said plate F constituting a liquid-suction opening for the pump. The narrow annular peripheral opening f⁰ constitutes the discharge-opening of the pump.

H represents a circular diaphragm of a concavo-convex form, its concave side being underneath and opposite the plate F, the said diaphragm being supported rigidly beneath the flaring lower end A' of the pump-casing concentric therewith by means of bolts h', which pass through bosses h and a⁰ on the said diaphragm and the said flaring portion of the pump-casing, respectively, by means of which bosses the said diaphragm and casing are spaced, forming an annular passage A⁰ within the pump-casing between these two portions of the apparatus. The diaphragm H has a slightly more sudden flare than the portion H' of the pump-casing, which causes the annular passage A⁰ to become narrower toward its outlet. As will be seen, this passage A⁰ communicates with the upper portion of the pump-casing and with the outlet connection C. The periphery of the diaphragm

H is provided with a sharp edge H^2 , which extends into, but not through, the annular discharge-opening f^0 and divides the approach to the said annular discharge-opening into two distinct passages, which merge into the said discharge-opening, the upper passage h^0 leading from the air or gas suction chamber through the annular passage and the lower passage k^0 leading from the liquid-suction opening F^0 through the pump-chamber K^2 , the direction of flow of the air or gas and of the liquid, respectively, being indicated by arrows in Fig. 1.

The diaphragm H is provided with a central cylindrical stem H' , having a central opening for the passage of the pump-shaft I. This pump-shaft I has a boss i thereon, which rests upon the central stem of the said diaphragm, and beneath the said diaphragm and conforming in shape to the concave outline thereof a pumping-wheel K is mounted upon the lower end of the shaft I. This pumping-wheel is splined or keyed upon the shaft to rotate therewith and secured by means of a nut and washer or any other suitable means, as shown. This pumping-wheel K, as shown most clearly in Figs. 1 and 3, is provided with a plurality of concave radial blades k , having their under passages cut away about the center of the wheel, as seen at K^0 , and having their outer ends tapering to a narrow point, thus conforming to the outwardly-contracted shape of the pump-chamber K^2 , formed between the diaphragm H and the plate F. The shaft I has a pulley I' or other suitable driving means mounted upon its upper end, which end is centered and securely held by means of a set-screw I^2 , which engages the arched frame I^3 , mounted above and rigidly secured to the pump-casing.

The operation of the device is as follows: The centrifugal wheel K is rapidly revolved in such a direction that the convex surfaces of the blades constitute the forward faces thereof, which acting upon the liquid in the tank during the rotation of the wheel draws the liquid into the pump-chamber K^2 through the central opening F^0 in the plate F and throws such liquid at great velocity by its centrifugal action outwardly through the annular space k^0 between the edge of the diaphragm H and the plate F to the discharge-passage f^0 , where it comes in contact with a film of air or gas which is drawn outwardly from the annular passage A^0 through the restricted passage h^0 . This film of air or gas thus coming into contact with the rapidly-moving liquid, which is constantly being drawn in through the central suction-opening F^0 and discharged through the opening f^0 , causes a strong suction through the connection C, leading to the pump-casing A, from the vessel or other source connected to the pump-casing, producing a vacuum or a degree of exhaustion in such vessel depending on the velocity of the liquid being thrown off by the pump-wheel.

It will be seen from the foregoing that the contracted form of the passages k^0 and h^0 causes the force and velocity of the liquid and the air or gas to be very much increased at these points, so that a very strong suction may be obtained, and this is a very important feature of my invention, as is also the feature of the annular form of the passages.

When used for exhausting the air or gas from a vessel as the primary object, the tank should be open, so that the air or gas drawn out by the current of liquid, after mixing with the liquid for awhile, may escape; but when the device is used for the primary object of impregnating a liquid with a gas, the tank should be closed and provided with a central inlet-opening in its bottom for liquid and with an outlet-opening for the gasified liquid in its side at a point on the level of the liquid.

The level of the liquid must at all times be somewhat above the level of the discharge-opening f^0 of the pump-casing in order to insure the perfect operation of the device.

The construction herein shown and described may be varied in many ways as to details of form and construction for accomplishing the same purpose, and I therefore do not wish to limit myself to the exact details herein shown and described, as many modifications might be made which could be used without departing from the spirit of my invention.

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

1. In a vacuum-pump, the combination with a receptacle for liquid; of a pump-casing suspended therein; a wheel-chamber in the lower portion of said casing having a suction-opening in its bottom and a discharge-opening at its periphery; a diaphragm above said chamber; an air or gas passage above said diaphragm communicating with said peripheral discharge-opening; and a bladed wheel mounted to rotate within said wheel-chamber, substantially as described.

2. In a vacuum-pump, the combination with a receptacle for liquid; of a pump-casing suspended therein; a wheel-chamber in the lower portion of said casing having a suction-opening in its bottom and a continuous discharge-opening at its periphery; a diaphragm above said chamber; an air or gas passage above said diaphragm communicating with said peripheral discharge-opening; and a bladed wheel mounted to rotate within said wheel-chamber, with its blades free from contact with the sides of said chamber, substantially as described.

3. In a vacuum-pump, the combination with a body of liquid; and a pump-casing suspended therein, said pump-casing having a water-suction opening, a peripheral discharge-opening, and an annular opening, concentric to and communicating with the said discharge-opening also communicating with the vessel to be exhausted; of a centrifugal pumping-

wheel mounted in said casing, and arranged to cause a flow of water outwardly through said peripheral discharge-opening, substantially as described.

5 4. In a vacuum-pump, the combination with a liquid-containing vessel; a pump-casing mounted therein and having a bell-shaped lower end, said casing having a pump-chamber provided with a central suction-opening,
10 an annular air or gas passage above said pump-chamber, narrowing outwardly in a cross-section, and a peripheral discharge-opening with which said pump-chamber and said air or gas passage communicate; a rotary
15 shaft mounted in said casing; and a bladed wheel mounted upon said shaft in the pump-chamber, substantially as described.

5. In a vacuum-pump, the combination with

a body of liquid; a pump-casing suspended therein, said pump-casing having a water-suc- 20
tion opening, a peripheral discharge-opening, and an annular opening narrowing outward in cross-section, concentric to and communicating with the said discharge-opening, also communicating with the vessel to be exhaust- 25
ed; of a centrifugal pumping-wheel mounted in said casing, and arranged to cause a flow of water outwardly through said peripheral discharge-opening, substantially as described.

In testimony whereof I affix my signature 30
in presence of two witnesses.

BURCHARD THOENS. [L. S.]

Witnesses:

JNO. J. WARD,

C. M. HERO.