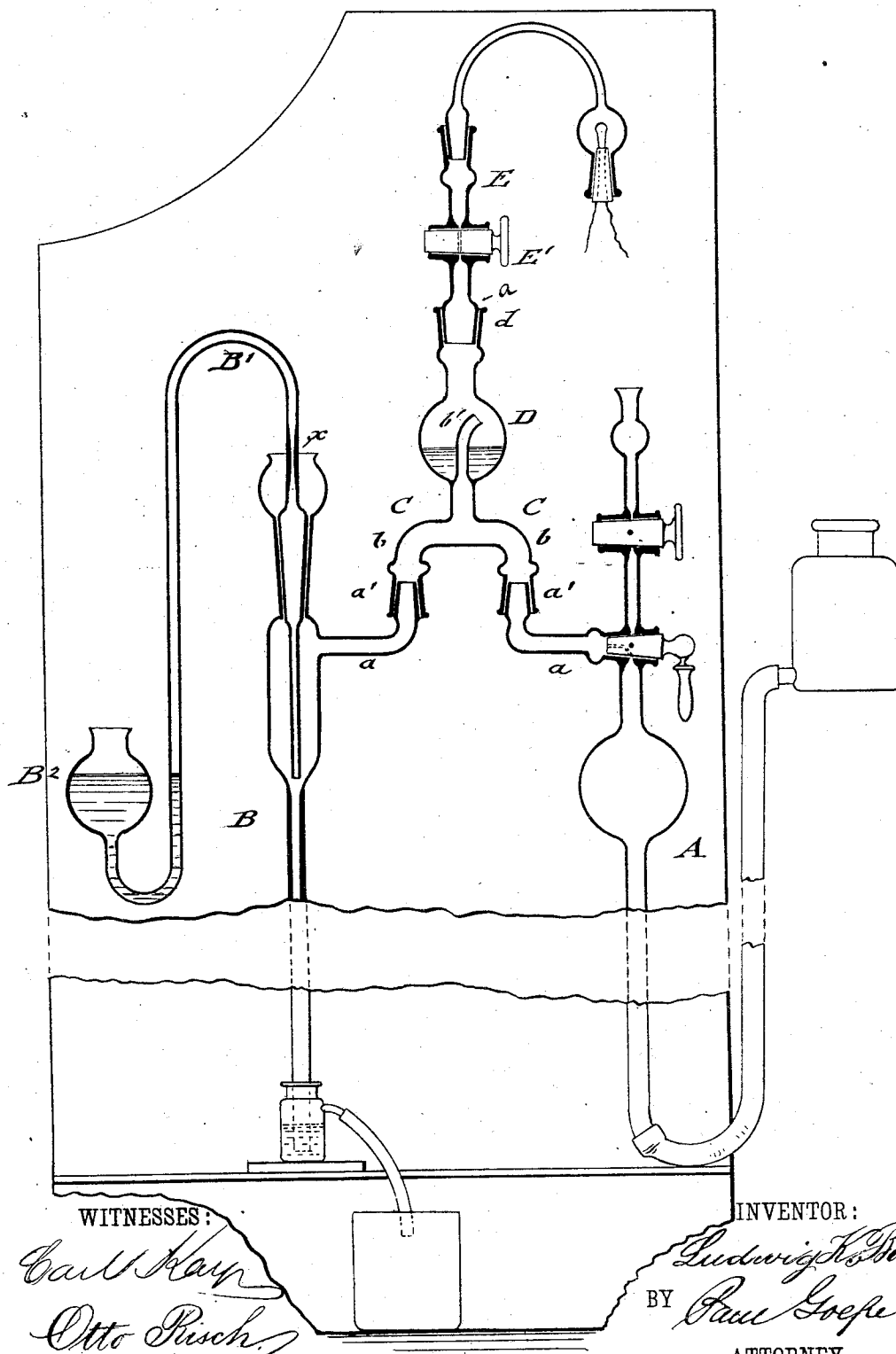


(No Model.)

L. K. BÖHM.
COMBINATION VACUUM PUMP.

No. 248,279.

Patented Oct. 18, 1881.



UNITED STATES PATENT OFFICE.

LUDWIG K. BÖHM, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN
ELECTRIC LIGHT COMPANY, OF SAME PLACE.

COMBINATION VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 248,279, dated October 18, 1881.

Application filed July 7, 1881. (No model.)

To all whom it may concern:

Be it known that I, LUDWIG K. BÖHM, of the city, county, and State of New York, have invented certain new and useful Improvements in Combination Vacuum-Pumps, of which the following is a specification.

This invention refers to improvements in combination vacuum-pumps for producing high vacua, in which the well-known Geissler and Sprengel systems are combined in a more simple and effective manner than heretofore, and by which electric lamps and other articles can be evacuated in a quicker and more reliable manner.

The combination-pumps heretofore in general use for laboratory purposes were too complicated for practical purposes, as they were easily injured, and as the lifting of the mercury after each working of the Sprengel pump into the reservoir of the same has been a great inconvenience in working the pump. To obviate these objections the construction is greatly simplified, and, furthermore, the pressure of the atmosphere employed automatically for working the Sprengel pump.

The invention consists of the combination of a well-known Geissler and a Sprengel vacuum-pump with an intermediate connecting portion, to which both systems are connected by ground glass joints. The connecting portion supports the drying-vessel and the tube with stop-cock, to which the lamp or other vessel is applied for evacuation.

The Sprengel pump is provided with a supply-tube, which is bent downward in the shape of an S and connected to a mercury-reservoir, so that whenever, by the action of the Geissler pump, the interior of the pumps is evacuated, the atmospheric pressure upon the mercury will force the same through the supply-tube and cause the automatic working of the Sprengel pump.

The accompanying drawing represents a front elevation of my improved combination vacuum-pump.

By reference to the drawing it will appear that my improved pump consists of three main parts—to wit, of a Geissler vacuum-pump, A, a Sprengel vacuum-pump, B, and an intermediate connecting portion, C, carrying the air-

drying vessel D. The evacuating-tubes *a a* of both systems A and B are connected by ground glass joints *a' a'* to branch pipes *b* of the intermediate portion, C, below the drying-vessel D, which is partly filled with anhydric phosphoric acid.

The branch pipes *b b* are sealed to the bottom of the drying-vessel and extended to the interior of the same, the extension-tube *b'* being curved sidewise above the surface of the acid, so that the air drawn through the drying-vessel impinges first upon the surface of the same, and passes then through the tube *b'* to the Geissler or Sprengel pump. It is thereby dried by coming in contact with the phosphoric acid, as is customary in this class of pumps.

To the neck of the drying-vessel D is secured, by a ground glass joint, *d*, the connecting-tube *a*, with a stop-cock, *E'*. To the upper end of the tube E is applied the lamp or other vessel to be evacuated, being thereto connected by a ground joint, as shown clearly in the drawing. The advantage of this construction is that both pump systems are brought closer together, which makes them less bulky, and simpler and less expensive in construction.

The Sprengel system B is provided in the supply-tube *B'*, above the discharge end of the same in the fall-tube, with a contraction or waist, *x*, for which a separate application for Letters Patent is now pending in the United States Patent Office. The supply-tube *B'* is bent above the contraction *x* and extended in a downward direction to a distance equal to or somewhat greater than the length of barometric pressure, being then bent upward again at the lower end and connected to a mercury-reservoir, *B²*. This arrangement has the advantage that whenever the interior spaces of the combination-pump are evacuated by one or more successive operations of the Geissler system the atmospheric pressure forces the mercury in the reservoir *B²* through the supply-tube *B'* and fall-tube of the Sprengel pump B. The Sprengel pump is thereby caused to work automatically whenever, by the working of the Geissler system, the air is exhausted from the interior, so that the outer atmospheric pressure can lift the mercury, and thus work the Sprengel system. The Sprengel pump contin-

ues to work until only a column of mercury equal in length to that of barometric pressure remains in the longer middle portion of the supply-tube. In this manner the evacuation takes place not only in less time, but also with considerably less trouble than heretofore, as no skilled attendant is required for working the pump.

By lifting the mercury of both pumps by a suitable power instead of by hand it is of advantage that the mercury of the Sprengel system has only to be lifted to about half its former height.

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

1. The combination of a Geissler pump, a Sprengel pump, an air-drying vessel, and an intermediate coupling connecting the exhaust-tubes of the respective pumps with each other and with the drying-vessel, said coupling being united to said exhaust-tubes by ground glass joints, substantially as described.

2. In a combination vacuum-pump, the intermediate portion, C, provided with a drying-vessel, D, branch pipes *b* below the same, and a curved extension-tube *b'* within the vessel D, substantially as set forth.

3. The combination of a Geissler vacuum-pump, a Sprengel pump, and an intermediate connection between the exhaust-tubes of the respective pumps, the supply-pipe of the Sprengel pump being bent into S shape, extended downward, and provided with a mercury-reservoir at its lower end, so as to utilize the atmospheric pressure when the Geissler system has been worked to a certain extent, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 29th day of June, 1881.

LUDWIG K. BÖHM.

Witnesses:

PAUL GOEPEL,
CARL KARP.