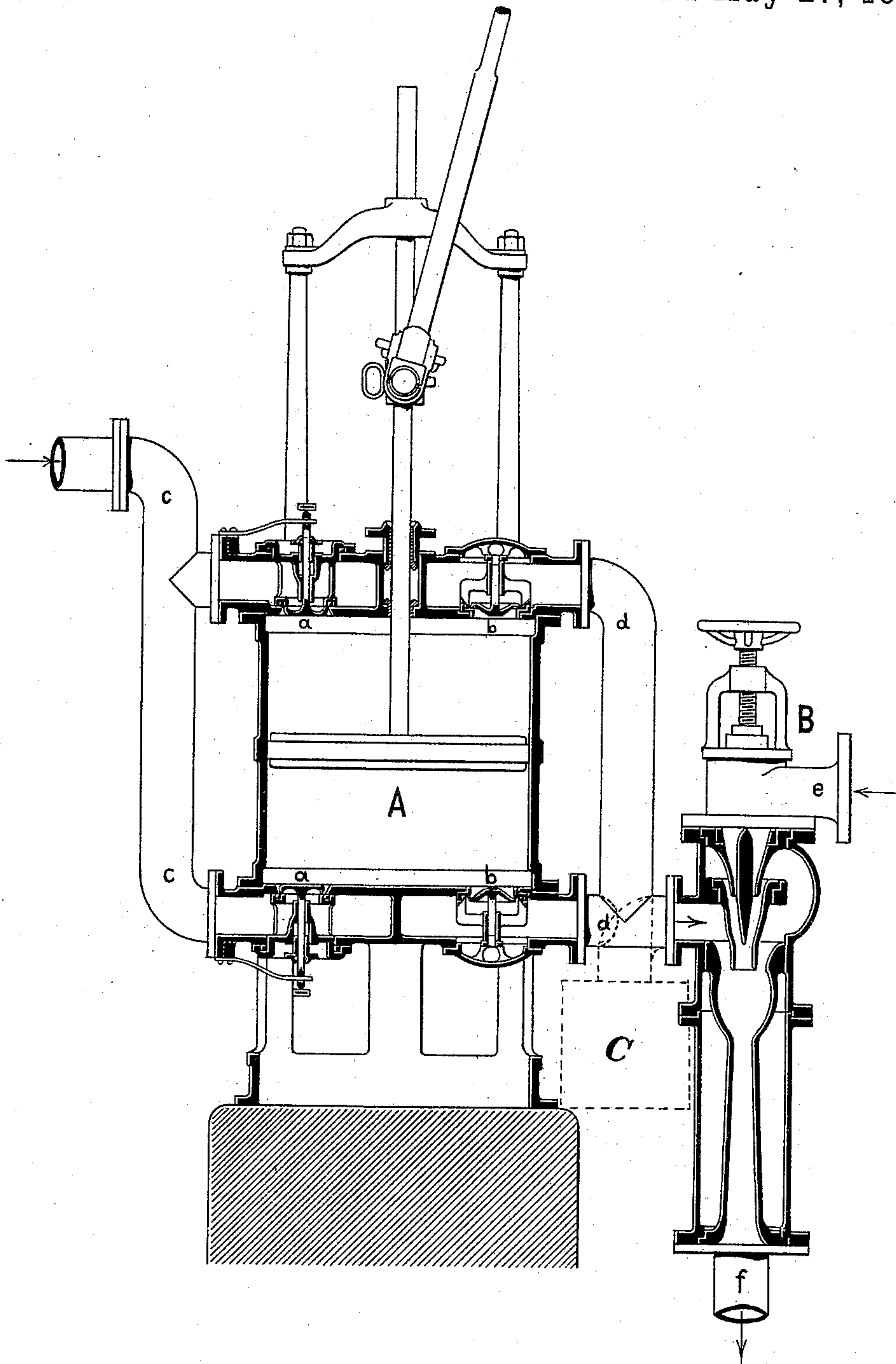


(No Model.)

W. RICHTER.  
COMPOUND VACUUM PUMP.

No. 299,267.

Patented May 27, 1884.



Attest  
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Atty

# UNITED STATES PATENT OFFICE.

WILHELM RICHTER, OF BERLIN, GERMANY, ASSIGNOR TO THE INTERNATIONALER VACUUM-EISMASCHINEN-VEREIN, OF SAME PLACE.

## COMPOUND VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 299,267, dated May 27, 1884.

Application filed June 6, 1883. (No model.) Patented in Germany August 24, 1882, No. 22,208; in France September 27, 1882, No. 151,286, and in England September 28, 1882, No. 4,606.

*To all whom it may concern:*

Be it known that I, WILHELM RICHTER, engineer, residing in Berlin, Kingdom of Prussia, German Empire, have invented new and useful Improvements in Compound Vacuum-Pumps, (for which I have obtained Letters Patent in Germany, No. 22,208, August 24, 1882; Great Britain, No. 4,606, September 28, 1882, and France, No. 151,286, September 27, 1882,) of which the following is a specification.

My invention relates to compound vacuum-pumps—such as the pump of Windhausen (described in the specification of the United States Letters Patent No. 247,456) and the pump of Galland—consisting of two co-operating pumps, of which the one producing the deep vacuum discharges the aspired air or vapor into a partly-evacuated space, while the other pump, which is of less capacity than the former, expels the air or vapor (the latter after being condensed) from the said space into the surrounding air.

The accompanying drawing shows a vertical section of an ordinary air-pump and my improved ejector applied thereto.

According to my invention, the second pump is replaced by an ejector of any suitable design operating by means of a jet of steam or water. An arrangement of this kind is shown on the annexed sheet of drawings.

A is a double-acting air-pump, provided with the suction-valves *a a* and the discharge-valves *b b*. These valves may be arranged to operate automatically, or they are worked by mechanical means from the outside, as is the case with the suction-valves in the pump described in the specification of the aforesaid patent, and as has been assumed in respect to these valves in the drawing. Also, slide-valves may be used, if preferred.

*c* is the pipe connecting the pump A with the space or vessel to be evacuated.

B is the ejector, into which the operating

medium enters at *e*; *d d*, the connection-pipe between the pump and the ejector, and *f* the discharge-pipe from the latter. In this combination the pump A sucks the air and, when present, vapor from the vessel in which the vacuum is to be created or maintained, and partly recompresses them, while the ejector draws off the air and vapor in this state from the pump, and discharges them through pipe *f* into the atmosphere. When vapors are to be removed and the ejector operates by steam, it is advantageous to cause such vapors to pass, on their way from the pump to the ejector, through a condenser, *c*, (represented in dotted lines,) for condensing the greater part thereof, in a manner similar to that in which a condensation of vapors is brought about in the duplicate pump of Windhausen; but when the ejector operates by means of a jet of water it will by itself condense the vapor, so that then no special condenser is required.

By the described arrangement the compound air-pumps are rendered more simple as well in respect to their construction as to the means to be employed for their operation.

I claim as my invention—

1. The combination, with an ordinary efficient air-pump provided with suitable valves, of an ejector of any suitable construction, in the manner and for the purpose described.

2. The combination of a vacuum-pump having an ordinary efficient air-pump provided with suitable valves, and an ejector operating by means of a jet of water and adapted to remove condensable vapors, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILHELM RICHTER.

Witnesses:

B. ROY,

G. H. SMITH.