(No Model.)

E. WESTON.

VACUUM APPARATUS.

No. 283,544. Patented Aug. 21, 1883.

Fig. 1.

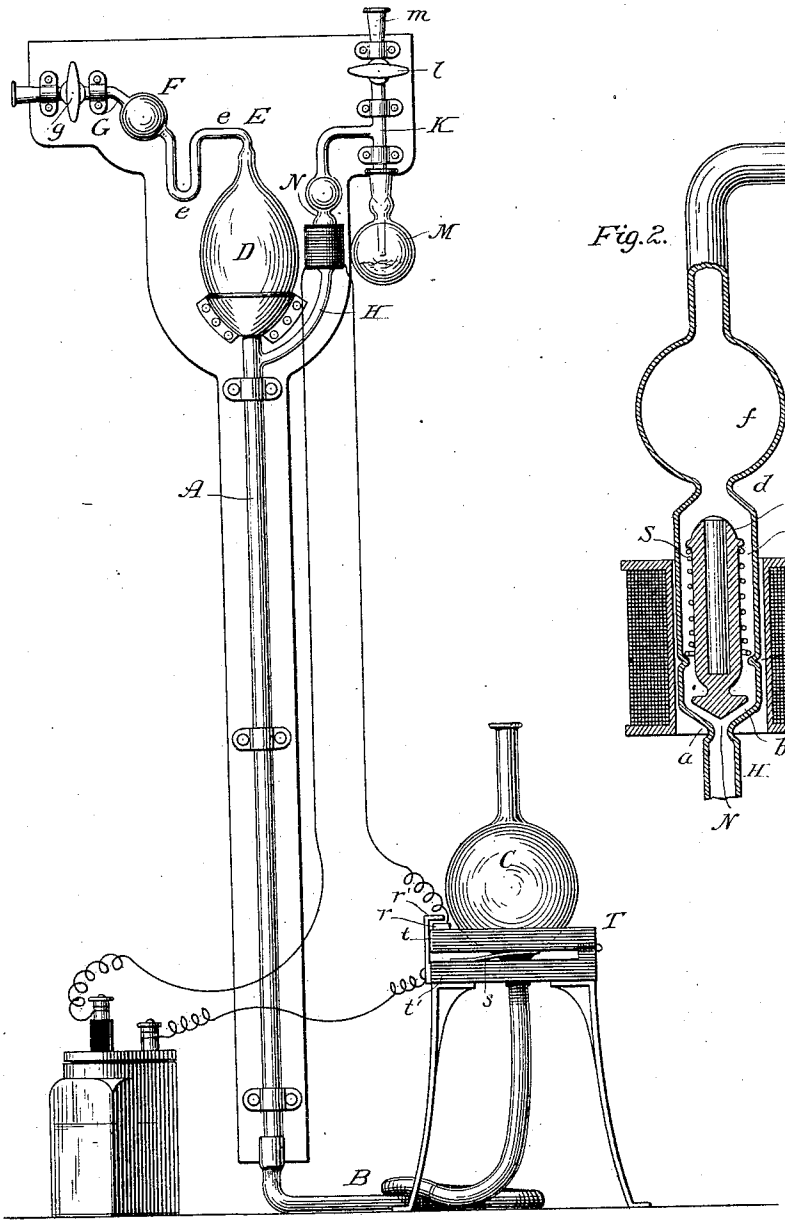


Fig. 2.

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UNITED STATES PATENT OFFICE.

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VACUUM APPARATUS.

SPECIFICATION forming part of Letters Patent No. 283,544, dated August 21, 1883.

Application filed December 14, 1882. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WESTON, a subject of the Queen of Great Britain, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Vacuum Apparatus, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

My invention relates to apparatus for producing high vacuums, it being especially designed for exhausting the air from incandescent-lamp globes and the like.

The invention has mainly for its object the construction of a more compact and substantial form of apparatus for this purpose than has heretofore been done, and it involves the employment of an electro-magnetic valve mechanism with the apparatus, under the conditions and in the manner hereinafter described.

In the drawings, Figure 1 is an elevation of a pump constructed according to my invention, together with all the means required for operating the same. Fig. 2 is a sectional view of the valve mechanism.

The apparatus which I have adopted in illustration of the invention consists of a vertical tube, A, thirty inches or more in length, with which is connected by a flexible tube, B, a mercury-reservoir, C. Tube A is joined to a vacuum-chamber, D, of the kind ordinarily used in Geisler pumps, and the upper extremity of this chamber ends off in a tube, E, supplied with suitable stop-cocks, or, as in the present instance, bent to form a trap, *e*, then enlarged or joined to a globe, F, from which leads a tube, G, with a stop-cock, *g*.

To the tube A, immediately below the chamber D, is joined a tube, H, which connects with a vertical tube, K, containing a stop-cock, *l*, and a ground-opening, *m*, and to which is connected a flask, M, for containing an anhydrous substance. In the tube H is inserted an automatic valve, N, the nature of which will be hereinafter described.

The parts described, with the exception of the valve N and flexible tube B, are all of glass, and exemplify a general type of pump, the operation of which is as follows: By means of a steam-pump or some similar device connected to the tube G, an imperfect vacuum is established in the apparatus. The reservoir C is then raised so that the mercury rises in and fills the chamber D. It is prevented from reaching the tube K or the lamp to be exhausted by the closing of valve N. By the use of a valve at this point it is obvious that the tube H, instead of being thirty inches or more in length, may be made quite short, thus making the pump much more compact and less fragile. By raising to a sufficient height the reservoir C the residual air in chamber D is forced over into the globe F, and the mercury that is simultaneously carried over collects in the trap *e* and shuts off communication between globe F and chamber D. By lowering the reservoir C and repeating the above operation a number of times, the air in the interior of the pump becomes more and more attenuated until a very high vacuum is produced.

The automatic valve is constructed and operated in the following manner: The tube H is contracted, as at *a*, then widened, forming a valve-seat, *b*, and a chamber, *c*. It is then contracted again at *d*, and above this point is formed a globe, *f*. The purpose of the globe is to retain any mercury which may leak through the valve until the latter is opened, when it again runs back into the tube A; otherwise, if mercury should pass through the valve N, it might reach the vertical tube K were the tube H of correspondingly small diameter. In the chamber *c* is inserted a valve, N, composed partly or entirely of magnetic metal. It is held off from its seat *b* by a spring, S, a shoulder or flange, *n*, being formed in the sides of chamber *c* to aid in this. Around the chamber *c* is placed a helix, P, of insulated wire, in such position that when traversed by a current it will draw the valve N down upon its seat. The ends of the helix are connected with a circuit including a battery and switch. This latter may be closed by hand at the proper time, or it may be operated by the mercury-reservoir by forming the rest or socket T for the reservoir in two parts, *t t'*. When the reservoir is in place, its weight lowers the part *t*, thus separating the contact-plate *r* from the

metal arm r' and breaking the circuit. On raising the reservoir the parts r and r' are brought together by a spring, s, and the circuit closed. With such an arrangement, when the reservoir is lifted, the valve N will be closed. Many important variations of this plan are obviously possible. For instance, the circuit may be closed by the mercury in tube A being caused to establish connection between two terminals introduced into the tube A; or the valve may be caused to operate by the breaking instead of the closing of the circuit.

In another application I have shown and described a valve in combination with a helix, and this I do not here claim *per se;* nor do I claim, broadly, an automatic valve in a vacuum apparatus of any kind; but, inasmuch as the form of valve which I have described possesses peculiar advantages over the cocks and valves ordinarily used in this kind of apparatus mainly from the fact that it cannot leak and is very durable, while its operation is more certain,

What I claim as my invention is—

1. The combination, with a glass tube, of a valve of magnetic metal contained in a chamber formed in the tube, and a helix surrounding the chamber and so placed that the operation of the valve may be effected by electro-magnetic action, as set forth.

2. In a vacuum apparatus, the combination, with a vacuum-tube, of a valve of magnetic metal for preventing the rise of mercury in the tube, and an electro-magnetic helix surrounding the tube and arranged to operate the valve, as set forth.

3. In a vacuum apparatus, the combination of tube H, electro-magnetic valve contained therein, a circuit by which the valve is operated, and means, substantially as described, for making or breaking the circuit when the mercury rises in the apparatus, as set forth.

4. In a vacuum apparatus, the combination, with an automatic valve, of a globe or enlargement, f, formed in the tube above the valve, for the purpose described.

In testimony whereof I have hereunto set my hand this 12th day of December, 1882.

EDWARD WESTON.

Witnesses:

W. M. ALLAIRE,

W. FRISBY.