

(No Model.)

2 Sheets—Sheet 1.

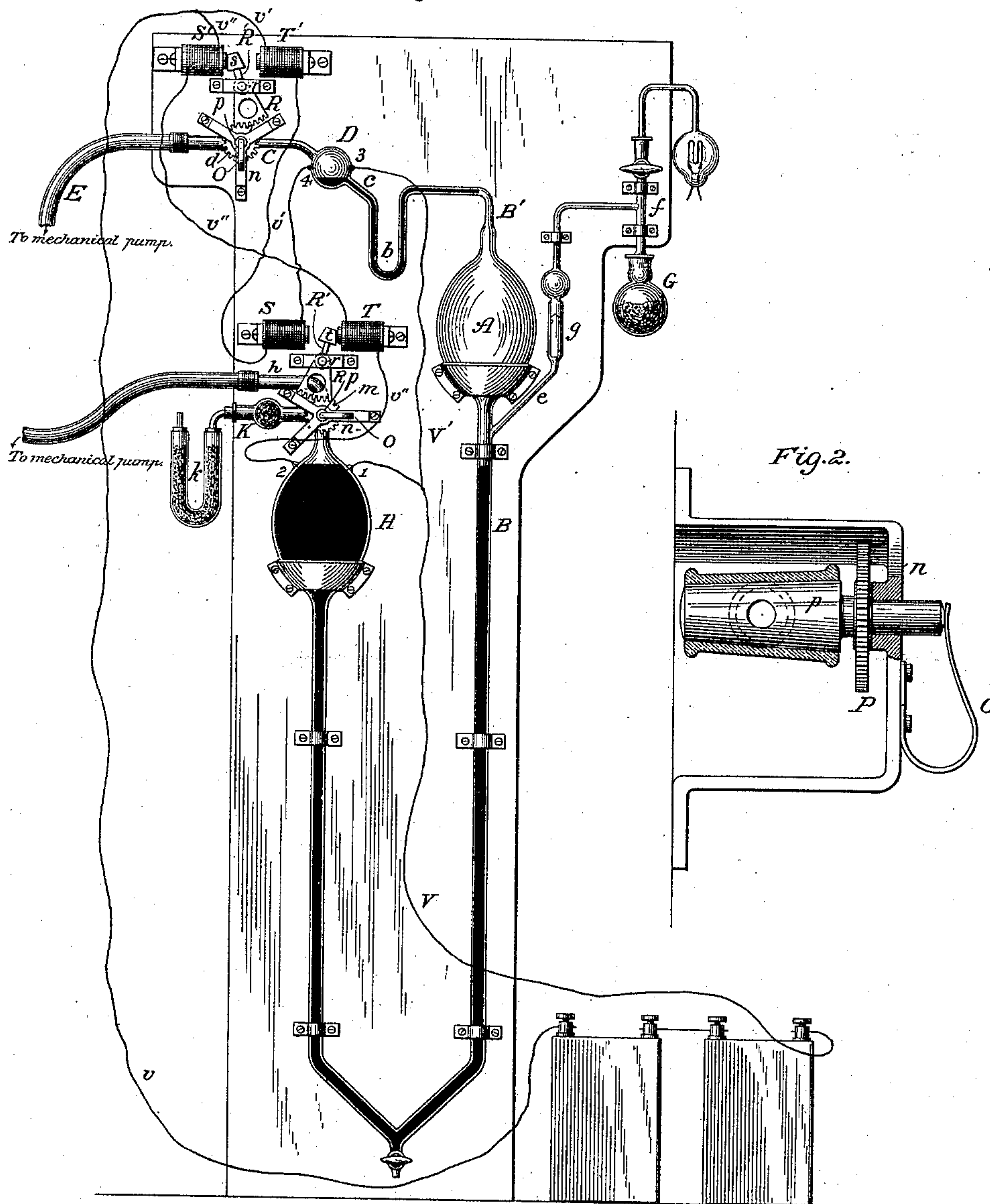
R. F. BARNES.

VACUUM PUMP.

No. 312,951.

Patented Feb. 24, 1885.

Fig. 1.



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2 Sheets—Sheet 2.

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Fig. 3.

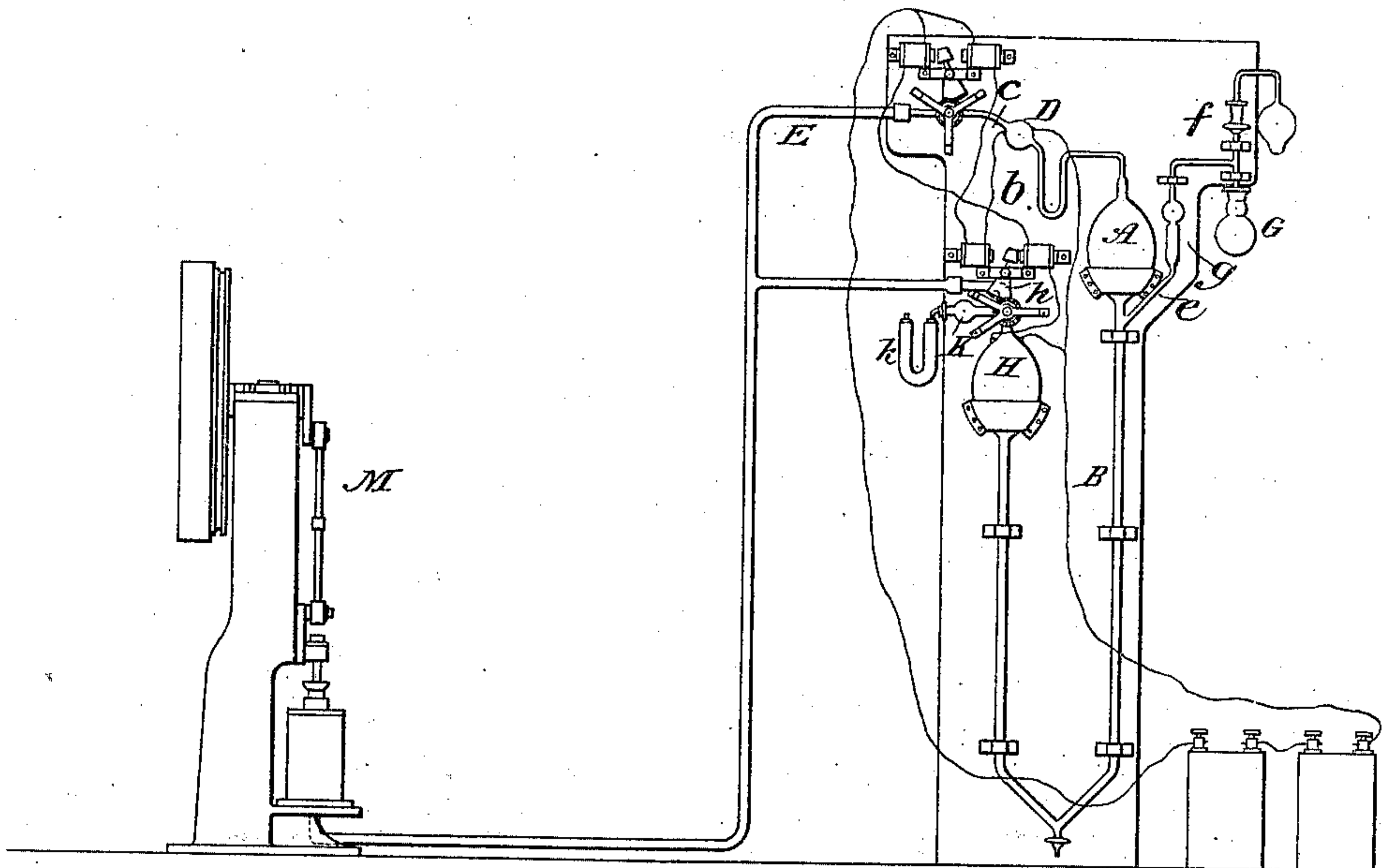


Fig. 4.

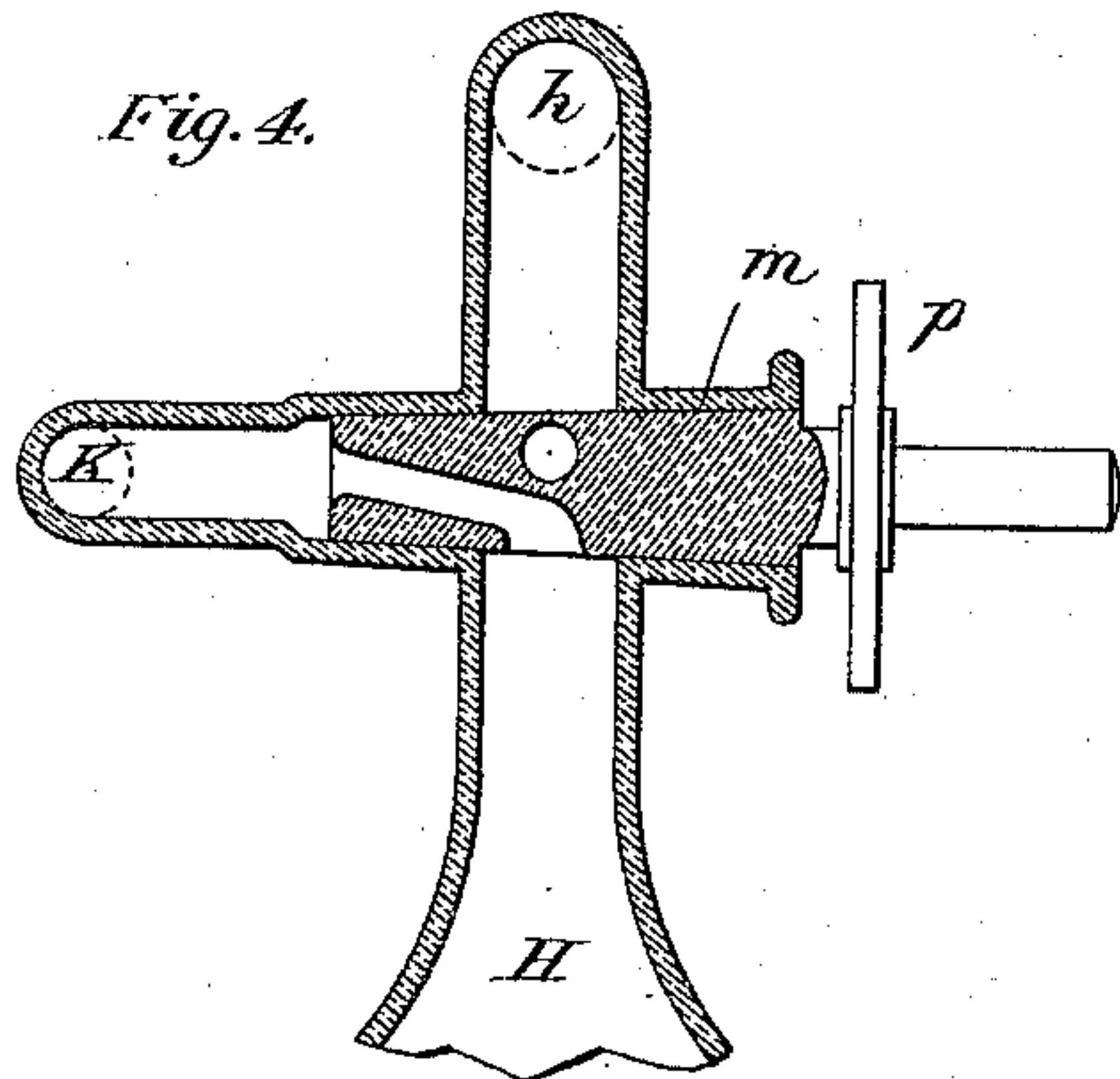
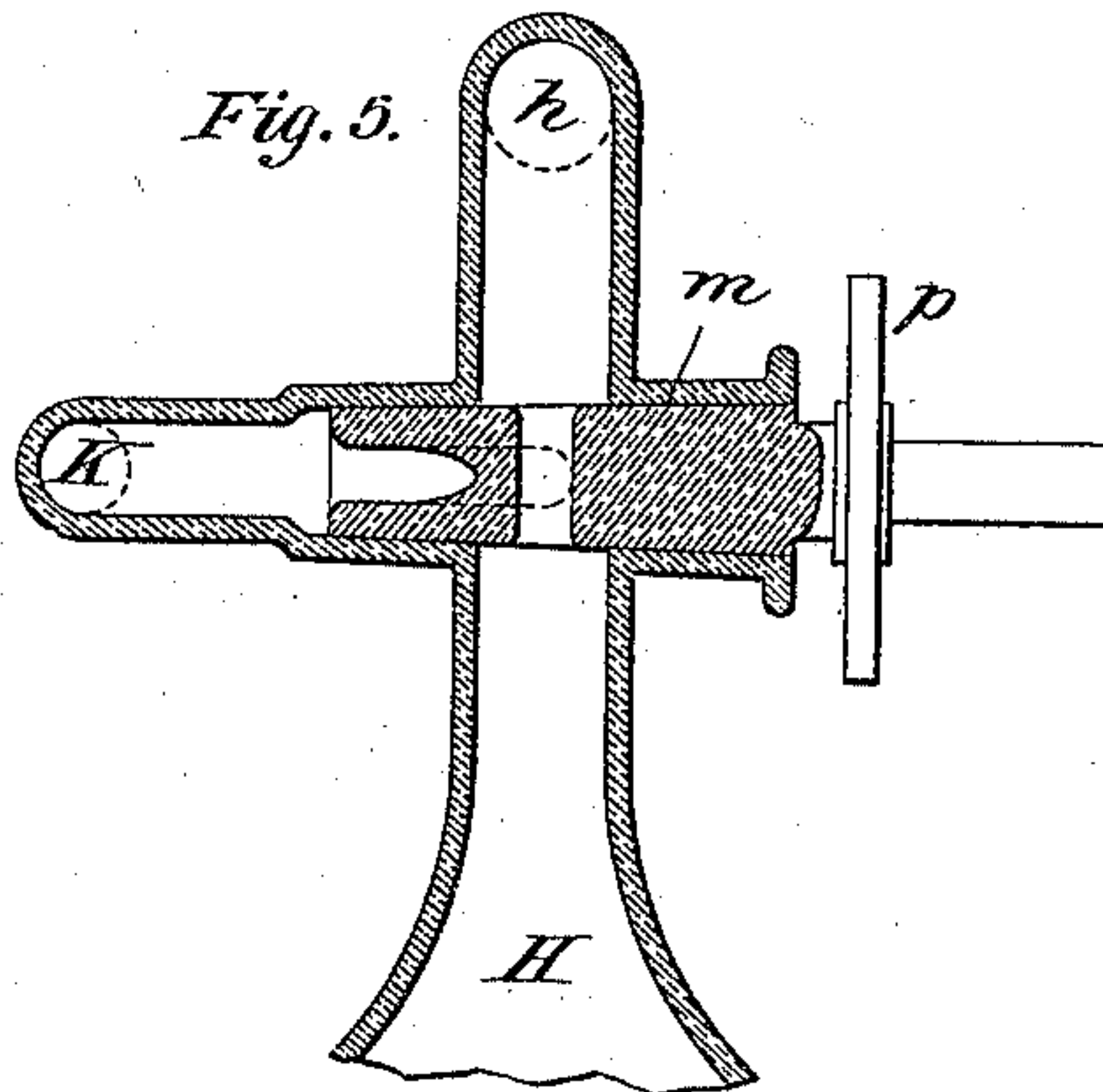


Fig. 5.



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UNITED STATES PATENT OFFICE.

RAYMOND F. BARNES, OF BROOKLYN, ASSIGNOR TO THE UNITED STATES
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VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 312,951, dated February 24, 1885.

Application filed January 12, 1884. (No model.)

To all whom it may concern:

Be it known that I, RAYMOND F. BARNES, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Vacuum-Pumps, 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 vacuum-pumps, or apparatus for producing high vacuums, such as are now commonly used for exhausting the globes of incandescent lamps and the like.

The invention consists in an apparatus or combination of devices for operating pumps of a certain kind, the nature of which will be explained by reference to the drawings.

Figure 1 is a diagram illustrating the construction and mode of operation of the pump. Fig. 2 is an enlarged section of one of the valves or cocks used in the pump. Fig. 3 is a diagram of the pump, showing the manner of connection with a mechanical exhaust-pump. Figs. 4 and 5 are sectional views of a two-way cock employed in the pump.

The working parts of the pump are designed to be attached to a suitable support, usually a board or frame.

A is a vacuum chamber or balloon of the kind commonly used in Geisler pumps; B, a tube extending downward from it. The upper portion of the chamber A tapers off into a tube, B', of small diameter, which extends horizontally for a short distance, is then bent into an elbow or trap at b, and joined to a globe or small chamber, D, at a point slightly above its lowest point.

From the globe D extends a tube, C, connected by a tube, E, with any ordinary form of steam or mechanical pump, M, of any ordinary construction, as shown in Fig. 3.

From the tube B, and immediately below the chamber A, leads a tube, e, to a vertical tube, f. G is a flask applied to the lower end of tube f, for containing an anhydrous substance. The upper end of tube f is adapted for receiving the lamps or other devices from which the air is to be withdrawn.

In the tube e is arranged a valve, g—such as an ordinary float-valve—which shuts off com-

munication between the tubes B and f when the mercury in the former rises sufficiently to raise and close the valve. The tube B is bent into U shape, and connects with the bottom of a stationary chamber, H. The latter is drawn out into a tube, h, and connects with a steam or mechanical pump, M, which may be the same as that connected to the mercury-chamber A, or an independent pump, as will obviously appear.

To the tube h is joined a branch, K, open to the air directly or through a receptacle, k, containing a moisture-absorbent.

In the tube c, between the chamber D and the tube E, is an ordinary cock or valve, d. At the junction of the tubes h and K is placed a two-way cock, m. The construction of these two valves and the apparatus for operating them form the subject of my invention.

The cocks d and m are composed of tapering plugs p p, ground to fit tightly in their seats. The plugs or stems are extended, and pass through metal plates or stands n n, secured to the board or support for the pump. Springs O O are attached to the plates n, and press upon the ends of the plugs p p and operate to keep them firmly or tightly in their seats. Toothed wheels or segments P are secured to the plugs p p, on either side of the plates, through which they pass. With these engage toothed segments R, pivoted at r and extended in arms R'. These latter carry armatures s t, on either side of which are electromagnets S T S' T'.

In the construction of the pump platinum contact-points are passed through the chambers D and H, near their top, and the glass welded to them, so as to be perfectly air-tight. These points are designated by the figures 1, 2, 3, and 4.

For the purpose of operating the pump a conductor, V, is led from a suitable battery to contact 1. A branch, V', of this conductor is taken to contact 3. The other conductor, v, runs from the opposite battery-pole to the magnets S T, where it is divided. One branch, v', includes the magnets S and T', and is connected to contact 4. The other, v'', includes magnets S' and T, and is connected with contact 2.

The two-way cock *m* is shown in detail in Figs. 4 and 5. In Fig. 4 it is turned to close communication between the tube *h* and the reservoir *H*, and to connect the latter with the
5 air-inlet *K*.

In Fig. 4 the position is shown in which reservoir *H* is connected through tube *h* with the mechanical pump and the tube *K* shut off.

The operation of the device is as follows:
10 Mercury is introduced into the chamber *H* until it rises in the chamber and the tube *B* to a level above the contact-points 1 and 2, completing the circuit through the conductor *V*, branch *v''*, and conductor *v*. This has the
15 effect of drawing over the armatures *s t* and the toothed segments and turning the cocks *d m*. The former is a single cock, and arranged to open by this movement communication between the mechanical exhaust and the interior
20 of the chamber *A*. The latter is a two-way cock, and by the movement thus imparted it is caused to shut off the mechanical pump connected with tube *h* and open the branch
25 *K*. Air being thus admitted to chamber *H* and withdrawn from chamber *A*, the mercury will rise in the latter. This continues until the globe *D* is filled sufficiently by the mercury, which enters it through tube *c* from the
30 chamber *A*, to close the circuit through the branches *V* and *V' v'*. This energizes magnets *S* and *T'*, shifts the levers *R'* and segments *R*, and turns the cocks *d m*, so that the former shuts off connection between exhaust-pump and globe *D*, while the latter connects
35 the exhaust-pump and chamber *H*, at the same time closing the branch *K*. This causes the mercury to return to chamber *H*, and this operation is repeated until the air is withdrawn from the pump and a high vacuum es-
40 tablished.

The precise details of construction which I have now described may be varied in many ways.

The object of the invention, as will now ap-
45 pear, is to render the pump automatic by

causing the movements of the mercury to make or break an electric circuit, and thereby open and close the valves or cocks, either directly or indirectly.

Having now described the best manner in which my invention is or may be carried into effect, what I claim is—

1. The combination, with the vacuum-chamber of an air-pump of the kind described, of a mercury-reservoir connected therewith, de-
55 vices for varying the pressure of air in said reservoir, electro-magnets for operating said devices, and circuits controlled by the movements of the mercury, as set forth.

2. The combination, with the vacuum-chamber of an air-pump of the kind described, a mercury-reservoir, and tube connecting the same, of devices for admitting air to and with-
60 drawing it from said reservoir, electro-magnets for operating the said devices, and circuits controlled by the movements of the mercury, as set forth.

3. The combination, with the vacuum-chamber of an air-pump, a mercury-reservoir, and tube connecting the same, of a tube for the
70 escape of air from the vacuum-chamber, and a cock or valve therein, an air-inlet tube and exhaust-tube connected to the mercury-reservoir, a two-way cock for controlling the same, electro-magnets for operating the valves, and
75 circuits controlled by the movements of the mercury, all as set forth.

4. The combination, with the valves or cocks *d m*, of electro-magnets and intermediate
80 mechanism for operating the same, circuits including said magnets, and connected with contact-points extending into the pump, so as to be brought into contact with the mercury, as and for the purpose specified.

In testimony whereof I have hereunto set
85 my hand this 5th day of January, 1884.

RAYMOND F. BARNES.

Witnesses:

W. FRISBY,

H. D. HARTLEY.