

(No Model.)

2 Sheets—Sheet 1.

A. L. REINMANN & C. G. OTT.
MERCURIAL AIR PUMP.

No. 327,313.

Patented Sept. 29, 1885.

Fig. 1.

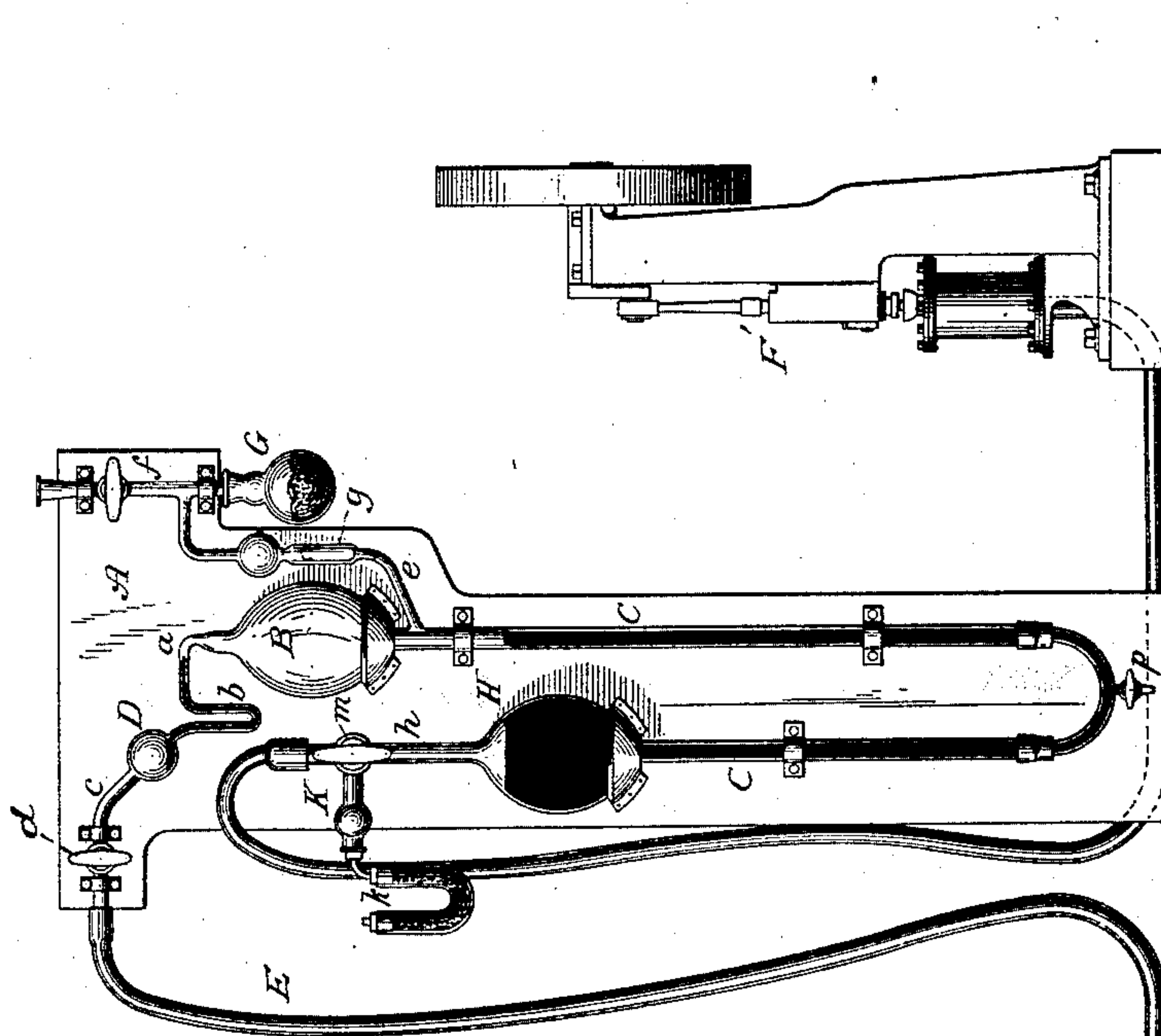
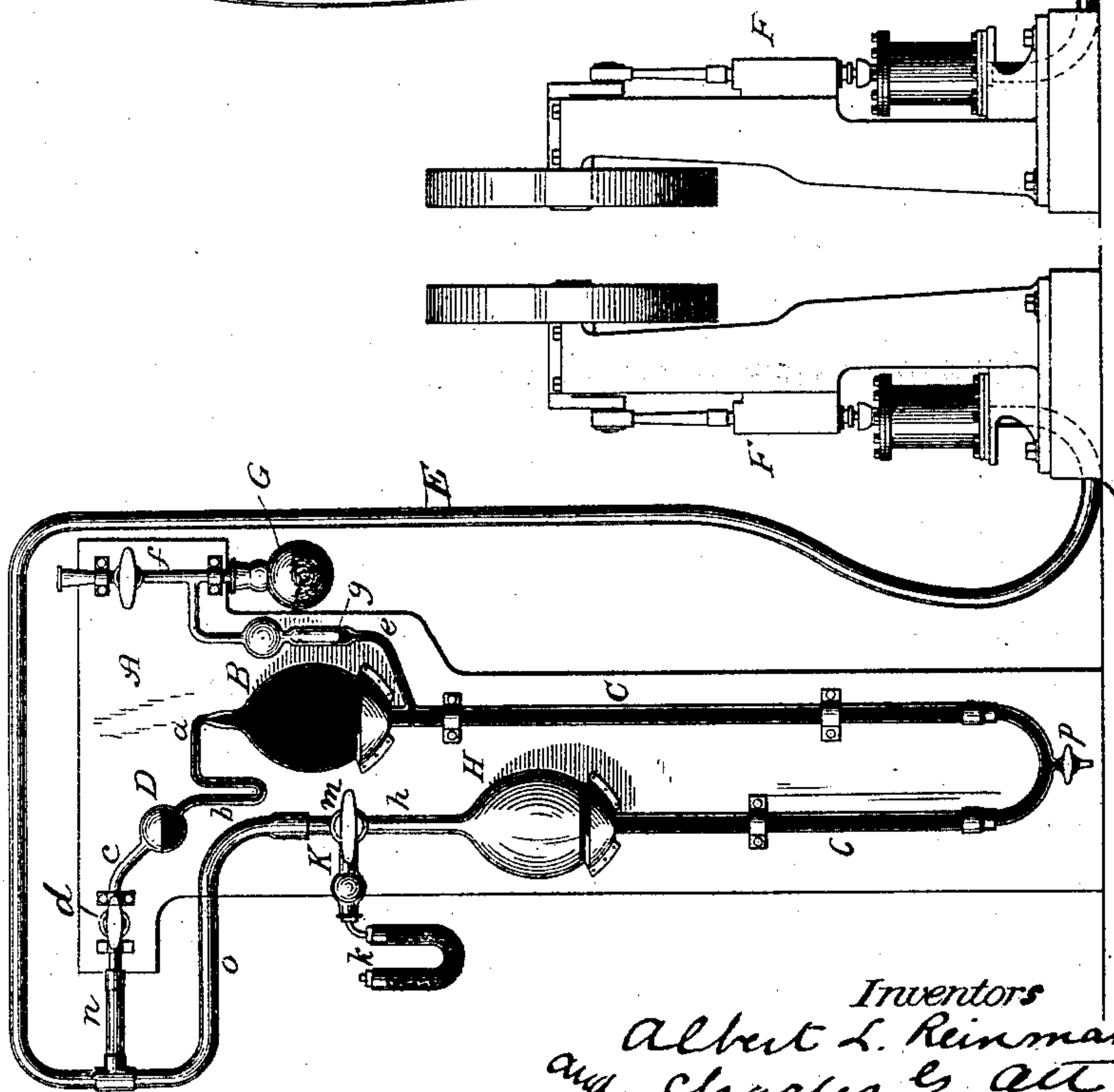


Fig. 2.



Attest:
Raymond T. Barnes.
W. H. Hartley.

Inventors
Albert L. Reinmann
and Charles G. Ott.
By Parker W. Page atty.

(No Model.)

2 Sheets—Sheet 2.

A. L. REINMANN & C. G. OTT.
MERCURIAL AIR PUMP.

No. 327,313.

Patented Sept. 29, 1885.

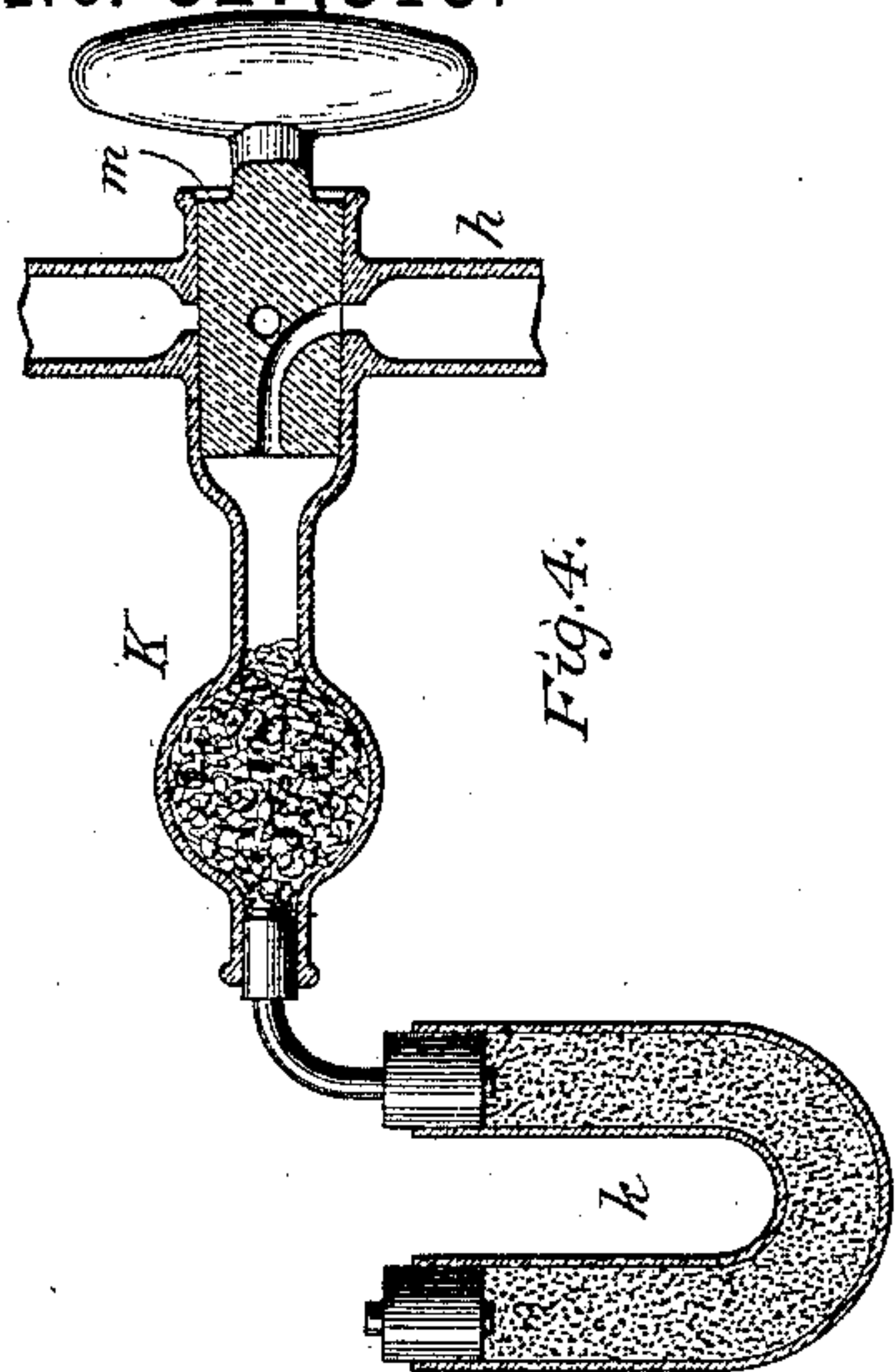
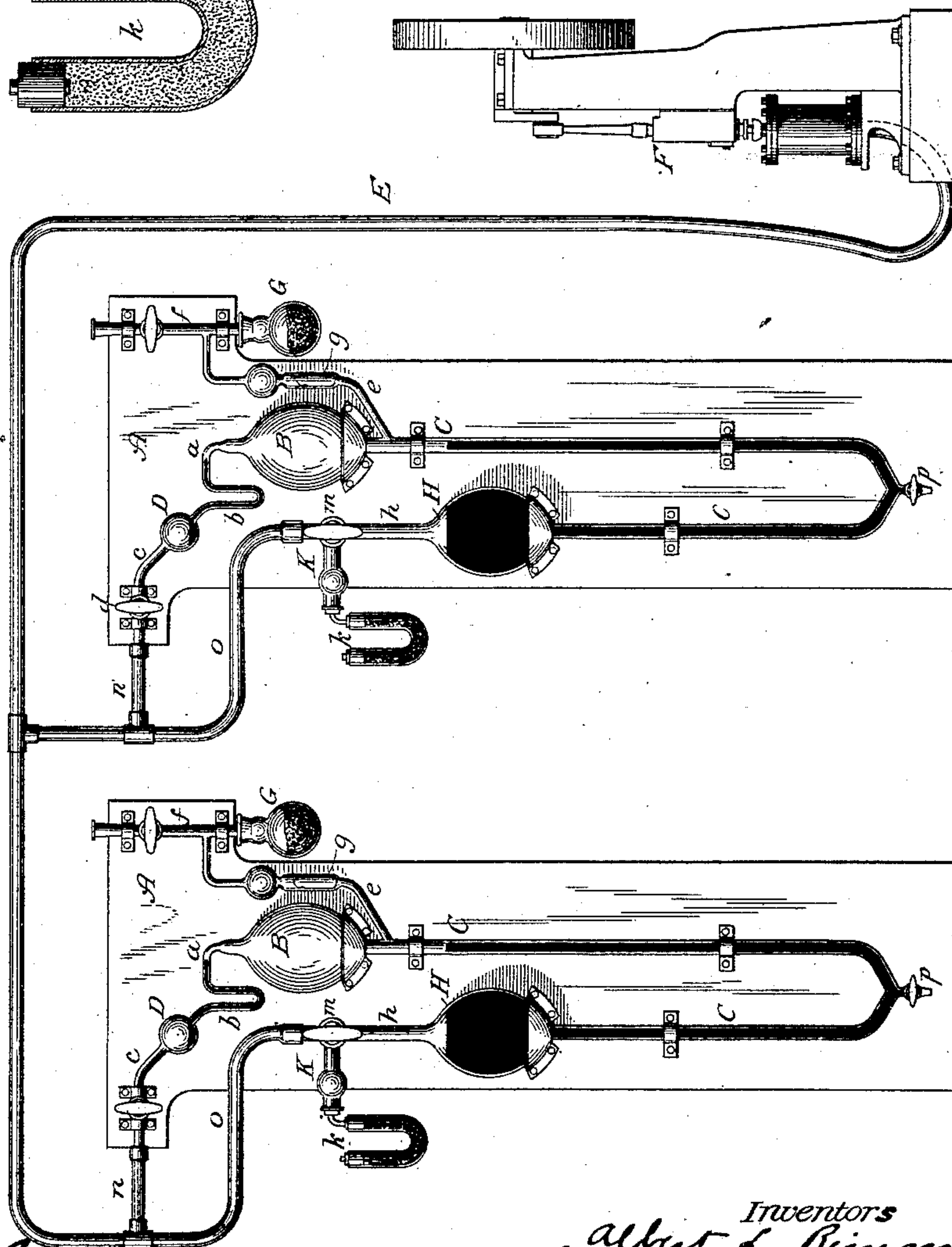


Fig. 4.

Fig. 3.



Attest:
Raymond A. Barnes.
W. H. Hartley.

Inventors
Albert L. Reinmann
and Charles G. Ott.
By Parker W. Page atty.

UNITED STATES PATENT OFFICE.

ALBERT L. REINMANN AND CHARLES G. OTT, OF NEWARK, NEW JERSEY.

MERCURIAL AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 327,313, dated September 29, 1885.

Application filed November 9, 1883. (No model.)

To all whom it may concern:

Be it known that we, ALBERT L. REINMANN, a citizen of the United States, and CHARLES G. OTT, a subject of the Emperor of Germany, both residents of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Mercurial Air-Pumps, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

Our invention relates to apparatus for producing high vacuums, and more particularly to the form of mercurial air-pump shown in United States patent to Edward Weston, No. 283,545, the principle of the invention and its manner of application to apparatus of this character being herein illustrated in connection with a pump constructed in accordance with said patent.

Our improvement consists in the combination, with an exhaust-pump constructed to operate on the principle of what are commonly termed "Geisler" pumps, of novel means for effecting and controlling the movement of the mercury by atmospheric pressure without the employment of flexible tubes, or the usual raising and lowering of the mercury-reservoir. The nature of these improvements will be described by reference to the accompanying drawings, in which—

Figure 1 is a view in elevation of an exhaust apparatus constructed in accordance with our invention; Fig. 2, the same with a modified arrangement of the mechanical exhaust; Fig. 3, a view of two pumps united for simultaneous operation with the same mechanical exhaust-pump. Fig. 4 illustrates details of valve mechanism.

Similar letters of reference indicate corresponding parts in the several figures.

A is a board or support, to which the parts of the pumps are attached by clamps.

B is the usual vacuum-chamber, from which extends downward the tube C. The upper portion of the chamber or balloon B tapers off into a tube, *a*, of small diameter, which extends horizontally for a short distance, is then bent into an elbow or trap, *b*, and joined to a globe or small chamber, D, at a point slightly above its lowest part. From the globe D ex-

tends a tube, *c*, containing a stop-cock, *d*, and connected by a tube, E, with a mechanical or other exhaust-pump, F. From the tube C, and immediately below the chamber B, 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 communication between the tubes C and *f*, when the mercury in the former rises sufficiently to raise and close the valve.

Heretofore the tube C has extended vertically thirty or more inches, and a flexible tube from a movable mercury-reservoir was joined to its lower end. The objections, hereinafter pointed out, to this arrangement we avoid by employing a stationary chamber or mercury-reservoir, H, bending the tube C into U shape and joining it to the bottom of the chamber H. The latter we draw out in a tube, *h*, and connect the same with an exhaust-pump, F'. To the tube *h* is joined a branch, K, open to the air directly or through a receptacle, *k*, containing a moisture-absorbent. At the junction of the tubes *h* and K is placed a two-way cock, *m*.

The operation of the apparatus is as follows: Mercury is introduced into the chamber H until it nearly fills it and rises in tube C to a point slightly below the tube *e*. The exhaust-pumps F F'—ordinary mechanical air-pumps may be used—are then connected to the tubes C and *h*, respectively, and set in operation. When the air has been withdrawn from the chamber B, and the parts communicating therewith, as perfectly as possible by this means, the cock *m* is turned to cut off the pump F' and to admit air through the tube K. This forces the mercury up into the chamber B, which closes the valve *g* in tube *e*, and after filling the chamber passes over into the globe D, carrying with it the residual air from the chamber B. The cock *m* is then turned to shut off the air and connect the pump F'. An equilibrium being thus established, the mercury flows back into chamber H until it is nearly on a level in the chamber and the tube C, the column in the tube being slightly

higher, owing to the more perfect vacuum above it. This operation is repeated as many times as may be necessary. By this construction the pump is operated by simply turning the cock *m*. All parts of the pump may be made of glass, the use of flexible tubes avoided, and the apparatus made in smaller compass.

In lieu of using two mechanical pumps, *F F'*, one only may be employed for a single pump, or more than one, as shown in Figs. 2 and 3.

In Fig. 2 the tubes *c* and *h* are connected with the branches *n o* of the pipe leading from the mechanical pump *F*. By the proper manipulation of the cocks *d* and *m*, the pump is operated as above described. The mercury in this figure is shown in the position to which it is brought by introducing air into the chamber *H* above the mercury.

In Fig. 3 two pumps are shown connected to the pipe *E*, and it is evident that more than two may be connected with this pipe in a similar manner. The details of construction of the apparatus may be greatly varied. For example, the bend in the tube *C*, instead of being round, may be V-shaped, as shown in Fig. 3, so as to better prevent the accumulation of air-bubbles. In either case it is desirable to have a cock, *p*, at the lowest point in the tube *C*, through which to draw off the mercury to clean it, or for other purposes. It is not essential that the tube *c* shall be enlarged to form a globe or chamber, as at *D*, though we have preferred to so construct it.

In Fig. 4 the two-way cock *m* and the parts of the apparatus with which it is used are illustrated in detail. These particulars, however, may also be greatly varied without departure from the invention.

We are aware that atmospheric pressure has been applied to the raising of the mercury in certain forms of air-pumps, and we do not claim this, broadly; but we do not confine ourselves to the exact construction of the pump or the mercury-raising devices here shown, and may use any known construction of said devices to which our improvements are applicable.

What we now claim is—

1. In a mercurial air-pump, an exhaust-

chamber provided with means for the escape of air therefrom, in combination with a mercury-reservoir having its lower end connected to the lower end of the exhaust-chamber by a tube or pipe, and a mechanical exhaust device, the mercury-reservoir being provided at or near its upper end by valved connections with the mechanical exhaust device and with the air, whereby the atmospheric pressure in the reservoir may be varied to effect the movement of the mercury to and from the exhaust-chamber, substantially as set forth.

2. In a mercurial air-pump, the exhaust-chamber suitably connected to the mechanical exhaust device, in combination with the mercury-reservoir having its lower end connected to the lower end of the exhaust-chamber, and the mechanical exhaust device, the mercurial reservoir being provided with valved connections with the mechanical exhaust device and with the air, whereby in the proper manipulation of the valve controlling such connections the atmospheric pressure in the reservoir may be varied to effect the movement of the mercury to and from the exhaust-chamber, substantially as set forth.

3. The combination, with the vacuum-chamber *B* and mercury-reservoir *H*, directly connected by a downwardly-bent tube, of the tube *h*, leading from the upper part of the reservoir to a mechanical exhaust-pump, the branch *K*, having its outer end open to the air, and the two-way cock arranged to connect the reservoir alternately with the mechanical exhaust-pump and the external air, substantially as and for the purpose set forth.

4. The combination, with the vacuum-chamber *B*, trap *b*, and tubes *a c*, of the reservoir *H*, tube *C*, tube *h*, branch *K*, mechanical means for exhausting connected with said tubes *C* and *h*, and suitable valves or cocks arranged in the several tubes, as described, for the purpose of opening and closing communication through the same.

In testimony whereof we have hereunto set our hands this 1st day of November, 1883.

ALBERT L. REINMANN.
CHARLES G. OTT.

Witnesses:

FRANK N. CRANE,
RICHARD VARLEY, Jr.