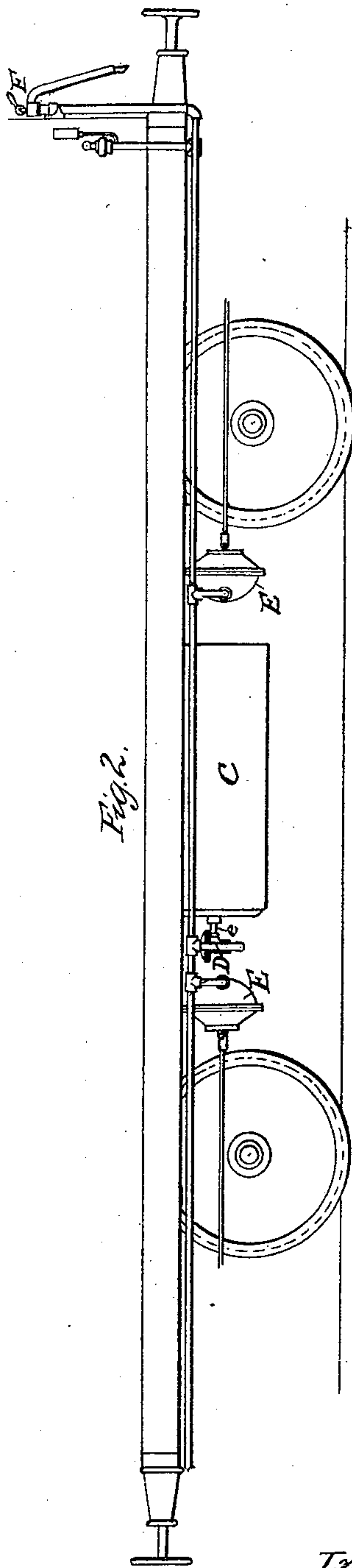
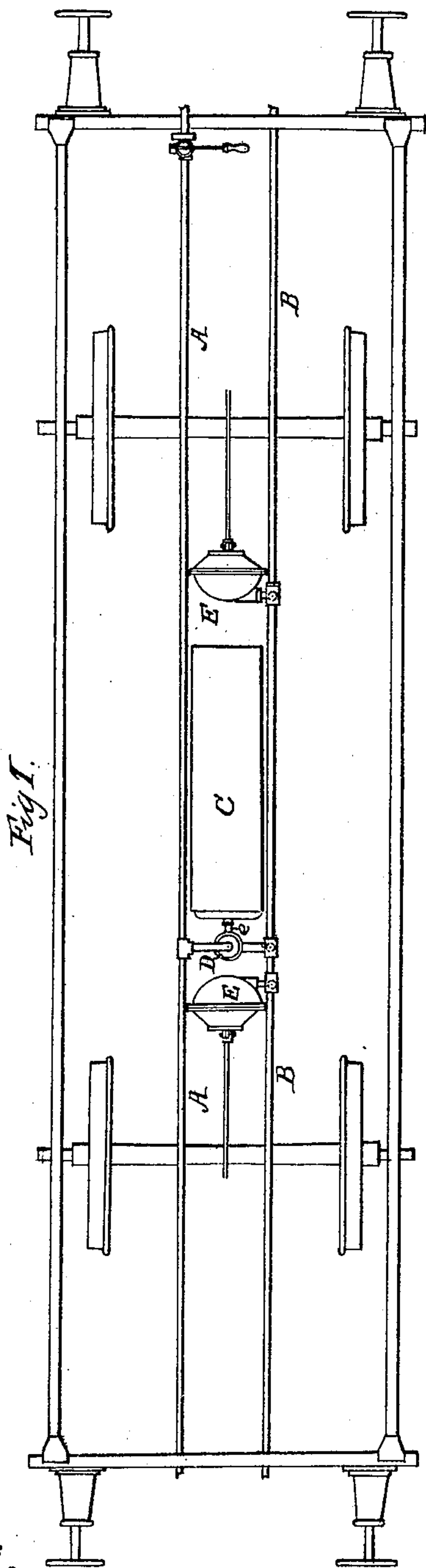


(No Model.)

3 Sheets—Sheet 1.

F. W. EAMES.
Vacuum Brake Apparatus.
No. 241,330. Patented May 10, 1881.



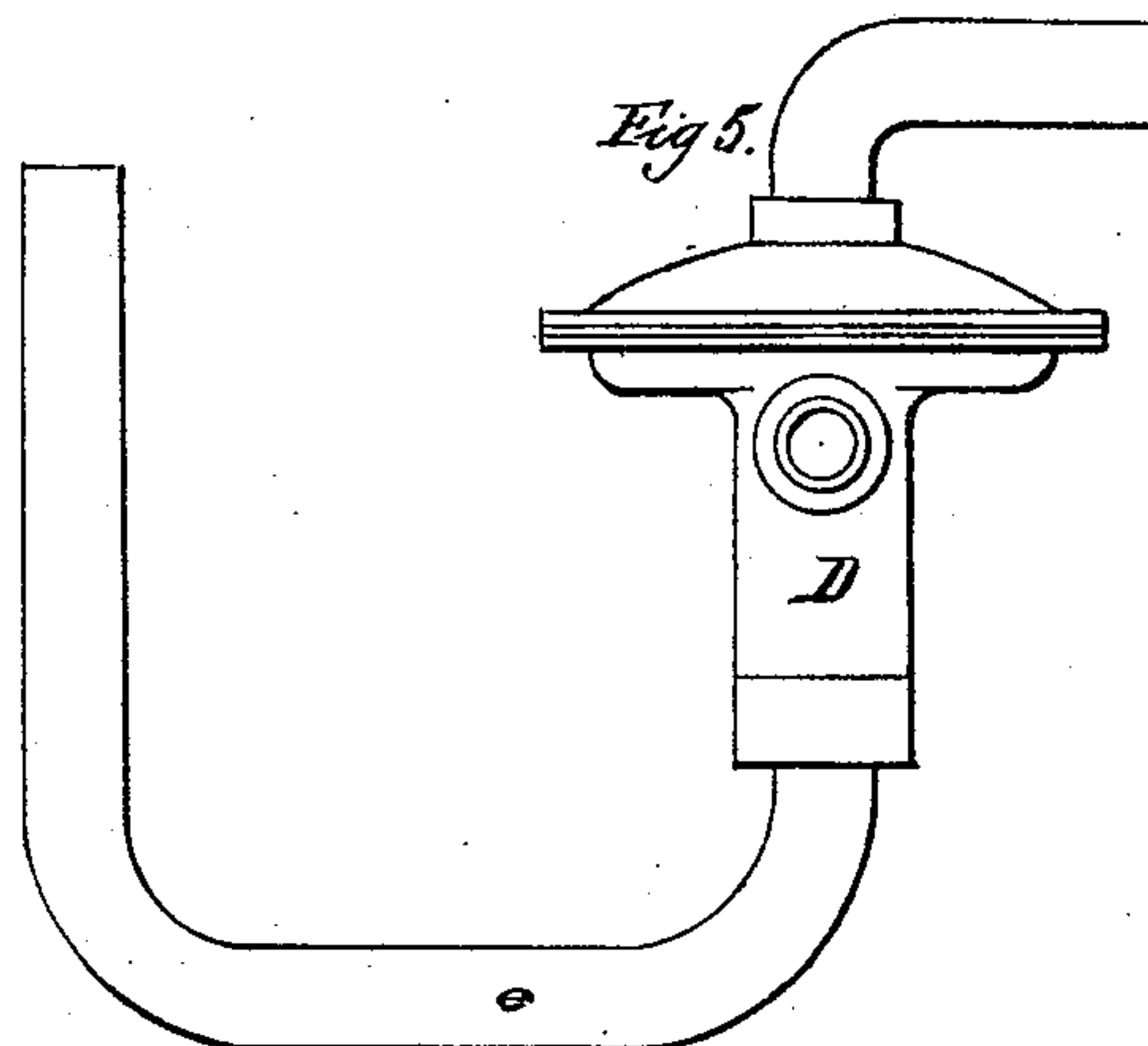
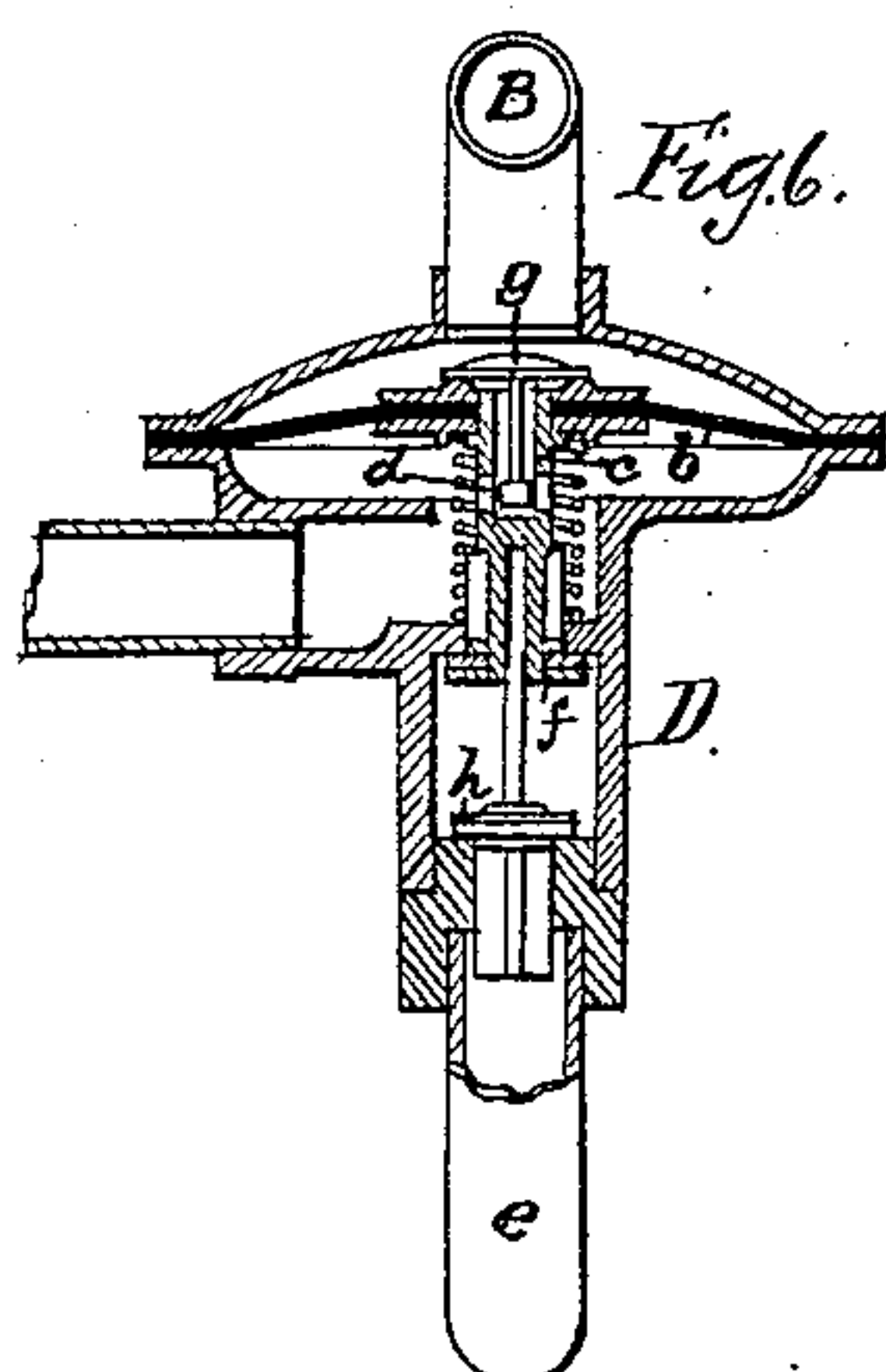
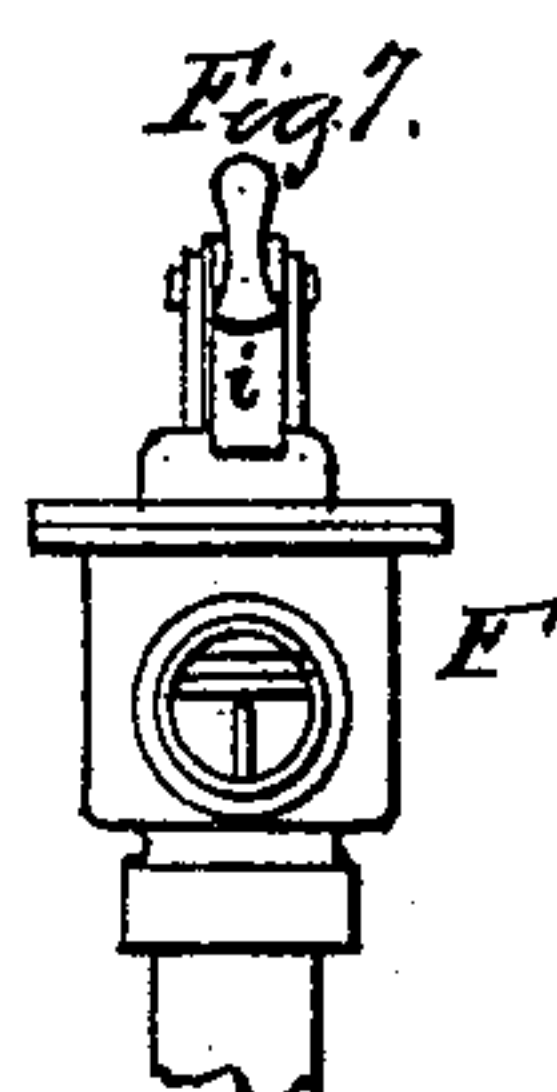
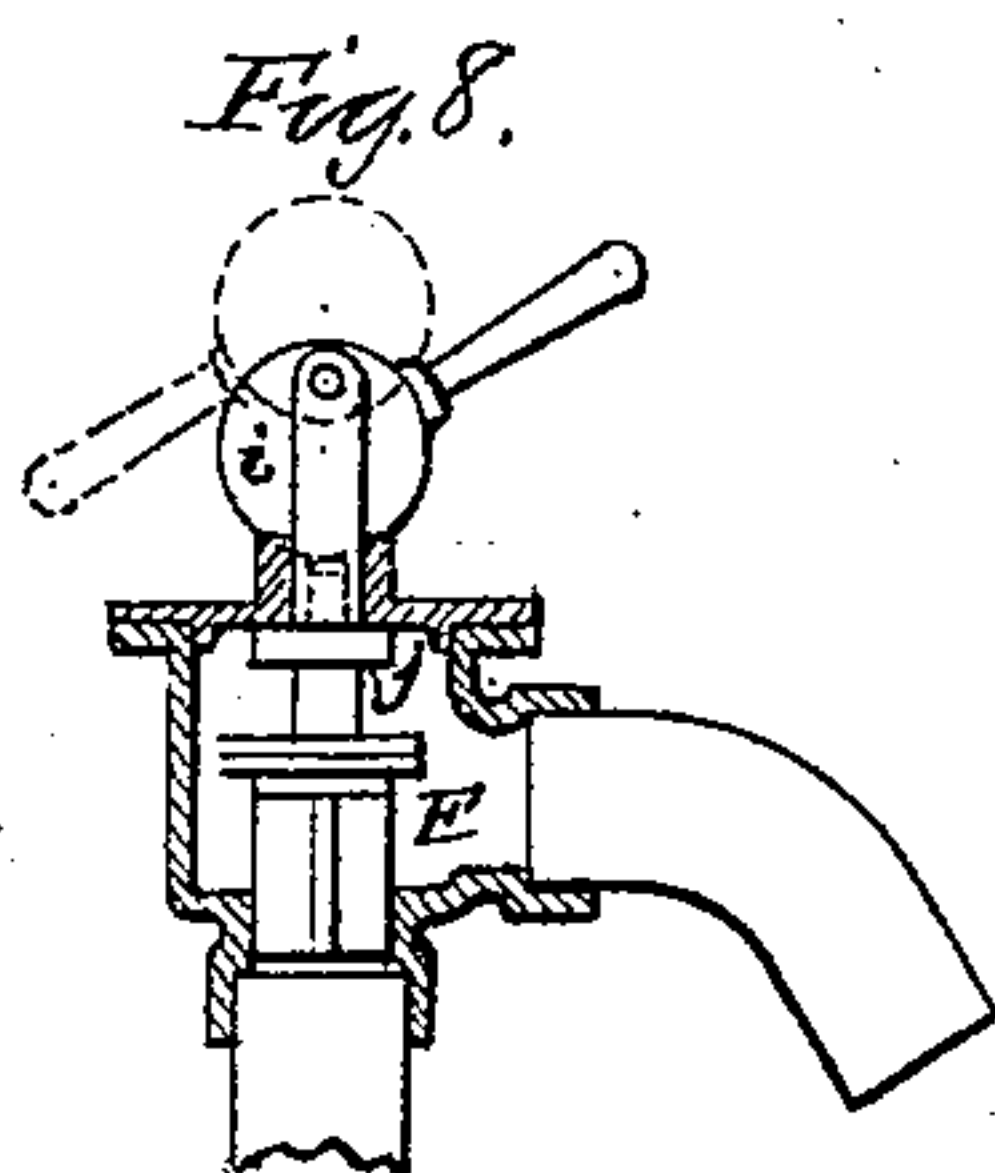
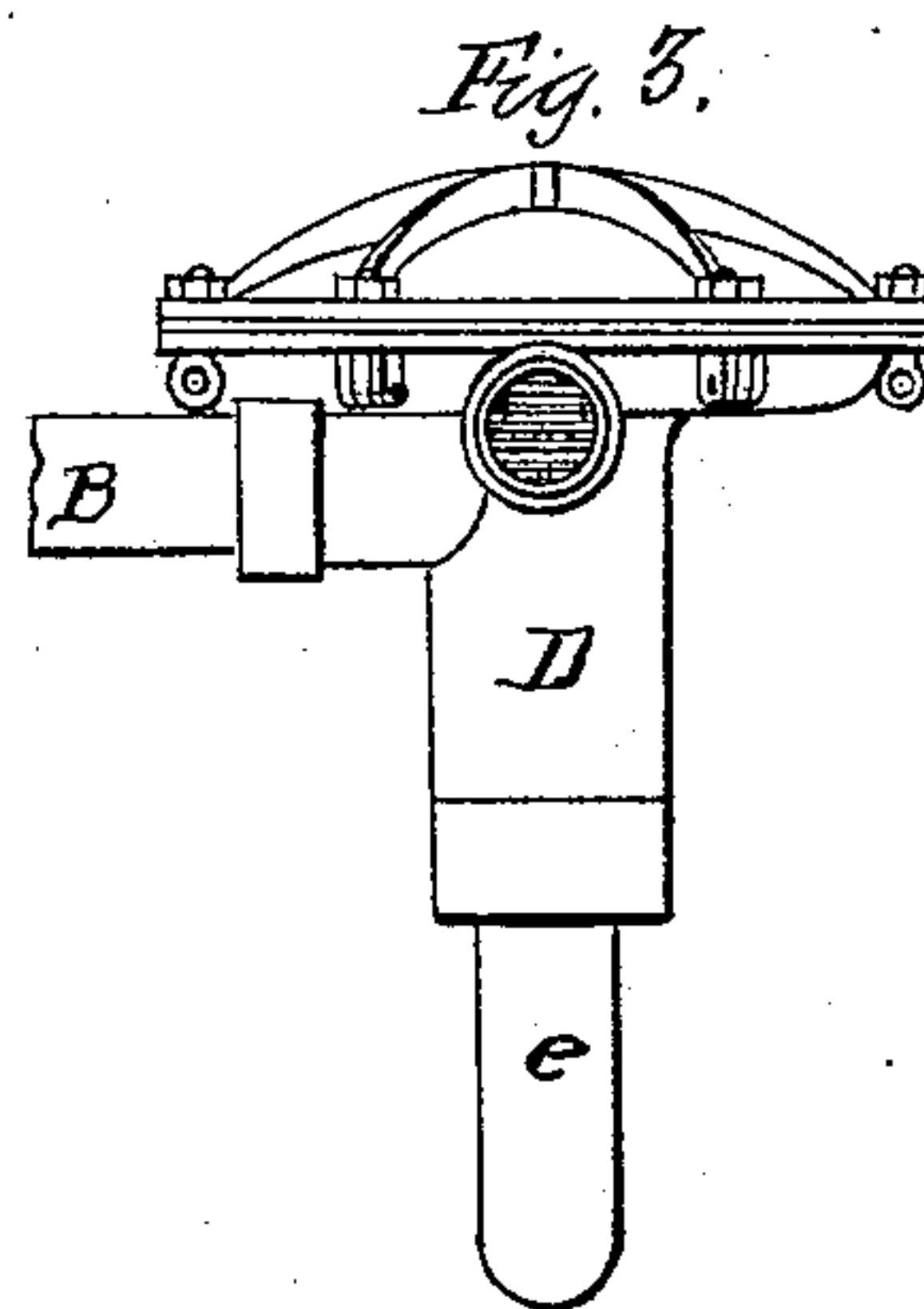
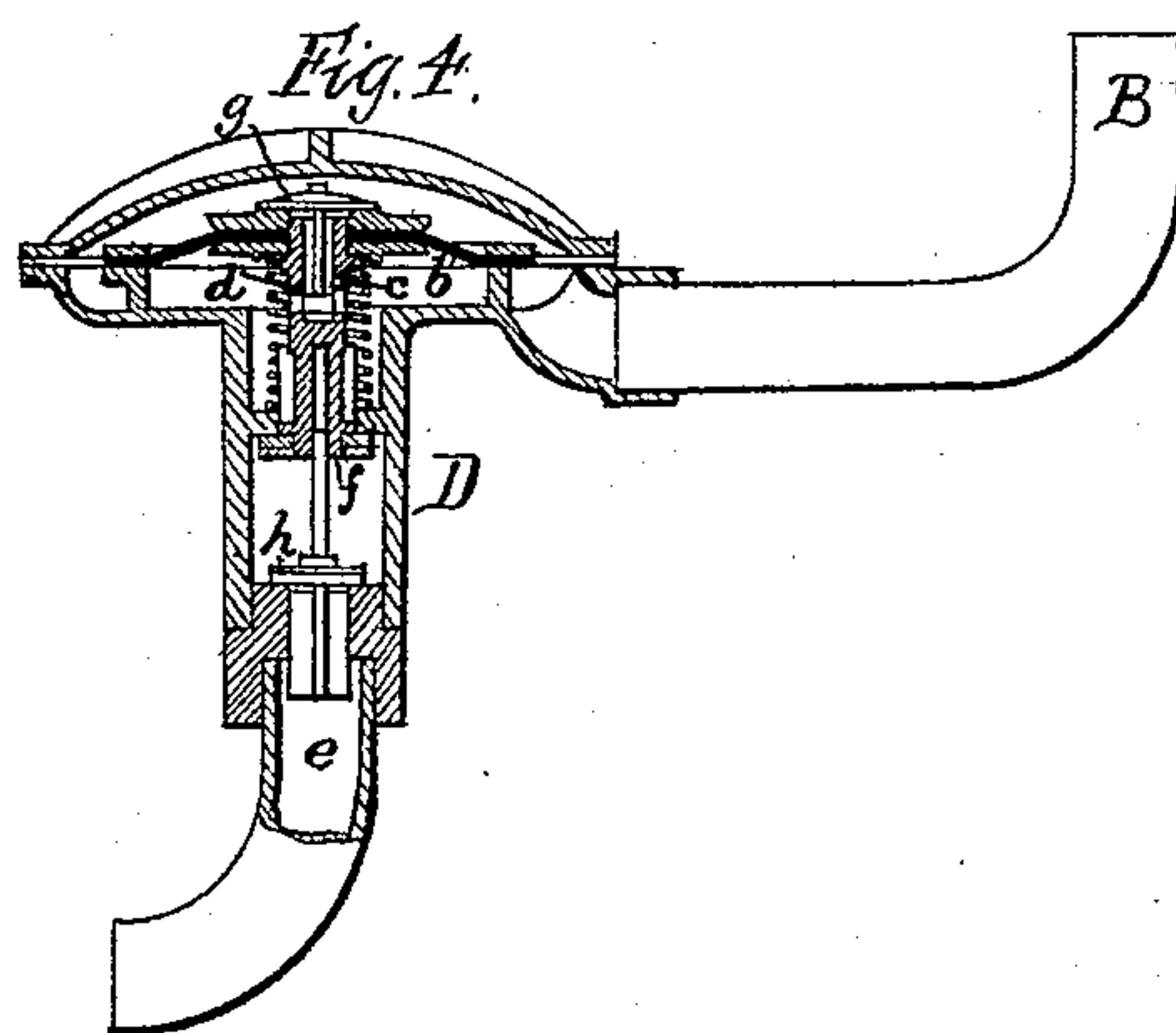
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(No Model.)

3 Sheets—Sheet 2.

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Vacuum Brake Apparatus.
No. 241,330.
Patented May 10, 1881.



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(No Model.)

3 Sheets—Sheet 3.

F. W. EAMES.
Vacuum Brake Apparatus.
No. 241,330. Patented May 10, 1881.

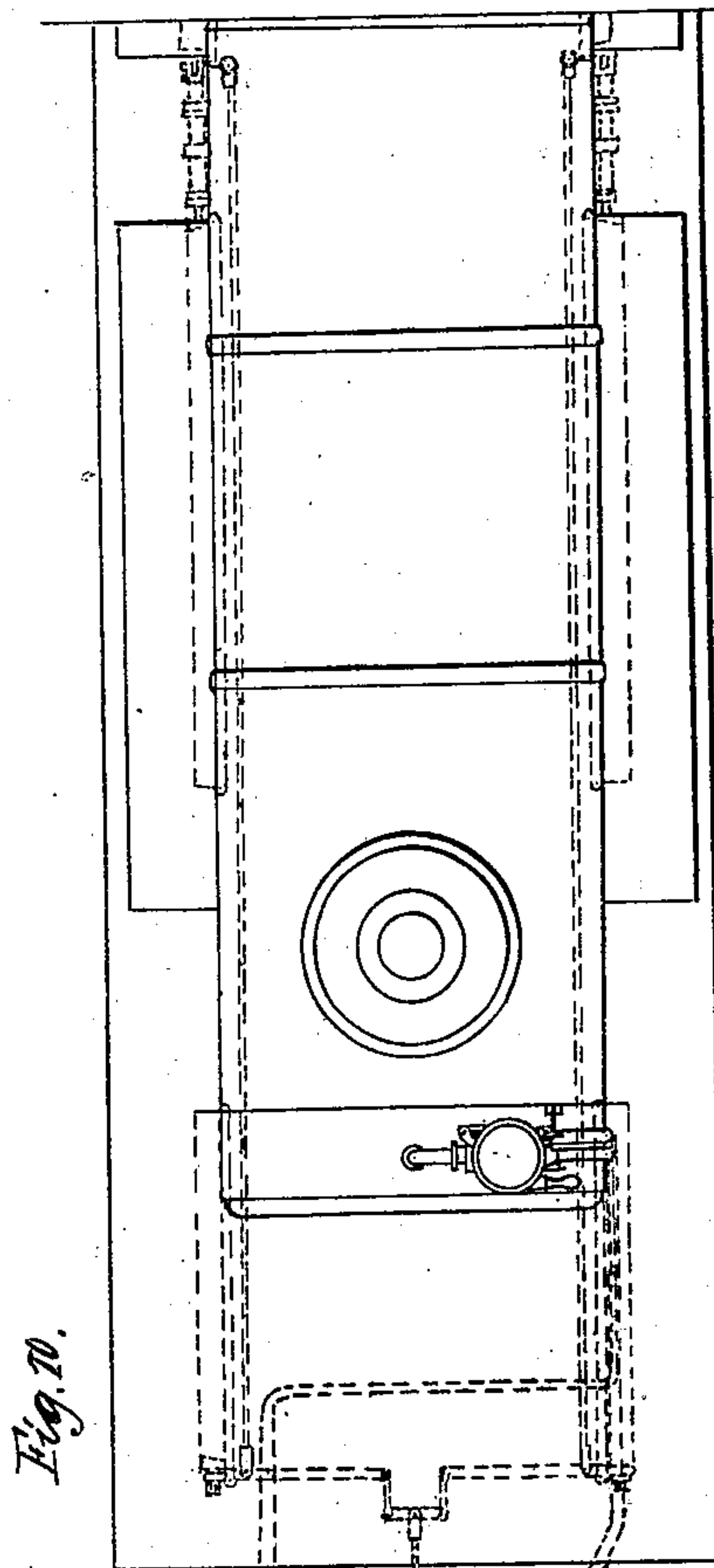


Fig. 10.

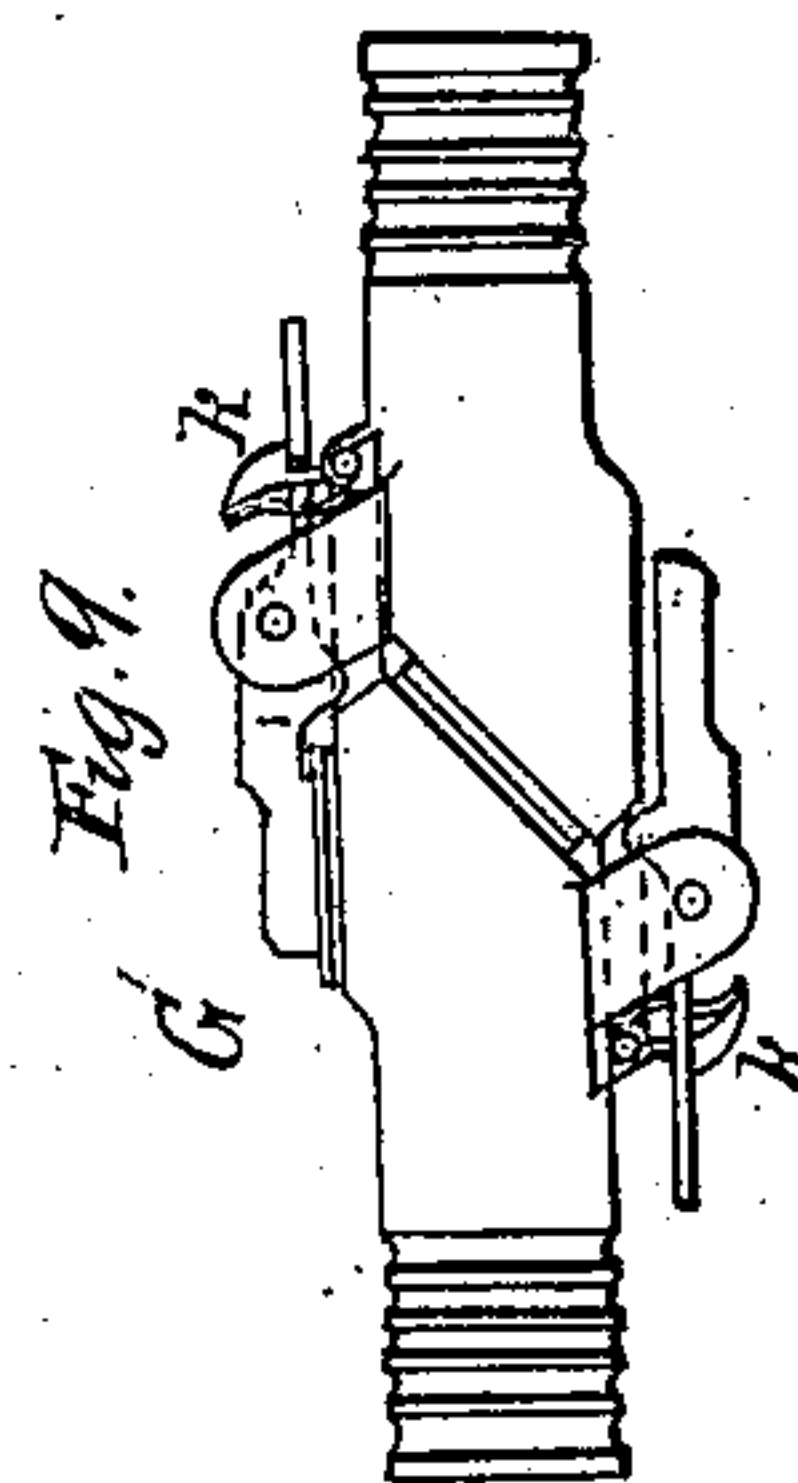
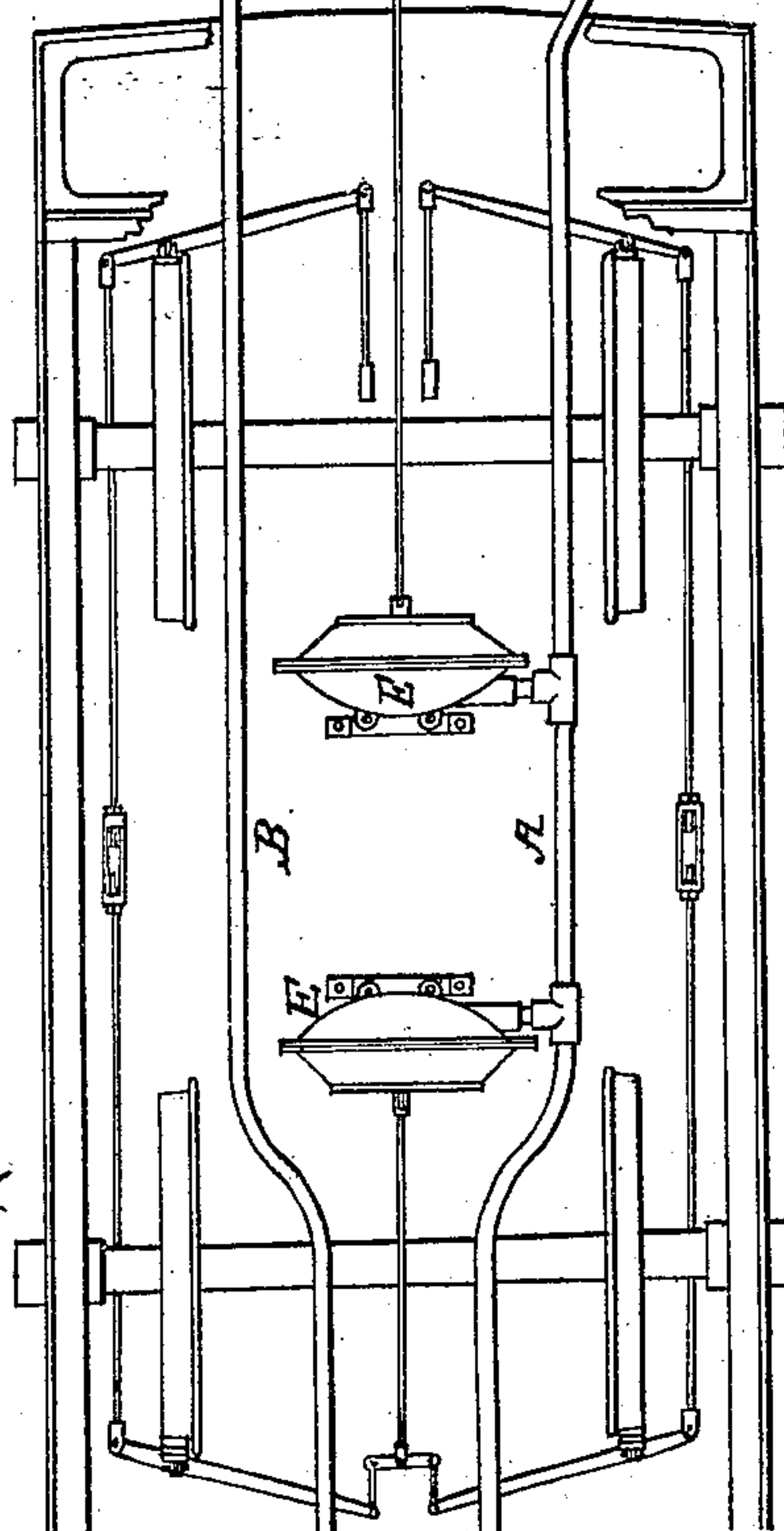


Fig. 9.



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UNITED STATES PATENT OFFICE.

FREDERICK W. EAMES, OF WATERTOWN, NEW YORK.

VACUUM-BRAKE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 241,330, dated May 10, 1881.

Application filed October 29, 1880. (No model.) Patented in England January 20, 1879.

To all whom it may concern :

Be it known that I, FREDERICK W. EAMES, a citizen of the United States, residing at Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Vacuum-Brake Apparatus, (Case H;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification, the same being patented to me by the government of Great Britain by Letters Patent No. 225, dated January 20, 1879.

Figure 1 represents a top-plan view of a car and car-truck to which my present improvements are shown applied, and illustrates the general arrangement thereof. Fig. 2 represents a side view of the same. Fig. 3 represents an outside elevation of a valve and valve-box having my improvements, through which communication is made with the brake-pipes, the vacuum-reservoir, and with the air vessels or chambers and their pneumatic levers. Fig. 4 represents a central vertical section of the same, showing its internal construction and arrangement. Fig. 5 represents a side elevation of a modification of my improved interposed valve arrangement, and Fig. 6 a central vertical section of the same. Fig. 7 represents an outside elevation of the cut-off valve adapted to be arranged at each end of each section of rigid tube or brake-pipe, and Fig. 8 a central vertical section of the same. Fig. 9 represents a plan view of the coupling for uniting the pipe-sections between the cars. Fig. 10 is a plan view of the same, the body of the tender being removed.

My invention relates to the pneumatic system of brake apparatus, and for this purpose consists, first, in providing a railroad-train with a duplex line of continuous brake-pipes, in one of which a vacuum is, and in the other of which a vacuum is not, automatically maintained; second, a duplex line of continuous brake-pipes provided with a vacuum chamber or chambers, their connection therewith being controlled by a novel arrangement of valvular

apparatus; third, a double line of brake-pipes, in one of which a vacuum is constantly maintained by a continuously-operating ejector or air-exhaust; fourth, a double line of brake-pipes, in one line of which a vacuum is continuously maintained, the brakes being ordinarily applied by creating a vacuum in the other line of pipes; fifth, a duplex line of brake-pipes having communication with a reservoir, in one line of which and the reservoir a vacuum is continuously maintained, to be there held in reserve as an additional power in cases of emergency, where a more effective and instantaneous application of the brake is required than under ordinary circumstances; sixth, in combination with a double line of brake-pipes having connection with themselves and with a storing-reservoir by means of a valve device of novel construction, a series of vacuum-chambers having direct communication with but one line of pipes, whereby one system of pipes is enabled to be used independently of the other; seventh, in combination with a brake-pipe in which the brakes are applied by a reduction of vacuum-pressure within the pipe, a hose-coupling uniting the brake-pipe sections between the cars, each half of which is so constructed as to keep the snap-valves open upon the accidental severance of cars, derailment, or from any other cause; eighth, an interposed automatic valve device connecting the double line of brake-pipes and the storing-reservoir, whereby the action in the line of pipes, in which the vacuum is constantly maintained, exhausts or stores the reservoir with reserve power, and the destruction of the same opens communication with the reservoir and the other line of pipes, thereby causing the application of the brakes; ninth, a double line of brake-pipes, each having communication with a separate independent ejector or exhauster; tenth, in providing the end of each section of rigid brake-pipe with a cut-off valve, which comes into action to close the end of the pipes when this latter is exposed or when a fracture of the pipe beyond this point takes place; and, eleventh, connecting the flexible vessels on the engine and tender which actuate the brakes directly with or to the line of pipes ordinarily employed to brake the train, whereby, when the brakes are set in action by air being admitted to the

other line of pipes, the brakes of the cars are first put on before the brakes are applied to the locomotive and tender.

In the accompanying drawings, in which the same letters of reference indicate the same parts, A represents one line of the double line of continuous brake-pipes and B the other line. These lines of pipes run throughout the length of the train and are connected between the cars by suitable flexible hose-couplings, and the brake-pipes are each connected at one end with a suitable air ejector or ejectors. Pipes A and B have communication with each other under certain conditions, and with the storing-reservoir C through a valve-box and valve apparatus, D, of novel construction and arrangement. This valve connects at its lower end with the flexible vessel or vessels E, which move the brake-levers through the pipe B.

Fitted to the upper part of the valve-box D and immediately below an air-space having connection with the tube B, is a flexible diaphragm, *b*, to which is attached a hollow rod, *c*, furnished with a flange at its upper end, which forms a valve-seat. This hollow rod or spindle forms a communication by lateral passages *d* with the spaces above and below the diaphragm.

e represents a pipe leading from one of the vacuum-chambers C and communicating with the space below the diaphragm *b*. The bottom of this space is provided with a partition, through which is pierced a central opening, which forms a seat for an inverted puppet-valve, *f*, carried by the hollow rod *c*. The opening in this partition is formed sufficiently large to receive wings projecting from the rod, which form between them passages for the exhausted air when the valve *f* is open. Fitted to the upper end of this hollow rod *c* is a winged valve-stem carrying a valve, *g*, for closing the central opening in the hollow rod.

Below the lower partition of the diaphragm-chamber, upon which the pendent puppet-valve *f* is seated, is another partition, upon which rests another or second puppet-valve, *h*, which closes the opening leading to the flexible air-vessels E and the brake-pipe A.

To facilitate access to the interior of the valve-box D it may be found desirable to furnish the box with a detachable cover, as shown in Figs. 3 and 4. In this case the pipe B will have its connection with the valve-box below the cover, and the diaphragm *b*, instead of being held in place between the box and cover, will be held to an annular flange by a clamping-ring. The cover is secured in place in any suitable way.

F represents a cut-off valve arranged so as to be within reach of the passengers or trainmen, or the valve-lever may have a cord attached leading to the car above. This valve is held off its seat by a cam-lever, *i*, pivoted to the outer end of the valve-spindle and bearing on top of the valve-case. The stem of this valve is provided with a cushioned disk, *j*,

which, when the valve is open, bears against the inner face of the valve-box, thereby forming a stuffing-box to the valve-spindle. By tripping the cam-lever *i* the valve seats itself and closes the end of the pipe, thus cutting off the defective portion of the brake apparatus. A similar contrivance may be applied to the outlet of each of the flexible vessels E and for the like purpose, the cam-levers being operated by an inspection when the train is stationary.

G represents the coupling for attaching the ends of the pipe-sections between the cars. This form of coupling forms the subject of a patent heretofore granted to me, and is well known; but in order to render it effective in connection with my present invention in the event of the severance of the train and provide for the admission of air to the pipe B, I provide the coupling with a spring-catch, *k*, which holds the valves of the coupling open against the pressure of their closing-springs and allows air to enter pipe B to destroy the vacuum and apply the brakes.

It has been found desirable in operating a brake apparatus that the brakes of the cars come into action before the brakes on the engine and tender in order to secure this result. I modify the arrangement of the brake apparatus on the engine and tender by dispensing with the storing-reservoir and the interposed tubular device connecting the brake-pipes and secure the flexible vessels or chambers directly to the brake-pipe A. This arrangement insures that the air admitted to the pipe B shall, through the action of the valve apparatus D, first put on the car-brakes, and in the act of so doing thus bring the pipe A into connection with the vacuum-chambers on the engine and tender, whereby their brakes will be set in action.

The operation of my present improvements is simple and easily understood and is as follows, here premising that it will be understood that ordinarily the brakes will be applied by creating a vacuum in the brake-pipe A and its attached air-vessels of the pneumatic levers by an air-exhauster having communication therewith: In the line of brake-pipes B and in the reservoir C a vacuum is constantly maintained by a supplementary air-injector, which I prefer to construct of comparatively small diameter and keep it constantly blowing. This action of the ejector exhausts the air from the pipe B, and, through its connection with the valvular device D, causes the valve *g*, seated on the flange of the hollow rod, to rise, and the air below the diaphragm *b* will pass upward until the exhaustion is complete in the vacuum-reservoir, the valves *f* and *h* closing to prevent any communication with the pipe A or the flexible vessels E. In this condition the brakes are off, and under ordinary circumstances, as before mentioned, the brakes will be put on by creating a vacuum in pipe A and the flexible vessels connected therewith. When, however,

an instantaneous application of the brakes is required, as in cases of emergency, air is admitted to the brake-pipe B, and the open valve mounted in the hollow rod of the flexible diaphragm will drop onto its seat, thus closing communication between the pipe B and the under side of the diaphragm. The diaphragm will now fall, carrying with it the hollow pendant puppet-valve *f*. An opening will thus be established between the vacuum-reservoir and the space immediately above the puppet-valve *h*, the effect of which will be to lift that valve and exhaust the flexible vessels of the brake apparatus through the pipe A, and thereby put the brakes in action. This exhaustion of the pipe A will be supplemented by an exhaustor attached thereto operating automatically or by the act of the engine-driver. It will be understood that this action takes place simultaneously under every car throughout the train, and is caused either by the accidental severance of the train or by the act of the engineer or passengers. In order to take the brakes off it will only be necessary for the engine-driver to admit air to the pipe A.

Having described my invention, what I claim is—

1. A double vacuum-brake pipe in one line of which a vacuum is, and in the other line of which a vacuum is not, automatically maintained and arranged for operation substantially as and for the purpose set forth.

2. A double vacuum-brake pipe, in combination with reservoir C and valve D, arranged for operation substantially as and for the purpose set forth.

3. The double vacuum-brake pipes A B, in which a vacuum is continuously and automatically maintained in one line of pipe by a constantly-operating ejector, as and for the purpose set forth.

4. A double vacuum-brake pipe A B, in one line of which a vacuum is continuously maintained, the brakes being ordinarily applied by creating a vacuum in the other line, substantially as and for the purpose set forth.

5. The double vacuum-brake pipes A B and

reservoir C, in the pipe B and reservoir C of which a vacuum is continuously maintained, the brakes being ordinarily applied by creating a vacuum in the pipe A, substantially as set forth.

6. The combination of the double brake-pipes A B, reservoir C, valve D, and flexible air-vessel E, substantially as set forth.

7. The valve device D, connecting-pipes A B, and reservoir C, whereby a vacuum constantly maintained in the pipe B exhausts the reservoir and closes communication with pipe A, and the destruction of the vacuum closes connection with pipe B and reservoir C and opens communication with said reservoir and pipe A, thereby applying the brakes, substantially as set forth.

8. The double vacuum-brake pipe A B, each having communication with a separate ejector, arranged for operation as and for the purposes set forth.

9. The cut-off valve F, arranged at the end of each section of rigid brake-pipe, substantially as and for the purpose set forth.

10. A double line of brake-pipes A B, having the flexible air-vessels so arranged upon the engine and tender that upon the brakes being applied the brakes of said engine and tender will not come into action until after the brakes of the cars have been applied, substantially as set forth.

11. The valve device D, consisting of diaphragm *b*, hollow spindle *c*, with lateral openings, and valves *g* and *f*, substantially as and for the purposes specified.

12. A brake apparatus having a double line of pipes, one line communicating with the reservoir and the other with the flexible chambers or pistons, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FRED. W. EAMES.

Witnesses:

CHAS. D. BINGHAM,
E. D. EAMES.