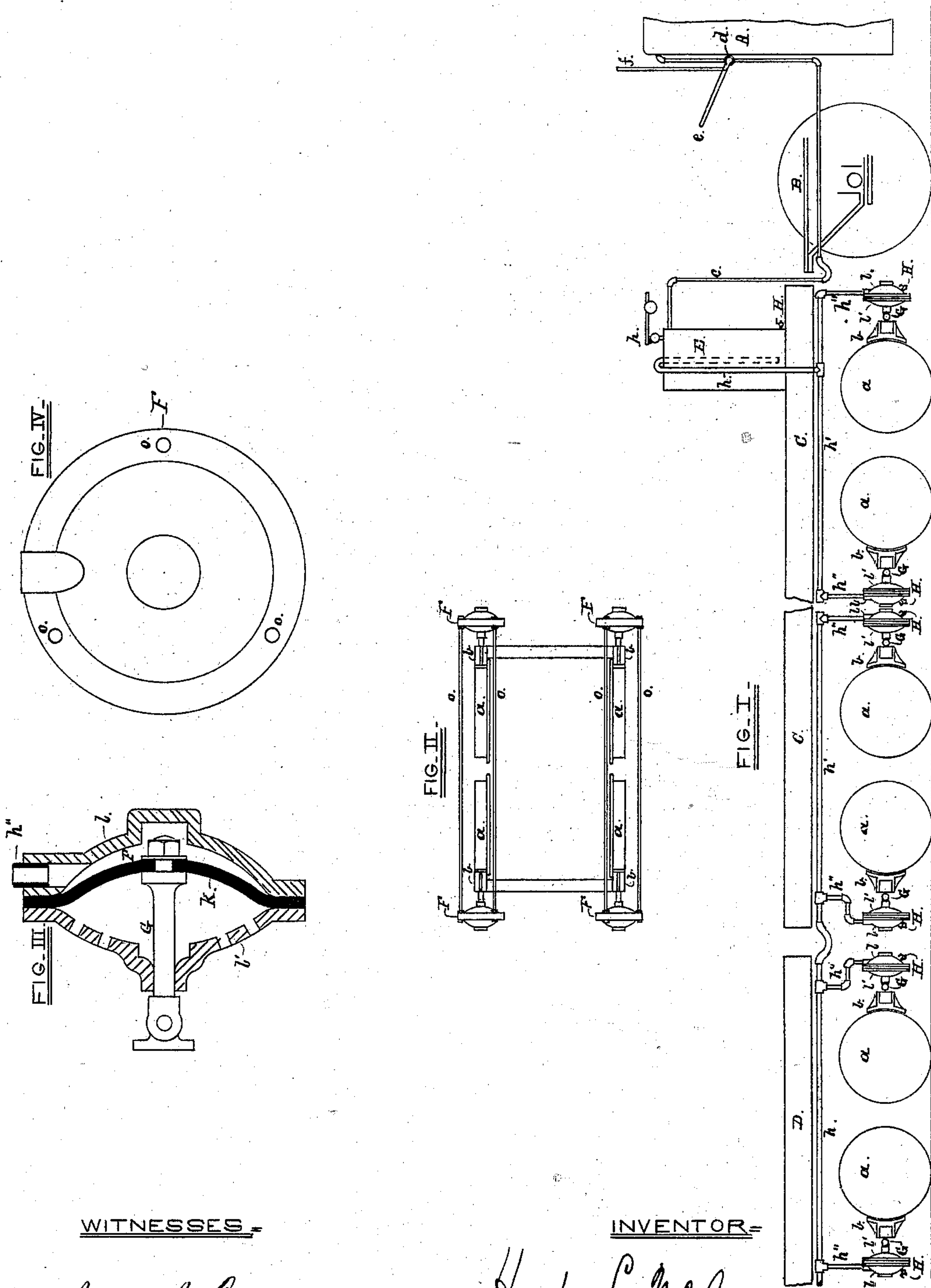


H. L. McAVOY.  
Steamer Power Air-Brakes.

No. 138,339.

Patented April 29, 1873.



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# UNITED STATES PATENT OFFICE.

HUGH L. McAVOY, OF BALTIMORE, MARYLAND.

## IMPROVEMENT IN STEAM-POWER AIR-BRAKES.

Specification forming part of Letters Patent No. **138,339**, dated April 29, 1873; application filed January 22, 1873.

*To all whom it may concern:*

Be it known that I, HUGH L. McAVOY, of the city of Baltimore and State of Maryland, have invented certain Improvements in Steam-Power Air-Brakes, of which the following is a specification; and I do hereby declare that the same is a full, clear, and exact description of my said invention, reference being had to the accompanying drawing and to the letters of reference marked thereon.

My invention relates to a brake to be applied to railway cars, and operated by the compression of atmospheric air or some other elastic aeriform body; and consists, first, in the combination of the steam generator or boiler of the locomotive, an air-reservoir, and a brake mechanism, the combination being effected by a steam-pipe connecting the reservoir with the boiler, and an air-pipe joining the said reservoir with the brake-operating mechanism. The object of this part of my invention is to produce within the reservoir, as a power to be used in operating the brakes, a body of air compressed by the direct action thereupon of the steam passed from the boiler into the reservoir, and, after its production, to convey the compressed air to machinery specially adapted to set or operate the brakes of the train. My invention further consists in the means whereby the said compressed air is applied to the purpose for which it is designed and produced.

In the accompanying drawing forming a part of this specification, Figure I is a longitudinal view of portions of a locomotive, tender, and car having my invention thereupon. Fig. II is a part plan of the same. Figs. III and IV are enlarged views of detached portions of the invention.

Similar letters of reference indicate similar parts of the invention in all the views.

A is the locomotive-boiler. B is the foot-board of the locomotive, upon which the engineer stands. C is the tender, and D a part of a car. The wheels of the tender and car represented by *a*, and the shoes and brake-beams, which operate upon the wheels to check the speed of the train, by *b*. E is an air-reservoir placed upon the tender or locomotive in some convenient position. The upper part of the reservoir is connected with

the steam-space of the boiler by means of the steam-pipe *c*, which pipe is provided with flexible couplings where necessary, and has a cock or valve, represented by *d*, in such position as to be within reach of the engineer, to be controlled by means of the lever *e*. The valve *d* is of that character usually known as "three-way," which, in this case, is constructed in such manner that, in one position of the lever *e*, the steam from the boiler flows into the reservoir, and, by altering the position of the lever, the flow of steam may be stopped and the steam contained in the reservoir discharged through the escape-pipe *f*. The lower portion of the reservoir is connected with the mechanism used to operate the brakes, and afterward more fully described, by means of the pipes represented by *h h' h''*. The pipe *h* is siphonic in form, and connects the interior of the reservoir, near the bottom, with the pipe *h'*, which extends the entire length of the train, and is provided with flexible couplings at necessary points to prevent injury to the said pipes and connecting parts, and to allow for the inequality in the distances between the cars. F F are chambers connected, by means of the pipes *h''*, to the air-pipe *h'*, and are formed by securing the diaphragms *k* to the concave side of the plate *l*. These diaphragms, which are made of gum, leather, or some other flexible material, conform nearly in shape to the interior surface of the plate *l*, and are fastened by bolts, which also secure the perforated guide-plates *l'*. The diaphragms, by presenting convex surfaces to the compressed air, are susceptible of a more extended movement than flat disks would be under similar circumstances, besides having a greater tendency to assume their original shape when the pressure is removed. G G are stems fastened, air-tight, to the diaphragms *k*, and connect the same with the brake-beams and shoes directly, as shown in the drawing, or connected to the ordinary brake levers and rods; in either case no alteration is necessary in the hand arrangement for operating the brakes, which remains intact to be used in case of an emergency. The chambers F, facing each other and operating upon the wheels on the same side of the truck of the car, are shown in Fig. II connected together by the



bolts *o*, which serve to take the strain when the brakes are applied, and to keep the said chambers at the desired distance apart.

I will now describe the operation of my improved brake when used by the engineer in checking the speed of the train to which it is attached. The valve *d* is opened by means of the lever *e*, so as to admit the steam from the locomotive-boiler into reservoir *E*. The air contained in the reservoir is, by this admission of steam, compressed, which compression may be continued until it is equal to the pressure of the steam in the boiler, if necessary. The chambers *F* being connected with the reservoir, as before described, the compressed air acts upon the diaphragms *k*, forcing them out, thereby placing a strain on the brake beams and shoes *b* and the wheels upon which they operate. When it is desired to release the wheels, the valve *d* is turned by means of the handle *e*, and the confined steam in the reservoir allowed to escape, as before described, when the compressed air attains its original bulk and pressure and the diaphragms their primary condition. Thus all strain is removed from the brake beams and shoes, and the wheels are free to turn as before the application of the brakes. The air in the reservoir need not at all times be compressed to the full extent, as the steam may be shut off when sufficient tension has been placed upon the wheels. To regulate the maximum pressure to which the reservoir and connecting parts are to be subjected, when the said pressure is to be less than that in the boiler, the safety-valve *p* is used, which valve is suitably weighted and placed in a position so as to be within reach of the engineer. *H H* are cocks placed in the reservoir and chambers for the purpose of allowing the water of condensation which may accumulate to pass off, and also to admit air into the said reservoir and chambers to supply any deficiency caused by leakage.

In the use of steam from the locomotive-boiler directly as a compressor, and the employment of the flexible diaphragms with their attendant parts as transmitters of motion, it is obvious that a large amount of friction is dispensed with, which would be unavoidable in the use of the ordinary appliances, such as

air-pumps and cylinders fitted with pistons; and that the operation of the brake does not depend in any way upon the motion of the engine.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of the locomotive-boiler, an air-compressing reservoir, a pipe connecting the boiler and reservoir, and a pipe or pipes leading from the said reservoir to a brake-operating mechanism, jointly with the method of compressing the air by the direct action of the steam thereon in such reservoir, substantially as herein set forth.

2. The chamber formed by the solid and perforated concavo-convex plates *l l'*, having within it the flexible diaphragm *k* and sliding stem *G*, connected by the pipes *h''*, *h'*, and *h* to the reservoir *E*, substantially as and for the purpose herein specified.

3. A series of two or more of the chambers *l l'*, connected together and to the reservoir *E* by the pipes *h''*, *h'*, and *h* common to the series of chambers, as set forth, for the purpose specified.

4. The stems *G* operating directly upon the brake-shoes *b*, in combination with the flexible diaphragms *k* forced outward within the chamber *l l'* by the action of compressed air at the back of the diaphragms, as herein set forth.

5. The combination of the air-reservoir *E*, safety-valve *p*, pipe *c*, cock *d*, and the boiler of the locomotive, as and for the purpose herein set forth.

6. For the purpose of relieving brakes, the combination of the pipe *f*, three-way cock *d*, and reservoir *E* with the pipes *h*, *h'*, and *h''*, leading to the back of the diaphragms *k* within the chambers *l l'*, as herein shown and specified.

In testimony whereof I have hereto subscribed my name in the city of Baltimore this 21st day of January, A. D. 1873.

HUGH L. McAVOY.

Witnesses:

JNO. T. MADDUX,  
WM. T. HOWARD.