(No Model.)

A. J. WISNER.

AIR BRAKE.

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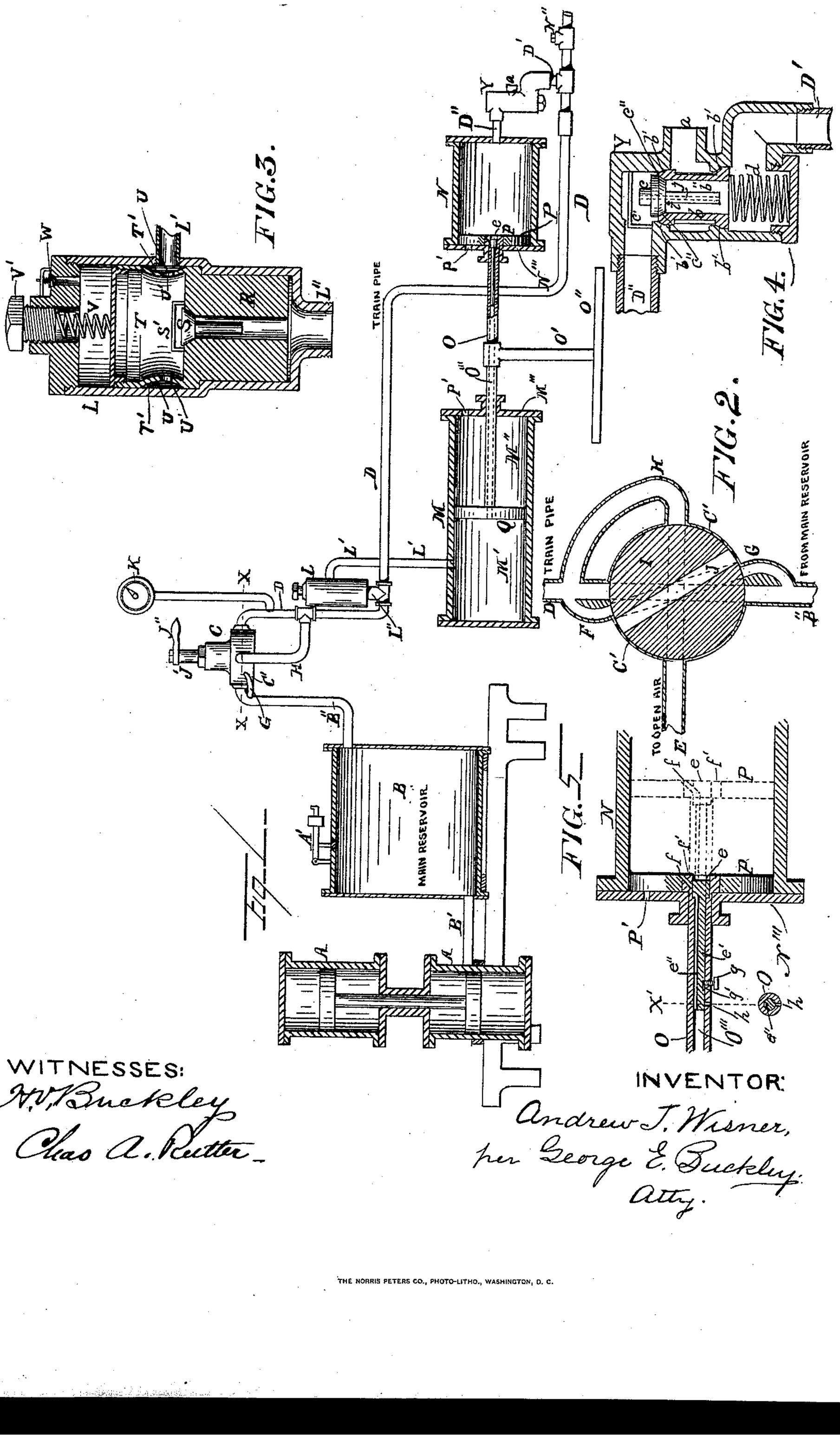

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

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AIR-BRAKE.

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To all whom it may concern:

Be it known that I, ANDREW J. WISNER, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain new and useful Improvements in Air-Brakes, of which the following is a description, reference being had to the annexed drawings, making part hereof.

In my present invention I use an engine and air-pump and an air-reservoir with a single compartment; but the nature of my invention will fully appear from the following description and claims.

In the drawings, Figure 1 is a longitudinal vertical sectional view of my apparatus, some of the smaller parts being in elevation; Fig. 2, a detached horizontal sectional view of the engineer's valve on line X X of Fig. 1; Fig. 3, a detached vertical sectional view of the automatic regulator-valve; Fig. 4, a detached vertical sectional view of the exhaust-valve; Fig. 5, a detached broken sectional view of the brake-cylinder, showing a valve in the piston-stem.

A A represent the air-pump and its cylinder; B, the main air-reservoir supplied with air from the pump through tube B'; B'', a tube from reservoir B to engineer's valve C.

A' is a simple safety-valve.

The engineer's valve is a short cylinder C', having openings in its sides. One end of tube B'' sets in one of these openings, one end of train-pipe D in another, open air-pipe E in another, and pipes F, G, and H in the others. A cylindrical block I sets snugly in cylinder C' and is turned therein by stem J' and handle J''. A hole or opening J is pierced laterally through the block I from side to side, and by so turning block I as to bring this opening opposite any pipe entering cylinder C' such pipe is brought into connection with any opposite pipe. Thus by bringing one end of opening J opposite opening of pipe H connection is made from pipe H to pipe E. When the block I is turned, as shown in Fig. 2, the pipes are all closed against communication with each other. Large switch-pipe H leads from train-pipe D to valve C, small pipe F from the same pipe to said valve, and small pipe G leads from pipe B'' to said valve at a point opposite to the pipe F. The opposite pipes which can be connected by the opening J are B'' and D, G and F, and H and E.

K is an air-pressure indicator with its tube K' letting into tube D; L, an air-regulator valve connected below with train-tube D and from its side by tube L', connected with the combined cylindrical auxiliary car-reservoir and brake-cylinder M; M', the air-storage chamber in the latter; N, a brake-cylinder set in a horizontal line with cylinder M and connected by pipes D' D'' with train-pipe D.

N'' is a valve set on the rear end of pipe D to close it.

O is a piston-rod; P, a piston on one end of the same, located in cylinder N, and Q is another piston on the other end of the same and located in cylinder M; O', a vertical rod connected with the bar O'', which latter connects with the brake-shoes of the train or car which is provided with my apparatus. The view in Fig. 1 shows the piston-heads thereon as far forward as they will go, in which case the brakes are "off."

P' P' are openings in those heads N''' M''' of cylinders M and N back of the respective pistons P Q to permit the free ingress and egress of air as the pistons move either way.

L is a regulator-valve provided internally with a vertically-movable cylinder R.

L'' is the short pipe from valve L to train-pipe D.

S is a check-valve; S', a bar or cage over the same to restrain it from jumping out of place; T, a hollow chamber in the upper part of block R, indented, as at T', thus forming an annular space U around it. This chamber is provided with openings U' around it, which communicate with the space U.

V is a spiral spring provided with a regulating set-screw V'.

W is a small pressure-valve to permit the escape of extra pressure from chamber.

In Fig. 4, Y is an exhaust-valve located between train-pipe D and cylinder N and connected therewith, respectively, by the short branch pipes D' and D''. *a* is a short open air tube or nozzle; *b*, an interior valve-cylinder with seats at *b' b' b' b'*. *c* is a check-valve closing the opening *b''* of valve-cylinder *b*. It has seats *c'' c''* and is restrained from jump-

ing too far by cage or bar c'. The vertical stem i of valve c is pierced by vertical opening j. d is a spiral spring simply designed to support valve-cylinder in place and return it to its seat when the pressure below the valve is in excess or about equal to the pressure above it.

In Fig. 5, e is a small regulating-valve having a gudgeon e' provided with a long groove e'' along its surface, the outer end of which groove when the head is pushed forward connects with opening f in block f' in the middle of piston P. The piston O is hollow, its long opening O''' receiving the gudgeon e'. g is a thumb-screw setting through the shell of hollow piston O and engaging in a short slot g' in the gudgeon e'. When this gudgeon is thrown out, this screw abuts against the rear end of the walls surrounding slot g' and restrains the valve e from leaving its place. It also restrains it at a point which will bring groove e'' and opening f flush with each other, as shown in dotted lines, thus permitting flow of air through this (then) continuous opening. The butt or inner end of gudgeon e' will also thus uncover open air-hole h. The latter opening is shown in Fig. 5 and in the small detail cross-sectional view therein on line X'.

The operation is as follows: We will suppose that the air-pressure in chamber B is maintained at eighty pounds. The spring V is so set as to hold down valve-block R with a force of forty pounds, whereby when a pressure of more than forty pounds is brought against it it will rise and close the port or opening of pipe L'. The check-valve S opens at any pressure from beneath, but closes against any back-pressure. As mentioned above, all the connections between pipes in the engineer's valve are made by turning block I to bring opening J opposite the pipes to be joined. It being desired to charge the train-pipe D, pipes B'' and D are joined, thus throwing eighty pounds pressure through pipes D, D', and D'', thus throwing the brake mechanism into the position shown in Fig. 1. The brakes are now off. This strong pressure of air operating through pipe L'' raises valve S and entering chamber T passes into outer annular chamber U and through pipe L' to car-reservoir M. When the pressure in chamber T exceeds forty pounds, the cylinder R will rise, as the spring V is not strong enough to hold it down at a pressure exceeding forty pounds. Thus a pressure of about forty pounds is maintained in chamber M' in front of piston Q. Now when it is desired to apply the brakes block I is turned so as to connect pipes H and open air-pipe E, whereupon the compressed air in cylinder N and pipes D', D'', and D rushes out, leaving only the normal atmospheric pressure of about fifteen pounds therein. The forty pounds pressure in chamber M' will then act against piston Q and drive it back, thus throwing back the brake-piston rod O and bars or rods O' O'', which will result in applying the brakes which will be "on" In going down long or heavy grades it becomes a matter of great importance to keep the brakes applied for the whole or nearly the whole of the grade. In doing this some of the compressed air in chamber M' will escape despite the packing (not shown) on piston Q. The instant the air is turned to the open air-pipe E and the high pressure in chamber T is relieved the cylinder R is driven down by spring V to the position shown in Fig. 3 and the pipe L' is opened again into chamber T; but the check-valve S then closes to retain the forty pounds pressure above it. Now as some of this compressed air (forty pounds) will escape, as above described, an engineer can feed and sustain the forty pounds pressure by occasionally turning block I so as to connect pipes G and F and thus recharge the chamber M. Supposing the pressure in chamber T to have fallen to thirty-two pounds. In such case the engineer, guided by the indicator K, sends a current of, say, about thirty-eight pounds through pipes F and D. This pressure, striking the valve S from beneath, will raise it so as to bring the pressure in chamber T, and consequently in chamber M', up to about thirty-eight pounds, whereupon he can turn block I to open air again to keep the brakes applied. He can repeat this action occasionally during the descent of the grade and keep his brakes on. If the train-pipe D were to be broken or a coupler-hose (not shown) between cars should be parted, it would result in releasing the air at once from the brake-cylinder N, and the forty-pounds' pressure in chamber M' would act at once to throw on or apply the brakes in both parted sections of the train.

There may be any number of openings P' in those heads of cylinders M and N which are pierced by the piston-rod O, because it is desirable that the air should have free ingress and egress at those ends of the cylinders, so as not to interfere with the free movements of the pistons when acted upon by the pressures through pipes L' or D.

As remarked above, when the full eighty-pounds air-pressure is on the brakes are off and the pistons P and Q are in the positions shown in Fig. 1. Now when the pressure in train-pipe D is turned to open air and thus escapes the air in cylinder N will act upon the top of check-valve c, which serves as a cap to valve b, and force the latter valve b to open to air-tube a, and the then exhausted train-pipe D to open air; but when the pressure in cylinder N decreases to nearly the pressure below valve b the spring d will raise the latter back to place, and the forward movement of piston Q, above described, in drawing piston P back by means of stem O will force the remaining air in cylinder N down through opening j in check-valve c and its pendent stem i. The pressure of air behind piston Q, not being then resisted by a heavy pressure on small regulating-valve e,

will force this valve forward, so as to connect groove *e''* in stem *e'* with opening *f* in block *f'*, thus also allowing air under pressure to escape from cylinder N through opening *h*, which is thus uncovered. This gradual escaping of low-pressure air in cylinder N permits such air to act as a cushion to gently check the action of the piston P when the train-pipe D is turned to open air at about the time piston P should be checked. When the full pressure is again turned on through train-pipe D, the high-pressure air will rush up through pipe D' into valve Y, through check-valve *c*, which it will force open, and through pipe D'' into cylinder N. So long as the high pressure is sustained through train-pipe D there will no air escape back through openings J or *h*.

By exhausting the pressure gradually from train-pipe D that in cylinder N escapes through small hole *j* in valve *c*, the light spring *d* keeping large valve *b* against its seats *b' b' b' b'*; but a sudden and free escape or reduction of the pressure in pipe D results in large valve *b* being forced down by the greater pressure above it, which at once escapes through tube *a* to the atmosphere or open air. Opening *h* is only uncovered when valve *e* is opened, and the head of this valve is never thrown clear of piston P, whereby a return heavy pressure will drive it to its seat. I call the face of the piston toward the rear the "back" face—that is, the face on the side opposite to the piston-stem O.

It will be observed that the head of valve *e* is so restrained by screw *g* as never to be thrown beyond the rear face of piston P, whereby a return of heavy pressure into cylinder N will act on this head to drive it to its seat and close openings *f* and *h*.

What I claim as new is—

1. In an air-brake system, the combination of main air-reservoir B, engineer's valve C, with its pipe connections, substantially as shown, combined car-reservoir and brake-cylinder M, provided with piston Q, brake-cylinder N, provided with pipe connection D' D'', with train-pipe D, pipe L' from chamber M' of the car-reservoir M to train-pipe D, regulator-valve L, located on pipe L', whereby about the same pressure can be maintained in chamber M', and the said chamber can be recharged from time to time while the brakes are on, the contiguous ends of said cylinders M and N, which are pierced by piston-rod O, being open or provided with openings to permit the free egress and ingress of air behind the pistons, substantially as described.

2. In an air-brake system, the regulator-valve L, located on pipe L' between the auxiliary car-reservoir and the train-pipe D, said valve being constructed with an outer cylinder or shell, inner vertically-movable cylinder R, provided with an upper chamber T, the side walls of which are pierced with openings U', cylinder R being also pierced vertically and centrally, the check-valve S, setting in the opening and its head resting on the edge of metal surrounding said opening, spring V, graduated to bear with a desired pressure on the top wall of the chamber T, an annular space U being left between the side walls of chamber T and the outer shell of the valve L, said pipe L' letting into said annular chamber, all combined and operating substantially as and for the purpose described.

3. In an air-brake system, the regulating-valve *e*, with its stem or gudgeon *e'* in hollow piston-stem O, its head being located in the middle of piston P and restrained by mechanism *g g'* from being thrown too far forward, said gudgeon being provided with groove *e''* and piston P being provided with opening *f*, whereby when valve *e* is thrown forward groove *e''* connects with opening *f* and permits air to escape from behind the piston through said groove, opening *h* in piston-stem O to permit the air to escape to the atmosphere or outer air, said last-named opening being so disposed as only to be uncovered when valve *e* is opened to aperture *f*, all combined and operating substantially as described.

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