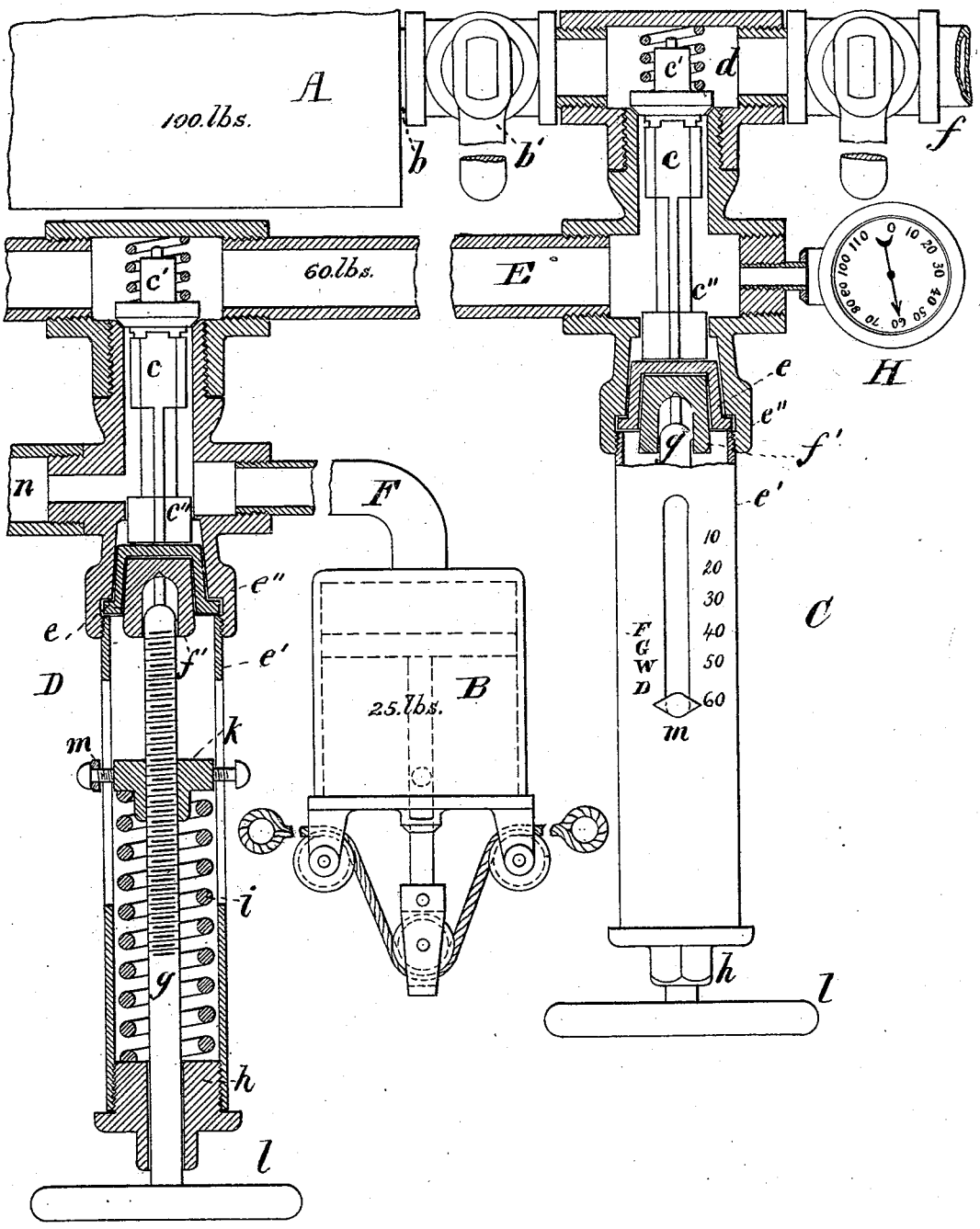
W. LOUGHRIDGE.

ATMOSPHERIC CAR-BRAKE.

No. 187,024. Patented Feb. 6, 1877.



WITNESSES.

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WILLIAM LOUGHRIDGE, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN ATMOSPHERIC CAR-BRAKES.

Specification forming part of Letters Patent No. **187,024**, dated February 6, 1877; application filed April 17, 1874.

To all whom it may concern:

Be it known that I, WILLIAM LOUGHRIDGE, of the city of Baltimore and State of Maryland, have invented certain new and useful Improvements in Atmospheric Car-Brakes, of which the following is a specification, reference being had to the accompanying drawing, forming a part hereof.

This invention relates to power-brakes operated throughout the train by the engineer, through the medium of compressed air, as the force to actuate the brake mechanism.

The object of the first part of my invention is to insure at all times in the main reservoir or actuating motor a surplus force to apply the brakes several times before the density of the air or supply of reserved power is reduced below the maximum braking power, and to maintain in the main conduit pipe or pipes throughout the train any desired even degree of pressure, regardless of any degree of higher pressure or irregular supply in the actuating force or reserved power. And this part of my invention consists in using the pressure or force of the air in the conduit-pipes to actuate a cut-off or automatic governor, to determine the required power on the brake mechanism by which the train is retarded; and in means whereby the engineer is enabled to store in the main reservoir a much greater reserved force than may be required for a maximum power in applying the brakes.

The object of the second part of my invention is to enable the train men, by means of convenient mechanism, constructed within or outside of the cars, to utilize the full retarding friction of each car in the train, whether heavy, light, empty, or partly or fully loaded, by delivering from an even force that exists throughout the main pipe or conduit an uneven force on the brakes of the several cars in the train in proportion to the weight of each car, thus securing full braking power to the train, and preventing the evil of sliding the wheels under either of the cars composing it, regardless of the wear of brake-shoes, lost motion in the brake mechanism, or differences in adhesion of the wheels resulting from the dryness, wetness, or other conditions of the rails. And this part of my invention consists of constructing in the branch pipes of the lighter cars in the train, or either of them, an indexed automatic cut-off or check to the force on the brakes, between the main conduit-pipe and brake-actuating cylinders of a compression or vacuum brake-actuating mechanism.

The importance of this part of my invention arises from the fact that the several cars in a train almost universally have different weights; for instance, a Pullman sleeper often has a weight of thirty tons, when the baggage-car or Adams' express cars common in passenger trains may only weigh fifteen tons; or express and other cars may run in one direction loaded, and return empty, or partly loaded. Air or vacuum, or fluid brakes in common use have, throughout the conduit-pipes, or means of conveying the force, an even pressure acting alike on each car or the actuating mechanism thereof. Hence the wheels of the lighter cars slide before the full braking-force is exerted on the heavier cars, and the train must pass through a greater distance before it can be stopped, which must in the end result in a greater loss of life and property in the event of collisions, open drawbridges, &c. Every moving train has a fixed percentage of the weight of each car or the train that is always reliable, if utilized by perfect brakes, as a retarding force, to destroy or divert the momentum, and stop the train within a distance that may be determined by multiplying the velocity of the train in feet per second by the ascertained adhesion of the wheels to the rails. Assuming that the weight of the train is three hundred tons, the speed thirty miles per hour, and the adhesion of the wheels to the rails one-eighth the weight of the train, then 44 (the velocity of the train in feet per second) $\times 8$ (the adhesion to the rail) $=352$, the feet in distance required to stop the train, provided the full sum of the friction of all the wheels in the train is at once utilized, and the force equally distributed to each wheel in the train proportionately as the weight of the respective wheels composing the train rests on the rails. If only one-half the friction is utilized the distance required to stop will be doubled. Hence the importance of distributing the braking-

force proportionately to the increased or diminished weight of the cars composing the train.

The object of the third part of my invention is to enable the engineer or train-men to determine intelligently the pressure of the air in the main pipe unaffected by the higher or disturbing pressure in the reservoir; also, the extent or degree of leakage in the pipes and cylinders, and, by comparison with the means provided for the purpose, to correct any defect in the cut-offs; and this part of my invention consists in the relative arrangement of the air-reservoir, its connecting-pipes and cocks, the cut-off attached to the same, with its pipes, and an air-gage, as hereinafter fully described.

In the further description of my invention which follows, due reference must be had to the accompanying drawing, which represents a view, principally in section, of my improvements, and is designed to show the same and their modes of operation regardless of details of attachment to the locomotive, cars, or otherwise, such details admitting of much change and variation, the general principles of my invention, however, remaining the same in all cases.

Referring to the drawing, it will be understood that the reservoir A is at or near the locomotive, and is that reservoir before referred to in which that surplus power or pressure of air is always found which enables the engineer to have always at command a greater reserved force than may be required to apply the brakes. It must also be understood that a brake-cylinder, B, is placed at each car of the train, each having a cut-off, D, properly set to supply the force to its brake-cylinder as required by the weight of its car.

It may here be remarked that the cut-off C attached at the locomotive to the air-reservoir A is of the same construction as each of the cut-offs applied to the several cars and brake-cylinders, and that the description herein given of one will apply to all.

E is the main air pipe or conduit, which, when coupled between the card by sections of flexible rubber hose, is continuous throughout the train. The air-reservoir A is connected by means of the pipe *b*, in which is a cock, *b'*, to the cut-off C, which, in contradistinction to the car cut-offs D, may be termed the locomotive cut-off. The main pipe E connects at each car with a car cut-off, D, each of which is in turn connected by a pipe, F, to a brake-cylinder, B. The locomotive cut-off C is provided with an exhaust-cock, *f*. An air-gage, H, is attached to the cut-off C, as shown. Another air-gage may be applied to the air-brake mechanism of the last car of the train, which gage will indicate the difference of the force acting both at the front and rear of the train, and show the loss of force by friction or loss of air in the pipes or from the cylinders.

The construction and operation of the cut-offs C and D are as follows, the parts of the locomotive cut-off C and the car cut-offs D being indicated by the same letters of reference: The said cut-offs, with respect to their construction only, form no part of my present invention; but the right is reserved of applying hereafter for Letters Patent therefor.

In the upper end of the upper section is a winged valve, *c*, having a stem, *c'*, to check or stop the use of the valve when the stem reaches the upper shell of the T-coupling *d*. At its lower end, projecting downward, is a stem, *c''*, which rests upon a diaphragm or elastic rubber hat, *e*, held air-tight by screwing its flange between the barrel *e'* and the upper section *e''* of the cut-off. Below and within the hat *e* a brass plug, *f'*, is placed at the end of the pivot-point on the upper extremity of the stem *g*, by means of which the valve *c* is forced open. At the lower end of the cut-off band a nut, *h*, is screwed, through which the stem *g* slides or turns loosely. In the inner end of the nut is a coiled weighting-spring, *i*, which may be compressed, more or less, by means of the nut *k*, by turning the winding-wheel *l*, the nut *k* traveling back and forth on a thread cut on the stem *g*. An index-finger, *m*, is carried on the nut *k*, by which index-finger the several figures are indicated. As the index-finger moves from 10 to 60, the force on the valve *c* will be proportionately increased. When the air is forced from the reservoir A into the pipes and cylinders it also rests with its full force on the diaphragms or hats *e* of the several cut-offs, and when the pressure on the same is equal to the required braking force, however uneven in the different cylinders by reason of their respective cut-offs having been set to suit differently-weighted cars, they (the hats *e*) give way, and the valves *c* fall to their seats and cut off the air, preventing any increased pressure on the brake.

In addition to having the numerals, the locomotive cut-off C is marked also with the letters D, W, G, and F, as shown, and the car cut-offs D may be similarly marked, if desired.

When the condition of the rail-surface changes the index-finger of the locomotive cut-off C must be screwed to the letter indicating the condition of the rail-surface D, W, G, and F, representing, respectively, "dry," "wet," "greasy," and "frosty;" then, also, when the pressure of air is equal to the work required, the cut-off will close. Should the other cut-off be similarly marked, the adjustment to the proper letter would be made by the trainmen, the cut-offs being within the cars or convenient of access. On the right side of the slot the stamped figures, from 10 to 60, correspond with the index on the air-gage H, with which the said figures are proven. Thus, when the air-gage indicates a pressure in the main pipe of sixty pounds to the square inch, the cut-off valve will close, and prevent any increased pressure on the brakes.

All the cut-offs of the train may be supplied with gages, if desired; but such cut-offs as

are not thus supplied are closed at the openings provided for the gages by plugs *n*.

If a heavy car is in the train, its cut-off D may be set at 60, and for a car of half its weight the index-finger of the cut-off D must be set at 30.

The brake-cylinder B in the drawing is marked as requiring twenty-five pounds, showing that the high pressure of one hundred pounds may be maintained in the reservoir A with sixty pounds in the main pipe E, and that other degrees of pressure in the other cars may be maintained in proportion to their weight, load, &c.

The ngineer and train-men are thus enabled to deliver variable forces to various parts of the train, very little care being required to accomplish this result.

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

1. The method of governing the pressure to the brakes on the respective cars throughout the train, in proportion to their weight, by combining an automatic cut-off with each brake-actuating mechanism, substantially in the manner hereinbefore described.

2. The combination of an air-reservoir and automatic indexed cut-off with a pipe running throughout the train, and a series of automatic indexed cut-offs, brake-cylinders, and brake-actuating devices, substantially as and for the purpose herein specified.

3. The combination of the main pipe, the brake-cylinder, and an interposed cut-off valve, and the means for regulating the same, substantially as herein described, for the purposes specified.

4. An air-reservoir having pipes and cocks for controlling the flow of air therefrom, an automatic indexed cut-off, connecting with the main pipe, and an air-gage, combined, substantially as and for the purposes specified.

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Witnesses:
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