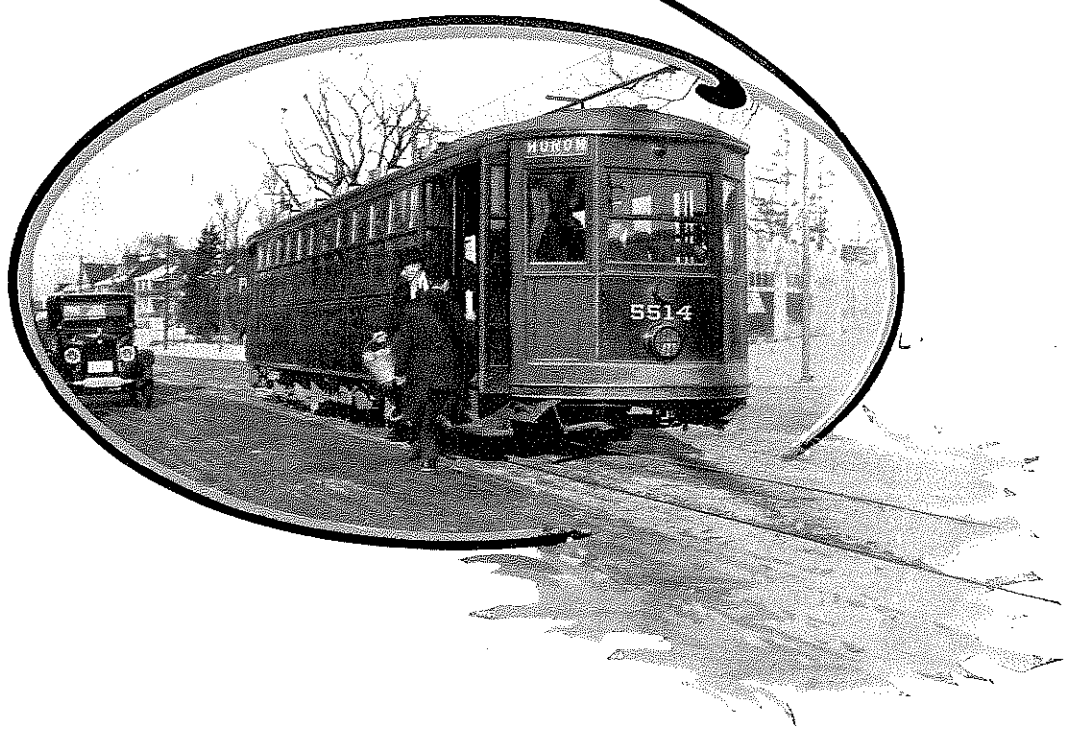
Uniform Braking with Varying Load



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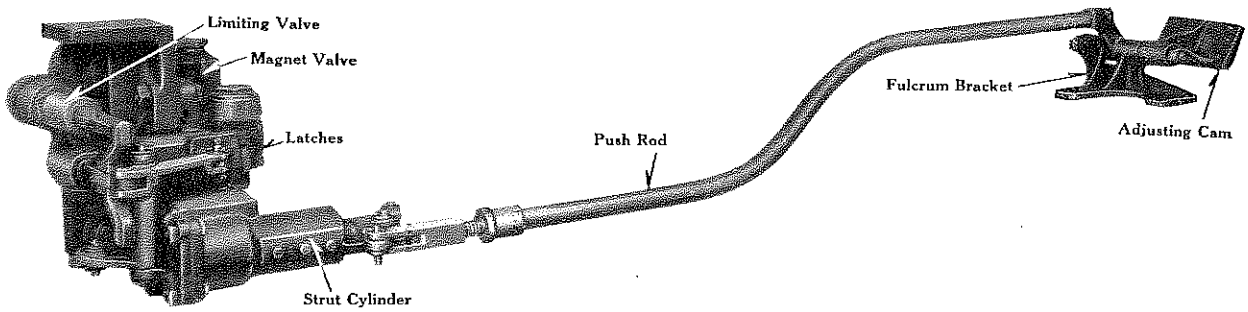


Variable Load Brake Mechanism

Westinghouse Traction Brake Company

Pittsburgh, Pa., U. S. A.

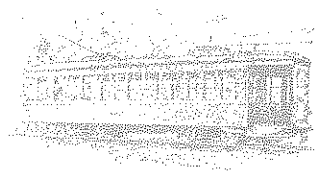
Works at Wilmerding, Pa.

Offices in all principal cities

WESTINGHOUSE
Variable Load Brake

THERE has been a marked tendency in recent years toward the construction of very light surface cars which have a high passenger carrying capacity, because appreciable operating economies may be effected by their use. Since this high passenger carrying capacity still further increases the margin of difference between loaded and empty weights, a new braking problem is thereby presented which necessitated the design and development of apparatus, for use in conjunction with the ordinary straight air or semi-automatic equipment which would provide the necessary car control.

Light weight surface cars present new braking problems



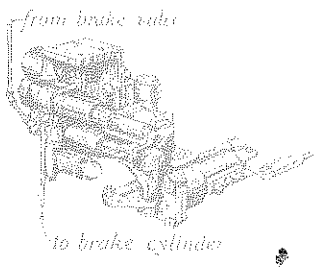
The customary practice, in designing a brake layout has been to provide a braking force so proportioned to the empty weight of the car as to insure freedom from wheel sliding when operating without load, although it is recognized that with an increase in the weight of the car, due to the loading, the effective retarding force will be decreased and the stopping distance lengthened proportionately. In other words, the braking force is constant in magnitude but varying in its relation to the car weight. Consequently it is less effective on a loaded car than on an empty car.

This is permissible with cars having a low ratio of live load to dead load, and satisfactory results are obtained because the decrease in retarding effect as the car becomes loaded is not sufficiently great to materially reduce the adequacy of car control. However, if there is a very great difference between the loaded and empty weights of

the car the reduction in braking effort is very noticeable and stopping distances with loaded cars will be excessively long, and the control on severe grades will be inadequate.

Variable Load Brake regulates cylinder pressure to suit car loading

For such conditions the only satisfactory method is to have available a braking force which will be adequate for a fully loaded car and make provision to control this force so that it will not cause wheel sliding when the car is empty, and that it will bear the same relation to the car weight throughout the whole range between empty and fully loaded.



The Westinghouse Variable Load Brake has been developed to solve the problem of controlling cars under widely varying load conditions. It is an attachment which may be added to any straight air or semi-automatic equipment whereby the braking force is **automatically** adjusted to suit the weight on the car, by regulating the brake cylinder pressure as the weight changes.

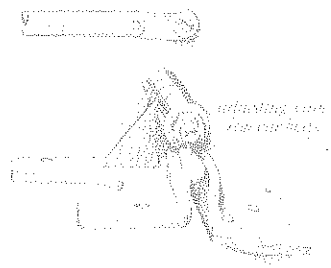
The regulation of maximum cylinder pressure to suit the varying load on the car is accomplished by the adjustment of a Limiting Valve (in effect an adjustable feed valve). This change is brought about by the vertical movement of the car body relative to the truck. One portion of the adjusting mechanism is attached to the truck transom which is at a constant distance from the rails. Another portion, the Adjusting Cam, with its supporting bracket, is fastened to the car body bolster. When the adjusting members are in contact, the vertical movement between the body bolster and the truck transom—which is a function of the movement of the truck springs and therefore of the car weight—provides for regulation of the Limiting Valve mechanism.

The adjusting mechanism is thrown into engagement by the opening of the car doors. While the doors are open, passengers are leaving and entering the car, and when the doors are closed again, the condition of loading will be that under which brake operation will take place for the next stop, or a slow-down, as occasion may demand.

Closing the car doors disengages the apparatus to save it from wear and tear, and from cutting in and out due to unevenness of the track.

When any one of the doors is opened, electrical contacts are made to close a circuit to a magnet which operates to actuate certain related valves. (Or, if desired, this may be effected pneumatically instead of electrically, as for example, when air is admitted to the door engines to open the doors). Air is thereby released from Latches to unlock the Limiting Valve mechanism and permit adjustment. Air is also admitted to a Strut Cylinder to move the adjusting mechanism into engagement so that any up or down movement of the car body will be transmitted to the Limiting Valve. (The Adjusting Cam is so designed as to cause equal movements of the rods and levers, and consequent uniform adjustments of the Limiting Valve, with equal increments in car loading, even though the truck springs do not deflect uniformly).

A Limiting Valve is automatically adjusted by relative movement between car body and truck



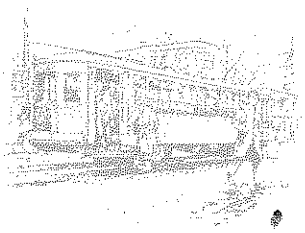
When the doors are again closed the circuit to the magnet valve will be opened, (or air released from the door engine) causing a reverse operation of the related valves in the Limiting Valve mechanism. The Limiting Valve is locked in the position it has assumed, and air is released from the Strut Cylinder to disengage the Adjusting Cam.

If now a brake application is made, air will flow through the Limiting Valve to the brake cylinder until such a pressure is developed as will provide for the proper degree of retarding force, when the supply will be cut off and further build up of pressure prevented. The motorman is not, however, relieved of the responsibility of so manipulating the brake valve as to secure the cylinder pressure required to control the car with whatever load it may be carrying, and in the case of an emergency application (when the air brake attempts to put into the brake cylinder whatever main reservoir pressure is carried) the Limiting Valve so functions as to cut off the flow

of air so as to give a cylinder pressure that is correct for that particular weight of car.

Uniform braking effect increases safety, and extends traffic possibilities

There are a number of operating advantages which result from the use of the Variable Load Brake.



With the ordinary straight air or semi-automatic equipment the full amount of brake cylinder pressure will vary according to the pressure in the main reservoir; at one stop it may be the minimum and at the next reach the maximum, due to the governor range. With the Variable Load attachment the same cylinder pressure is automatically obtained for a full service application with a given car loading regardless of the main reservoir pressure. This obviously contributes to more uniform braking of the car, giving the motorman increased confidence in his air brake control.

The air brake may be considered both as a safety device and as a utility device. With respect to safety, the advantages of the Variable Load attachment are obvious, because its use makes it possible to stop the loaded car in a shorter distance than could otherwise be realized. On account of the generally congested conditions of city streets at the present time the benefits accruing from short emergency stops are obvious. It should be borne in mind also that these shorter stops are obtainable not only when an emergency application is made but also when service applications are brought about. In passing along crowded streets, and down severe grades, this better control of the loaded car with service braking is of evident importance. Not only is the loaded car braked more effectively, but there is uniformity of braking effect throughout the range of car weights from empty to fully loaded.

Considering the utility side of the attachment, since the **length** of a stop is shortened, this means that **less time** is consumed in making the stop. It will be evident that in a normal service run there are three essential periods, acceleration, running at maximum permis-

sible speed, and deceleration. The longer the running period and the shorter the deceleration period, the higher will be the average speed and consequently the shorter will be the running time between stops.

This saving of time and increasing of schedule speed enables individual cars to get over the road more quickly. Even though this may not be sufficient to decrease the number of cars required for a particular route, it is evident that it will decrease the car hours that have to be furnished. A saving in car hours obviously means greater economy of operation and a potentiality for increasing the volume of traffic over a given system. Generally speaking then, it may be said that, shortening stops makes possible higher speeds and shorter schedules with consequent increased traffic with the same number of cars and power consumption; or the same traffic with fewer cars; or the same average speeds, schedules, and traffic capacity with **less** power consumption, since the power may be shut off sooner and the car allowed to coast for a period before applying the brakes to make the stop at the same point.

This attachment will help solve surface transportation problems

Another item in connection with the variable load attachment which should not be overlooked is that the initial adjustment of the Limiting Valve may be readily changed so as to vary the braking ratio on a car. If it should prove desirable with different seasons of the year, or any other reason, the braking ratio could be changed to from 85 per cent to 100 per cent, say, in a very few minutes, or can be adjusted otherwise as desired.

The Variable Load Brake should commend itself to all transportation men because of its safety and economy-promoting possibilities. More definite and complete information concerning this mechanism may be had by applying to any of our district offices, where Westinghouse representatives are always available to assist in the solution of transportation problems, upon which the air brake has an important influence.

FORM 49

THE MUNICIPAL TRAMWAYS TRUST, ADELAIDE

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Contents Brakes

Refer Letter dated

Agent Westinghouse Traction Brake Co.

Address Pittsburg U.S.A.

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