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Instruction Pamphlet No. T 5013

**Straight-Air Brake  
Equipment  
with  
Axle-Driven Compressor**

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**WESTINGHOUSE TRACTION BRAKE CO.,**  
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New York, U. S. A.

## The Westinghouse Straight-Air Traction Brake with Axle-Driven Compressor.

This equipment is comprised of the following parts:

First—An Air Compressor actuated from the car motors by being geared directly to an axle of the car instead of to an independent electrically-driven motor.

Second—A Compressor Regulator which automatically controls the operation of the compressor, thereby maintaining the pressure and regulating the supply of compressed air.

Third—A Reservoir in which the compressed air is stored.

Fourth—A Brake Cylinder, the piston rod of which is connected to the brake levers in such a manner that when the piston is forced outward by the air pressure the brakes are applied.

Fifth—An Operating Valve, mounted at each controlling point of the car, by means of which the compressed air is admitted to or released from the brake cylinder.

Sixth—A System of Piping, which, with various small fittings, forms the connections between the above mentioned parts, and when trailers are used includes flexible hose and couplings between cars.

Seventh—A Safety Valve, placed in the air supply system, to prevent any possibility of accumulating an excessive pressure.

Eighth—Also often specified is a Chime Whistle Set, operated by air pressure, as a warning of approach in place of a gong or bell.

Fig. 1 shows the general arrangement of apparatus and piping as applied to a double-truck car, while Fig. 2

(3)

is a diagrammatical illustration showing the relative location of the various essential parts of an equipment upon a motor car and trailer.

The application of the brakes by admission of compressed air from the reservoir to the brake cylinder is effected by opening either the small or the large port in the operating valve, thereby causing the piston in the cylinder to move outwardly, applying the brakes with a greater or less degree of force, depending upon which port is used and the length of time it remains open. In an ordinary service stop the small port is opened, which allows air to flow gradually from the reservoir to the brake cylinder; but in an emergency stop the large port is employed, allowing a larger amount of air to flow almost instantly into the brake cylinder, thus the motorman is able to apply the brakes with such pressure up to the maximum and in as small a space of time as is desired. After admitting air to the cylinder, if the handle is placed in the position where all ports are closed, the air already admitted to the brake cylinder is retained there, thus holding the brakes applied; a further movement of the handle to the release position connects the brake cylinder with the atmosphere, permitting air to escape and thereby releasing the brakes. A gradual release of the brake may be obtained by permitting a portion of the air in the cylinder to escape and then returning the handle to the position where all ports are closed.

On cars running in city and also interurban service we have introduced a system (see Fig. 2) comprising two reservoirs, a preliminary of moderate capacity (usually 12" diameter and 20" long) connected directly to the discharge pipe of the compressor and the operating valves, and a larger main reservoir that is con-

nected to the preliminary through a duplex check valve, shown and described in Instruction Pamphlet No. T 5009. The tension on the spring 14 is so adjusted that the air pressure on the diaphragm 11 must have attained 35 lbs. before the valve 8 is lifted from its seat, and air may pass into the main storage reservoir. Thus, air may flow freely through the check valve 6 from the main storage reservoir to the preliminary, but about 35 lbs. pressure must be attained in the latter before any air can pass into the main reservoir, so that a car starting out of the barns with empty reservoirs will not have run 100 yards before a sufficient pressure is attained in the preliminary reservoir to enable the motorman to operate the air-brake. It also insures sufficient braking pressure on interurban cars when running at slow speed through the cities, and effectually removes all objection against the axle driven compressor on this score.

### **Installation of Axle-Driven Compressor Equipments.**

In Fig. 2 we show the arrangement of the various apparatus comprising our axle-driven compressor equipment. This is the result of careful study and much experience, and we earnestly recommend that the parts of this equipment be connected in the same relative order as shown in this diagram; otherwise trouble may occur, due to the presence of water and dirt in parts which will not be the case if properly connected.

In figuring out the best possible locations for the compressor, brake cylinder and reservoir due regard must be had to the electrical apparatus already under the car or to be placed there, as well as to the fact that those parts requiring inspection and care should be placed as far as

possible in the most accessible locations to facilitate inspection and maintenance. After these locations have been settled upon we would recommend that the apparatus be installed according to the instructions given in the instruction pamphlets mentioned on the last page of this pamphlet.

### **Instructions for Operating the Straight-Air Brake.**

As the Operating Valve has notches which mark the position of the handle for the various positions of the valve, it is very easy for one to operate the brake with certainty the first time, but smooth, quick and accurate stops are only made after a little practice. The operating valve handle must always be inserted at the lap position where the slot in the body is enlarged for that purpose, and withdrawn at the same point when changing from one end of the car to the other. When the handle is in lap position, as indicated by the deep notch, the valve is so placed that air can neither pass into nor out of the brake cylinder. Moving the handle of the O. V. J. valve to the end of the slot toward the left places the valve in full release, while a movement to the right, as far as the small notch, opens the small port, and a further movement to the right end of the slot opens wide the large port. A good deal of compressed air will flow through a small opening in a short time, so that in order to make a light application of the brakes, move the handle to the small notch, and then quickly back to the deep notch or lap, thus the air that has been admitted to the cylinder is retained there, holding the brakes applied. To partially release the brake reduce the pressure in the cylinder by turning

the handle to the release position at the left end of the slot, and almost immediately returning it to lap, thus allowing a portion of the air to escape from the cylinder.

The quickest stop obtainable is made by applying, throughout the stop, the greatest pressure possible to the wheels without causing them to slide on the rails, and the higher the speed the greater the pressure that may be applied without danger of sliding. Thus it is evident that in order to make a quick stop apply full pressure at once, and release it gradually as the speed falls; this method will also give a smooth stop, as the rapid reduction of speed at the end of the stop, which throws passengers, is avoided. Therefore, in making a service stop, admit twenty-five or thirty pounds of air pressure to the brake cylinder quickly at the beginning of the stop by partially opening the large port, and release it little by little as the speed drops, retaining about ten pounds in the cylinder till the car stops. A little experience will show the distance required in which to make a stop from a given speed so that all stops will be made quickly, smoothly and with but one application of the brake. A succession of applications and releases while making a stop imparts a very disagreeable motion to the car, is most wasteful of compressed air, and reprehensible in every respect. For the emergency stop admit full pressure (about sixty pounds) immediately, without even waiting till the controller is turned off, then apply sand and release a little of the pressure as the speed drops.

Upon receiving the signal to go ahead, turn the handle to the release position before turning on the electric power. When descending a grade a beginner generally makes the mistake of putting the brake on too hard at the start; it cannot be expected that the instant the brake

is applied the car will take the speed desired; make an easy application at first, hold the handle at "Lap" and give the car time to feel the effect of the brake, then if the speed is still too high, let in a *little* more air; repeat the operation as often as necessary until off the grade, in case it is a long one.

When leaving a car, always set up the hand brake, as some one might tamper with the cut-out cocks. Before starting from the car barn, be sure all cocks are properly set and that there is a good supply of air in the reservoir. Insert the handle in its socket in the operating valve and throw it around to emergency, then back to release, to see that it works freely. Try the air brake both in "service" and "emergency" to make sure that it has not been left improperly connected, etc. After this trial and as long as proper pressure is maintained the brake may be relied upon to perform its duty.

TRAILERS—Care must be taken in making up trains, that all hose couplings are thoroughly united so that the air will apply throughout the entire train. All the cut-out cocks must be opened, except those on the rear of the last car and on the front of the motor car, which must be closed. In uncoupling the cars close the cocks and disconnect the hose before pulling the drawbar pin.

The air brake is essentially a labor saving device for the motorman, and it is scarcely necessary to ask for his cooperation in the use and care of it. Its success and general adoption for fast and heavy street railway service depends very much on his interesting himself in its use, and having an intelligent understanding of the functions of the various parts, that he may readily notice when anything about them is not working properly, and report the trouble before it becomes serious. Like the other appa-

tus of a street car, the air brake will not operate indefinitely without attention, and the old proverb of "a stitch in time saves nine" applies in this case as in all others.

The following Instruction Pamphlets, added to this one, go to make up a complete set as applied to the Straight-Air Brake Equipment with Axle-Driven Compressor:

	Instruction Pamphlet	
Axle-Driven Compressors.....	No. T	5014
Compressor Regulator, D. R. E.....	T	5015
Reservoirs.....	T	5005
Brake Cylinder.....	T	5006
Operating Valves.....	T	5007
Piping.....	T	5008
Chime Whistle Set.....	T	5009

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