

Brake Cylinder.

A Brake Cylinder H is fitted to every locomotive, tender and braked vehicle.

Plate II represents in section the cylinder of the standard Quick-Acting Brake Apparatus, but several other patterns of brake cylinders are sometimes used to suit the various constructions of the rolling stock to which they are applied (see Figs. 12 to 15). Although these cylinders differ in size and form, they are all identical in their working and general arrangement, and the following description will therefore apply to all.

Each Brake Cylinder contains a piston, having its rod attached to the brake gear in such a manner, that the brake blocks are pressed against the wheels when the piston is forced out by air pressure.

As long as the Brake is not applied the cylinder is free from air pressure, and the piston is in the position shown on Plate II. When, however, the Brake is put into operation compressed air is admitted to the cylinder by the corresponding Triple Valve. The air pressure, acting upon the piston, forces the latter forward, thus applying the brake blocks to the wheels. Upon the air being allowed to escape from the cylinder, the spring (which had been compressed in applying the Brake) extends and returns the piston and brake gear to their original positions, thereby releasing the blocks from the wheels.

All Brake Cylinders are so constructed as to avoid the use of stuffing boxes, which are difficult to keep in order, and give rise to much trouble and annoyance.

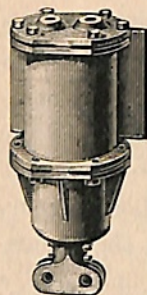
To prevent the application of the Brake from slight leakage in the Main Pipe, each Brake Cylinder is provided with a small Groove *n*, which establishes a communication between both sides of the piston when the Brake is not applied. If, on account of such leakage, a slight flow of air to the Brake Cylinder should occur, the air would pass through the Groove *n* to the atmosphere without moving the piston. When, however, a considerable quantity of air is suddenly admitted to the cylinder, as in an ordinary application of the Brake, the piston is immediately forced past the groove, and an escape of air from the cylinder is thus prevented.

In order to insure that the pistons of all the Brake Cylinders in the train completely clear the corresponding leakage grooves, the Driver should always reduce the pressure in the Main Pipe by at least 6 or 8-lbs. whenever he puts the brake into operation, and care must also be taken that on every vehicle the brake gear is so adjusted that it allows the piston to travel sufficiently far.

The minimum stroke of the brake pistons is hereafter given for our standard cylinders, also the maximum service stroke. As soon as the latter is reached, owing to the wear of the brake blocks, the brake gear should be taken up, so that the stroke of the piston is again reduced to the minimum.

DRIVING WHEEL BRAKE CYLINDER.

Fig. 12.



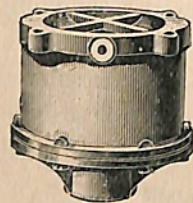
Diameter 6 inches.

Stroke of Piston { minimum 2½ inches.
 { maximum 5 inches.

These cylinders are used on locomotives only. One of them is fixed on either side of the engine between the coupled wheels, and the pressure exerted upon their pistons is transmitted to the brake blocks by means of cams.

VERTICAL BRAKE CYLINDERS.

Fig. 13.



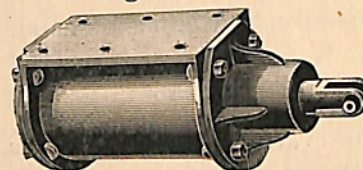
Diameters 10 and 13 inches.

Stroke of Piston { Minimum 2½ inches.
 { Maximum 4 inches.

Cylinders of this design are principally employed on locomotives and tenders. They are very convenient for coupling to existing hand-brake gear, especially when a rocking shaft is employed, since the trunk pistons permit the use of very short connecting rods. For vehicles they are less suitable, since, owing to their short stroke of piston, they require somewhat frequent adjustment of the brake blocks, which cannot always be done on vehicles not constantly under supervision.

HORIZONTAL BRAKE CYLINDERS WITH SINGLE PISTONS.

Fig. 14.



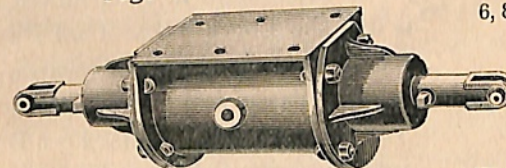
Diameters :
6, 8, 10 and 12 inches.

Stroke of Piston :
Minimum 4 inches.
Maximum 8 inches.

These cylinders are usually employed on tenders and vehicles. The Brake Cylinder H of the combined Quick-Acting Brake Apparatus represented on Plate II, belongs also to this type.

HORIZONTAL BRAKE CYLINDERS WITH DOUBLE PISTONS.

Fig. 15.



Diameters :
6, 8 and 10 inches.

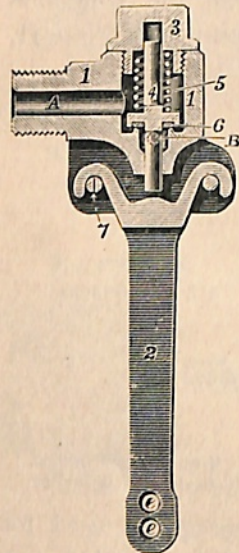
Stroke of each of the two Pistons : { Minimum 2 inches.
 { Maximum 4 inches.

These cylinders can with advantage be used for vehicles not required to be fitted with handbrakes, as a very simple gear may be employed with them. When the Brake is put into operation, compressed air is admitted between the two pistons which are thrust outwards with equal force, thus pressing the brake blocks against the wheels.

Release Valve.

A Release Valve, as represented in Fig. 16, is fitted to each vehicle provided with brake apparatus; it serves for releasing the corresponding brake by hand, if applied when an engine is not connected to the vehicle.

Fig. 16.



The Valve Case 1 encloses a Check Valve 4, which is held to its seat by a Spring 5, when the Handle 2 is in the position shown in the drawing. Light wires or chains are usually attached to the lower end of the Handle 2, and fixed to the carriage frame so that the handle may be pulled from either side of the vehicle. When the handle is thus moved it lifts the Check Valve 4 off its seat, and compressed air escapes by the Passage A through the Valve 4 and the Exhaust Port B into the atmosphere. So soon as the handle is set free, the Spring 5 returns the Check Valve 4 to its seat, which prevents a further escape of air.

On locomotives the Release Valve is in direct communication with the Brake Cylinders, from which the air pressure is directly discharged into the atmosphere

when the valve is opened. On tenders and vehicles the Release Valve is so placed that the Port A communicates with the Auxiliary Reservoir. In this case the air pressure, acting in the Brake Cylinder, cannot be directly discharged through the Release Valve, but on opening the valve air escapes from the Auxiliary Reservoir. As soon as the pressure in the Reservoir becomes lower than that in the Main Pipe, the Triple Valve Piston is forced back, and the air pressure in the Brake Cylinder escapes through the Exhaust Port of the Triple Valve in the same way as when the brakes are released from the engine. Therefore, to release the Quick-Acting Brake by hand, it is sufficient, if the Release Valve is kept open until the piston of the Triple Valve is reversed, and air begins to escape from the exhaust port of the last named valve. If the Release Valve is held open a still longer time, the air pressure in the Auxiliary Reservoir and Main Pipe will gradually diminish, and the whole of the air in the apparatus may thus be discharged, if desired.

In the Standard Quick-Acting Brake Apparatus the Release Valve is attached to the cast iron reservoir, which is provided at either side with a boss suitable to receive the valve. If, however, the principal parts of the Brake Apparatus are separately arranged (as on the tender shown on Plate I), the Release Valve J is attached to the tube connecting the Triple Valve F and the Auxiliary Reservoir G.

WESTINGHOUSE SIGNAL COMMUNICATION FOR RAILWAY TRAINS.

—:0:—

The Westinghouse system of Automatic Brake affords a ready means of communicating signals from Guards and Passengers to the Engine Driver, by utilizing the compressed air which is always contained in the Main Pipe throughout the train.

The apparatus serving this purpose consists of parts placed both on the engine and on the vehicles. Each *Carriage* is fitted with a Signal Cock and Whistle, placed on the end of the roof, and connected by a tube to the Main Brake Pipe. On the top of each compartment a Pull Box is fitted into the roof, containing a handle which projects into the carriage. All the pull boxes on a vehicle are connected to one another and to the corresponding signal cock by a tube, containing a Cord of copper wire which is fixed to the handle of the signal cock and also to the Cord Strainer fastened to the pull box at the opposite end of the carriage. The pull box handles are provided at their upper ends with pulleys which ride upon the cord, so that on pulling down the handle in

any compartment the cord is depressed, and the signal cock opened. On the *Locomotive* a Signal Valve is placed in the Driver's cab, having a whistle attached to it which is sounded when air is discharged from the Main Brake Pipe of the train, except when the discharge of air is effected by means of the Driver's Brake Valve.

When the handle in any compartment is pulled down, the signal cock on the roof of the vehicle is opened, thus causing a continuous flow of air from the Main Pipe through the carriage whistle, which is thus sounded. At the same time the whistle on the engine also sounds, and the Brake applies itself by the reduction of pressure in the Main Pipe. The Driver may then at once stop the train, but should the signal be given in an inconvenient place, he has the power to keep the brakes off for a few minutes, by admitting air from the Main Reservoir into the Main Pipe, thus overcoming the escape.

The handle cannot be replaced from within the compartment, and the whistle on the carriage will continue to sound until the Guard closes the cock by pulling down a chain or rod suitably arranged for the purpose at the end of the carriage. By the same movement the handle in the compartment from which the signal has been given is raised again to its normal position.

—:0:—

INSTRUCTIONS
FOR THE
WORKING AND MAINTENANCE
OF THE
WESTINGHOUSE
QUICK-ACTING BRAKE.

1893.

INSTRUCTIONS TO ENGINE DRIVERS.

—:0:—

1. **Preparations for a Journey.**—Before the locomotive is attached to a train, the Brake Apparatus on engine and tender must be carefully examined, to make sure that all parts are in good working order.

The Driver must see (1) that the Pipes and Joints are all tight; (2) that the Brake Gear is properly adjusted for the wear of the blocks by being **uniformly** taken up; (3) that the Air pump, after having been lubricated according to instructions hereafter given, is started and air pressure of about 90 to 95 lbs. stored in the Main Reservoir before coming to the train; (4) that the Driver's Brake Valve works properly in all positions of the handle, and retains an excess pressure of at least 20 lbs. in the Main Reservoir when the handle is placed in the "position whilst running" (Fig. 3, page 24), where it usually should be kept when the brake is not applied.

Any leaks which may be found should be stopped, and all defects repaired before the locomotive leaves the running shed.

2. **Coupling to Train.**—When the locomotive is coupled to a train carrying less air pressure, the brakes on engine and tender will be automatically applied, as the pressure in the Main Pipe of the locomotive will, of course, be reduced by equalizing with the lower pressure in the train. No inconvenience, however, will result from this,

if the Driver has been careful to come up to the train with sufficient air pressure (say 90 lbs.) in the Main Reservoir, and the brakes will at once be released when the train is charged. In any case, the Release Valves (which ought to be so arranged as to be worked from the foot plate of the engine) may be opened.

The Driver is responsible for the brake connection between the locomotive and train being perfect, and must satisfy himself before starting that the hose coupling on the engine or tender is properly connected to that on the first vehicle, and that the corresponding cocks in the main brake pipe are open. (See Figs. 5 to 8, page 30).

3. **Charging Train Brake Apparatus.**—To charge the Brake Apparatus on the vehicles, the handle of the Driver's Brake Valve should be placed in the "Release Position I" (see Fig. 3, page 24), and kept there until the Main Pipe and the Auxiliary Reservoirs on the vehicles are charged with an air pressure of 70 lbs. When this pressure is indicated on the gauge, the handle of the Brake Valve should at once be turned to the "Position whilst running" (II), where it must usually be kept.

The Air Pump should be set to work when the train is charged, and should be kept going until a pressure of 90 lbs. is again obtained in the Main Reservoir.

4. **Brake Test.**—It is of the utmost importance to make sure that the Brake Couplings are properly united, and that the Cocks in the Main Pipe are ALL opened so that the Brakes will apply to all the braked vehicles in the train. The Brakes on the entire train must therefore be tested before starting from the terminus, or

from any place where Hose Couplings have been separated and re-coupled, (in order to change the locomotive, to add or detach vehicles, or for any other purpose).

At a signal from the Inspector or Guard, the Driver should apply the Brakes, and leave them so applied until they have all been examined, and the signal is given to release.

The Driver must not start away until it has been ascertained that all Brakes are released, and he has been informed by the Inspector or Guard that the Brakes on all the vehicles operate properly.

5. **General Rules to be observed during the Journey.**—The Air Pump should continually be kept working with moderate speed, so regulated that the required air pressure of about 90 lbs. in the Main Reservoir is maintained.

Whilst the train is running unbraked, it is important that the handle of the Driver's Brake Valve should always be kept in the "Position whilst running" (see Fig. 3, page 24), so that in the Main Reservoir an excess pressure of about 25 lbs. is retained, which will insure quick and prompt release of the Brakes.

The air pressure in the Main Pipe should not exceed 70 lbs. Carrying an excessive air pressure may cause trouble or delay, especially when vehicles are detached and coupled to other trains. If a Driver finds the air pressure in the train too high, he can readily reduce it by applying the Brakes with full force without producing the quick action, and then releasing them again.

6. **Service Applications.**—Drivers must exercise care and moderation in applying the Brakes, so as to bring

the trains to rest without inconvenience to the passengers. To ensure this, it is necessary that for ordinary stops the Brakes should be lightly applied at a sufficient distance from the stopping point, and the brake force may then be gradually increased, as found necessary.

To apply the Brakes with moderate force the handle of the Driver's Valve should be turned between the Positions III and IV (Fig. 3) until in the Main Pipe a **reduction of pressure of at least 6 or 8 lbs.** (according to the length of the train), has been effected, when the handle must be placed in the Neutral Position III. This reduction is required to insure that the pistons of all the brake cylinders in the train completely clear the corresponding leakage grooves.

When the Brakes have thus been put into operation, very small reductions of the pressure in the Main Pipe will serve to gradually increase the Brake power, as circumstances may require. The Brakes, however, are fully applied when a reduction of 20 to 25 lbs. has been effected in the Main Pipe pressure, and it would be useless to discharge any further quantity of air.

Drivers should always bear in mind that less brake force is required for stopping from a low than from a high speed, and that the Brakes should not be so forcibly applied as to skid the wheels, which is less effective in stopping, and gives a most disagreeable sensation to the passengers.

For ordinary stops the handle of the Brake Valve should not be turned beyond the Position IV (Fig. 3), since this would produce the quick action of the Brakes, which should not be employed except when absolutely necessary to avoid an accident.

Long trains, particularly those not completely fitted with brake apparatus, require more careful handling than short ones, in order to prevent shocks. With such trains Drivers should take care to apply the Brakes lightly, and to allow the slack of the train to be taken up before the brake force is increased.

Drivers sometimes place the handle of the Brake Valve in the "Release Position I" (Fig. 3) just before applying the Brakes. This is a mistaken practice which may cause trouble, as it destroys the extra pressure in the Main Reservoir, which is required for releasing.

To prevent the jerk which is often experienced with all kinds of Brakes at the moment when the train comes to rest—the Driver should release the Brakes at the last revolution of the wheels, in order to allow the vehicles to assume their normal position which will prevent them from rebounding.

7. Emergency Applications.—For quick stops, as in cases of emergency, the handle of the Brake Valve should be turned as far as possible to the right (Position V in Fig. 3), when instantaneous action of all the brakes with full force is produced. Stops of this kind should not be made except in cases of emergency.

If the Brakes should be applied from the train, either by the Guard, or automatically (on account of a separation of the train, the rupture of a Hose Coupling, etc.), the Driver must at once aid in stopping by turning the Brake Valve handle towards the right, as in ordinary applications, which will also prevent the escape of air from the Main Reservoir.

8. Release.—To release the Brakes the handle of the Driver's Brake Valve should be turned to the Position I (see Fig. 3), and be allowed to remain there for about 10 or 20

seconds, according to the length of the train. The handle must then be placed in the "Position whilst Running, II," (Fig. 3), **where it should usually be kept.**

If any Brakes creep on again, on account of the handle being too quickly brought to the Position II, it should be put back into the "Release Position I" for a few seconds, and then be returned to the Position II.

9. Handling of the Brakes in descending Inclines.—To control the train upon descending grades the Brakes should be lightly applied before too high a speed is reached, and the brake force should then be gradually increased as needed to keep the speed uniform. If the brake force should become too high the Driver may release the Brakes on engine and tender by gradually opening the Release Valves.

The Air Pump must be kept going, so that the maximum air pressure is maintained in the Main Reservoir.

The Driver should particularly take care when releasing the Brakes, to keep the Brake Valve handle in the Release Position (I) for a sufficient length of time to properly recharge the Auxiliary Reservoirs.

10. Pilot Running.—When trains are worked by means of a pilot engine, the Brakes should be entirely under the control of the Driver of the front engine.

On the second engine, the Isolating Cock in the Main Reservoir Pipe under the Driver's Brake Valve must be closed, and the Brake Valve handle placed in the "Release Position I," as soon as the pilot engine is connected. The Air Pump of the second engine should be kept going and the maximum air pressure be maintained in the Main

Reservoir, so that the Driver of the second engine may be ready at any time to take charge of the Brakes, if necessary.

In cases of emergency the Driver of the second engine can apply all the Brakes in the train by throwing open the Brake Valve in the usual way.

When the pilot engine is removed, the Driver of the second engine should at once open the Cock under the Brake Valve. If he forgets this, he will not be able to release the train Brakes from the engine.

11. Attaching or Detaching Vehicles.—Before detaching the engine or any carriages the Brakes must be fully released on the whole train. Neglecting this precaution may cause inconveniences in shunting.

If vehicles carrying different air pressures be coupled together, the Brakes will automatically apply themselves on those which have the highest pressure. To avoid detentions from this cause, **Drivers should be careful not to leave more than 60 lbs. of pressure in a train when detaching at junctions or termini.**

Engines to be connected to the train at such places should, as already advised, carry a high pressure (say 90 lbs.) in the Main Reservoir to insure the certain release of all the Brakes.

When several attachments are made, the Driver must be careful to put only a low pressure into the first and second portions. The handle of the Brake Valve should then be kept in the "Neutral Position" until the last portion has been attached, when the train should be completely charged.

Whenever the locomotive is changed or temporarily detached from the train, and in all cases where the hose

couplings between any of the vehicles have been separated and re-coupled, the Brakes on the entire train should invariably be tested, as explained on page 51. The Driver should not start away until he has been informed that the Brakes on all the vehicles operate properly.

12. Maintenance of the Brake Apparatus on Engine and Tender.—For the proper maintenance of the Air Pump, as well as of the Brake Apparatus generally, it is particularly desirable that the Air Cylinder of the Pump is only sparingly lubricated, and that for this purpose a suitable lubricant is used which will not cause gummy deposits in the air passages and valves. The small oil-cup placed on the top of the Air Cylinder should be filled not more than once a day with "Osmolin Oil" (or "Paragon Grease," which must previously be warmed, so that it may freely run in). Tallow or other animal or vegetable oils must not be used in the Air Cylinder, and the lubricant should never be allowed to be sucked in through the Air Valves.

The Steam Cylinder of the Air Pump should be lubricated with pure Mineral Oil, as used for high-pressure engines.

The Pump should be started slowly, to allow the condensation to escape from the Steam Cylinder, and to prevent knocking, which is more likely to occur when the air pressure in the Main Reservoir is low. The Pump should always be worked with moderate speed, it must not be forced into extraordinary action, nor be required to maintain more than 90 to 100 lbs. of pressure in the Main Reservoir. The Main Piston Rod must be kept well packed, to prevent condensation in the Steam Cylinder from running down into the Air Cylinder.

It is important that the Main Reservoir and Drip Cup be drained at regular intervals. For this purpose the plug in the Main Reservoir as well as the Bottom Cap of the Drip Cup should be unscrewed at least once a week, and more frequently in winter time.

The Blocks of the Driving Wheel and Tender Brakes should be so adjusted that the stroke of the Brake Pistons is always kept within the limits given on pages 40 and 41, for the various cylinders employed.

The Brake Cylinders should be lubricated at least every three months with "Paragon Grease" which must previously be warmed, so that it may readily be injected by means of a syringe. The Brake Gear should then be detached from the crossheads and the pistons turned round a few times.

INSTRUCTIONS TO GUARDS AND BRAKE INSPECTORS.

—:0:—

1. **Preparations for the Journey.**—The vehicles of the train should be carefully examined, to see **that all the Hand Brakes are screwed clear off, that the Brake Couplings are properly united and the Cocks in the Main Brake Pipe are all open**, except that at the rear end of the last vehicle, which must be closed. These cocks are open when their handles are in the position shown in Fig. 5 and 7 (page 30), and they are shut when their handles stand as represented in Fig. 6 and 8.

2. **Coupling the Engine to the Train.**—The Main Pipe under the locomotive and tender should always be blown out by opening the coupling cock at the back of the tender for a short interval before the couplings between the tender and the train are united.

3. **Brake Test.** It is of the utmost importance to make sure that the Brake Connections are properly coupled, so that the Brakes will apply to all the braked vehicles in the train. This is only insured by testing the Brakes on the entire train, as hereafter explained :

When the Brake Apparatus on the vehicles has been charged with compressed air, the Driver must be signaled to apply the Brakes, and the train should then be examined by the Inspector or Guard, to see that the Brakes are all in operation and that the travel of the Brake pistons does not exceed the limits given on pages 40 and 41. This having

been ascertained the Driver must be signaled to release, and each vehicle should then again be examined, to make sure that the Brakes are all properly released.

If the couplings between any of the vehicles are not united, or a cock in the Main Pipe not opened, this will readily be detected, as the Brakes in the rear of this point will not operate. Any such fault, or other defects which may be discovered, must at once be remedied and the test be repeated until it is ascertained that the Brakes on the entire train operate satisfactorily. The Guard should then notify the Driver that the Brakes are all right, and should also inform him how many vehicles in the train are not provided with the Quick-acting Westinghouse Brake.

This test should invariably be made before starting from the terminus or from any place where hose couplings have been separated and re-coupled (in order to change the locomotive, to add or detach vehicles. or for any other purpose).

No train should be started with any of the Brakes put out of operation. Vehicles with leaky pipes, or other damage which affects the working of the Brakes on the whole train, should be removed and repaired.

4. **Attaching and Detaching Vehicles.**—Carriages fitted with ordinary Westinghouse Brakes, or with Pipe Connections only, should be equally distributed in the Train amongst those provided with Quick-acting Brakes. More than three vehicles not fitted with the Quick-acting Triple Valve (Fig. 9) should never be placed together.

After the hose couplings of two vehicles have been connected, the corresponding cocks in the Main Brake pipe must at once be opened.

Before the Locomotive or any vehicles are detached the Brakes should be fully released on the whole train. When this has been done, first close at the point of separation the Coupling Cocks in the Main Pipe, then part the couplings by hand, and connect the Dummies to the Coupling Ends, in order to prevent sand and dirt from entering the Pipe.

Whenever an engine or vehicles are added or detached from the train, the Brake should invariably again be tested before the journey is continued, and the Guard should notify the Driver of any alteration in the number of braked vehicles in the train.

5. General Rules to be observed during the journey:—In ordinary working the Brakes are entirely under the control of the Driver. If, however, in an emergency the Guard should have occasion to stop the train, he must open the Tap, provided for this purpose, and allow the air to escape until the train is brought to a standstill, when it should at once be closed. Before starting, the Guard should ascertain where the before-mentioned Cock is located in his compartment.

6. Releasing the Brake by hand, and emptying the Apparatus.—The Air Brake on any vehicle may be released by hand, if necessary. For this purpose the Wire or Chain, attached to the Release Valve Handle and fixed to the carriage frame, must be pulled until the Triple Valve Piston is reversed and air begins to escape from its Exhaust Port.

If the Release Valve is held open a still longer time, the Air Pressure in the Auxiliary Reservoir and in the Main Pipe will gradually diminish. The whole of the Air in the Brake Apparatus of a detached vehicle may thus be discharged if desired.

When it is intended to **empty** the Brake Apparatus on a detached portion of a train the Air Pressure should at first be discharged from the Main Pipe by opening a coupling cock, before the Release Valves are opened.

7. Irregularities during the journey.—If owing to a defect in the Apparatus, the Brake on any of the vehicles should not work properly, and there being no time to remedy the defect, first place the Handle of the Cock in the bottom part of the Triple Valve in a horizontal position (marked O. in Fig. 9) and test the Brake with the Cock Handle kept in this position. If the operation of the Brake is still found to be improper it must be entirely cut out, by turning the Cock Handle on the Triple Valve midway between the horizontal and vertical positions (see position marked N. in Fig 9). The Release valve must then at once be opened and all air pressure be discharged from this Brake apparatus. However, **the Brake must never be put out of action, neither partly nor entirely upon any vehicle, unless the apparatus is defective**, but when it is necessary to do so, the Guard must notify the Driver, and report to the Inspector at the end of the journey who should take care that the defect is remedied before the vehicle in question is again placed in service.

In the event of the **bursting of a Coupling Hose** the Brakes on the entire train will be applied and the train brought to a standstill. The Cock in the Main Pipe immediately in front of the burst hose must then be closed, and the Driver signaled to release. All the Brakes in the rear of the burst hose must be released by opening the Release Valves and entirely discharging the air pressure from the apparatus of this portion of the train, on which the Air Brakes, of course, become inoperative. Upon the Guard having

informed the Driver how many Brakes have thus been put out of action, and how many still remain in working order, the train should proceed to the next stopping place, where the burst hose must be replaced, or the vehicle be put at the end of the train. When the entire train has been recharged with compressed air the Brakes must again be tested, as explained under No. 3.

If a train should break in two the Brakes will automatically be applied to both portions of the train, which will thus be stopped. The Cock in the Main Pipe at the rear end of the first section should be closed and the Driver signalled to release. The two parts of the train must then be re-coupled, the hose couplings united, and the Brakes on the second section also released by the Driver. When it is ascertained by inspecting each vehicle that the Brakes are all properly released, the train may proceed on its journey.

If the train is stopped by a passenger pulling an emergency Brake handle, the Guard should ascertain in which compartment the handle has been pulled down. This is easily detected by the position of the handle, as it cannot be replaced from the inside of the carriage. When the cause of the stoppage has been ascertained the Guard must close the emergency Brake Cock on the roof of the carriage by pulling down the chain or rod (hanging at the end of the carriage) which is connected to the outside lever of that Cock. The handle in the compartment from which the signal has been given is thereby also raised again to its normal position.

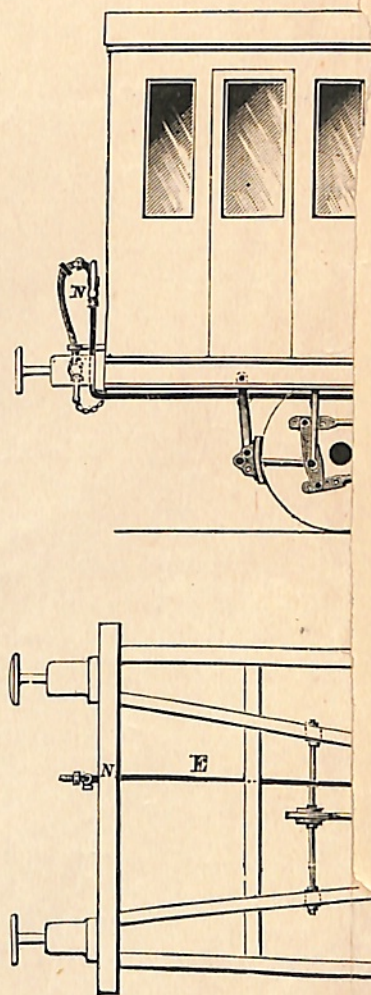
If Vehicles carrying different Air Pressures be coupled together, the Brakes will apply themselves on those having the highest pressure, and should be released by hand, in case there are difficulties in the way of releasing them at once from the Engine.

8. Maintenance of the Carriage Brake Apparatus.—Inspectors should see **that the Brake Gear is properly adjusted for the wear of the Blocks by being uniformly taken up.** The Pistons of Horizontal Double Piston Cylinders should each travel not less than two, nor more than four inches, when the Brake is fully applied. Those of Horizontal Single Piston Cylinders should not travel less than four, nor more than eight inches, and of Vertical Cylinders not less than two-and-a-half, nor more than four inches. (See pages 40 and 41.)

When taking up the slack in the Brake Gear be careful to have the hand brakes fully released, and the levers and pistons pushed back to their proper places.

The joints of the air pipes, etc., must be kept tight, and when leaks are discovered they should be corrected at the first opportunity. Failure to do so may involve serious detention and unsatisfactory operation of the Brakes.

The Brake Cylinders should be lubricated at least every three months with fluid Paragon Grease by means of a syringe. After the grease has been injected the push rods should be detached from the crossheads, and the brake pistons turned round a few times.

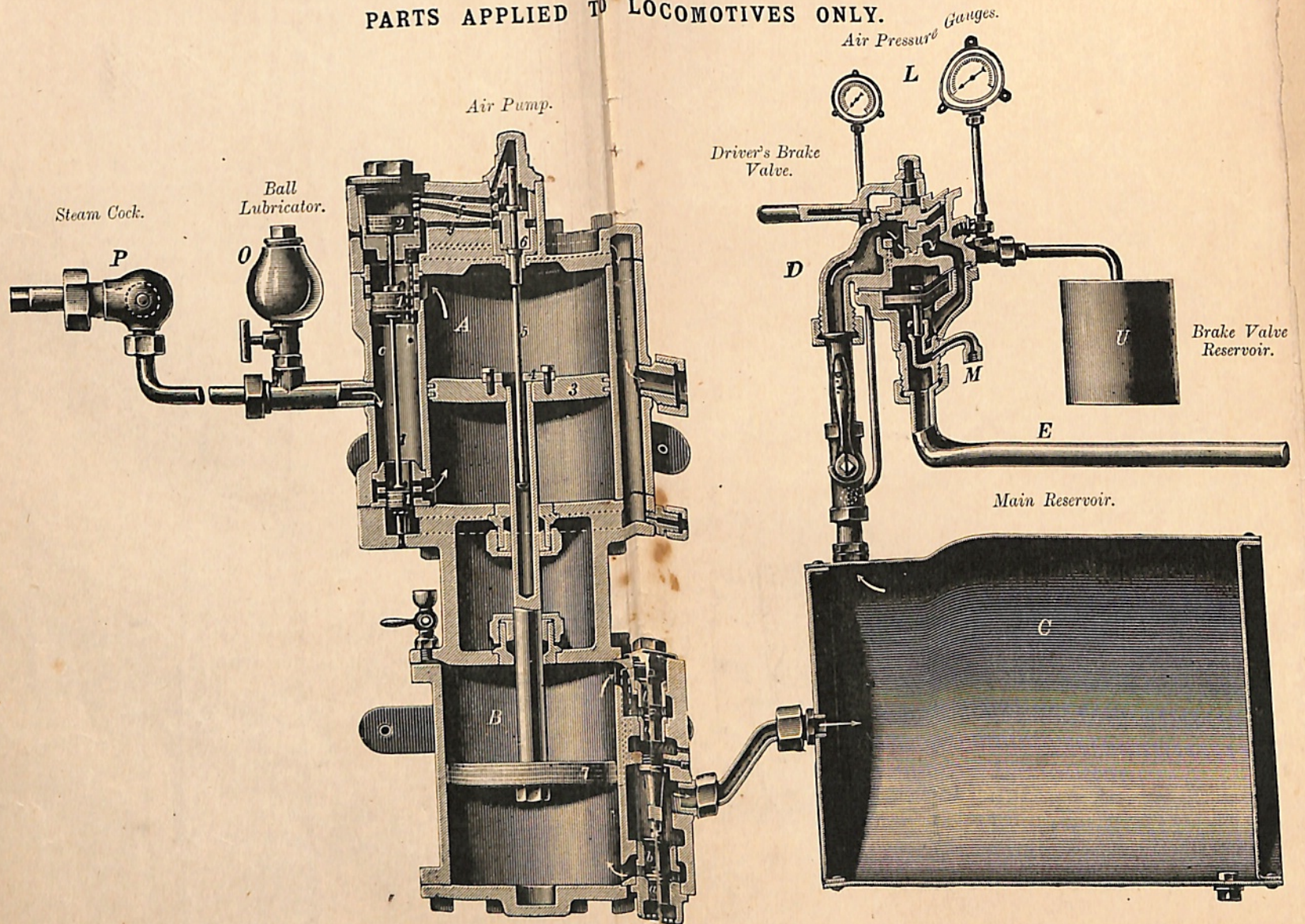


WESTINGHOUSE QU

DIAGRAM ILLUSTRATING THE C

(Not drawn

PARTS APPLIED TO LOCOMOTIVES ONLY.

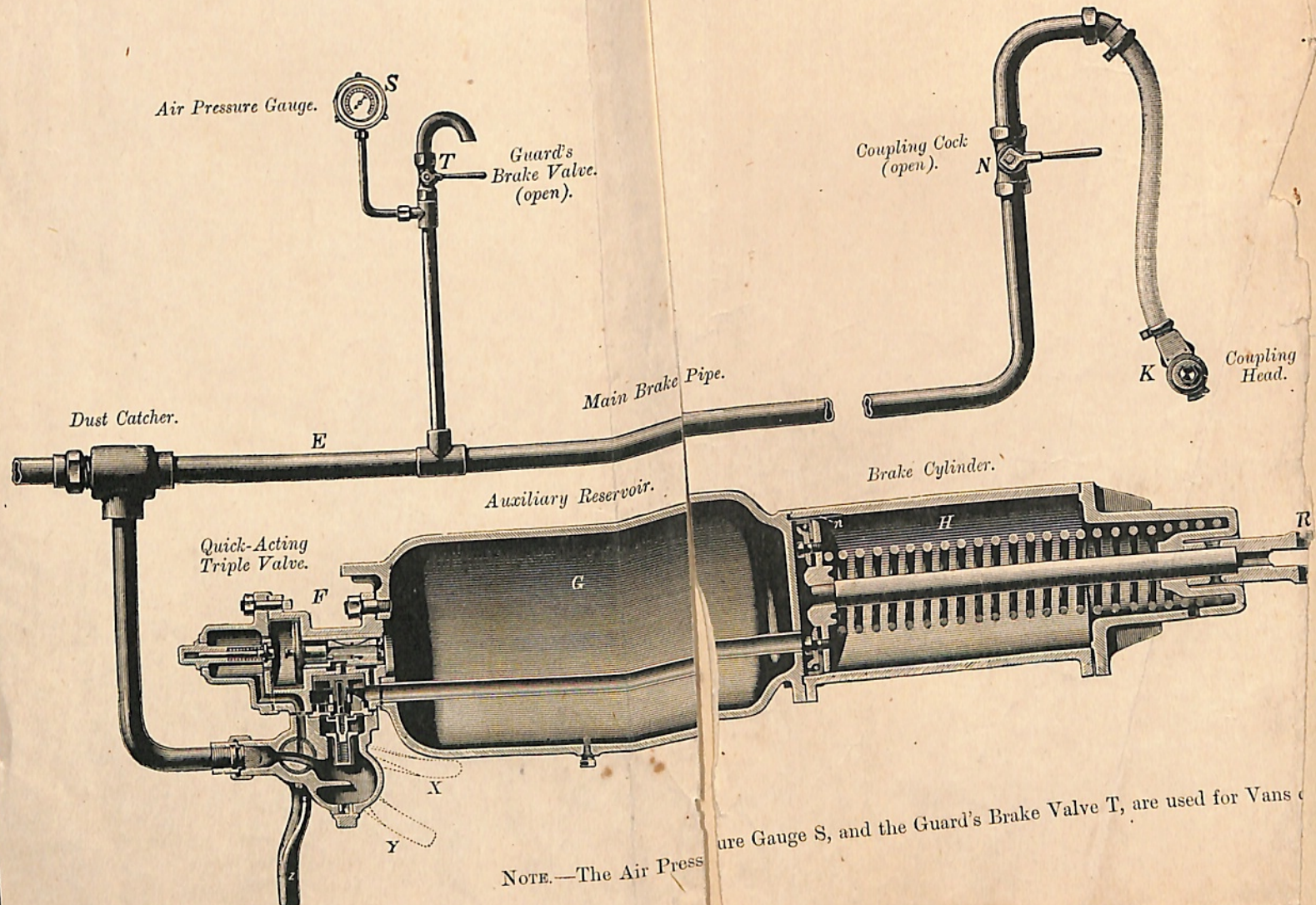


QUICK-ACTING BRAKE.

CONTINUITY OF THE BRAKE PARTS.

(to Scale.)

PARTS APPLIED TO TENDERS, CARRIAGES, OR VANS.



NOTE.—The Air Pressure Gauge S, and the Guard's Brake Valve T, are used for Vans

