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THE AIR BRAKE

AND

TRAIN AIR SIGNAL

INSTRUCTIONS

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PENNSYLVANIA RAILROAD COMPANY

PHILADELPHIA, BALTIMORE & WASHINGTON RAILROAD
WEST JERSEY & SEASHORE RAILROAD

PENNSYLVANIA LINES WEST OF PITTSBURGH
VANDALIA RAILROAD COMPANY
GRAND RAPIDS & INDIANA RAILWAY COMPANY
CUMBERLAND VALLEY RAILROAD COMPANY
NEW YORK, PHILADELPHIA & NORFOLK RAILROAD COMPANY

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AND

TRAIN AIR SIGNAL

INSTRUCTIONS

ISSUED ALTOONA, PA.
MARCH 1, 1916

GENERAL NOTICE

Every employe whose duties are in any way connected with the operation or maintenance of the Air Brake and Train Air Signal Equipment is required to have a thorough knowledge of the instructions pertaining to the same.

This book gives the proper instructions relative to the operation and maintenance of the Automatic Air Brake, the Automatic Quick Action Brake, the High Speed Brake, the Universal Comman Standard Electro-Pneumatic Equipment, the No. 5 and No. 6 ET Equipment, the Independent or Straight Air Brake, the Train Air Signal, and other air operated devices on Locomitives and Cars.

The equipment described in this book is Pennsylvania System standard, all apparatus used being the Westinghouse equipment ,except that which is designated to the contrary.

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THE OPERATION AND MAINTENANCE OF THE AIR BRAKE AND TRAIN AIR SIGNAL

1. ESSENTIAL PARTS:

THE AIR BRAKE (SEE FIGS. 1 AND 3).

First. The Air Compressor, which produces the pressure.

Second. The Compressor Governor, which controls the Main Reservoir pressure.

Third. The Main Reservoirs, in which the pressure is stored.

Fourth. The Automatic Brake Valve, which controls the exhaust of air from and admission of air to the brake pipe to apply and release the brakes.

Fifth. The Straight Air or Independent Brake Valve, for applying and releasing the brakes on the locomotive and tender independently of the rest of the train.

Sixth. The Brake Pipe, including Angle Cocks, Cut Out Cocks, Centrifugal Dirt Collectors or Strainers, Hose and Hose Couplings.

Seventh. The Triple Valve and Auxiliary Reservoir, the Distributing Valve and its Reservoir. (In the UC equipment the Auxiliary Reservoirs consist of the Auxiliary Reservoir proper, the Service Reservoir, the Small Emergency Reservoir, and the Large Emergency Reservoir).

Eighth. The Brake Cylinder and its Piston connected to the brake lever.

Ninth. The High Speed Reducing Valve, or Safety Valve, for reducing the pressure in the brake cylinder, when it exceeds a predetermined amount.

Tenth. The Conductor's Valve, placed on all passenger equipment cars, for applying the brakes from the train when necessary.

Eleventh. The Pressure Retaining Valve, to be found on all freight equipment cars, some Pullman, foreign and business passenger equipment cars, and used to hold air in the brake cylinder when desired.

Twelfth. The Double Heading Cock, placed in the pipe connecting the main reservoir with the automatic brake valve, used on Divisions where it is the practice to haul trains with two or more locomotives. (On the Lines West a cut out cock placed in the pipe leading from the brake valve to the brake pipe is used with the No. 5 ET equipment).

THE TRAIN AIR SIGNAL (SEE FIG. 2).

Thirteenth. The Train Air Signal Reducing Valve, which reduces main reservoir pressure to signal line pressure.

Fourteenth. The Signal Pipe, including Strainers, Stop Cocks, Cut Out Cocks, Hose, and Hose Couplings.

Fifteenth. The Car Discharge Valve.

Sixteenth. The Signal Valve and the Signal Whistle.

2. Main Reservoir and Brake Pipe Pressure—The following tables show the main reservoir and brake pipe pressures to be carried in the two classes of service under various conditions:

MAIN RESERVOIR

Service	Type of Governor	Pressures
Freight.....	Single Top.....	.....100 lbs.
"	Double Top.....	Low....100 lbs. High....130 lbs.
"	S F.....	Low.... 90 lbs. High....110 lbs.
Passenger.....	Single Top.....	.....130 lbs. By special instructions, 140 lbs.
"	S F.....	Low....120 lbs. High....140 lbs.

BRAKE PIPE

Service	Pressure
Freight.....	.....70 lbs.
"	By special instructions, 95-100 lbs.
Passenger.....	.....110 lbs.

The brake pipe pressure must be 95 to 100 lbs. before descending grades specified in the Time Table with freight trains of loaded cars, to be obtained by placing the automatic brake valve handle in full release position; and the engineman must operate the air brake in such a manner as to maintain a brake pipe pressure of not less than 70 lbs. at all times. On trains of empty cars on such grades, the brake pipe pressure must be the standard, 70 lbs. (See Instruction No. 6).

In all cases where freight locomotives are used to haul passenger trains, the brake pipe pressure on the locomotive must be increased to the standard for passenger trains, and the main reservoir pressure correspondingly increased, **before** the locomotive is coupled to the passenger train.

When **one** air gauge is used, the black hand indicates equalizing reservoir pressure, and the red hand main reservoir pressure.

When **two** air gauges are used, the black hand of the one shows equalizing reservoir pressure, and the red hand main reservoir pressure; the black hand of the other shows brake pipe pressure, and the red hand brake cylinder pressure.

3. Trains—Percentage of Air Brakes— All trains must have the air brakes of all cars in the train coupled up and operative leaving terminal points, and must at all times have not less than 85 per cent. of the air brakes on the cars in the train operative. Under no circumstances must a train be operated with less than the required percentage of brakes, without specific instructions from the Division Superintendent, who may specify the manner in which the train brakes shall be operated.

NOTE—Whenever it is necessary to cut out the air brakes on any of the cars in the train enroute, care must be exercised to see that no two cars with the air brakes cut out shall be placed in consecutive order.

The word "car" means all cars or dead engines in a train. The tender of a steam locomotive or one unit of an electric locomotive will be counted as a car. If a car with **two** independent sets of air brake equipment has **one** set inoperative, the car must be counted as **a non air** car in determining whether the train has the required 85 per cent. of air brakes operative.

The following table may be used to determine how many cars will be allowed in trains without operative air brakes in order to maintain the required 85 per cent.:

Number of Cars in Train	Maximum Number of Cars Allowed Without Operative Air Brakes
6 cars or less	0
7 " to 13 cars inclusive	1
14 " " 19 " "	2
20 " " 26 " "	3
27 " " 33 " "	4
34 " " 39 " "	5
40 " " 46 " "	6
47 " " 53 " "	7
54 " " 59 " "	8
60 " " 66 " "	9
67 " " 73 " "	10
74 " " 79 " "	11
80 " " 86 " "	12
87 " " 93 " "	13
94 " " 99 " "	14
100 " " 106 " "	15
107 " " 113 " "	16
114 " " 119 " "	17
120 " " 126 " "	18
127 " " 133 " "	19
134 " " 139 " "	20
140 " " 146 " "	21

4. To Make Up a Train—(Passenger)—Connect the brake pipe and signal pipe by uniting the couplings A and M (Figs. 1 and 2) with the corresponding couplings on the next car. Turn the angle cock handle B **slowly** in line with the hose, and stop cock handle L **slowly** to a position crosswise of the pipe, thus opening both the angle cock and stop cock. Always turn the angle cock handle B nearest the locomotive first, and the stop cock handle L nearest the locomotive last. Then see that cut out cock handle H is crosswise of pipe; that release valve K is closed; and that all hand brakes are released. If a car is equipped with a pressure retaining valve, it must be in release position (handle pointing downward).

(Freight Cars in a Passenger Train)—When freight cars are equipped for either permanent or temporary passenger service, a safety valve should be applied to the brake cylinders, K triple valves replaced with H triple valves, and pipes to the retaining valves disconnected at the triple valve exhaust. When these cars are dismantled for freight service they should again be equipped with their respective triple valves, pipes to the retaining valves connected, and the safety valves removed.

(Freight)—Connect the brake pipe by uniting coupling A (Fig. 3) with the corresponding coupling on the next car. Turn the angle cock handle B **slowly** in line with the hose, thus

opening the cock, being careful to turn the angle cock handle B on or nearest the locomotive first. Then see that cut out cock handle H is crosswise of pipe; that the handle of the pressure retaining valve is in release position (pointing downward) and that the hand brakes are released.

(Passenger Cars in a Freight Train)—A passenger car in a freight train should be coupled up as in the preceding paragraph; but it **must** be equipped with a safety valve or high speed reducing valve, which should be set at 35 pounds unless otherwise covered by special instructions. If this valve is not a part of the regular equipment of the car, a safety valve must be attached to the brake cylinder at the oil hole, and set as above.

(Dead Locomotives in a Freight Train)—A dead locomotive in a freight train should be coupled up the same as a freight car (see above). It must also have the handles of the brake valves securely clamped in the running position by the use of the clamp standard for that purpose.

Locomotives equipped with the ET brake equipment, the tension must be removed from the feed valve adjusting spring, the brake pipe exhaust blanked, and the safety valve on distributing valve adjusted to 30 pounds.

Locomotives equipped with A 1 brake equipment having triple valves, the double heading

cock must be closed and a safety valve attached to brake cylinder adjusted to 30 pounds.

After the locomotive which is to haul the train has been coupled to the train, the train should be stretched to see that all cars are coupled. When this is known, and before the brake hose between the tender and the train has been coupled, the engineman should make a 10-pound brake pipe reduction, and hold the brakes applied until the proper signal to charge the train has been received.

When air has been turned into the train, the engineman will place the automatic brake valve handle in release position, and allow it to remain there until the required pressure is obtained for a test of the brakes. The brake valve handle should then be placed in running position, and if the brake pipe pressure falls more than 5 pounds below the required pressure, the brake valve handle should be returned to release position until the desired pressure is obtained.

5. Testing Brakes—In no case must a train be started until one of the trainmen or inspectors has personally notified the engineman as to the condition of the brakes, and the number of cars in the train.

In passenger service the signal for the application or re-application of the brakes may be made either as in freight service (see following paragraph) or by four blasts of the air signal

whistle obtained by pulling the signal cord on **any** car in the train. The signal for the release of the brakes will be four blasts of the air signal whistle, which must be given by pulling the signal cord on the **rear** car.

In freight service, to first apply the brakes, or after a test has been made, should it be necessary to make additional applications of the brakes, on account of defects found while passing along the train, inspectors or trainmen shall signal the engineman as follows: A hand, flag, or lamp swung horizontally above the head, when train is standing. The signal for the release of brakes, when testing them, will be as follows: A hand, flag, or lamp held at arm's length above the head, when train is standing.

(Terminal Test)—As soon as the locomotive has been coupled to the train and the required pressure equalized throughout the train (see Instruction No. 2), the engineman, upon the request or proper signal from a trainman or inspector, shall make a service application of the brakes (15 pounds reduction of pressure), and hold them on until the trainmen or inspectors shall have examined the brakes on the tender and each car, which should be done as quickly as possible.

Brake pipe leakage must not exceed eight (8) pounds per minute, and preferably should not exceed five (5) pounds per minute, following a 15 pounds service reduction from stand-

ard brake pipe pressure with brake valve in lap position.

If the trainmen or inspectors find the brakes in proper position they shall signal from the rear car of the train to the engineman, who shall then release the brakes. A test of the brakes is not complete until the trainmen or inspectors have re-examined the brakes, to know that they have released properly, without the use of the release valve (see Instruction No. 39), after which they must report to the engineman the condition of the brakes and the number of air brake cars in service in the train. Engineman and conductor will be held responsible for securing this information.

Note—Retaining valves should be tested at points specified by special instructions.

At intermediate terminals it will be satisfactory to make the terminal test on a passenger train when the brake system is charged up to 70 pounds, unless "Undesired Quick Action" has been experienced, when the full pressure should be used.

Where standard yard testing plants are used, it will be satisfactory to make the terminal test from the yard plant, by making a 15 pounds reduction of pressure, and after the locomotive is attached only the road test will be necessary.

Note—It is advisable at originating terminals to make a terminal test of the brakes on passenger trains when the locomotive has been coupled to the train, even if the cars have been

tested at a yard testing plant. It will be satisfactory, however, to make such terminal test when the brake system is charged up to 70 pounds, **if** the cars were tested at the yard testing plant with the usual normal brake pipe pressure. When this procedure is followed, the road test need not be made in addition to the terminal test.

To expedite the making up of trains at points where they must be collected from two or more tracks, the terminal test may be made on each section, as they in turn are coupled to the locomotive or yard testing plant, as above, and charged to the required pressure. After the train is completely made up the road test should be made.

The terminal test must be made after every change in the make up of a train on all cars added, and at points, as specified in the Time Table or "General Notice," preparatory to descending heavy grades.

(Road Test)—When a train has been parted, or an angle cock closed, for any reason, at or between terminals, and coupltd again, or when the terminal test has been made in sections or by a yard testing plant, the engineman, upon receiving the proper signal, will give one blast of the locomotive whistle, except at points where the blowing of the whistle is prohibited, and make a service application of the brakes for test, being careful to note that the brake valve discharges the proper amount of air from

the brake pipe. The trainman or inspector stationed at the rear portion of the train, upon seeing that the brakes have applied properly, will signal for the release. If the latter takes place, it will indicate that no angle cocks in the brake pipe have been left closed.

(Running Test)—Enginemen must make a running test of the brakes at the first opportunity after leaving a terminal, and before descending grades.

6. Failure to Maintain Required Pressure—When, from any cause, the pressure required for the safe handling of the train cannot be maintained, the engineman must immediately notify the conductor, and both engineman and conductor will be held responsible for taking the necessary action to insure the safe movement of the train.

6-a. Inoperative Air Brake—(On Trains)—When the air brake becomes inoperative on a train it will proceed carefully with hand brakes to the first telegraph or telephone office, where it will report to the Superintendent for orders. (For passenger trains on grades, see Instruction No. 7).

(On Locomotives)—All locomotives must leave the originating point with the driving wheel brake in serviceable condition. Therefore, when a driving wheel brake on any locomotive is found inoperative before, leaving the originating point, such locomotive must not be permitted to leave, but must be replaced by

a locomotive having the driving wheel brake in an operative condition. If the driving wheel brake should become inoperative en route, the locomotive may proceed to the next available terminal where repairs can be made, and the engineman must exercise the caution made necesary by the loss of braking power caused by defective brake.

7. Hand Brakes—All trains must be controlled by the air brake, supplemented on heavy descending grades by hand brakes when necessary to insure the safe movement of the train.

To insure the safe movement of freight trains on heavy descending grades, the conductor and engineman must arrange for the number of hand brakes necessary to be applied supplementary to the air brakes.

(Freight Trains)—The usual call for hand brakes—one short blast of the locomotive whistle—will signify that they must be applied supplementary to the air brakes, but continuous calling for brakes will signify "No Air," in which event the angle cock at the rear of the train must be opened, and the hand brakes must be promptly applied on all cars until the train has been stopped, when it must be immediately protected as per Rule 99, Book of Rules. Engineman and conductor must then agree as to the method in which the brakes should be handled, to insure safe operation to the next telegraph or telephone office as per Instruction

No. 6-a, before the train should be allowed to proceed.

(Passenger Trains)—One short blast of the locomotive whistle will be a signal by the engineman that the brakes cannot be operated from the locomotive by reason of "No Air." Trainmen should immediately open the conductor's valve (see Instruction No. 40), and the hand brakes must at once be applied on all cars until the train has been stopped, when it must be immediately protected as per Rule 99, Book of Rules. The train should not then proceed until the conductor and engineman have agreed upon the method of handling the brakes, to insure safe operation to the next telegraph or telephone office. (See Instruction No. 6-a.)

When a locomotive is detached from a passenger train, whether purposely or accidentally, or the air brake becomes inoperative, on grades specified in the Time Table, trainmen must be governed as follows:

On ascending grades promptly apply the hand brakes on each car, beginning with the rear car in train, and if necessary, block the wheels. On descending grades, trains must be secured in the same manner, but beginning with the first car in the train. If blocking has been used it must not be removed, nor must the hand brakes be released until after the terminal test has been made in accordance with Instruction No. 5.

A car having the hand brakes inoperative must never be the rear car of a train.

A car having the air brake inoperative may, however, be the rear car in a train, except as otherwise covered by special instructions.

A car having an operative air brake must **never** be the first car in a passenger train when two or more locomotives are in charge.

Trains standing on grades **must** be secured with hand brakes.

8. Pressure Retaining Valve—This valve, placed on the end of the car near the brake wheel, must be used on grades where it is necessary to hold the brakes applied while recharging auxiliary reservoirs and to hold the slack of the train when operating conditions require. It is connected by a small pipe with the exhaust port of the triple valve, and through it the air is exhausted from the brake cylinders, when the brakes are released. When the handle I (Fig. 3) is vertical (pointing downward) the port is fully open; when horizintal (crosswise of pipe), a certain portion of the air is retained in the brake cylinder after the triple valve is in release position. Some cars are equipped with the three-position retaining valves, in which the third position, midway between horizontal and vertical, and known as the 45 degree (middle) position, retains a higher pressure in the brake cylinder than the horizontal position.

On loaded cars equipped with the three-position retaining valve, the handle must be placed

in the 45 degree position when descending grades as specified in the Time Table, unless there are 15 or more consecutive cars equipped with the two-position retaining valve, in which case the valves on the cars to the rear of them must have the handle in horizontal position (crosswise of pipe). The conductor will be held responsible for knowing that the handles of the pressure retaining valves are in the proper position.

On trains of empty cars, descending specified grades, retaining valves will be used with the handles placed in horizontal position on 30 to 50 per cent. of the cars in the train, as required.

Trainmen will set these valves for use when necessary, and must change them back to vertical position as soon as their use is no longer required. Neglect of this will cause the brakes to drag, and may cause damage to wheels.

9. Train Dragging—If the train is found to be dragging on account of the brakes being slightly applied, the engineman must make an effort to release the brakes, which may be done by either of the following methods:

A. By making a service application of the brakes and releasing in the usual manner.

B. By moving the brake valve handle to release position. If the excess pressure causes the brakes to release, the handle must be immediately moved to running position.

If the brakes cannot be released as outlined,

the train must be stopped and the trainmen notified to examine the brakes.

In passenger service one sound of the air signal whistle is a signal from the conductor to the engineman that the brakes are sticking. The engineman will answer as per Rule 14-g (Book of Rules)—two short blasts of the locomotive whistle—after which the conductor will repeat the signal. The engineman should then proceed as above.

10. Air Compressors—Before starting an air compressor, care should be taken that all drain cocks are open. Always start and run an air compressor slowly until it becomes warm and about 30 lbs. pressure is obtained in the main reservoir, which will provide for a cushion in the air cylinder, at which time the drain cocks should be closed. The maximum speed of an air compressor should not exceed 130 single strokes per minute. Air inlet strainers must be kept clean at all times. All drain cocks must be opened when air compressors are out of service. The compressor and compressor governor must be tested at maximum pressures.

The lubricator should be in operation as soon as possible after starting the compressor so as to thoroughly lubricate the steam cylinders, at which time the oil feed should be adjusted to feed ten or fifteen drops of oil as rapidly as possible; then regulate the feed to about one drop per minute per compressor. The lubri-

cator should be kept in operation while the compressor is running.

A swab, well saturated with valve oil, is essential on the piston rod.

The air cylinder of a compressor should be sparingly lubricated with the authorized oil as required. Engine oil should never be used in the air cylinder of a compressor, as it clogs and restricts the air passages, causing the compressor to heat and producing bad results in general.

11. Helping Locomotives — Locomotives assigned to divisions on which it is the practice to use them in helping service must be equipped with the double heading cock (Fig. 4), located in the pipe connecting the main reservoir with the automatic brake valve, or with the cut out cock in the brake pipe. When two or more locomotives are coupled to any part of a train, and when running light over the road coupled together, the air brake and air signal must be connected to, and the brakes operated from the leading locomotive. The handle of the double heading cock on all locomotives except the one from which the air brake is operated must be placed in position No. 2 (crosswise of pipe) (Fig. 4), thus closing the cock. On these locomotives (on which the double heading cock is closed) the handle of the automatic brake valve must be placed in running position, and the air compressor kept working to maintain the pressure in the main reservoirs, to apply the locomotive brakes and so as to be prepared to

assume control of the brakes in case of the failure of the air compressor, or some other part of the brake apparatus on the leading locomotive; but in no case must the handle of the double heading cock be placed in position No. 1 (in line with pipe) on any of the locomotives not having control of the brakes, until the handle of the double heading cock on the locomotive having control of the brakes is placed in position No. 2 (crosswise of pipe), or until the proper brake couplings are separated.

In case of emergency the brakes can be applied from a locomotive having the handle of the double heading cock in position No. 2 (crosswise of pipe), by moving the handle of the automatic brake valve to emergency position.

Locomotives equipped with the cut out cock in the brake pipe, and which do not control the brake, must have the cut out cock closed, the brake valve handle carried in running position (or lap position, with the No. 5 ET equipment), and the air compressor kept working, to maintain main reservoir pressure. To apply the train brakes, open the cut out cock and move the brake valve handle to service or emergency position as may be required.

When two or more locomotives are coupled together and making yard movements to or from trains, the leading locomotive in charge of the train when on the road shall operate the brakes on both or all locomotives when making such movements.

OPERATION OF THE AUTOMATIC AND STRAIGHT AIR BRAKE (SWA & SWB)

12. To Charge the Train — Place the handle of the automatic brake valve (Fig. 5) in release position until the required pressure is obtained, as indicated by black pointer on gauge. Then move the handle of the automatic brake valve to running position.

13. To Make a Service Application—Move the handle of the automatic brake valve to service position (Fig. 5) and hold it there until the pressure, as indicated by the black pointer on gauge, has been reduced the required amount; then move the handle of the automatic brake valve to lap position.

14. To Make an Emergency Application— Move the handle of the automatic brake valve quickly to emergency position, where it must remain until the train has stopped.

15. To Hold Brakes Applied—Place the handle of the automatic brake valve in lap position.

16. To Release Brakes—Move the handle of the automatic brake valve to release position.

17. To Apply the Straight Air Brakes on Locomotive and Tender—Move the handle of the straight air brake valve to application position (Fig. 6).

18. To Hold the Straight Air Brakes Applied on Locomotive and Tender—Leave the

handle of the straight air brake valve in application position.

19. To Release the Straight Air Brakes on Locomotive and Tender—Move the handle of the straight air brake valve to release position, where it should remain when the brake is not in use, except that with the type S3a straight air brake valve the handle should be carried in running position.

OPERATION OF THE ET BRAKE EQUIPMENT

20. To Charge the Train — Place the handle of the automatic brake valve in release position (Fig. 7) until the required pressure is obtained in the brake pipe, as indicated by the black pointer on the gauge. Then move the handle of the automatic brake valve to running position, where it should remain when the brake is not being used. The handle of the independent brake valve should be in running position during this operation and at all times when the independent brake is not being used.

21. To Make a Service Application—Move the handle of the automatic brake valve to service position, and hold it there until the brake pipe pressure, as indicated on gauge, has been reduced as required; then move the handle of the automatic brake valve to lap position.

22. To Make an Emergency Application—Move the handle of the automatic brake valve

quickly to emergency position, where it must remain until the train has stopped.

23. To Hold Brakes Applied—Place the handle of the automatic brake valve in lap position.

24. To Release the Brakes on Cars—Move the handle of the automatic brake valve to release position.

25. To Release the Brakes on Locomotive and Tender—(a). Move the handle of the automatic brake valve to running position, if the brakes on the cars have been released as per Instruction No. 24, or if the brakes on the locomotive and tender have been held applied, as per Instruction No. 26. (b). Move the handle of the independent brake valve to release position, and **hold it there** until the locomotive and tender brakes have been released, if the handle of the automatic brake valve is in any position other than running. (c). Move the handle of the independent brake valve to running position if the application to be released had been made with the independent brake only.

The release position of the independent brake valve should release the brakes on the locomotive and tender under any and all conditions.

26. To Hold Brake Applied on the Locomotive and Tender Only—(a). Move the handle of the automatic brake valve to holding position, if the brakes on the cars have been

released as per Instruction No. 24. (b). Allow the handle of the independent brake valve to return to lap position, if the handle of the automatic brake valve is in running position and the application to be held applied had been made with the independent brake only.

27. To Apply the Independent Brakes on Locomotive and Tender—Move the handle of the independent brake valve to either slow or quick application position as desired.

GENERAL INSTRUCTIONS—(Continued)

28. Condition of Brake and Signal Apparatus on Locomotives and Tenders—Enginemen, when taking charge of a locomotive, must see that the brake and signal apparatus on locomotive and tender are in good working order; that the air compressor and lubricator work properly; that the engineman's brake valves work properly in all the different positions of their handles; that the required pressure is obtained and not exceeded in the brake pipe when the handle of the automatic brake valve is in running position; that the governor controls the compressor when the maximum pressure is obtained in the main reservoir; and that, when the brakes are fully applied, the locomotive and tender brakes have proper piston travel, and are in good order. (See Instruction No. 29).

29. Locomotive Piston Travel—The piston travel on the locomotive and tender must not

vary more than 1 inch in either direction from the following dimensions:

	Piston Travel
Equalizer Driver Brake.....	5″
Locomotive Truck Brake.....	5″
Locomotive Trailer Brake.....	5″
Tender Brakes	6″

30. To Avoid Rough Handling of Train— Service stops with passenger trains of less than 8 cars should be made, **where practicable,** with two applications of the brakes, which should be released before coming to a full stop, except on grades. When a train consists of 8 or more cars, or is hauled by more than one locomotive, the second application should not be released before coming to a full stop. Service stops with passenger trains can be made satisfactorily by either the one or the two application methods. When using the one application method care must be exercised to avoid making a total of more than 20 pounds brake pipe reductions in such a manner that an excessively high brake cylinder pressure would be obtained at the moment of stop. When using the two-application method, the release of the first application should be made at a speed of not less than 15 miles per hour, the brake valve handle being placed in release position a sufficient length of time to insure a full release of the brakes and a readjustment of the slack being obtained before the second application is made.

In order to insure the release of the brakes when operating the air brake on passenger trains in which are Pullman cars equipped with two independent sets of air brake equipment, two or more reductions should be made. The initial reduction should be 8 pounds, followed by such other reductions as are necessary to make the stop. When the total reductions do not exceed fifteen (15) pounds, a further reduction should be made after the train has stopped. When releasing the brakes the brake valve handle should be placed in release position a sufficient length of time to insure a prompt release of the brakes.

To insure the proper release of the brakes when they have been applied to reduce the speed of the train, as when making slow downs to conform to speed regulations, an initial reduction of 8 pounds should be made. This should be followed by a further reduction, if conditions will permit, and as soon as the speed of the train has been sufficiently reduced the brakes should be released in the manner prescribed in the preceding paragraph.

The brakes on freight trains of 25 cars or more must never be released at speeds of less than ten (10) miles per hour until after the train has come to a full stop.

31. Frequent Application and Release of Brakes—As the brakes are applied by air from the auxiliary reservoirs, frequent application

and release reduces the pressure and consequently the power to apply the brakes; for, while applied, the supply of air to the auxiliary reservoir is cut off. Therefore, after each release, the handle of the brake valve must be left in release position until the moment the brakes are applied again, or until the required pressure is obtained in the brake pipe and auxiliary reservoirs.

32. Emergency Application, Accidental or from Train—Should the brake apply suddenly, the steam throttle valve must be immediately closed, and the brake valve handle moved to lap position in freight service (to conserve the main reservoir air used in re-charging), and to emergency position in passenger service, and be held there until the train has stopped.

33. Starting, Stopping or Retarding Speed of Train—When starting trains great care must be exercised, and the steam throttle valve must not be opened until sufficient time has been given to insure the full release of all brakes throughout the train.

When stopping or retarding speed of trains, in all cases, the brakes must be applied and released in such a manner as to prevent shocks and injury to cars and lading.

34. Reporting Defects — Engineman must report at the end of each trip, on the regular form furnished for the purpose, any defects to locomotive and tender brake and signal apparatus.

Conductors must report, on blank provided for the purpose, **all** defects existing in brake or signal apparatus on cars in their train. These blanks must be handed, on the arrival at the end of the trip, to Station Master, Yard Master, or Foreman of Car Inspectors.

Both engineman and conductor must report all cases of undesired quick action.

35. To Cut Off a Car or Locomotive from a Passenger Train—

First—See that all the brakes on the car or locomotive to be cut off are released.

Second—Turn the angle cock handles crosswise of pipe and the signal line cock handles in line with pipe on each side of the couplings to be separated. Turn the handle of the angle cock farthest from the locomotive first.

Third—Disconnect the brake hose couplings A and the signal hose couplings M (Figs. 1 and 2) and unite them with their dummy couplings when required. Couplings must always be separated before the cars are uncoupled.

36. To Cut Off a Car or Locomotive from a Freight Train —

First—See that all the brakes on the car or locomotive to be cut off are released.

Second—Turn the angle cock handles crosswise of pipe on each side of the couplings to be separated, turning handle farthest from the locomotive first.

Third—Disconnect the brake hose couplings, which must be done before the cars are separated.

37. Cars Standing Detached from a Locomotive—The hand brakes and not the air brakes must be applied, except as noted below.

To prevent injury to passengers, it is desirable to have the air brakes applied on all cars in trains while standing at stations where locomotive or car must be separated for shifting movements. Enginemen will, therefore, not release the brakes on the train if the stop has been made without the final release; or, if the release has been made shortly before coming to a stop, a reduction of from eight to ten pounds should be made immediately after the train has stopped, before the locomotive is detached.

38. To Cut Out a Defective Brake—To cut out a defective brake on cars equipped with quick action triple valves, turn the handle of the cut out cock in the branch pipe (Figs. 1 and 3) in line with the pipe, and open the auxiliary reservoir release valve K, holding it open until all the air is exhausted from the reservoir.

On cars equipped with UC valves, when necessary to cut the air out on account of undesired quick action or a serious leak between the branch pipe cut out cock and the UC valve, turn the handles of the branch pipe and brake cylinder cut out cocks in line with the pipes. If the air is cut out for any other defect in the

brake, merely turn the handle of the brake cylinder cut out cock in line with the pipe.

On cars in freight trains, attach a Defective Air Brake Card, M. P. 276, in accordance with detailed directions in Instructions Nos. 48 and 50. (See also instructions No. 5-Note, and No. 7.)

When it is necessary to place a car on which the air brakes cannot be used on the rear of a train, the brake hose coupling must be united with that on the car in front, and the angle cocks (except that on the rear of the train) left open, so that the air can pass into the brake pipe of the rear car, when this pipe is in good condition. When the brake pipe is **not** in good condition, the angle cock on the forward end or rear car must be closed, and both engineman and conductor notified.

39. Releasing Brakes by Means of Release Valve—Open the auxiliary reservoir release valve K (Figs. 1 and 3) and hold it open until the air starts to escape from the triple valve exhaust port or retaining valve exhaust port, when it must be immediately closed. When releasing a brake in a train, the release valve K should only be used after an investigation has shown that the brakes cannot be released by the engineman.

40. To Apply Brakes from Train—This must only be done in case of emergency, and never from the rear car of the train except to

avoid an accident. Trainmen must endeavor, wherever possible, to attract the engineman's attention by signaling, before applying the brakes from the train, and enginemen will look back along their train for signals, as often as it is consistent. When necessary to apply the brake from the train, any one of three ways may be used in passenger service, and either of two ways in freight service.

A—By pulling down on the conductor's valve cord, on passenger equipment cars, and holding it down until the train is stopped.

B—By disconnecting the couplinge between two cars.

C—By opening the angle cock on the rear of the last car in train by turning the angle cock handle B (Figs. 1 and 3) in line with pipe.

41. Burst Hose—In case of a burst air brake hose, turn the angle cock handle B (Figs. 1 and 3) immediately in front crosswise of pipe and signal engineman to release the brakes.

In case of a burst signal hose, turn the signal line stop cock handle L (Fig. 2) immediately in front in line with pipe.

After the defective hose has been replaced, unite the couplings in the usual way and make the road test.

42. Air Brake and Signal Hose, Removal of—Trainmen or inspectors in removing defective air hose from locomotives or cars will not remove the extension nipple where applied to

the angle cock. These nipples are applied in order to give the air hose the proper length and their removal may result in the hose parting. Air brake or signal hose which become defective on trains enroute must be removed and properly tagged, showing the number of the train, initials and number of car or locomotive, which end of car, locomotive, or tender from which removed, date and place of renewal. If removed from locomotives or tenders they should be sent by the engineman to the Engine-house Foreman, if from passenger equipment cars by the conductor to the authorized person, and if from freight cars they should be turned over by the conductor to the car inspectors, from whom he will receive a new hose for each defective hose turned in. (Note—The end of the car toward which the cylinder push rod travels is known as the B end).

The proper tagging of the hose is essential in order that the proper bill can be made against foreign roads for material applied to their cars.

In applying air hose gaskets, either on the road or in yards, the groove in the hose couplings provided to receive the gaskets must first be cleaned out to admit the gasket. The trimming of the hose gaskets in order to have them enter the groove of the couplings is not permissible.

43. Broken Brake Pipe—In case of failure of brake pipe or branch pipe to the conductor's

valve on passenger equipment cars or tenders, the signal line may be used on the car with the broken brake pipe to transmit brake pipe pressure to the rear cars in the train by forcing the signal line hose coupling with the air brake hose coupling on cars adjoining the one with the broken brake pipe. This change will destroy the operation of the air signal on the defective car and all cars following. In order to obtain a signal on cars ahead of the defective one, the signal line should be closed by placing the handle of the signal line stop cock on the rear of the car immediately in front of the defective car in line with the pipe.

At the point where couplings made in this manner are separated, they should be gauged with the gauge shown on standard tracing No. 37485, to determine if any damage has been done by forcing the couplings together.

44. If Train Breaks in Two—Turn the angle cock handle crosswise of pipe on rear end of car immediately in front of break, and signal engineman to release brakes. After the train has been coupled, close the angle cock on rear portion of train immediately in back of break, and test the air brake hose before charging up the rear portion of the train and releasing brakes. After the brake system has been fully re-charged, a road test of the brakes must be made as explained in Instruction No. 5—Road Test.

45. Operation of the Train Air Signal—The pull on the valve cord should be directly downward, and only sufficiently hard to open the valve.

In order that the proper blast of the signal whistle be obtained, an exhaust of not less than one (1) second duration with not less than three (3) seconds intervening between pulls on the cord should be made. With a train of twelve cars or over, allow at least four (4) seconds between discharges.

A defective car discharge valve can be cut out of service by closing the cut out cock T in signal branch pipe (Fig. 2).

When the air signal fails, and cannot be repaired without serious detention to the train, the trainmen or inspectors will notify the conductor, who will have an understanding with the engineman as to how the train will be handled, instruct his crew accordingly, and proceed, reporting the fact by wire to the Superintendent.

46. Piston Travel Adjustment—The adjustment of the brake rigging should be such that the piston travel under full service application shall be as follows:

On Cars—On freight equipment cars six (6) inches; on passenger equipment cars (with cast iron wheels) seven (7) inches; on passenger equipment cars (with steel or steel tired wheels) six (6) inches. The maximum travel of the piston on cars in service should not

exceed eight (8) inches. Where automatic slack adjusters are provided, they must be maintained in good condition and adjusted properly when any change is made in the brake rigging or shoes.

On Locomotives—See Instruction No. 29.

47. Repairs to Trucks—When necessary to make repairs of any character to the brake rigging, brake shoes, or any part of the truck, the cut out cock in the branch pipe must be closed and air pressure drained from auxiliary reservoir by means of release valve.

NOTE—If the car is equipped with the UC valve, merely turn the handle of the brake cylinder cut out cock in line with the pipe, and do **not** release the air from the auxiliary reservoir.

On locomotives equipped with the ET equipment, close the cut out cocks in the supply pipe to the distributing valve and brake cylinder. On locomotives having triple valves, follow the same procedure as for cars.

DEFECTIVE AIR BRAKE CARDS

48. Use Of—The attention of trainmen is called to the importance of using Defective Air Brake Card, M. P. 276, when any defect occurs to the air brake equipment on cars in freight trains.

When necessary to attach this card to a car, the particular defect for which the brake is cut out must be marked off on the card for the information of inspectors and repairmen.

Cars having defective air brake cards attached must be repaired at the first terminal repair point.

When these repairs are made, cards should be removed, properly filled out and forwarded to the office of the Superintendent of Motive Power, and if a foreign car and when required, cards should be forwarded to the proper authority for billing in accordance with the A. R. A. Rules.

The defective air brake card should be attached to the branch pipe near the triple valve when the air brake apparatus is in a defective condition from one or more of the following causes. (See Fig. 12).

B. Brake Will Not Apply.
C. Brake Will Not Release.
D. Triple Leaks at Exhaust.
E. Undesired Quick Action in Service.
F. Crossover Pipe (if between cut out cock and triple valve).
G. Brake Cylinder.
H. Brake Leaks Off.
I. Brake Rigging.

M. Retainer Valve Pipe.
N. Release Valve.

49. Defects, Effects Of—Any of the parts noted in Instruction No. 48, being found in a defective condition, will render the air brake on a car inoperative, but does not in any way interfere with the main brake pipe for use in passing the air pressure through the other cars, so that a car equipped with air brakes having one or more of these parts defective, can have the air brake cut out of service by closing the cut out cock in the branch pipe, and by opening the release valve until all the air is exhausted from the reservoir. The car can then be operated between air brake cars in service to the first terminal repair point by having one of the cut out cards, M. P. 276, attached to the branch pipe, as close to the triple valve as possible. Two cars so cut out should never be operated consecutively in the same train.

50. Use Of—Defect cards should be attached to the brake pipe near the angle cock on both ends of a car when the apparatus is defective for any of the following reasons:

A. Brake Pipe including cut out cock.
F. Crossover Pipe (if between brake pipe and cut out cock).
L. Angle Cock.

51. Defects, Effects Of—Any of the parts noted in Instruction No. 50, being found in a defective condition, will render the air brake on a car inoperative, and will also prevent the use of the brake pipe to pass air through to other cars, so that a car having one or more of these defects cannot be operated between air brake cars in service.

In emergency cases where it is necessary to dispatch a car from a terminal repair point with inoperative air brakes, such car or cars must be placed between the cars with operative air brakes controlled by the engineman, and the cabin car, and the air brake must be cut out on the cabin car.

GENERAL INSTRUCTIONS—(Concluded).

52. Back Up Hose—When it is the practice to push trains in and out of stations, or through yards, or in the operation of work trains, the Back Up Hose must be used. This is a device, connected, by a standard hose coupling, to the air brake hose, by means of which the trainman on the leading car is enabled to apply the brakes either in service or emergency applications, when the handle of the automatic brake valve is in running position. It is also used to give warning of the approach of the train by means of its whistle signal.

The cut out cock is closed when the handle S (Fig. 10) is in line with the pipe and the whistle cock is closed when the handle W (Fig. 10) is crosswise of pipe.

To make a service application of the brakes, partially open the cut out cocks by turning the handle S toward a position crosswise of pipe, until the desired result has been obtained, when the cock should be closed. To make an emergency application, turn handle S quickly crosswise of pipe and hold it there until the train stops.

To operate the whistle simply open and close the whistle cock, by moving handle W alternately in line with pipe and crosswise of pipe.

When cars are pushed by an engine, the trainmen in charge of the movement must know that the air brake and train air signal are coupled through from the front of the leading car to the engine, and in an operative condition; that the Back Up Hose is coupled to the front end of the leading car, and is in good working order. The trainman riding the leading car will then take a conspicuous position on the front end, and signal the engineman by the use of both communicating air signals and hand signals.

The engineman will control the movement in accordance with signals from the trainman on the front end of the leading car.

When necessary to stop, the trainman on the front end of the leading car.

When necessary to stop, the trainman on the front end of the leading car will signal to the engineman by means of the communicating air signal. If the engineman does not quickly

respond to this signal, the trainmen will be held responsible for stopping the movement at once by opening stop cock S; also to stop the movement in emergencies.

The engineman shall not start the train until the signal to start, given by the communicating air signal, has been followed by a hand signal from the trainman. Cars may, however, be switched simply by the use of hand signals.

When the train air signal is inoperative, or when a freight train or work train not equipped with the train air signal is making a reverse movement, the trainman must notify the engineman, who will then be governed by hand signals only. When the stop signal is not acted on promptly by the engineman, the trainman on the front end of the leading car must stop the train (apply the brakes) by the use of stop cock S.

53. Air Operated Water Scoop—To lower the scope, move the handle of the water scoop air valve to Down position (Fig. 2). To raise the scoop, move the handle of the air valve to Up position, which should be done before the end of the water trough is reached.

The water scoop air valve handle should be kept in Up position at all times except when using the water scoop.

INSPECTION AT TERMINALS

Cars

54. Duties of Inspectors and Repairmen—All car inspectors and repairmen, whose duty it is to inspect and make light repairs to trucks and draft arrangements must also be required to give the same attention to hand brake defects, adjustment of brake rigging, brake pipe hangers, angle cocks, hose and couplings, and pipe connections. The repairs must be made at the same time that other defects to the cars receive attention.

55. Repairs, When and Where to Be Made—If the air brake defects are such that the repairs cannot be made on the terminal yard tracks, the car must be sent at once to the shop or yard repair tracks for air brake repairs.

56. Brake Cylinders, Triple Valves, UC Valves, Etc.—Inspectors must see that these parts are cleaned, lubricated and tested not less frequently than once every twelve (12) months on passenger and freight equipment cars, and once every six (6) months on cabin cars, and the date on which this work is done must be stenciled on the auxiliary reservoir. (On a car equipped with the UC valve

stencil the large emergency reservoir). On cars not having the auxiliary reservoir in plain view, this stenciling should be placed on the side of car adjacent to the release valve rod, in accordance with standard tracings.

NOTE—For detailed instructions on this work see Passenger Car Maintenance Instructions No. P-2-B and Freight Car Maintenance Instructions No. F-2-D.

57. Triple Valve Renewed on a Foreign Car—A triple valve removed from a foreign car for cleaning, testing and repairing, must be replaced with a repaired triple valve of the same type, as that standard to the car that has been tested on an approved test rack. The inspector or repairman removing the valve from car must sign and insert in the check valve case a standard triple valve repair card, noting thereon the initial and number of car, date and place of removal, initial or road, and date of last previous cleaning, make and type of the triple valve removed, and why sent to the test rack. Immediately after removal, the triple valve must be protected in the proper manner, and the opening in the check valve case sealed with a cap (painted red when the valve is removed from a foreign car) to prevent the loss of this form.

All material used, and labor performed in removing and replacing a triple valve in a foreign car, must be shown on the M. C. B. Billing Repair Card.

58. Applying Triple and UC Valve Gaskets—The triple valve and UC valve gaskets should always be applied to the valves, and not to the auxiliary reservoir or pipe bracket, with the rib side of the gasket next to the valve. These gaskets must be in good condition.

59. Applying Triple and UC Valves—Precautions—In applying the triple valve and parts of the UC valve, it should be known that the induction or supply pipe to the brake cylinder is clean and that all parts of the UC valve bracket are open and free from any foreign substance. The branch pipe should be thoroughly blown out and the cone shaped strainer in the branch pipe leading to the triple valve or UC valve bracket thoroughly cleaned before the valves are connected. It should be known that the air escapes freely past the brake pipe strainer or centrifugal dirt collector, and if it does not, they should be cleaned or renewed; in case of renewal, the old parts must be sent to the shop for repairs. In all cases, the union connecting the centrifugal dirt collector to the UC valve bracket or triple valve, must be disconnected before blowing out the centrifugal dirt collector.

60. Testing Brakes After Applying a Triple Valve or UC Valve—When a new or repaired triple or UC valve is applied, a test must be made to ascertain that the brakes will apply in both service and emergency applications and

release when operated in the proper manner. All necessary light repairs to the brake pipe, pipe hangers, angle cocks, and hose couplings must be made and the piston travel must be properly adjusted. (See Instruction No. 47).

61. Examination and Repairs to Break Apparatus—Examine carefully all parts of the air brake rigging, making repairs such as tightening of unions, applying cotters in brake lever pins, brake beams and connections, application of brake shoes, defective hose and couplings, including gaskets, burst or broken pipes, loose or missing pipe hangers, also adjusting angle cocks on wooden freight equipment cars so as to set at an angle of approximately 30 degrees, as shown on standard tracing (see Fig. 8). Nuts and bolts securing brake cylinder and auxiliary reservoir to car body must be tightened.

62. Adjustment of Brake Rigging—Brakes must be adjusted, being guided by clearance of brake shoes on the wheels and not neglecting the adjustment of bottom connections so as to put levers in proper relation to one another.

63. The Automatic Slack Adjuster—To let out or take up slack for the application of new shoes, or to alter the piston travel, turn the adjusting screw with a wrench. In adjusting the brakes, the adjusting screw should not be drawn up to its limit, as in this position no more slack

can be taken up. Should this occur, the bolt on the end of the adjuster body should be loosened, which will loosen the ratchet wheel, and allow the screw to be turned. The adjusting screw should be kept free from all lubricant, so as to avoid the collection of dirt. The adjustment of the foundation brake rigging should not be changed except to restore original conditions.

64. The Shim Slack Adjuster—To let out or take up slack for the application of new shoes, raise pin D (Fig. 9) and turn the box B half way around, making sure that all the shims have dropped into this portion of the box. Then adjust the slack adjuster rod on which is the box B to its shortest position. Turn the box through the remaining half circle so that the side of the box that was originally uppermost is again on top, when pin D should be replaced. The levers should then be adjusted by hand, starting the slack adjuster with the proper brake shoe clearance, after which it will adjust the piston travel automatically.

65. Inspection and Repairs of Hand Brake Connections—All parts and connections of the hand brake should be carefully examined and any necessary changes and repairs made.

66. Water Raising System on Passenger Cars—The general arrangement of this system is shown in Fig. 11. To fill the water tank W move handle H to a vertical position and close

drain valve D by moving its handle to a horizontal position. Then fill the tank W by admitting water through inlet A, until the water flows from inlet A, when the tank will be full. (When handle H is in a vertical position the air is automatically cut off from the system by the five way cock V). As soon as the tank W is filled, handle H must be moved to a horizontal position and secured there, and drain valve D must be opened by moving its handle to a vertical position.

To ascertain if the tank W is sufficiently full, proceed as follows:

Move handle H to a vertical position. If the ensuing exhaust of air is short, the tank is sufficiently full; but if long, the tank should be filled as above.

To drain the system, **all** the drain cocks **in** the car should be opened and left open, and handle H should be placed in a vertical position and left there, drain valve D opened and the hoppers flushed.

The **air** may be cut out of the system by closing cut out cock C.

The system may be cut out of the car by closing stop cock S, but this should only be done when absolutely necessary.

Trainmen and inspectors should make sure that the system is **drained** whenever conditions are such that the water is **liable to freeze.**

Thus, if, at the lay over point—unless the lay over is unusually short—there is no equipment to keep the car heated, the system should be drained as above.

67. Carburetor System of Lighting Cars— A number of passenger equipment cars are equipped with the carburetor system of lighting, controlled by compressed air fed from the auxiliary reservoir. For description of this system see standard book, entitled, "Directions for Using Carburetor System of Lighting Cars, With a General Description of the System."

LOCOMOTIVES

68. Inspection—Enginehouse Foreman and inspectors must see that all parts of the air brake and train air signal apparatus on locomotives and tenders are properly inspected and tested after each trip.

69. Main Reservoirs, Draining of — All main reservoirs must be drained after each trip.

70. Pressures, Testing of—When testing pressures in brake pipe, signal pipe, main reservoir, and for testing locomotive gauges, the special apparatus shown on standard tracing must be used.

This device must be tested with a Master Gauge at least once a week, and if the gauge on the test device varies 3 pounds or more from the Master Gauge, it must be removed and given the proper attention.

71. Air Gauges—These gauges must be tested once every three months on a gauge testing apparatus, and properly stenciled, showing date and shop abbreviation. If a locomotive air gauge varies five or more pounds from the test gauge (see Instruction No. 70) it must be removed and given the proper attention.

72. Pressures—The main reservoir and brake pipe pressures are as shown in Instruction No. 2. The independent brake valve feed valve, and the train air signal reducing or feed valve, should be set at 45 pounds. If the pressure varies three or more pounds from the above figures, it must be adjusted.

73. Brake Valve—The handles of the automatic, independent and straight air brake valves must operate freely in all positions.

74. Pneumatic Sanders and Bell Ringers for Locomotives—Pneumatic sanders and bell ringers are standard for certain locomotives. These devices are controlled by compressed air, fed from the main reservoir, the details of which are shown on standard tracings.

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CUTS

RESERVOIRS FOR U. C. PASSENGER CAR BRAKE EQUIPMENT

AUXILIARY RESERVOIRS		Cylinders Standard with Auxiliary, Service and Emergency Reservoirs. One Cylinder Fundamental with U. C. Equipment	SERVICE RESERVOIRS		LARGE EMERGENCY RESERVOIRS		SMALL EMERGENCY RESERVOIRS	
Size, Inches	Cap. Cu. In.		Size, Inches	Cap. Cu. In.	Size, Inches	Cap. Cu. In.	Size, Inches	Cap. Cu. In.
10 x 33	2125	14" x 12"	12" x 33"	3088	22½"x36"	12099	10 x 24	1588
10 x 33	2125	16" x 12"	14" x 33"	4476	20½"x54"	15930	10 x 33	2125
10 x 33	2125	18" x 12"	16" x 33"	5724	22½"x54"	18942	12 x 33	3088

TABLE SHOWING STYLE OF TRIPLE VALVE AND SIZE OF AUXILIARY RESERVOIR RECOMMENDED FOR USE WITH SUNDRY BRAKE EQUIPMENT

Equipment	Class of Service		Cylinder Dimension	Triple Valve	Auxiliary Reservoir	Capacity Cu. Inches
Cars	Passenger Cars	Without Supplementary Reservoir	8 in. x 12 in.	P 1 or L 1	10 in. x 24 in.	1588
			10 in. x 12 in.	P 1 or L 1	12 in. x 27 in.	2450
			12 in. x 12 in.	P 2 or L 2	12 in. x 33 in.	3088
			14 in. x 12 in.	P 2 or L 2	14 in. x 33 in.	4476
			16 in. x 12 in.	P 2 or L 3	16 in. x 33 in.	5724
			18 in. x 12 in.	L3	16 in. x 42 in.	7436
		When equipped with Supplementary Reservoir L Type Triple Valve must be used.				
Cars	Freight Cars	Detached Equipment	8 in. x 12 in.	H 1 or K 1	{Std. Cast. Iron Res.}	1620
			10 in. x 12 in.	H 2 or K 2		2440
		Combined Equipment	8 in. x 12 in.	H 1 or K 1	{Std. Cast. Iron Res.}	1620
			10 in. x 12 in.	H 2 or K 2		2440

TABLE SHOWING STYLE OF TRIPLE VALVES AND SIZE OF AUXILIARY RESERVOIRS RECOMMENDED FOR USE WITH SUNDRY BRAKE EQUIPMENTS

Equipment	Class of Service	Cylinder Dimensions	Triple Valve	Auxiliary Reservoir	Capacity Cu. In.
Driver Brake.....	All locomotives with or without high-speed attachments.	8 in.	F 1	10 in. x 33 in.	2125
		10 in.	F 1	12 in. x 33 in.	3088
		12 in.	F 2	14 in. x 33 in.	4476
		14 in.	F 2	16 in. x 33 in.	5724
		16 in.	F 2	16 in. x 42 in.	7436
		18 in.	F 2	16 in. x 48 in.	8577
Truck Brake.....	All Locomotives.	6 in.		10 in. x 14½ in.	890
		8 in.	Driver Brake	10 in. x 20 in.	1221
		10 in.	Triple	10 in. x 28 in.	1809
		12 in.		12 in. x 27 in.	2450
Tenders.....	Old Standard Equipment Passenger or Freight with Quick Action Triple Valve.	8 in. x 12 in.		10 in. x 24 in.	1588
		10 in. x 12 in.	H 1	12 in. x 27 in.	2450
		12 in. x 12 in.	P 1	12 in. x 33 in.	3088
		14 in. x 12 in.	P 2	14 in. x 33 in.	4476
		16 in. x 12 in.	P 2	16 in. x 33 in.	5724
	Old Standard Equipment Freight with Plain Triple Valve.	8 in. x 12 in.	P 2	10 in. x 24 in.	1588
		10 in. x 12 in.	F 1	12 in. x 27 in.	2450
		12 in. x 12 in.	F 1	12 in. x 33 in.	3088
		14 in. x 12 in.	F 2	14 in. x 33 in.	4476
		16 in. x 12 in.	F 2	16 in. x 33 in.	5724
	E. T. Equipment, All Classes.	8 in. x 12 in.	F 2	None	
		10 in. x 12 in.		Air Supply	
		12 in. x 12 in.	None	Taken from	
		14 in. x 12 in.		Main Res'voir	
		16 in. x 12 in.			

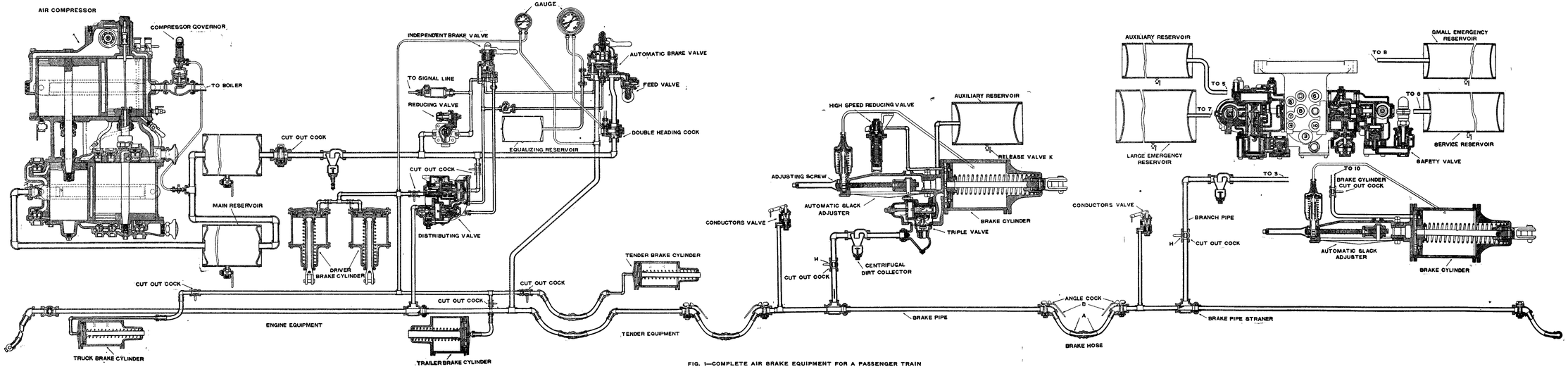

FIG. 1—COMPLETE AIR BRAKE EQUIPMENT FOR A PASSENGER TRAIN

FIGURE 1

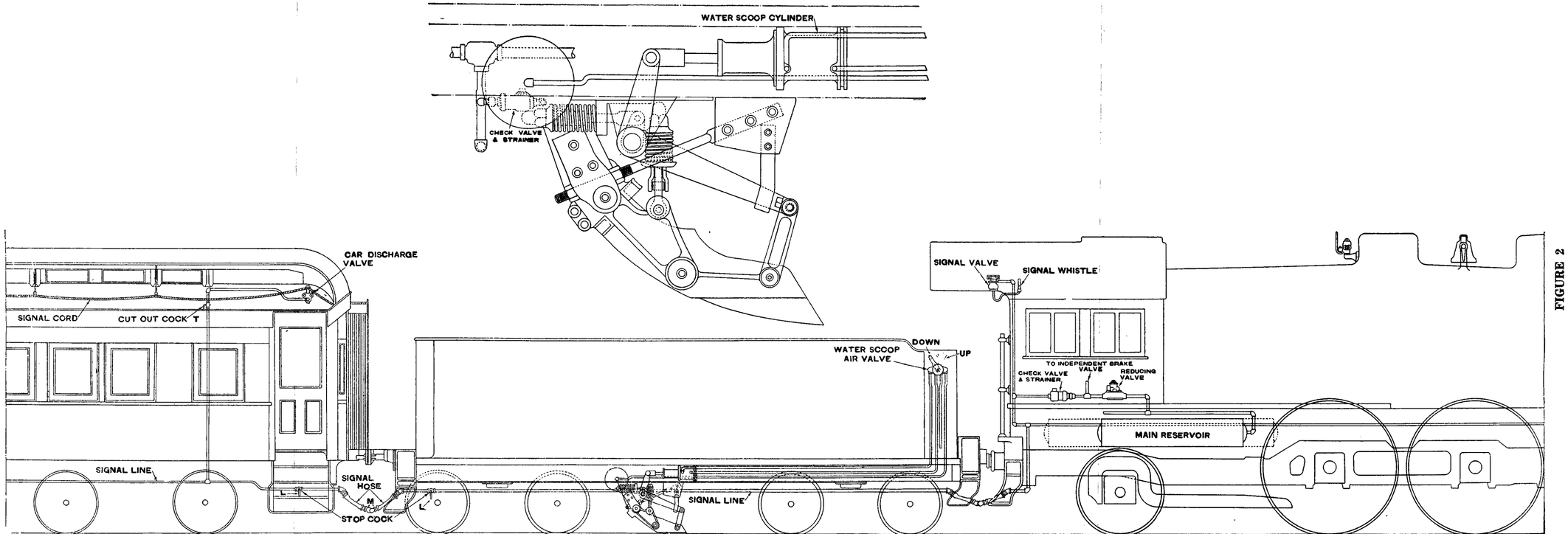

FIG. 2—COMPLETE AIR SIGNAL AND WATER SCOOP EQUIPMENT

FIGURE 2

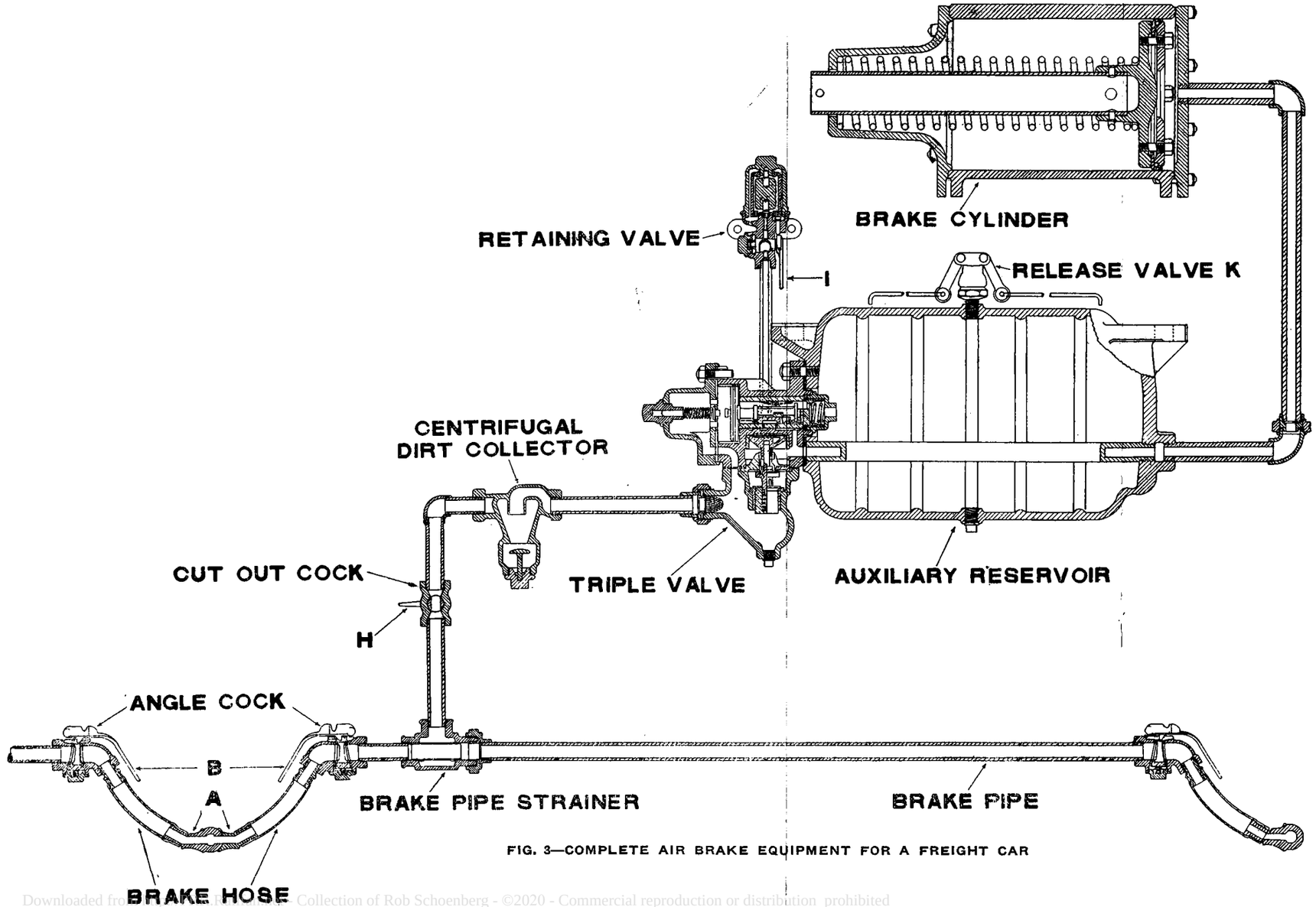

FIG. 3—COMPLETE AIR BRAKE EQUIPMENT FOR A FREIGHT CAR

FIGURE 3

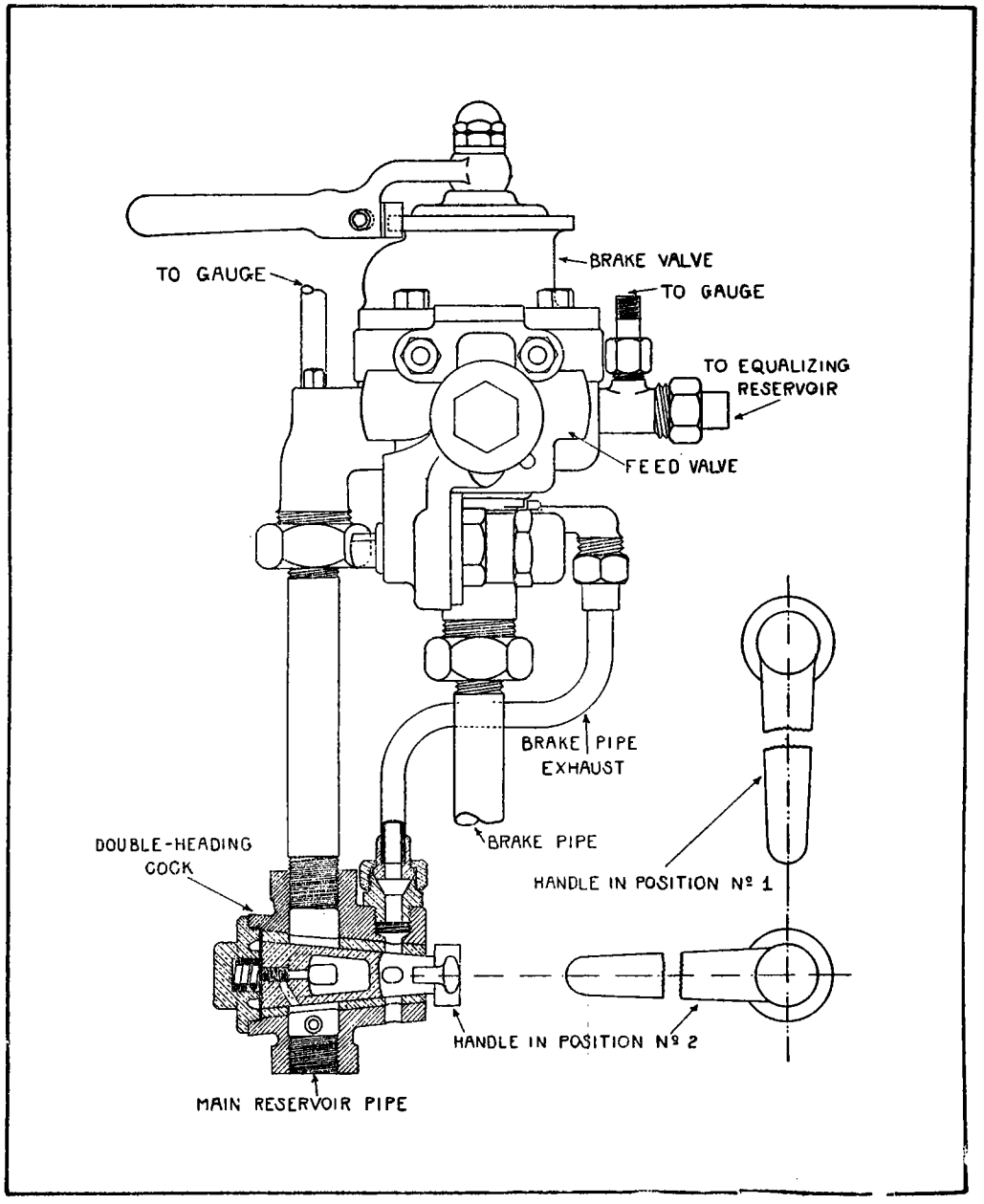

FIG. 4—DOUBLE HEADING COCK

FIGURE 4

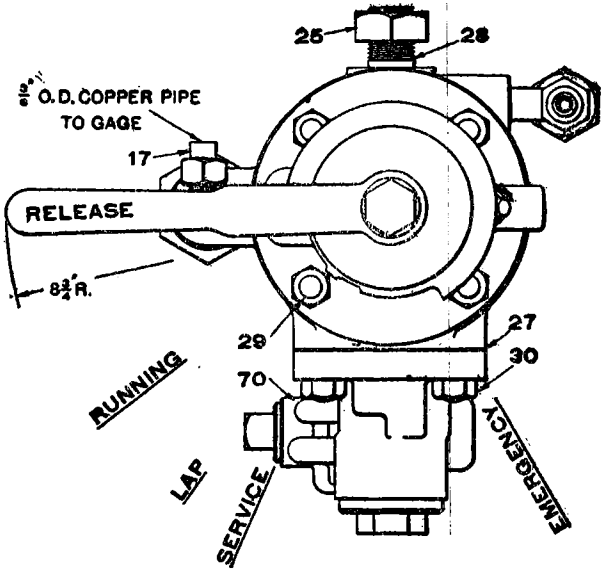

FIG. 5—G-6 BRAKE VALVE

FIGURE 5.

FIG. 6—STRAIGHT AIR BRAKE VALVE

FIGURE 6

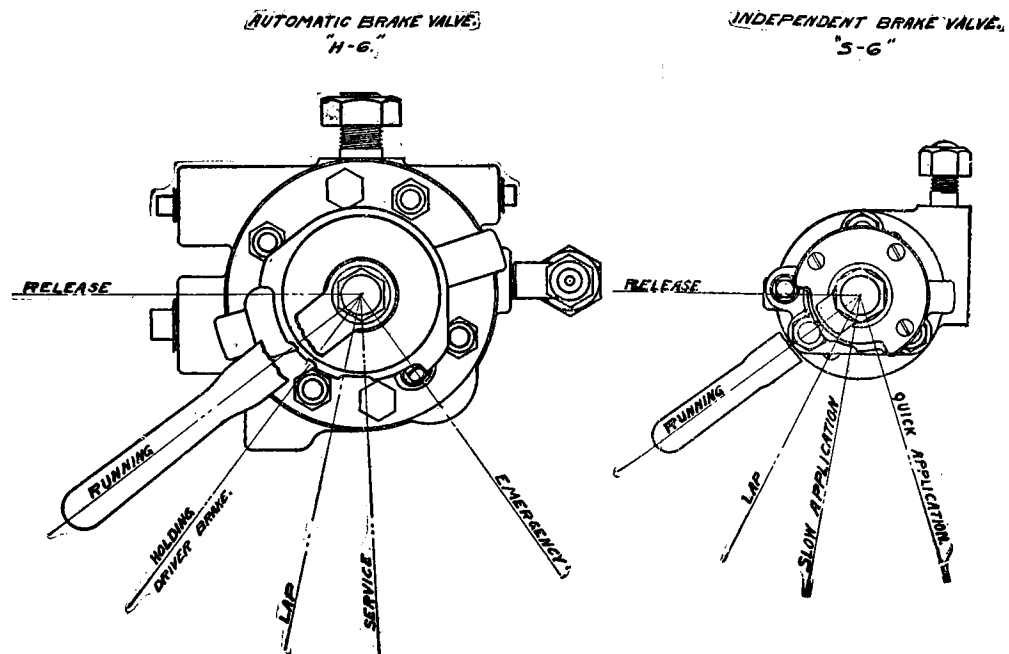

FIG. 7—H-6 AND S-6 BRAKE VALVES

FIGURE 7

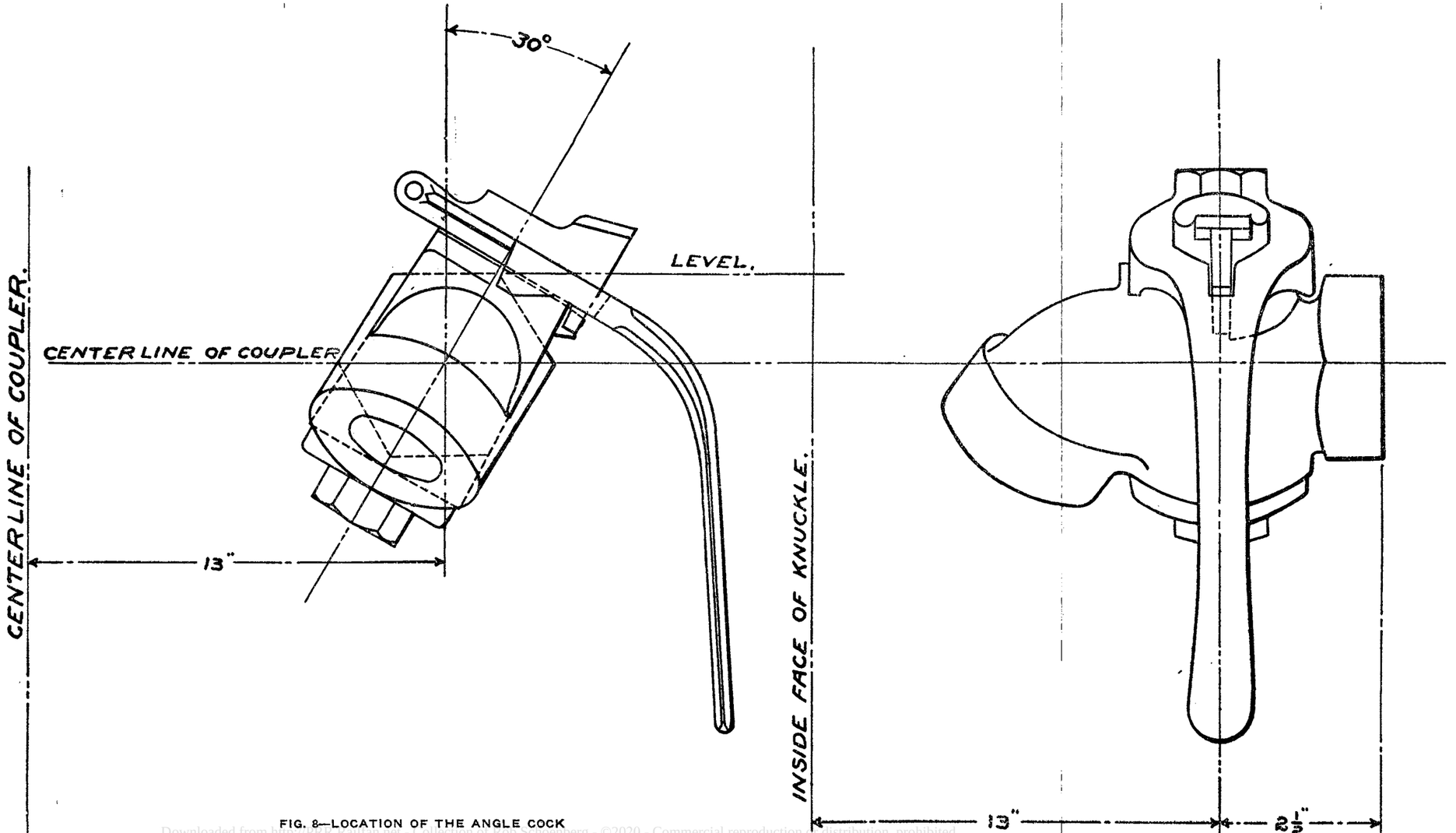

FIG. 8—LOCATION OF THE ANGLE COCK

FIGURE 8

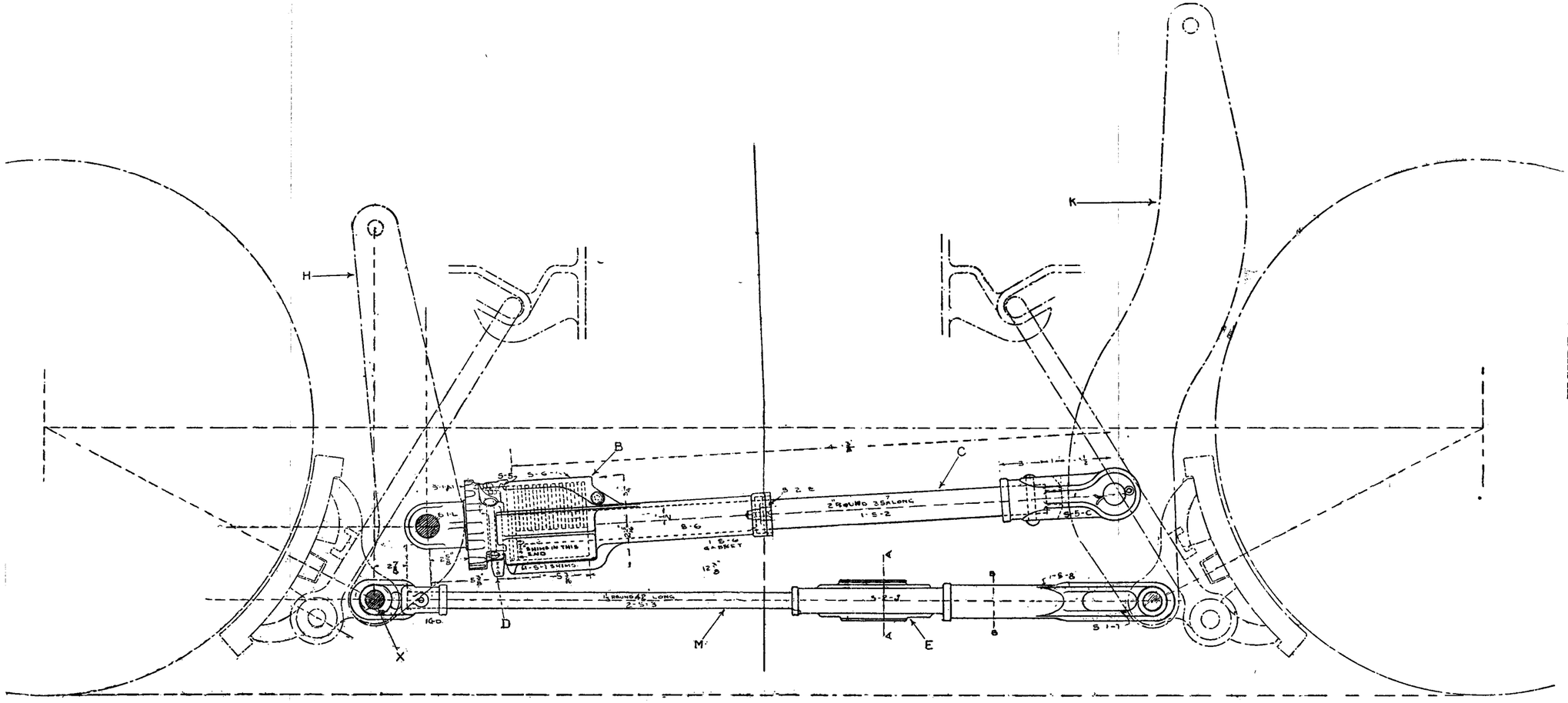

FIG. 9—THE SHIM SLACK ADJUSTER

FIGURE 9

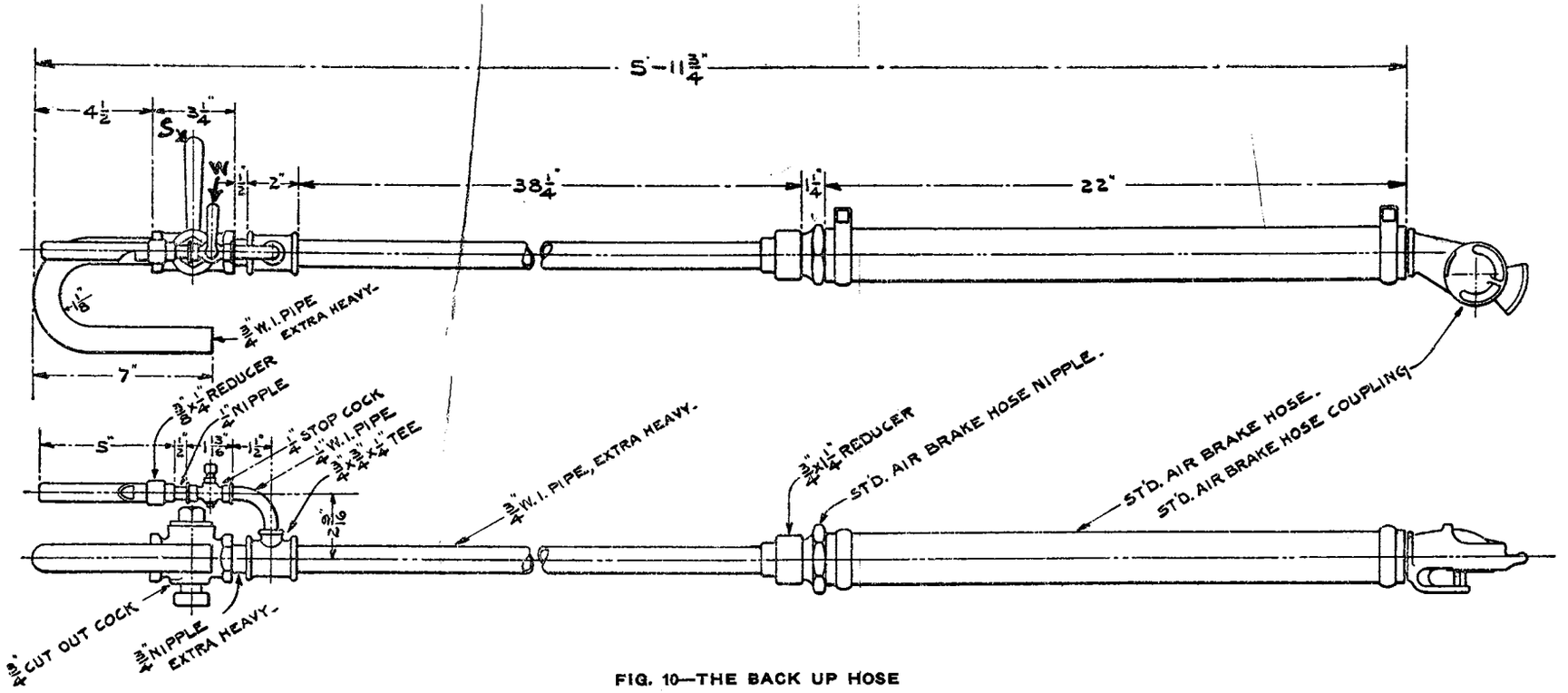

FIG. 10—THE BACK UP HOSE

FIGURE 10

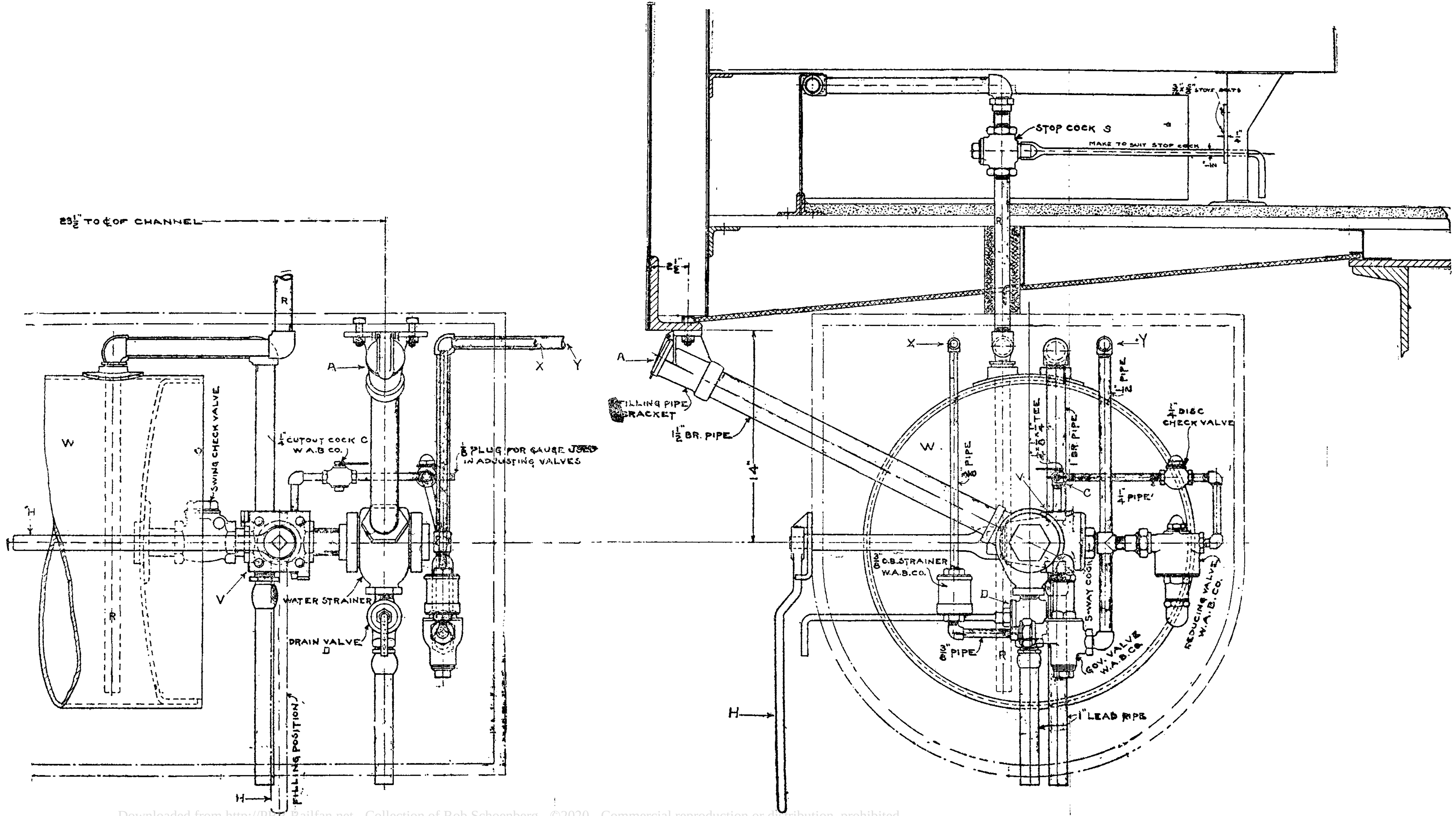

FIG. 11—THE PNEUMATIC WATER RAISING SYSTEM

FIGURE 11

DEFECTS

A—Brake pipe
B—Brake will not apply
C—Brake will not release
D—Triple leaks at exhaust
E—Undesirable quick action in service
F—Crossover pipe
G—Brake cylinder
H—Brake leaks off
J—Train pipe clamps
K—Brake rigging
L—Angle cock
M—Retainer valve pipe
N—Release valve

NOTE:—To designate the defect draw a line through description.

If car can be placed between air brake cars, tie this card near triple valve, where it can be readily seen.

If car must not be placed between air brake cars, tie a card to the brake pipe near the angle cock at each end of car.

Forward this card to Supt. Motive Power as soon as brakes have been repaired.

FIG. 12—DEFECTIVE AIR BRAKE CARD

FIGURE 12